

isrAcademy

international
scientific
research
academy

2nd
INTERNATIONAL
SCIENTIFIC
RESEARCH
CONGRESS

February 22-23, 2025
Istanbul

CONGRESS BOOK

isrAcademy
Publishing
isbn: 978-625-95570-2-1



isrAcademy

international
scientific
research
academy

2nd

INTERNATIONAL

SCIENTIFIC

RESEARCH

CONGRESS

February 22-23, 2025

Istanbul

CONGRESS BOOK

isrAcademy

Publishing

isbn: 978-625-95570-2-1



978-625-95570-2-1

international scientific research academy

isrAcademy

International Scientific Research

Congress, Congress Book

isbn: 978-625-95570-2-1

Publisher: isrAcademy Publishing

Istanbul

February 2025



www.isracademy.org

SCIENTIFIC COMMITTEE

Prof. Dr. J. Mark HALSTEAD
(Oxford Centre for Islamic Studies, United Kingdom)

Prof. Dr. Mehmet ÖZDEMİR
(Amasya Üniversitesi, Turkey)

Prof. Dr. Stefan BALINT
(Emeritus, Romania)

Prof. Dr. Hikmat ASADOV
(National Aerospace Agency, Azerbaijan Republic)

Prof. Dr. Aliye ÇINAR
(Karamanoğlu Mehmet Bey University, Turkey)

Prof. Dr. Sayyed Ali MIRENAYAT
(Universiti Putra Malaysia, Malaysia)

Prof. Dr. Dhurata SHEHRI
(University of Tirana, Albania)

Prof. Dr. Mina SADIQUI
(Université Moulay Ismail Meknès, Morocco)

Prof. Dr. Akhtar ALAM
(Jawaharlal Nehru University, India)

Prof. Dr. Özlem ALTUNÖZ
(Hacı Bayram Veli University, Turkey)

Prof. Dr. Hae Won JEONG
(Abu Dhabi University, BEA)

Prof. Dr. Selçuk BALI
(Selçuk University, Turkey)

Prof. Dr. Ibrahim Mohamed ZAIN
(Hamad Bin Khalifa University, Qatar)

Prof. Dr. Jacob Kehinde AYANTAYO
(University of Ibadan, Nigeria)

Prof. Dr. K. P. JAYASANKAR
(Tata Institute of Social Sciences, India)

Prof. Dr. Renzhong CUI
(Minzu University of China, China)

Prof. Dr. Rizwanur RAHMAN
(Jawaharlal Nehru University, India)

Prof. Dr. S. M. Masum Baki BILLAH
(University of Dhaka, Bangladesh)

Prof. Dr. Samson FATOKUN
(University of Ibadan, Nigeria)

Prof. Dr. Shih-chung HSIEH
(Harvard University, USA)

Prof. Dr. Norhasni Zainal ABIDDIN
(Universiti Putra Malaysia, Malaysia)

Prof. Dr. Wissal BENHASSINE
(University of Batna 2, Algeria)

Prof. Dr. Djanette BLIZAK MERIEM
(University of Boumerdes, Algeria)

Assoc. Prof. Dr. M. Arif KAMAL
(Aligarh Muslim University, India)

Assoc. Prof. Dr. Ahmet DAGLI
(Ondokuz Mayıs University, Turkey)

Assoc. Prof. Dr. Soraya ABTOUCHE
(University of Sciences and Technology, Algeria)

Assoc. Prof. Dr. Imad Ibraheem KH. MOSTAFA
(Al Ain University, BEA)

Assoc. Prof. Dr. Jostina DHIMITRI
(University of Tirana (Albania))

Assoc. Prof. Dr. Elham Taha HUSSEIN
(Al Ain University, BEA)

Assoc. Prof. Dr. M. Remy Rozainy MOHD ARIF ZAINOL
(Universiti Sains, Malaysia)

Assoc. Prof. Dr. Hasan Mansur DURGUN
(Dicle University, Turkey)

Assoc. Prof. Dr. Ülhak ÇİMEN
(Atatürk University, Turkey)

Assoc. Prof. Dr. Muhammet KUZUBAS
(Kocaeli University, Turkey)

Assoc. Prof. Dr. Safinur ÇELİK
(Atatürk University, Turkey)

Assoc. Prof. Dr. Salih DEMİRBİLEK
(Ondokuz Mayıs University, Turkey)

Assoc. Prof. Dr. Erenestina Gjergji HALILI
(University of Tirana, Albania)

Assoc. Prof. Dr. Muhammad Noor HOSSAIN
(University of Chittagong, Bangladesh)

Assoc. Prof. Dr. Hammadi ELFARISSI
(Abdelmalek Essaâdi University, Morocco)

Assoc. Prof. Dr. Revathy SANKARAN
(UCSI University, Bangladesh)

Assoc. Prof. Lekë PEPKOLAJ
(University Metropolitan Tirana, Albania)

Asst. Prof. Dr. Alberto REGAGLIOLO
(UKSW University, Poland)

Asst. Prof. Dr. Atina Shofawati
(Universitas Airlangga, Indonesia)

Asst. Prof. Dr. Irfan Moeen KHAN
(Lahore University, Pakistan)

Asst. Prof. Dr. Revathy SANKARA
(UCSI University, Malaysia)

Asst. Prof. Dr. Abdulwahed Jalal NORI
(International Islamic University, Malaysia)

Asst. Prof. Dr. Saadia LHARTI
(University of Rabat, Morocco)

Asst. Prof. Dr. Nardjesse BENSEKHRIA
(M. Benboualid University, Algeria)

Asst. Prof. Dr. Fereydoun NOBAKHT-ERSI
(Urmia University, Iran)

Asst. Prof. Dr. Krzysztof DROZDZOL
(Opole University of Technology, Poland)

Asst. Prof. Dr. Wissam BOUHIDEL
(University of Batna 2, Algeria)

Dr. Mohd Amirul-MAHAMUD
(Universiti Sains Malaysia)

Dr. Hazim Abdul Rahman ALHITI
(Higher Health Institute-Al Anbar, Iraq)

Dr. Ernest KOVAC
(Comenius University, Slovakia)

Dr. Wafa BOULAGOUAS
(University of Batna, Algeria)

Congress Secretariat

Res. Asst. Gurkan EYIGUN (Istanbul University)

Coordinator: Ummugulsum Kuzubas EYIGUN (Kocaeli University)

2nd International Scientific Research Congress
February 22-23, 2025

CONTENTS

Social and Humanities

Small Nations and Great Empires: How Central Europe Maintains its Identity
Kristýna ZÁKOSTELNOVÁ - Jan BOLEHOVSKÝ
3-14

Bilingualism and Ethnic Greek Minority in Albania
Zamira BOBOLI - Aleksander BOBOLI - Dr. Blerta KORRE
15-19

Teaching English through Questioning: Socratic Strategies for Teaching English to VYEL and YEL
Assoc. Prof. Dr. Joana TAÇI - Lect. Zamira BOBOLI
20-25

Comparative System on the Arbitration Procedure in the American and European Systems
Iacob Andra BIANCA
26-38

The Relationship between European Union and Ukraine during the Russian-Ukraine Conflict
Iacob Andra BIANCA
39-48

The Noun Phrase in Dosoftei's Writings. The Modifier
Mihai-Andrei LAZĂR
49-57

Validity and Transformation of the Autonomous-Relational Self Model on Today's Young People in Türkiye
Lect. Ezgi LİF
58-65

The Use of Blood in Hittite Rituals
Dr. Hilal KUTLU ALANCI
66-69

Tradition and Modernity in the Novel Agonia
Dr. Mirela SARAÇI
70-73

Social and Moral Crises of a Society in Transition
Msc. Laureta KONOMI
74-78

Imam Al-Ghazali's Communal Consumptive Ethics And Its Significance to a Contemporary and Sustainable Society
Dr. Mohammed Muneer'deen Olodo Al-Shafi'I - Assoc. Prof. Dr. Mohd Safri Ali - Dr. Engku Ibrahim Engku Wok Zin - Dr. Moustafa Hassan Mohamed El Khaiat - Assoc. Prof. Dr. Amilah Bt. Awang Abd. Rahman Jusoh
79-79

Imam Al-Ghazali's Scholastic Ethics and Its Significance to Solving the Contemporary Un-Ethical Dealings
Dr. Mohammed Muneer'deen Olodo Al-Shafi'I - Assoc. Prof. Dr. Mohd Safri Ali - Dr. Engku Ibrahim Engku Wok Zin - Dr. Moustafa Hassan Mohamed El Khaiat - Assoc. Prof. Dr. Amilah Bt. Awang Abd. Rahman Jusoh
80-80

Molla Fenârî: A Journey from the Ibn Arabî School to Ottoman Thought
Res. Asst. Raziye SAYAR
81-87

The Application of Eye-Tracking in the Evaluation of Functional Visual Perception in Preschool Children
Agnieszka ZALEWSKA-MELER - Małgorzata OBRYCKA
88-105

Reality Communication Model
Ivana FERKOVIC PASIC
106-111

Reading Cultures in Transition: From 19th-Century Ionian Societies to Modern Reading Clubs
Lect. Dr. Yanna DIMITRIOU
112-120

Recent Developments in Greece Business Administration: A Bibliometric Review
Dr. Zacharias PAPANIKOLAOU - Apostolos GOULAS
121-121

Women and Business Management: A Bibliometric Review
Dr. Zacharias PAPANIKOLAOU - Apostolos GOULAS
122-122

Navigating Regulatory Challenges and Opportunities in FoodTech Startups: Fostering Innovation in a Complex Ecosystem
Ulviyya MAMMADOVA
123-132

Sustainability and Responsibility as Aspects in European Tourism Policy Framework and the Potential for Tourism Sector in Greece
Evangelos TALIOURIS - Assoc. Prof. Dr. Nikolaos TRIHAS
133-133

Crisis Management and Financial Strategies: Revitalizing Tourism Amid Recession
Lect. Ioannis VALACHIS - Assoc. Prof. Dr. Nikolaos TRIHAS
134-134

Investigation of Mathematical Modeling Ability of 7th Grade Students in MEB-BILSEM Schools
Onur Ensar TURHAN - Prof. Dr. Ali ERASLAN
135-135

The Use of Bibliometric Analysis Methods in the Fields of Theatre and Cinema
Asst. Prof. Dr. Orkun ÖNGEN
136-141

Investigation of Mathematical Modelling Abilities of Middle School First Grade BILSEM Students
Mualla DEMİRCİ - Prof. Dr. Ali ERASLAN
142-142

Artificial Intelligence in Scientific Writing: Ethical Challenges and Regulatory Perspective
Dr. Naima MESSAOUDI
143-151

A Comparative Analysis of Word Formation Processes in English and Albanian languages. Morphological Strategies and Linguistic Evolution
Dr. Blerta KORRE - Zamira BOBOLI - Aleksander BOBOLI
152-156

The Phenomenon of the „Eugen Ionesco“ National Theatre in the Republic of Moldova
Vera MARIANCIC-COBZAC
157-161

Examination of Postgraduate Theses about Curriculum Fidelity and Factors Affecting Fidelity on Turkish Trainer
Vakkas AYGÜN
162-163

Public and Digital Diplomacy as Tools to Promote the Image of Romania
Lect. Ana-Maria ANDRONACHE
164-173

Strained Finances, Strained Marriages? Perceived Financial Hardship and Divorce Likelihood in Azerbaijani Families
Lect. Maryam ADILKHANOVA
174-174

Business Management in the New Digital Era
Apostolos GOULAS - Dr. Zacharias PAPANIKOLAOU
175-176

Examining the Reflections of Spatial Perception on Human Psychology and Emotional State through the Concepts of "Play-Fiction"
Tuğçe ÖZYÜZGEN
177-178

The Insurance Industry in Turkey and the Importance of Home Insurance
Merve Esra GÜLCEMAL - Prof. Dr. Ali Kemal ŞEHİRLİOĞLU
179-184

Persian Rule in Egypt from the Beginning until the Inaros Revolt (525-460 BC)
Yusuf Başbuğ ARMAĞAN
185-192

Effective Online English Teaching with Interactive Methods
Elona ZIREK - Zamira BOBOLI
193-199

Comparative Analysis of Performances in Western European And Eastern European Economies-Free Market Economies vs Command Economies
Assoc. Prof. Dr. Tahir MAHMUTEFENDIC
200-219

The Queen and the Mountain of Bandaman Maurice : A Dramatization of the Insignificance of the Contemporary Political World
Yaoua Bio ADJOU MANI - Dr. N'golo Aboudou SORO
220-220

Inspection of Cost Accounting and Pricing Adequacy of an Object
Assoc. Prof. Dr. Malkhaz SULASHVILI - Prof. Dr. Olga KHUTSISHVILI - Prof. Dr. Alexander SICHINAVA - Giorgi ZAALISHVILI - Mariami GOGOCHURI
221-225

**The Impact of Cooperative Learning in Developing English Language Skills Among
Primary School Students in a Romanian Private School**
Corina Georgiana BALABAN
226-226

**Greek Language Influence on the Albanian Language and Literature: A Historical and
Cultural Overview**
Aleksander BOBOLI - Elona ZIREK - Zamira BOBOLI
227-227

Balancing Digital and In-Person Communication in Social Service Provision
Edvarts PAVULENS
228-228

Science and Engineering

Mathematical Modelling and Structural Stability in Aerospace
Andreea V. COJOCARU - Prof. Dr. Stefan BALINT
230-238

The Importance of Operational Excellence within StartUps and Early Stage Companies
Momir POLENAKOVIKJ
239-239

**Preliminary Study on Development of Waffle Cones Formulated with Powder from
Rosehip Waste**
Alexandra Raluca BORŞA (BOGDAN) - Prof. Dr. Adriana PĂUCEAN - Lect. Andrei
BORŞA - Lect. Melinda FOGARASI - MSc Student Raluca Alexandra MATEI - Lect.
Maria Simona CHIŞ - Prof. Dr. Cristina Anamaria SEMENIUC
240-241

**Reassessment of conservation status and analysis of the distribution patterns of the genus
Verbascum L. (Scrophulariaceae) in Morocco**
Asst. Prof. Dr. Hamid KHAMAR - Prof. Dr. Amina Ouazzani TOUHAMI - Prof. Dr. Laure
CIVEYREL
242-243

Determination of the Angular Accuracy When Setting Out the Centers of Bridge Piers
Asst. Prof. Dr. Ani STEFANOVA
244-251

**Fabrication and Performance Improvement of ZnO NRs Based Photodetectors via
Localized Surface Plasmons Resonance Effects**
Somaye HOSEINGHOLI OGHLI - Asst. Prof. Dr. Pantea AURANG
252-259

**Future Challenges and Perspectives on the Integration of Artificial Intelligence in
Albanian Education**

Assoc. Prof. Dr. Lekë PEPKOLAJ - Arbër MALAJ
260-268

**Empowering Human-like Non-Player Character Interactions in Virtual Reality through
Large Language Models**

Haarinesh SELVARAJU - Asst. Prof. Dr. Noreen Izza Binti ARSHAD
269-269

Atmosphere, Weather, Climate Can They be Predicted? Why is This Important?
Dokleida HODAJ

270-272

Artificial Intelligence (AI) and Reading fMRI Exams - Study of the Scientific Method
**Prof. Dr. Mariana Nucci Penteado - Hernán Joel Cervantes Rodríguez - Renata Barbosa
Vicente - Cristina Lopomo Defendi - Kauã Machado dos Santos - Isabella Silva Cantos -
Prof. Dr. Maria Célia Lima-Hernandes**

273-284

Leveraging AI for a Smarter and Sustainable Urban Planning
**Asst. Prof. Dr. Alexandra ALEXANDROPOULOU - Asst. Prof. Dr. Andreas FOUSTERIS -
Maria KARVOUNIDI**

285-285

**Designing Of 264 Kw Solar Power System With Spotlight on tThe Weather Aand
Location: Case Study of N'djamena City, Chad**

Prof. Dr. Ziyodulla YUSUPOV - Abakar Mahamat HASSAN - Ulugbek AVLIYOROV
286-286

**Two-Level Architecture of Hybrid Control Systems with Behavioral Abstractions and AI
Supervisor**

**Assoc. Prof. Dr. Pavel UGAROV - Prof. Dr. Vladimir TELEZHKIN - Assoc. Prof. Dr.
Maksim DEVYATOV**

287-287

How to Create a Successful Technopark: Key Factors and Best Practices

Prof. Dr. Javanshir ZEYNALOV - Lect. Sariya GASIMOVA

288-298

Applications of Generalized Pell Sequences on Matrices

Bariş Can ÇAKIR

299-308

**An Advanced Method for Classifying Froth Flotation Images Utilizing Attention and
Reward Mechanisms to Address Visually Similar Classes**

**Khalid A. ABOUDA - Prof. Dr. Xu DEGANG - Wail M. IDRESS - Hager M. ELMAKI -
Aala A. AHMED - Waleed M. IDRESS**

309-309

2nd International Scientific Research Congress

February 22-23, 2025, Istanbul

&

isrAcademy

International Scientific Research Academy

Process of Isolation and Characterization of Lycopene from Grapefruit
Dr. Aida SMAJLAGIĆ - Assoc. Prof. Dr. Ermina ČILOVIĆ KOZAREVIĆ - Jasmina
SIOČIĆ - Asst. Prof. Dr. Merima IBIŠEVIĆ - Asst. Prof. Dr. Maida ŠLJIVIĆ -
HUSEINOVIĆ - Asst. Prof. Dr. Amra DŽAMBIĆ - Dr. Enida KARIĆ - Merima
SALKOVIĆ
310-310

Determination of Crocins in Saffron (*Crocus Sativus Linn., Iridaceae*)"
Assoc. Prof. Dr. Elena Anatolevna SOKOLOVA - Asst. Prof. Dr. Natalya Petrovna
STEPANOVA
311-311

**Extraction, Content of Total Polyphenols and Antioxidant Potential of Hibiscus (*Hibiscus
sabdariffa*) Using Different Solvents**
Asst. Prof. Dr. Edina HUSEINOVIĆ - Asst. Prof. Dr. Jasmina DEDIĆ - Emina
MEHMEDOVIĆ - Emir HOROZIĆ
312-322

**Analysis of Polyphenol Content and Antioxidant Capacity of Aqueous Extracts of
Commercial Sage (*Salvia officinalis L.*)**
Emir HOROZIĆ - Dr. Edina HUSEINOVIĆ - Dr. Jasmina DEDIĆ - Emina
MEHMEDOVIĆ - Dr. Mirela BRIGA
323-327

**Enhanced CT Imaging Using Super-Resolution Generative Adversarial Networks for
Improved Diagnostic Accuracy**
Wail M. IDRESS - Prof. Dr. Yuqian ZHAO - Khalid A. ABOUDA - Aala A. AHMED -
Osama Ziad SHAHIN - Dr. Eman Ali Elhussin AHMED - Wleed M. IDRESS
328-328

**Investigation of the Geometric Design of the Uhbp Fan Blade Profile of Advanced
Turbomachinery**
Fatima RAMAZANOVA
329-336

**Walrus Optimization Algorithm (WaOA)-based Load Frequency Control in Multi-area
Interconnected Power System**
Dr. Jahanzeab HUSSAIN - Dr. Akhtar SAMINA - Dr. Ali DANISH
337-337

**Analysis of DFIG-Based Wind Turbines with Superconducting Fault Current
Limiter Operation**
Prof. Dr. Ziyodulla YUSUPOV - Gabdoulbe Noel MBOURING
338-338

**Methylene Blue (MB) Loaded ZIF-8 Synthesis, Characterization and Investigation of
Photodynamic Therapy Activity on Breast Cancer**
Derya METE - Pınar ÖZTÜRK - Tuğçe AKBAŞ - Assoc. Prof. Dr. Muhammed ÜÇÜNCÜ -
Prof. Dr. Gülşah Şanlı MOHAMMED
339-339

2nd International Scientific Research Congress

February 22-23, 2025, Istanbul

&

isrAcademy

International Scientific Research Academy

**Using Digital "Control" Technologies to Improve the Performance of Oil and Gas
Extraction Facilities**
Rana Elkhan MAMMADOVA
340-346

Health Sciences

**Determination of Lipocalin 2 and Lipocalin 13 balance before and after Laparoscopic
Sleeve Gastrectomy**
Res. Asst. Fatma TEKSAR - Assoc. Prof. Dr. Kenan BİNNETOĞLU
347 - 356

An Overview of Tissue Adhesives and Biomimetic Adhesives
Tuğçe KARTAL - Assoc. Prof. Dr. M. Gökhan ŞENOCAK
357-368

A Comprehensive Overview of Hernias in Veterinary Surgery
Tuğçe KARTAL - Assoc. Prof. Dr. Sıtkıcan OKUR
369-376

**Exploring the Effect of Oral Exam Stress on Physiological Parameters in Students: Insights
from Smart Bracelet Monitoring - A Pilot Study**
**Ana DZONLIC - Asst. Prof. Dr. Silviye SEGULJA - Julijana PELIVAN - Assoc. Prof. Dr.
Bojan MILETIIC**
377-377

The Importance of Evaluating the Degree Satisfaction of Hospitalized Patients
Assoc. Prof. Dr. Frâncu VIOLETA
378-378

Anatomy of Speech
Asst. Prof. Dr. Ayşe ÖMERLİ
379-382

Is Bilateral Block Necessary in Spinal Anesthesia?
Asst. Prof. Dr. Mehtap BALCI
383-389

Explaining the Perceptions and Fear of Tooth Extraction: A Qualitative Study
**Prof. Dr. Ebrahim YARMOHAMADI - Prof. Dr. Vahid Molla BASHI - Asst. Prof. Dr.
Elahe EZATI**
390-390

Mass Spectrometry of Human Brain Gangliosides in Health and Disease
Mirela SARBU - Raluca ICA - Roxana BIRICIOIU - Prof. Dr. Liana DEHELEAN - Prof. Dr.
David E. CLEMMER - Prof. Dr. Alina D. ZAMFIR
391-392

Legal Responsibility of Professionals in the Filed of Pharmacovigilance
Asst. Prof. Dr. Sonia Bianca BLAJ
393-393

Microbiological Safety of Baby and Dietary Foods
Anđela BOJANIĆ - Prof. Dr. Mirjana ĐERMANOVIĆ
394-394

Patulin as A Potential Risk in Children's Food
Anđela BOJANIĆ - Prof. Dr. Mirjana ĐERMANOVIĆ
395-395

PIK3CA Mutation Analysis in Breast Cancer Patients by HRM-COLD-PCR
Dr. Saoussen DEBOUKI-JOUDI - Dr. Wala BEN KRIDIS - Asst. Prof. Dr. Fatma TRIFA -
Asst. Prof. Dr. Wajdi AYADI - Dr. Abdelmajid KHABIR - Prof. Dr. Tahia SELLAMI-
BOUDAWARA - Prof. Dr. Jamel DAOUD - Prof. Dr. Afef KHANFIR - Prof. Dr. Raja
MOKDAD-GARGOURI
396-397

**Integrative Management of Tibial Plateau Fracture and Medial Gonarthrosis with High
Tibial Open Wedge Osteotomy: A Comprehensive Case Study**
Valentin VEJSELI - Radmila Mila MIHAJLOVA ILIE - Edmond BRAVA
398-398

Determination of Some Trace Metal Levels in Cheese Samples by ICP-MS
Assoc. Prof. Dr. Sevda Pehlivanlar ÖNEN - Res. Asst. Eray BURTAÇGİRAY
399-399

Policysttic Ovary Syndrome - What do Women in Poland Know about It?"
Julia BYWALEC - Dr. Dorota NALEPA - Olga SMOLIŃSKA - Dr. Iwona MORAWIK -
Mariusz SUTRYK
400-400

**The Role of the Nurse in the Reduction of the Pre-operative Stress of the Patients
Qualify for the Surgery**
Monika GESEK - Assoc. Prof. Dr. Iwona MORAWIK
401-401

Radiotherapy-Induced Thyroid Dysfunction
Dr. Brunilda HAXHIU - Prof. Dr. Goran KONDOV - Fesal SELIMI - Dr. Doriana PALOJI -
Assoc. Prof. Dr. Ilir KURTISHI - Prof. Dr. Naser GJONBALAJ
402-402

isrAcademy

**international
scientific
research
academy**

2nd International Scientific Research Congress

February 22-23, 2025

Istanbul

(Online)

CONGRESS PROGRAM

PARTICIPATING COUNTRIES

Albania	Morocco
Algeria	Poland
Bosnia and Herzegovina	Republic of Macedonia
Brasil	Republic of Moldova
Bulgaria	Romania
China	Sudan
Côte d'Ivoire	Tunisia
Croatia	Türkiye
France	United States of America
Georgia	Uzbekistan
Greece	North Macedonia
Iran	Azerbaijan
Kosovo	Russia
Latvia	Czech Republic
Malaysia	Montenegro

IMPORTANT INFORMATION

- Congress sessions will be held **via Zoom**.
- A session link has been created for each session.
- **Connection links are located on the session page.**
- Make sure there are no problems with your computer's camera and microphone connections.
- The **Zoom application is free** and there is no need to create an account to use it. **You can connect by clicking on the session link.**
- **If Zoom is installed on your computer / tablet / phone, you can connect via the program.** If Zoom is not installed, you should continue from the page that opens when you click on the link.
- **Session halls will open 10 minutes before the session time.** To avoid any problems in session planning, the **participant must connect to the session at least 5 minutes before the presentation time.**
- Please pay attention to the session times to avoid disruption of the congress program.

SESSION TIMES:

- **Session times are according to Istanbul (Türkiye) time.** Due to time differences between countries, we kindly ask you to pay special attention to this issue. You can learn the difference between Istanbul time zone and the time zone used in your country via the internet.
- To avoid any problems in session planning, the **participant must connect to the session at least 5 minutes before the presentation time.**
- Moderator manages the presentation and scientific discussion (question-answer) part of the session.
- **Participation certificates will be sent to the moderators and all participants after the congress.**

Important Dates	
Congress Program	February 15, 2025
Abstract Book Publication	February 18, 2025
Congress Dates	February 22-23, 2025
Sending the Participation Certificates	February 25, 2025
Deadline for Full Text Submission	February 28, 2025
Publication of Congress Full Text Book	March 10, 2025

February 22, (Saturday)

10.00 - 12.00

SESSION - 1 HALL - 1

Moderator: Prof. Dr. Ali ERASLAN

AUTHORS	AFFILIATION	TITLE
Lect. Ezgi LİF	<i>Kilis 7 Aralık University, Türkiye</i>	Validity and Transformation of the Autonomous-Relational Self Model on Today's Young People in Türkiye
Dr. Hilal KUTLU ALANCI	<i>Kilis 7 Aralık University, Türkiye</i>	The Use of Blood in Hittite Rituals
Res. Asst. Raziye SAYAR	<i>Selcuk University, Türkiye</i>	Molla Fenârî: A Journey from the Ibn Arabî School to Ottoman Thought
Vakkas AYGÜN	<i>MEB, Besni İlçe Müdürlüğü, Türkiye</i>	Examination of Postgraduate Theses about Curriculum Fidelity and Factors Affecting Fidelity on Turkish Trainer
Mualla DEMİRCİ Prof. Dr. Ali ERASLAN	<i>Ondokuz Mayıs University, Türkiye</i>	Investigation of Mathematical Modelling Abilities of Middle School First Grade BİLSEM Students
Onur Ensar TURHAN, Prof. Dr. Ali ERASLAN	<i>Ondokuz Mayıs University, Türkiye</i>	Investigation of Mathematical Modeling Ability of 7th Grade Students in MEB-BİLSEM Schools

ZOOM LINK:

<https://us06web.zoom.us/j/88000700991?pwd=bj2hSll4PuLambAapK5AHdQ6wUbNGz.1>

(It will be active 10 minutes before the meeting time)

Health Sciences

February 22, (Saturday)

10.00 - 12.00

SESSION - 1 HALL - 2

Moderator: Assoc. Prof. Dr. Kenan BİNNETOĞLU

AUTHORS	AFFILIATION	TITLE
Asst. Prof. Dr. Ayşe ÖMERLİ	<i>Nuh Naci Yazgan University, Türkiye</i>	Anatomy of Speech
Asst. Prof. Dr. Mehtap BALCI	<i>Nuh Naci Yazgan University, Türkiye</i>	Is Bilateral Block Necessary in Spinal Anesthesia?
Res. Asst. Fatma TEKSAR, Assoc. Prof. Dr. Kenan BİNNETOĞLU	<i>Kafkas University, Türkiye</i>	Determination of Lipocalin 2 and Lipocalin 13 balance before and after Laparoscopic Sleeve Gastrectomy
Assoc. Prof. Dr. Sevda Pehlivanlar ÖNEN, Res. Asst. Eray BURTAÇGİRAY	<i>Hatay Mustafa Kemal University, Türkiye</i>	Determination of Some Trace Metal Levels in Cheese Samples by ICP-MS
Tuğçe KARTAL, Assoc. Prof. Dr. M. Gökhan ŞENOCAK	<i>Ataturk University, Türkiye</i>	An Overview of Tissue Adhesives and Biomimetic Adhesives
Tuğçe KARTAL, Assoc. Prof. Dr. Sitkican OKUR	<i>Ataturk University, Türkiye</i>	A Comprehensive Overview of Hernias in Veterinary Surgery

ZOOM LINK:

<https://us06web.zoom.us/j/87495038991?pwd=aymfOrXj64S9dybKu5tu1lneaMJOS3.1>

(It will be active 10 minutes before the meeting time)

February 22, (Saturday)

12.30 - 14.30

SESSION - 2 HALL - 1

Moderator: Asst. Prof. Dr. Orkun ÖNGEN

AUTHORS	AFFILIATION	TITLE
Tuğçe ÖZYÜZGEN	<i>Niğantaşı University, Türkiye</i>	Examining the Reflections of Spatial Perception on Human Psychology and Emotional State Through the Concepts of "Play-Fiction"
Merve Esra GÜLCEMAL, Prof. Dr. Ali Kemal ŞEHİRLİOĞLU	<i>Dokuz Eylül University, Türkiye</i>	The Insurance Industry in Turkey and the Importance of Home Insurance
Yusuf Başbuğ ARMAĞAN	<i>Ondokuz Mayıs University, Türkiye</i>	Persian Rule in Egypt from the Beginning until the Inaros Revolt (525-460 BC)
Lect. Maryam ADILKHANOVA	<i>Azerbaijan State Economic University (UNEC), Azerbaijan</i>	Strained Finances, Strained Marriages? Perceived Financial Hardship and Divorce Likelihood in Azerbaijani Families
Ulviyya MAMMADOVA	<i>Azerbaijan Technological University, Azerbaijan</i>	Navigating Regulatory Challenges and Opportunities in FoodTech Startups: Fostering Innovation in a Complex Ecosystem
Asst. Prof. Dr. Orkun ÖNGEN	<i>Ordu University, Türkiye</i>	The Use of Bibliometric Analysis Methods in the Fields of Theatre and Cinema

ZOOM LINK:

<https://us06web.zoom.us/j/88594504881?pwd=TQy0vdGqeO4JxUPQG0Xd2zLAhXqlmj.1>

(It will be active 10 minutes before the meeting time)

February 22, (Saturday)

12.30 - 14.30

SESSION - 2 HALL - 2

Moderator: Prof. Dr. Stefan BALINT

AUTHORS	AFFILIATION	TITLE
Andreea V. COJOCARU, Prof. Dr. Stefan BALINT	<i>West University of Timisoara, Romania</i>	Mathematical Modelling and Structural Stability in Aerospace
Assoc. Prof. Dr. Lekë PEPKOLAJ, Arbër MALAJ	<i>Metropolitan University of Tirana, Albania; Polytechnic University of Tirana, Albania;</i>	Future Challenges and Perspectives on the Integration of Artificial Intelligence in Albanian Education
Dokleida HODAJ	<i>University Ismail Qemali, Albania; University of Montenegro, Montenegro</i>	Atmosphere, Weather, Climate can They be Predicted? Why is This Important?"
Asst. Prof. Dr. Alexandra ALEXANDROPOULOU, Asst. Prof. Dr. Andreas FOUSTERIS, Maria KARVOUNIDI	<i>University of Piraeus, Greece</i>	Leveraging AI for a Smarter and Sustainable Urban Planning
Dr. Aida SMAJLAGIĆ, Assoc. Prof. Dr. Ermina Čilović KOZAREVIĆ, Jasmina ŠIOČIĆ, Asst. Prof. Dr. Merima IBIŠEVIĆ, Asst. Prof. Dr. Maida Šljivić HUŠEINOVIĆ, Asst. Prof. Dr. Amra DŽAMBIĆ, Dr. Enida KARIĆ, Merima SALKOVIĆ,	<i>University of Tuzla, Bosnia and Herzegovina</i>	Process of Isolation and Characterization of Lycopene from Grapefruit

ZOOM LINK:

<https://us06web.zoom.us/j/83885346044?pwd=bBuPml3Ab0sM3xlCrcVPnl6JgAzK6q.1>

(It will be active 10 minutes before the meeting time)

February 22, (Saturday)

15.00 - 17.00

SESSION - 3 HALL - 1

Moderator: Prof. Dr. Joana TAÇI

AUTHORS	AFFILIATION	TITLE
Kristýna ZÁKOSTELNOVÁ, Jan BOLEHOVSKÝ	<i>University of Hradec Králové, Czech Republic</i>	Small Nations and Great Empires: How Central Europe maintains its Identity
Prof. Dr. Joana TAÇI, Lect. Zamira BOBOLI	<i>"Eqrem Çabej" University, Gjirokaster, Albania</i>	Teaching English through questioning: Socratic Strategies for teaching English to VYEL and YEL
Iacob Andra BIANCA	<i>University Lucian Blaga of Sibiu, Romania</i>	Comparative System on the Arbitration Procedure in the American and European Systems
Iacob Andra BIANCA	<i>University Lucian Blaga of Sibiu, Romania</i>	The Relationship Between European Union And Ukraine during the Russian- Ukraine Conflict
Edvarts PAVULENS	<i>Rīga Stradiņš University, Latvia</i>	Balancing Digital and In-Person Communication in Social Service Provision
Mihai-Andrei LAZĂR	<i>Babeş-Bolyai University of Cluj-Napoca, Romania</i>	The Noun Phrase in Dosoftei's Writings. The Modifier

ZOOM LINK:

<https://us06web.zoom.us/j/84288354762?pwd=YsVGabb1yUWCs6SbaeklTyAloeZ2Eb.1>

(It will be active 10 minutes before the meeting time)

February 22, (Saturday)

15.00–17.00

SESSION - 3 HALL - 2

Moderator: Prof. Dr. Javanshir ZEYNALOV

AUTHORS	AFFILIATION	TITLE
<p>Assoc. Prof. Dr. Pavel UGAROV, Prof. Dr. Vladimir TELEZHKIN, Assoc. Prof. Dr. Maksim DEVYATOV</p>	<p><i>South Ural State University, Russia</i></p>	<p>Two-Level Architecture of Hybrid Control Systems with Behavioral Abstractions and AI Supervisor</p>
<p>Assoc. Prof. Dr. Elena Anatolevna SOKOLOVA, Asst. Prof. Dr. Natalya Petrovna STEPANOVA,</p>	<p><i>North-Western State Medical University named after I.I. Mechnikov (NWSMU), Russia</i></p>	<p>Determination of crocins in saffron (<i>Crocus sativus</i> Linn., Iridaceae)</p>
<p>Fatima RAMAZANOVA</p>	<p><i>National Aviation Academy, Azerbaijan</i></p>	<p>Investigation of the Geometric Design of the UHBP Fan Blade Profile of Advanced Turbomachinery</p>
<p>Mammadova Rana ELKHAN</p>	<p><i>Azerbaijan State Oil and Industry University, Azerbaijan</i></p>	<p>Using Digital "Control" Technologies to Improve the Performance of Oil and Gas Extraction Facilities</p>
<p>Prof. Dr. Javanshir ZEYNALOV, Lect. Sariya GASIMOVA</p>	<p><i>Nakhchivan State University, Azerbaijan</i></p>	<p>How to Create a Successful Technopark: Key Factors and Best Practices</p>

ZOOM LINK:

<https://us06web.zoom.us/j/83577210263?pwd=0zj8PMPFWRwE5fqntBMQwGtNrJC1mi.1>

(It will be active 10 minutes before the meeting time)

February 22, (Saturday)

17.30-19.30

SESSION - 4 HALL - 1

Moderator: Assoc. Prof. Dr. Agnieszka ZALEWSKA-MELER

AUTHORS	AFFILIATION	TITLE
Laureta KONOMI	<i>"Eqrem Çabej" University, Gjirokaster, Albania</i>	Social and Moral Crises of a Society in Transition
Assoc. Prof. Dr. Agnieszka ZALEWSKA-MELER, Asst. Prof. Dr. Małgorzata OBRYCKA	<i>Pomeranian University in Slupsk, Poland; University of Gdańsk, Poland</i>	The Application of Eye-Tracking in the Evaluation of Functional Visual Perception in Preschool Children
Ivana Ferkovic PASIC	<i>University od Tuzla, Bosnia and Herzegovina</i>	Reality Communication Model
Dr. Yanna DIMITRIOU	<i>Ionian University, Greece</i>	Reading Cultures in Transition: From 19th-Century Ionian Societies to Modern Reading Clubs
Dr. Zacharias PAPANIKOLAOU, Apostolos GOULAS	<i>Democritus University of Thrace, Greece; University of Thessaly, Greece</i>	Recent Developments in Greece Business Administration: A Bibliometric Review
Dr. Zacharias PAPANIKOLAOU, Apostolos GOULAS	<i>Democritus University of Thrace, Greece; University of Thessaly, Greece</i>	Women and Business Management: A Bibliometric Review

ZOOM LINK:

<https://us06web.zoom.us/j/85969861461?pwd=9adzDz56SoAIXFmdNnMBkZbdfhg9lW.1>

(It will be active 10 minutes before the meeting time)

February 22, (Saturday)
17.30-19.30

SESSION - 4 HALL - 2
Moderator: Prof. Dr. Adriana PĂUCEAN

AUTHORS	AFFILIATION	TITLE
Momir POLENAKOVIKJ	<i>Ss. Cyril and Methodius University in Skopje, North Macedonia</i>	The Importance of Operational Excellence within StartUps and Early Stage Companies
Alexandra Raluca BORȘA (BOGDAN), Prof. Dr. Adriana PĂUCEAN, Lect. Andrei BORȘA, Lect. Melinda FOGARASI, MSc Student Raluca Alexandra MATEI, Lect. Maria Simona CHIȘ, Prof. Dr. Cristina Anamaria SEMENIUC	<i>University of Agricultural Sciences and Veterinary Medicine of Cluj-Napoca, Romania</i>	Preliminary Study on the Development of Waffle Cones Formulated with Powder From Rosehip Waste
Asst. Prof. Dr. Hamid KHAMAR, Prof. Dr. Amina Ouazzani TOUHAMI, Prof. Dr. Laure CIVEYREL	<i>University Mohammed V in Rabat, Morocco; Ibn Tofail University, Kenitra, Morocco; Paul Sabatier University III, France</i>	Reassessment of conservation status and analysis of the distribution patterns of the genus <i>Verbascum</i> L. (Scrophulariaceae) in Morocco
Asst. Prof. Dr. Ani STEFANOVA	<i>UACEG, Sofia, Bulgaria</i>	Determination of the Angular Accuracy When Setting Out the Centers of Bridge Piers
Prof. Dr. Maria Célia Lima-Hernandes, Prof. Dr. Mariana Nucci Penteadó, Prof. Dr. Hernán Joel Cervantes Rodríguez, Isabella Silva Cantos, Kauã Machado,	<i>FFLCH - USP, FM - USP, IF - USP, FFLCH - USP, FFLCH - USP (Brasil)</i>	Artificial Intelligence (AI) and reading fMRI exams – study of the scientific method
Somaye Hoseingholi OGHLI, Asst. Prof. Dr. Pantea AURANG	<i>Urmia University, Iran</i>	Fabrication and Performance Improvement of ZnO NRs Based Photodetectors via Localized surface plasmons Resonance Effects

ZOOM LINK:

<https://us06web.zoom.us/j/87419980795?pwd=wYh4itg4U0JifyGyxuKjaidukcklgL1>

(It will be active 10 minutes before the meeting time)

Health Sciences

February 23, (Sunday)

10.00 - 12.00

SESSION - 1 HALL - 1

Moderator: Assoc. Prof. Dr. Frâncu VIOLETA

AUTHORS	AFFILIATION	TITLE
Ana DZONLIC, Asst. Prof. Dr. Silvije SEGULJA, Julijana Pelivan Assoc. Prof. Dr. Bojan MILETIC	<i>Faculty of Health Studies, University of Rijeka, Croatia</i>	Exploring the Effect of Oral Exam Stress on Physiological Parameters in Students: Insights from Smart Bracelet Monitoring - A Pilot Study
Assoc. Prof. Dr. Frâncu VIOLETA	<i>Lucian Blaga University, Romania</i>	The Importance of Evaluating the Degree Satisfaction of Hospitalized Patients
Prof. Dr. Ebrahim YARMOHAMADI, Prof. Dr. Vahid Molla BASHI, Asst. Prof. Dr. Elahe EZATI	<i>Asadabad University of Medical Sciences, Asadabad, Iran</i>	Explaining the Perceptions and Fear of Tooth Extraction: A Qualitative Study
Mirela SARBU, Raluca ICA, Roxana BIRICIOIU, Prof. Dr. Liana Dehelean, Prof. Dr. David E. CLEMMER, Prof. Dr. Alina D. ZAMFIR	<i>National Institute for Research and Development in Electrochemistry and Condensed Matter, Timisoara, Romania; West University of Timisoara, Romania; University of Medicine and Pharmacy "Victor Babes", Timisoara, Romania Indiana University, Bloomington, Indiana, United States of America; "Aurel Vlaicu" University of Arad, Arad, Romania</i>	Mass Spectrometry of Human Brain Gangliosides in Health and Disease
Asst. Prof. Dr. Sonia Bianca Blaj,	<i>University of Medicine, Pharmacy, Science and Technology (UMFST) "G.E.Palade" Tîrgu-Mureş, Romania</i>	Legal Responsibility of Professionals in the Filed of Pharmacovigilance
Dr. Valentin VEJSELI, Dr. Radmila Mila Mihajlova ILIE, Edmond BRAVA,	<i>Ss. Cyril and Methodius University in Skopje (UKIM), Republic of Macedoine</i>	Integrative Management of Tibial Plateau Fracture and Medial Gonarthrosis with High Tibial Open Wedge Osteotomy: A Comprehensive Case Study

ZOOM LINK:

<https://us06web.zoom.us/j/86993559596?pwd=l0glB3bB1qTseKKYc6YR3b4hLpz7J7.1>

(It will be active 10 minutes before the meeting time)

February 23, (Sunday)

10.00-12.00

SESSION - 1 HALL - 2

Moderator: Dr. Jahanzeab HUSSAIN

AUTHORS	AFFILIATION	TITLE
Dr. Jahanzeab HUSSAIN, Dr. Akhtar SAMINA, Dr. Ali DANISH	<i>Central South University, Changsha, China; Wuhan University, Hubei, China; Dalian University of Technology, Liaoning, China</i>	Walrus Optimization Algorithm (WaOA)-based Load Frequency Control in Multi-area Interconnected Power System
Wail M. IDRESS, Prof. Dr. Yuqian ZHAO, Khalid A. ABOUDA, Aala A AHMED, Osama Ziad SHAHIN, Dr. Eman Ali Elhussin AHMED, Wleed M. IDRESS	<i>Central South University, China; Al-Zaiem Al-Azhari University, Sudan; University of Science and Technology, Sudan</i>	Enhanced CT Imaging Using Super- Resolution Generative Adversarial Networks for Improved Diagnostic Accuracy
Khalid A. ABOUDA, Prof. Dr. Xu DEGANG, Wail M. IDRESS, Hager M. ELMAKI, Aala A. AHMED, Waleed M. IDRESS	<i>Central South University, China; Al-Zaiem Al-Azhari University, Sudan; University of Science and Technology, Sudan</i>	An Advanced Method for Classifying Froth Flotation Images Utilizing Attention and Reward Mechanisms to Address Visually Similar Classes
Haarinesh SELVARAJU, Assoc. Prof. Dr. Noreen Izza Binti ARSHAD	<i>Universiti Teknologi PETRONAS, Malaysia</i>	Empowering Human-like Non-Player Character Interactions in Virtual Reality through Large Language Models
Emir HOROZIĆ Asst. Prof. Dr. Edina HUSEİNOVIĆ Dr. Jasmina DEDIĆ Emina MEHMEDOVIĆ Dr. Mirela BRIGA	<i>University of Tuzla, Bosnia and Herzegovina</i>	Analysis of Polyphenol Content and Antioxidant Capacity of Aqueous Extracts of Commercial Sage (<i>Salvia officinalis</i> L.)
Asst. Prof. Dr. Edina HUSEİNOVIC, Asst. Prof. Dr. Jasmina DEDIĆ, Emina MEHMEDOVIĆ, Emir HOROZIĆ	<i>University of Tuzla, Bosnia and Herzegovina</i>	Extraction, content of total polyphenols and antioxidant potential of hibiscus (<i>Hibiscus sabdariffa</i>) using different solvents

ZOOM LINK:

<https://us06web.zoom.us/j/84621714000?pwd=lHbMchVrrj5MLvgx0QGb9HYESLW0Ew.1>

(It will be active 10 minutes before the meeting time)

Health Sciences

February 23, (Sunday)

12.30 – 14.30

SESSION - 2 HALL - 1

Moderator: Prof. Dr. Mirjana ĐERMANOVIĆ

AUTHORS	AFFILIATION	TITLE
Anđela BOJANIĆ, Prof. Dr. Mirjana ĐERMANOVIĆ	<i>University of Banja Luka, Bosnia and Herzegovina</i>	Microbiological Safety of Baby and Dietary Foods
Anđela BOJANIĆ, Prof. Dr. Mirjana ĐERMANOVIĆ	<i>University of Banja Luka, Bosnia and Herzegovina</i>	Patulin as a Potential Risk in Children's Food
Assoc. Prof. Dr Khanfir FATEN, Dr. Harbi HAMED, Assoc. Prof. Dr Tili MOHAMED, Asst. Prof. Dr. Rmida ARIJ, Prof. Dr. Khalfi Mohamed SALAH, Prof. Dr. Ben Amor FATEN	<i>Monastir University, Tunisia</i>	What is the Safety Situation of the Retromolar Bone Harvesting Procedure
Julia BYWALEC, Dr. Dorota NALEPA, Olga SMOLIŃSKA, Dr. Iwona MORAWIK, Mariusz SUTRYK	<i>WSEI University, Poland; The Academy of Zamość, Poland; Medical University of Lublin, Poland</i>	Policysttic Ovary Syndrome- What do women in Poland know about it?"
Dr. Brunilda HAXHIU, Prof. Dr. Goran KONDOV, Fesal SELIMI, Dr. Doriana PALOJI, Assoc. Prof. Dr. Ilir KURTISHI, Prof. Dr. Naser GJONBALAJ	<i>University of Prishtina, Kosovo; University Clinical Centre of Kosovo</i>	Radiotherapy-Induced Thyroid Dysfunction
Dr. Saoussen Debouki-Joudi, Dr. Wala Ben Kridis, Asst. Prof. Dr. Fatma Trifa, Asst. Prof. Dr. Wajdi Ayadi, Dr. Abdelmajid Khabir, Prof. Dr. Tahia Sellami-Boudawara, Prof. Dr. Jamel Daoud, Prof. Dr. Afef Khanfir, Prof. Dr. Raja Mokdad-Gargouri	<i>University of Jendouba, Tunisia</i>	PIK3CA Mutation Analysis in Breast Cancer Patients by HRM-COLD-PCR

ZOOM LINK:

<https://us06web.zoom.us/j/86037247873?pwd=abMrMnW9S8kD77KTLAHS6RfGoHpug.1>

(It will be active 10 minutes before the meeting time)

February 23, (Sunday)

12.30-14.30

SESSION - 2 HALL - 2

Moderator: Prof. Dr. Ziyodulla YUSUPOV

AUTHORS	AFFILIATION	TITLE
Prof. Dr. Ziyodulla YUSUPOV, Abakar Mahamat HASSAN, Ulugbek AVLIYOROV	<i>Karabük University, Türkiye;</i> <i>National Research University TIAME, Uzbekistan</i>	Designing of 264 kw Solar Power System with Spotlight on the Weather and Location: Case Study of N'djamena City, Chad
Prof. Dr. Ziyodulla YUSUPOV, Gabdoulbe Noel MBOURING	<i>Karabük University, Türkiye</i>	Analysis of DFIG-Based Wind Turbines with Superconducting Fault Current Limiter Operation
Barış Can ÇAKIR	<i>Gazi University, Türkiye</i>	Applications of Generalized Pell Sequences on Matrices
Derya METE, Pınar ÖZTÜRK, Tuğçe AKBAŞ, Assoc. Prof. Dr. Muhammed ÜÇÜNCÜ, Prof. Dr. Gülşah Şanlı MOHAMMED	<i>İzmir Institute of Technology, Türkiye</i>	Methylene Blue (MB) Loaded ZIF-8 Synthesis, Characterization and Investigation of Photodynamic Therapy Activity on Breast Cancer

ZOOM LINK:

<https://us06web.zoom.us/j/85952913694?pwd=UjQbMaKGfkDPvmdlQdhhK21WEUW5Ka.1>

(It will be active 10 minutes before the meeting time)

Small Nations and Great Empires: How Central Europe Maintains its Identity

Kristýna ZÁKOSTELNOVÁ

PhD Student, University of Hradec Králové, Czech Republic

Jan BOLEHOVSKÝ

PhD Student, University of Hradec Králové, Czech Republic

Abstract

The small nations of Central Europe, such as Czechs, Slovaks, Hungarians and Poles, have historically faced constant pressure from powerful empires – Habsburg, German and Soviet. This research explores the strategies these nations trying to preserve their identity and autonomy within the dominance of larger political and cultural structures. The focus is placed on the Czech context, including Palacký's vision of Austria as a necessary protector against Germanization and Hungarianization, the First Republic's efforts to position itself as an "island of democracy" between two totalitarian regimes and the Velvet Revolution's emphasis on moral principles and nonviolent resistance.

The presentation demonstrates how small nations did not only survive, but actively shaped larger entities through their adaptability, cultural renewal and political Innovation. It also connects this Central European narrative to similar processes providing a broader perspective on the role of small nations in a globalized world. The outcome is a fresh lens for understanding the historical and contemporary dynamics between smaller and larger actors on the political stage.

Keywords: Central Europe, Nations, Identity, History, Historiography

1. INTRODUCTION, PROBLEM DEFINITION, CONTEXTUAL INTEGRATION

Central Europe in the 19th century represented a specific region where the influences of great empires, national revivals, and societal changes intertwined. For small nations such as the Czechs, Slovaks, Poles, and Hungarians, this period posed both a challenge and an opportunity. This paper focuses on the position of the Czechs, their efforts towards cultural and political emancipation, and how they preserved their identity despite the pressures of major powers within the broader context of European development.

Following the Napoleonic Wars and the Congress of Vienna in 1815, Central Europe became dominated by three major imperial powers: the Austrian Empire, Prussia, and the Russian Empire. A deeper historical and scholarly justification for Central Europe as a historical subcontinent was provided by Halecki in 1950. He defined it as a transitional zone between the West and the East and even proposed an internal division into West and East

Central Europe.¹ The small nations in this area were mostly incorporated into these great powers, with minimal autonomy. The political scene was controlled by conservative monarchies that sought to maintain the status quo. The national aspirations of small nations were suppressed, and any revolutionary or liberal efforts were perceived as a threat. Despite oppression, national revivals emerged throughout the 19th century, aiming to restore the language, culture, and historical consciousness of individual nations. The main driving forces behind this process were intellectuals, writers, scholars, and artists, who often drew inspiration from Romanticism and its emphasis on national identity. This process of national revival took place across all Central European nations, particularly during the first half of the 19th century. However, how can the geopolitical definition of Central Europe at that time be interpreted?

*"The historical territory of Central Europe is thus dynamic throughout history, and this fact must be reflected in its interpretation: from the 18th century and throughout the 'long' 19th century, its core was the Habsburg monarchy, and during the interwar period, its successor states. During World War II, Nazism divided the fate of the countries in this region – some were directly annexed by the Nazi Reich (such as Austria, the Sudetenland, and western Poland), others were occupied (Czechs and Poles), or collaborated as fascist satellites and allies, such as Hungary or Slovakia."*²

In the 19th century, Central Europe was a region where various influences of geopolitics, historical events, and cultural diversity converged. Defining this space cannot be considered simple, as the very concept of "Central Europe" is historically and politically variable. In the 19th century, Central Europe stood at the intersection of several great empires that shaped its form. The Austrian Empire, Prussia, the Russian Empire, and the Ottoman Empire were the dominant powers whose influence extended into this region. Geographically, Central Europe was defined by rivers, mountain ranges, and historical borders. The Danube, Elbe, and Vistula formed the natural axes of the region, while the Carpathians, Alps, and Sudetes provided physical barriers between individual areas.

In the 19th century, Central Europe encompassed territories that today form modern states such as Germany, Austria, the Czech Republic, Slovakia, Poland, Hungary, Slovenia, and parts of Croatia, Serbia, Ukraine, and Romania.³ Each of these regions had its own cultural, linguistic, and political specificities, making it difficult to define the region uniformly. One of the key parts of Central Europe was the territory of the German states. In the 19th century, Germany was not a unified state but a collection of more than three hundred states, principalities, and city-states united in the German Confederation after 1815. Prussia played a dominant role and gradually moved towards the unification of Germany in 1871.

Another key territory was the Austrian Empire. The Habsburg monarchy was a multi-ethnic state encompassing a wide range of nationalities, including Czechs, Hungarians, Poles, Slovenes, and others. Geopolitically, the Austrian Empire was considered the core of Central Europe. Likewise, Poland, which was partitioned between Prussia, Austria, and Russia at the end of the 18th century, remained a crucial part of Central Europe as a geographical entity. Despite political oppression and lack of sovereignty, the Polish nation continued to exist culturally and politically, contributing to the definition of Central Europe as a space of competing power interests.

The geopolitical definition of Central Europe in the 19th century was significant not only in terms of geopolitics but also in shaping modern European identity.⁴ This region was

¹ KŘEN, Jan. *Dvě století střední Evropy*. Praha, 2019, pp. 22.

² KŘEN, Jan. *Dvě století střední Evropy*. Praha, 2019, pp. 27.

³ See further: KUČEROVÁ, Irah. *Střední Evropa*. Praha, 2015, pp. 29–38.

⁴ See further: VAŠEK, Richard – RYCHLÍK, Jan. *Formování moderních národů ve střední a východní Evropě v 19. a 20. století*. Praha – Sofie, 2010.

a meeting point of various cultures, ideologies, and power struggles. Central Europe thus played a crucial role in shaping modern Europe and remained a symbol of cultural diversity and historical complexity.

This paper aims to analyze the mechanisms through which the small nations of Central Europe managed to preserve their identity in the 19th century despite political, cultural, and social pressures from great empires. The study will focus on the processes of national revival, the importance of cultural and linguistic diversity, and the role of intellectuals and other key figures in shaping and maintaining national identity within this complex geopolitical context. The objective is also to contribute to a better understanding of the historical dynamics that shaped Central Europe as a space where power interests intersect with cultural diversity.

2. DEFINITION OF THE TERMS "SMALL NATIONS" AND "GREAT EMPIRES" IN THE HISTORICAL CONTEXT OF CENTRAL EUROPE

In this contribution, it is important to define the terms "small nations" and "great empires" in the context of 19th-century Central Europe.⁵ Small nations can be characterized by certain geographical and demographic limitations, political marginalization, and efforts for cultural emancipation. These are nations whose political autonomy was often minimal or completely suppressed, making them subjects of power politics. Specifically, this refers to the Czechs, Poles, Hungarians, and Slovaks.⁶ A significant feature of these nations was the effort for cultural and linguistic emancipation, which became a key part of their national revival. This process, driven by intellectuals,⁷ sought to preserve and restore national identity in the face of the assimilation pressures these nations faced. "A small nation, although it must necessarily and naturally adopt cultural and civilizational values from its nearer and farther neighbors, or through them, still demands, in its self-defense, albeit only postulated and not actualized, cultural and economic self-sufficiency. These are signs not only general and adopted from other patriotisms, but signs to which the social-psychological reality of the small nation itself also forced."⁸ The status of a small nation exhibits other characteristic features as well. The cultural and material strength, as well as the political power, that such a nation typically lacks, is compensated by an ethical emphasis on values like truth, justice, and historical or global rights. These values become spiritual weapons used in promotion, which strategically rely on literature, readership, and education in general. Instead of physical force and power, rights prevail, instead of numerical superiority, culture, and these aspects are then replaced by the epic nature of the national mission and its means.⁹

On the other hand, "great empires," such as the Austrian Empire, Prussia, the Russian Empire, and the Ottoman Empire, represented dominant power structures that controlled vast territories with many ethnically and culturally distinct groups. These empires were characterized by political and military dominance and the effort to culturally assimilate the subjugated nations. However, their internal complexity, caused by cultural and national diversity, was also a source of constant challenges and potential crises. In both concepts, it is essential not to overlook the fact that the idea of nationality is an indisputable historical

⁵ See further: HROCH, Miroslav. *Národy nejsou dílem náhody*. Praha, 2009.; HROCH, Miroslav. *Na prahu národní existence*. Praha, 1999.; HROCH, Miroslav. *Pohled na národ a nacionalismus*. Praha, 2004.; HROCH, Miroslav. *V národním zájmu: Požadavky a cíle evropských národních hnutí devatenáctého století v komparativní perspektivě*. Praha, 1996.; HROCH, Miroslav. *Evropa – historické události*. Praha, 1980.; HROCH, Miroslav. *Evropská národní hnutí v 19. století*. Praha, 1986.; HROCH, Miroslav. *Hledání souvislosti – Eseje z komparativních dějin Evropy*. Praha, 2016.

⁶ KŘEN, Jan. *Dvě století střední Evropy*. Praha, 2019, pp. 22.

⁷ One of the most considered were J. Dobrovský, J. Jungmann, Fr. Palacký, A. Mickiewicz, H. Sienkiewicz, S. Petöfi, L. Kossuth či L. Štúr.

⁸ KUTNAR, František. *Obrozené vlastenectví a nacionalismus*. Praha, 2003, pp. 294.

⁹ KUTNAR, František. *Obrozené vlastenectví a nacionalismus*. Praha, 2003, pp. 294.

reality. For example, the Habsburg Monarchy faced increasing nationalism from various nationalities, leading to heightened tensions between the imperial government and regions like Hungary or the Czech lands.¹⁰ Similarly, the Ottoman Empire had to confront the gradual loss of its territory due to national liberation movements in the Balkans. At the same time, however, the fact cannot be ignored that the idea of nationality is an undeniable historical reality that had a significant impact on the political and social organization of modern Europe. It was precisely in the context of the conflict between imperial ambitions and national aspirations that new forms of political negotiation and identity emerged.

The pressure exerted by great powers on small nations in 19th-century Central Europe was a complex and multifaceted process. This pressure included political control, economic coercion, cultural assimilation, and military intervention. However, small nations responded to these pressures with determination to preserve their identity, leading to the development of national awareness, cultural revival, and eventually political liberation. Although they were often subjected to unequal conditions, their resilience and ability to organize represent a significant chapter in European history. The dynamics of relations between great powers and small nations remains relevant today, making this a key area of historical research.

3. CENTRAL EUROPE UNDER PRESSURE FROM GREAT POWERS

In the case of the Czech lands, the 19th century represents one of the key periods for the formation of the Czech national identity.¹¹ This process was closely linked to the ongoing national revival, social changes, and political events in the Habsburg Monarchy. Key roles were played by cultural, linguistic, political, and economic aspects, which gradually led to the consolidation of national awareness and the creation of a strong Czech national identity. One of the important factors in this process was the linguistic renaissance, which focused on the restoration and expansion of the Czech language. Thanks to the efforts of figures such as Josef Dobrovský, Josef Jungmann, and František Palacký, the Czech language became a means of cultural communication, science, and art once again. This linguistic revival was the cornerstone of the broader process of national awareness. The significance of the formation of Czech national identity in the 19th century lies in its ability to connect linguistic, cultural, political, and economic factors into a unified whole. This process created the foundation for the future emergence of an independent Czechoslovak state and contributed to consolidating the position of the Czech lands within Central Europe. With a solid foundation of national identity, the Czech lands were able to face the challenges brought by modernization and globalization in the 20th and 21st centuries.

A) The Habsburg Monarchy and František Palacký in the Context of the Czech National Revival

The national revival was a response to the loss of Czech political and cultural autonomy after the Battle of White Mountain in 1620 and the long-standing Germanization that weakened the position of the Czech language.¹² The first phase of the revival focused primarily on preserving the Czech language, which became the fundamental element of

¹⁰ See further: HROCH, Miroslav. *Národy nejsou dílem náhody*. Praha, 2009.

¹¹ See further: KŘEN, Jan. *Dvě století střední Evropy*. Praha, 2019.

¹² The Polish and Czech concepts of nationalism in the 19th century were rather different than similar. In the Czech lands, the linguistic aspect played a crucial role. On the other hand, Polish nationalists emphasized the geographical aspect. Partial parallels in both nations can be seen in the failure and suppression of the revolutionary efforts which both enslaved nations developed during the first decades of the 19th century. In the second half of the 19th century, the Czechs accepted 'the role' of a nation undergoing an endless fight with the German nation, while the Poles stylized themselves as 'a model' of suffering and sacrifice.

national identity.¹³ Linguistic scholars such as Josef Dobrovský and Josef Jungmann worked on the codification and development of the Czech language, while literary creation helped spread the Czech language among the broader society. In the second phase of the national revival, the focus shifted to cultural and socio-political aspects. Cultural institutions, such as Matice česká or the Museum of the Kingdom of Bohemia (now the National Museum), were established to support Czech culture and education. At the turn of the 18th and 19th centuries, the foundation for a broader social movement that could unite the Czech nation began to form.

The revolution of 1848 had a significant influence on the formation of national identity.¹⁴ This "Spring of Nations" is often considered the third phase of the national revival and marked the first major attempt by Czech patriots to achieve political rights and autonomous status for the Czech nation within the Habsburg Monarchy. A key role during the revolutionary years of 1848-1849 in the Czech lands was played by František Palacký. In 1848, this prominent historian, professor, and regional historian actively entered the political scene of the Austrian Empire.¹⁵ He responded with skepticism to the news of the outbreak of revolution in France and Germany at the beginning of 1848. Palacký also took a very reserved position in March 1848 towards the radical Svatováclavský Committee, which was established in Prague and led primarily by representatives of the liberal Prague bourgeoisie.

Palacký believed that the Czech national movement should continue to rely on legal means, so at the beginning of April 1848, he accepted an offer from Count Rudolf Stadion, who appointed him to the "consultative extraordinary gubernatorial commission." This commission consisted of twenty-four members, with Antonín Strobach elected as its chairman, and represented a counterbalance to the revolutionary Svatováclavský Committee. On April 10, 1848, however, the provisional gubernatorial commission was merged with the Svatováclavský Committee, leading to the formation of the so-called National Committee,¹⁶ of which Palacký became a member.

Before presenting the first modern purely Czech political program, František Palacký clearly and sharply expressed his opinion regarding the invitation for Czech political representation to participate in the assembly in Frankfurt am Main. This assembly aimed to unify German-speaking territories into one entity, and alongside Austria, it included the lands of Bohemia and Moravia. It was against this planned reality that Palacký distanced himself in an open letter sent on April 11, 1848, to the assembly in Frankfurt am Main, in which he rejected the invitation to the pan-German assembly.

In this open letter,¹⁷ František Palacký presented himself as a moderate liberal with libertarian views, as it was here that he first introduced the concept of Austroslavism,¹⁸ demonstrating the idea of preserving the Habsburg Monarchy as a nationally just federal state led by the Emperor and a constitutional government. It must be added that Palacký had very serious and historically substantiated reasons for this idea. The first reason was undoubtedly the fear of the Germanization of the Czechs, and the second was the fear of the disintegration of the Habsburg Empire, which would pose a danger of further German expansion in Central Europe. For Palacký, the Austrian Empire was a guarantor for the nations of Central Europe, a "civilizational dam" between the expansionist Germany and the

¹³ See further: HROCH, Miroslav. *V národním zájmu*. Praha, 1996.; MACURA, Vladimír. *Znamení zrodu*. Praha1, 995.; SCHULZE, Hagen. *Staat und Nation in der europäischen Geschichte*. München, 1994.

¹⁴ ŠTAIF, Jiří. *Revoluční léta 1848-1849 a české země*. Praha, 1990, pp. 29.

¹⁵ For more on the personality, work, and activities of František Palackého see: KOŘALKA, Jiří. *František Palacký (1798-1876)*. Praha, 1998.; MORAVA, Jiří. *Palacký: Čech - Rakušan - Evropan*. Ostrava, 1994.; PEKAŘ, Josef. *František Palacký*. Praha, 2005.; ŠTAIF, Jiří. *František Palacký - život, dílo, mýtus*. Praha, 2009.

¹⁶ KOŘALKA, Jiří. František Palacký a politická moc ve čtyřicátých letech 19. století. *Český časopis historický* 4, 1997, s. 654.

¹⁷ ZNOJ, Milan - HAVRÁNEK, Jan. *Český liberalismus - texty a osobnosti*. Praha, 1995, pp. 9.

¹⁸ MORAVA, Jiří. *Palacký: Čech - Rakušan - Evropan*. Ostrava, 1994, pp. 58-59.

Russian autocracy. In his "Letter to Frankfurt," the Czech bourgeois intellectual first appeared as an Austrian statesman and European politician in modern history.¹⁹ Palacký clearly defined the Czech national identity as separate and distinct from the German nation, but he also connected it with the existence of a reformed Habsburg Monarchy.

František Palacký, as a representative of the Czech bourgeois intellectual, offered a vision of Austroslavism that not only allowed for the protection of the Czech nation from Germanization but also preserved the stability of the Central European region through a nationally just federation under the leadership of the Habsburg Monarchy. This strategy combined pragmatic diplomatic approaches with a bold formulation of national aspirations. As Palacký showed in his letter to Frankfurt, the defense of small nations did not only lie in resistance but also in the ability to formulate a sustainable alternative vision of coexistence. This approach provided the basis for modern concepts of democratic arrangement and cultural autonomy, which remain relevant today.²⁰

After the elections to the Austrian Reichstag in late June and early July 1848, František Palacký took a leading role among Czech and Moravian deputies. The deputies of the Reichstag aimed to prepare a constitution modeled on the French and American examples.²¹ In October 1848, due to revolutionary unrest, the Reichstag session was moved from Vienna to the Archbishop's Castle in Kroměříž. The session began on November 22, 1848. Palacký, together with Kajetán Mayer, František Smolka, Joseph Goldmark, and Ferdinand Gobbi, was elected to a five-member subcommittee tasked with creating a proposal for the organization of legislative and executive power, while a three-member subcommittee, led by František Ladislav Rieger, worked on a proposal for general civil rights.

According to the original plans, each of the five members of the subcommittee was to prepare their own proposal, but due to the passivity of most members, Palacký's constitutional proposal gained prominence. Palacký presented himself as an "absolute federalist" when he put forward a radical program of strict ethnic federalization:²² he proposed dividing the entire monarchy, including the unrepresented lands (Hungary and the Italian possessions), into eight entities: the German-Austrian lands, the Czech lands (Bohemia, Moravia, Silesia, and Upper Hungary/Slovakia within Hungary as a whole), Polish lands, Illyrian lands, Italian lands, South Slavic lands, Hungarian lands, and Romanian lands. This proposal was defended rhetorically by František Ladislav Rieger, but the majority of the committee members considered it illusory and fantastical, rejecting it as such. This reaction deeply hurt František Palacký, who then withdrew from the debate and formally withdrew from the constitutional committee on February 3, 1849.

Before the new constitution could be approved and adopted, the Reichstag in Kroměříž was dissolved. This occurred under the influence of new political circumstances on March 7, 1849. The new Austrian Emperor Franz Joseph I, an ardent conservative who favored neo-absolutist tendencies,²³ immediately at the beginning of his reign made it clear that he would not accept the decisions of the "Kroměříž Reichstag." The constitution created by the Reichstag in Kroměříž thus never came into effect.

The year 1848 was truly a pivotal year for František Palacký. The prominent historian, professor, and regional historian emerged for the first time in modern history as a Czech

¹⁹ HAVRÁNEK, Jan. Zrození politika. *Dějiny a současnost* 3, 1998, pp. 18.

²⁰ See further: HROCH, Miroslav. *Národy nejsou dílem náhody*. Praha, 2009.; KUTNAR, František. *Obrozenské vlastenectví a nacionalismus*. Praha, 2003.; RYNEŠ, Václav. *Zápas o národní a středoevropskou federaci*. Praha, 2016.; RAPPORT, Michael. *Evropa devatenáctého století*. Praha, 2011.

²¹ VÁLKA, Josef. *La théorie de l'histoire chez F. Palacký*. In: Sborník prací Filozofické fakulty brněnské univerzity (Řada historická). Brno, 1967, pp. 110-111.

²² URBAN, Otto. *Politik František Palacký*. In: Pocta Josefu Petráňovi (sborník prací z českých dějin k 60. narozeninám prof. dr. Josefa Petráně). Praha, 1991, pp. 499-501.

²³ KOŘALKA, Jiří. František Palacký a politická moc ve čtyřicátých letech 19. století. *Český časopis historický* 4, 1997, pp. 654.

bourgeois intellectual, as an Austrian statesman and European politician, sharply defining himself against the Germanization tendencies of the pan-German assembly in Frankfurt am Main. He also presented his own political program and, most importantly, became the leader of the political representation of the modern Czech nation, which would guide the direction of Czech political developments during the following decades of the second half of the 19th century.

4. SMALL NATIONS OF CENTRAL EUROPE ON THE WAY TO MODERNITY

The end of World War I in 1918 marked a significant transformation of the political map of Central Europe. The dissolution of Austria-Hungary paved the way for the creation of new nation-states, such as Czechoslovakia, Hungary, Austria, and Yugoslavia.²⁴ However, this transition to modernity was not without challenges, whether in the political, economic, or social realms. The small nations of this region had to come to terms with new geopolitical realities, a redefinition of their identity, and modernization pressures coming not only from abroad but also from within their own societies.

The disintegration of Austria-Hungary and the Ottoman Empire led to the creation of new states based on the principle of nationality, as formulated, among others, in Wilson's Fourteen Points.²⁵ For the small nations of Central Europe, this meant an opportunity for political emancipation but also the necessity of building new state structures. Czechoslovakia became one of the most stable democratic states in the region, while Hungary went through revolutionary and counter-revolutionary upheavals, including the short-lived Hungarian Soviet Republic in 1919.

This transition to modernity²⁶ also brought about significant changes in the social structure. Industrialization, urbanization, and increasing literacy led to the gradual transformation of traditional societies. Reforms in education were taking place in most of the newly established states, contributing to the emergence of a new generation of intellectuals and political leaders. The promotion of greater gender equality also began, as evidenced by the introduction of women's suffrage in Czechoslovakia in 1919.

During the interwar period, the small nations of Central Europe experienced a flourishing of national culture and intellectual life. Avant-garde literature, theater, and cinema thrived in Czechoslovakia, while new philosophical movements and scientific research developed in Hungary and Austria. However, these periods of cultural expansion were often influenced by the political situation and growing nationalist tendencies.

Despite the effort to create nation-states, the newly formed countries contained a number of ethnic minorities, which led to tensions and conflicts.²⁷ In Czechoslovakia, Germans, Hungarians, and Poles made up a significant portion of the population, resulting in political clashes, particularly during periods of economic crises. Hungary, which lost a large part of its territory due to the Treaty of Trianon in 1920, faced problems related to revisionist sentiments and instability.

A) National Identity in the First Czechoslovak Republic (1918–1938)

The creation of the First Czechoslovak Republic in 1918 marked a significant shift in the history of Central Europe. This new state, founded on the principles of democracy and national self-determination, had to face a number of challenges related to building its

²⁴ See further: WANDY CZ, Piotr S. *Střední Evropa v dějinách od středověku do současnosti*. Praha, 2004.

²⁵ See further: SEMOTANOVÁ, Eva. *Historická geografie: tradice a modernita*. Praha, 2018.; POSPÍŠIL, Ivo. *Střední Evropa včera a dnes: proměny koncepcí*. Brno, 2015.

²⁶ EKSTEINS, Modris. *Svěcení jara*. Praha, 2019, pp. 155–158.

²⁷ See further: KUČEROVÁ, Irah. *Střední Evropa: komparace vývoje středoevropských států*. Praha, 2015, pp. 74–81.

identity.²⁸ Given the ethnic and cultural diversity of its population, the issue of national identity was not straightforward. The Czechoslovak identity was shaped not only by political elites but also by cultural and social institutions.

After the collapse of Austria-Hungary, the newly formed Czechoslovak Republic sought to create a unified national identity. Tomáš Garrigue Masaryk and Edvard Beneš promoted the concept of a Czechoslovak nation as a whole composed of Czechs and Slovaks, in order to provide a strong foundation for the new state. However, this construct faced challenges due to the differing historical experiences and cultural traditions of the two nations. While in Bohemia and Moravia nationalism was linked to a long-standing cultural and political emancipation, in Slovakia, the development of national identity was still in its early stages and often influenced by the Hungarianization policies of previous decades.

Czechoslovakia was a multi-ethnic state, where besides Czechs and Slovaks, other significant national groups lived, including Germans, Hungarians, Rusyns, Poles, and Jews. The biggest challenge for the national identity was the position of the German minority, which constituted about 23% of the population. Germans, particularly in the border regions of the Sudetenland, often did not feel part of the new state and demanded autonomy. Similarly, Hungarians in southern Slovakia and Rusyns in the east of the country sought greater self-government. Government policy tried to integrate minorities through education and state administration, but it often encountered resistance and growing separatist tendencies.

B) The First Republic's Idea of Czechoslovakism

Czechoslovakism was one of the key ideological pillars of the First Czechoslovak Republic.²⁹ This concept represented an effort to create a unified Czechoslovak national identity that would legitimize the existence of the new state and strengthen its internal cohesion. Czechoslovakism began to take shape in the 19th century during the Czech and Slovak national revivals. Both Czech and Slovak intellectuals, such as František Palacký and Ľudovít Štúr, sought ways to secure the cultural and political emancipation of their nations within the Austro-Hungarian Empire. The idea of a unified Czechoslovak nation was also a reaction to the Hungarianization policies of Hungary, which limited the Slovak national identity. The growing ideas of Slavic solidarity³⁰ and increasing resistance to Austria-Hungary led Czech and Slovak politicians in exile, particularly Tomáš Garrigue Masaryk, Edvard Beneš, and Milan Rastislav Štefánik, to promote Czechoslovakism as the foundational idea for the new state. As a result of these efforts, the Czechoslovak Republic was declared on October 28, 1918.

After the establishment of Czechoslovakia, Czechoslovakism became the official state ideology. The first Czechoslovak Constitution of 1920 declared the existence of a single Czechoslovak nation, which was important especially when negotiating the borders of the new state. This concept had several main functions. The first was political legitimacy, as Czechoslovakia was conceived as a state of one nation with minorities, which justified its existence within the post-war European order. The second was social integration. Czechoslovakism aimed to promote cohesion among the population and reduce tensions between Czechs and Slovaks. The third function was to protect against Hungarian

²⁸ See further: HUDEK, Adam. *Czechoslovakism*. London – New York, 2022.

²⁹ See further: HUDEK, Adam – KOPEČEK, Michal – MERVART, Jan. *Čecko/slovakismus*. Praha, 2019.; JOHN, Miloslav. *Čechoslovakismus a ČSR 1914–1938*. Beroun, 1994.; JAHSELKA, Tomáš – JANČIGA, Roman. *Ivan Dérer: K diskusi o čechoslovakizme*. Bratislava, 2015.

³⁰ Seen from the then Czech standpoint, the Russian Empire, the only independent Slavic country of that time, was to support the oppressed Slavic nations. However, the reality was completely different as Russia followed only its own political interests and the fate of the enslaved Slavic nations did not interest the tsarist government in St. Petersburg. The visions of Pan-Slavism were not fulfilled, but their ideals had been surviving among Czech patriots until the end of the Great War in 1918.

revisionism, as emphasizing Czechoslovak identity aimed to prevent Hungarian attempts to revise borders and weaken Slovakia.

Although Czechoslovakism stemmed from a positive desire for unity, it had several significant limitations. The first was found in the Slovaks' push for autonomy. Many Slovaks, especially from Catholic and nationalist circles, saw Czechoslovakism as a form of Czechization. The Slovak political representation, including the Hlinka's Slovak People's Party, criticized this concept as denying Slovaks' distinctiveness. Moreover, since 1918, an uneven relationship between Czechs and Slovaks can be observed. The Czechoslovak government was based in Prague, and most administrative and economic decisions were made with little involvement from Slovaks. Slovaks often viewed Czechoslovakism as a means of Czech dominance. At the same time, the concept of a unified Czechoslovak nation made it harder for Germans, Hungarians, Rusyns, and other minorities, who often felt marginalized in the new state.

Czechoslovakism was an ambitious project designed to ensure the stability and unity of the new state, but in practice, it encountered numerous obstacles and limitations. While for Czechs it represented a natural extension of their national identity, for Slovaks it was often seen as an imposed concept. Nevertheless, it played a key role in the creation and shaping of Czechoslovakia and influenced the form of the state until its first dissolution in 1939. Its legacy, however, remains a significant topic in historical debates about identity and state organization in Czechoslovakia.

C) The Concept of "Small Democracy"³¹ as a Model for Preserving the Identity of a Small Nation³²

As already mentioned, small nations throughout history have often faced issues related to preserving their identity within larger state entities, multinational empires, or cultural influences. The First Czechoslovak Republic, despite its relative success as a democratic state, revealed the vulnerability of a small nation to external pressures and internal ethnic tensions. Therefore, the concept of "small democracy" can be considered a key model for understanding how the identity of small nations can not only be preserved but also cultivated in complex historical and political conditions. The experience of the First Czechoslovak Republic shows that a small nation can be stable and effective if it succeeds in combining democratic principles with a national identity based on a balance between different communities.³³ The Czechoslovak project was, to some extent, an attempt to apply the idea of "small democracy," although with limited success. Democratic mechanisms were introduced into the political system, but insufficient recognition of the cultural and historical distinctiveness of Slovaks and minorities led to a disruption of this balance.

A small democracy, however, can offer a lesson: instead of a unifying national identity, a pluralistic identity should be emphasized, in which all parts of society have a secure place.³⁴ This approach could minimize internal tensions and provide a stronger defense against external threats. Small democracies must deal with a specific challenge: how

³¹ See further: KAMUSELLA, Tomasz. *The Politics of Language and Nationalism in Modern Central Europe.*, JUDT, Tony. *Postwar: A History of Europe Since 1945* or ORZOFF, Andrea. *Battle for the Castle: The Myth of Czechoslovakia in Europe, 1914-1948.*

³² The text is based on the interpretation of Patočka's philosophy of history (Patočka, 1990) and the ideas of T. G. Masaryk on democratic organization (Masaryk, 1920). It also draws inspiration from the political concept of small states, as formulated by Václav Havel (Havel, 1989) and Andrea Orzoff (Orzoff, 2009), both of whom explored the issues of legitimacy of small nations within the geopolitical context.

³³ A small democracy, inspired by the ideas of intellectuals such as Jan Patočka, is not merely a reference to the size of the state or its population, but primarily to the quality of civic life, democratic governance, and collective responsibility. This concept emphasizes that the political power of small nations should not be defined solely by external structures, but rather by their capacity for internal self-determination, solidarity, and a profound respect for their own historical roots. The strength of a small nation's democracy lies precisely in its ability to adapt while preserving an authentic cultural identity.

³⁴ See further: HOMOLKA, Jakub. *Koncept racionální civilizace: Patočkovo pojetí modernity ve světle civilizační analýzy.* Praha, 2016.

to connect a stable political system with a dynamic cultural identity that is open to change but firmly rooted in its past. This model views the preservation of identity as active citizen participation in democratic decision-making and a willingness to constantly renew the relationship with the past. In practice, this could mean an emphasis on education that reflects not only national pride but also a critical reflection on historical mistakes, such as the unresolved ethnic issues in the First Czechoslovak Republic.

5. IDENTITY³⁵ OF CENTRAL EUROPE IN THE 21ST CENTURY

A) The Challenges of Globalization: How Small Nations Respond to the Pressure from Great Powers

Central Europe, traditionally a multifaceted and culturally diverse region, faces numerous new challenges in the 21st century. One of the most significant is globalization, which exerts intense pressure on the economic, political, and cultural structures of small states. Globalization is often associated with the dominance of great powers such as the United States, Russia, and China, which have the ability to influence local economies, technological systems, and cultural values. Small nations in Central Europe are confronted with the dilemma of integrating into the global system while preserving their own identity.³⁶ This pressure primarily comes in the form of economic and geopolitical relations, and the process emerging from this is that small states must find a balance between the opportunities offered by globalization and the threats associated with the potential loss of sovereignty. Another important mechanism by which small nations respond to the pressures of globalization is "smart adaptation," which can be characterized as the ability to harness global influences without losing cultural authenticity. This concept is based on the selective adoption of foreign elements, which are integrated into the local context in a way that strengthens domestic traditions. For example, in the fields of science and technology, small states often adopt global trends, but in cultural policy, they strive to support local creation and preserve linguistic and cultural identity.

B) The Role of Culture in Maintaining National Identity: The Case of Czechoslovakia and the Czech Republic Today³⁷

Culture plays a key role in shaping and maintaining national identity, especially during periods of rapid social and technological change. In the case of Central Europe, where national identities are often built on historical memory and shared traditions, the cultural sphere is an irreplaceable tool for resisting the assimilation pressures of globalization. Cultural institutions such as museums, theaters, national libraries, and film production are crucial means of preserving collective memory. The educational system also plays an important role in transmitting cultural capital to new generations. For example, literature and film are powerful tools of national consciousness, as they shape the image of the past and influence how society perceives historical events and their consequences. The cultural policy of small nations should therefore focus on supporting local creative activities and preserving linguistic and historical identity. The "active maintenance" model of identity involves funding projects that combine traditional elements with modern modes of expression, such as digital art, online museums, or interactive education.

The historical experience of the Czechoslovak Republic shows how small nations can seek a balance between the influence of global forces and the preservation of their own

³⁵ See further: SMITH, Anthony. *National Identity*.

³⁶ For more on this issue see TRÁVNÍČEK, Jiří. *V kleštích dějin – střední Evropa jako pojem a problém*. Brno, 2009.

³⁷ See further: HOLÝ, Ladislav. *The Little Czech and the Great Czech Nation: National Identity and the Post-Communist Transformation of Society*.

identity. The First Czechoslovak Republic (1918–1938) was an example of a state that managed to capitalize on international opportunities for its consolidation, but also had to face pressures in the form of ethnic conflicts and threats from larger powers. Today, the Czech Republic faces a similar challenge – finding its position within the EU and the global environment, while striving to protect its cultural and democratic traditions.

Current cultural policy in the Czech Republic supports local artists, traditional crafts, and language projects, helping to maintain internal cohesion. Active participation in international cultural projects is also important, as it allows the presentation of Czech culture abroad, thus strengthening awareness of its own identity at home. An example of this could be the support of Czech films, literature, and festivals that draw from the rich cultural tradition while responding to contemporary global issues. The Czech Republic thus continues to build the concept of the "small democracy," which emphasizes citizen involvement and the support of a pluralistic cultural identity as a tool for resilience against the pressures of globalization.

CONCLUSION

Central Europe in the 19th and early 20th centuries represents a region where the historical dynamics of small nations intersect with the hegemonic ambitions of large empires. This area, characterized by rich cultural diversity, linguistic plurality, and constant geopolitical changes, offers important lessons for the present. The small nations of Central Europe faced constant pressure to assimilate, political marginalization, and cultural suppression, yet they managed to preserve their identity through national revival movements, intellectual movements, and political strategies.

František Palacký's Austroslavism played an important role in the Czech political scene after 1848. Although it was not realized in practice, it influenced the thinking of Czech politicians, who continued to pursue the federalization of the monarchy. In the long term, the concept of Austroslavism contributed to the development of Czech political identity and laid the foundation for further efforts toward national emancipation, which culminated in the establishment of an independent Czechoslovakia in 1918. Palacký's ideas remained pivotal not only for his time but also for later generations of Czech politicians and historians. Austroslavism, in the mid-19th century, represented a significant attempt to address the national question in the Austro-Hungarian Empire. While its concept of a federal structure was not implemented in practice, it influenced the direction of the Czech national movement. Palacký's vision emphasized the importance of balance among the nations of Central Europe and protection against the domination of larger powers, making it a lasting source of intellectual inspiration.

A key component of the first Czechoslovak Republic (1918–1938) was the idea of Czechoslovakism, which had a significant impact on the formation of the Czechoslovak state identity. Czechoslovakism brought several positive aspects, such as state stabilization, international recognition, and protection from external threats. However, it also carried tensions between Czechs and Slovaks, which ultimately contributed to the weakening of the republic. Its significance is evident not only in the context of the First Republic but also in a broader historical framework. The idea of a common Czechoslovak nation, while problematic and unrealistic, laid the foundation for long-term cooperation between Czechs and Slovaks. Despite the eventual dissolution of the common state in 1993, Czechoslovakism remains an important concept in the history of Czechoslovak nationalism, and its legacy is still apparent in the cultural and social ties between the Czech and Slovak Republics.

In retrospect, Czechoslovakism can be understood as a reflection of the effort to create a stable, democratic, and strong state in the complex geopolitical space of Central

Europe. Although it ultimately turned out that a fully integrated Czechoslovak nation was not a viable concept, it brought several positive impacts on the political development of the region and laid solid foundations for future cooperation between the two nations.

František Palacký's experience with Austroslavism, the Czechoslovak project of Tomáš Garrigue Masaryk, and the democratic stability of the First Republic show different approaches to how small nations can respond to external threats. While these strategies were not always flawless, their contribution to understanding the role of small states in the global environment remains crucial. It is precisely the pluralistic approach to national identity, the combination of democratic principles, and cultural autonomy that can serve as a model for small states facing globalization pressures today.

The legacy of Central Europe is not only a historical reflection of the past but also a challenge to actively seek a balance between integration into the broader international environment and the protection of internal values. As shown by the current situation in the region, small nations can play a significant role in shaping global trends if they are able to connect historical experiences with modern approaches to preserving their identity.

REFERENCES

- Havránek, Jan. (1998). *Zrození politika. Dějiny a současnost* 3.
- Hroch, Miroslav. (2009). *Národy nejsou dílem náhody*. Praha.
- Homolka, Jakub. (2016). *Koncept racionální civilizace: Patočkovo pojetí modernity ve světle civilizační analýzy*. Praha.
- Hudek, Adam. (2022). *Czechoslovakism*. London – New York.
- Eksteins, Modris. (2019). *Svěcení jara*. Praha.
- Kořalka, Jiří. (1997). *František Palacký a politická moc ve čtyřicátých letech 19. století*. Český časopis historický 4.
- Kučerová, Irah. (2015). *Střední Evropa*. Praha.
- Kutnar, František. (2003). *Obrozenské vlastenectví a nacionalismus*. Praha.
- Křen, Jan. (2019). *Dvě století střední Evropy*. Praha.
- Morava, Jiří. (1994). *Palacký: Čech – Rakušan – Evropan*. Ostrava.
- Vašek, Richard – RYCHLÍK, Jan. (2010). *Formování moderních národů ve střední a východní Evropě v 19. a 20. století*. Praha – Sofie.
- válka, Josef. (1967). *La théorie de l'histoire chez F. Palacký*. In: Sborník prací Filozofické fakulty brněnské univerzity (Řada historická). Brno.
- Štaif, Jiří. (1990). *Revoluční léta 1848–1849 a české země*. Praha.
- znoj, Milan – HAVRÁNEK, Jan. (1995). *Český liberalismus – texty a osobnosti*. Praha.

Bilingualism and Ethnic Greek Minority in Albania

Zamira BOBOLI

Researcher, "Eqrem Cabej" University of Gjirokastra, Albania

Aleksander BOBOLI

Researcher, "Eqrem Cabej" University of Gjirokastra, Albania

Dr. Blerta KORRE

"Eqrem Cabej" University of Gjirokastra, Albania

Abstract

Bilingualism plays a crucial role in the lives of the ethnic Greek minorities in south Albania, shaping their social, cultural and educational experiences. This study examines the impact of bilingualism on the Greek minority's identity, language practices and integration in the Albanian society. In areas like Dropull and Vurg, bilingualism between the Greeks and the Albanians serves not only as a means of communication but also as a tool for preserving the cultural heritage. This linguistic duality enables members of the ethnic Greek community to keep connections to their roots while adjusting to the socio-political and linguistic reality of Albania. Nevertheless, the bilingual environment presents challenges, particularly regarding the need for integration into the dominant culture. Furthermore, bilingualism's role in education, the media and inter-generational transmission of the Greek language and culture is crucial for understanding the complex dynamics of ethnic minority survival in an evolving national context. In conclusion, bilingualism in southern Albania functions both as a bridge to the globalised world and as a safeguard for minority identity.

Keywords: Bilingualism, Greek Minority, Cultural Preservation, Identity, Globalization.

Bilingualism is a prominent feature in many regions of the world, where multiple languages are spoken within the same community. One of the most intriguing examples of bilingualism can be found in Albania, where the ethnic Greek minority, particularly in the southern regions, speaks both Greek and Albanian. This linguistic duality is not only a product of historical, cultural, and social factors but also has significant implications for the identity, education, and integration of the Greek-speaking community in Albania.

This article explores the phenomenon of bilingualism among the ethnic Greek minority in Albania, examining its historical roots, current status, and the challenges and opportunities it presents

Historical Background: The Greek Minority in Albania

The Greek ethnic minority in Albania is primarily concentrated in the southern part of the country, particularly around the towns of Himara, Gjirokastër, Sarandë, and Delvinë. These areas have historically had strong Greek influences, dating back to ancient times when the region was under the influence of the Greek-speaking world. The ancient Greek colonies established along the coast of present-day Albania, contributed to a long-standing Greek presence in the area.

During the Ottoman Empire's rule, the Greeks in Albania, particularly in the south, maintained their cultural and linguistic heritage. However, the complexities of national borders, the shifting of political allegiances, and the tensions between Greece and Albania in the 20th century, have all influenced the status of the Greek language and the position of the ethnic Greek minority within Albanian society.

Bilingualism in the Greek Minority: Language Practices and Identity

For many members of the Greek minority in Albania, bilingualism is a way of life. Greek is spoken primarily within the home and community, while Albanian is used in formal settings, education, and government institutions. This bilingualism is particularly prominent in rural areas, where Greek-speaking communities are concentrated, though it extends to urban areas as well.

Greek language is a cultural and linguistic symbol to these communities. The Greek language serves as a strong marker of cultural and ethnic identity for the Greek minority in Albania. Despite the challenges they have faced, especially during the communist regime, many members of the Greek-speaking community view their language as an integral part of their heritage. Greek is used in daily communication, cultural practices, and religious rituals, especially within the context of the Greek Orthodox Church, which is a central institution for the community. However, Albanian is the official language of Albania, and all citizens are required to learn and use it in public life, including schools, government offices, and the media.

For the ethnic Greek minority, fluency in Albanian is crucial for social mobility and integration into wider Albanian society. Consequently, many Greek-speaking individuals are fluent in both languages, although the degree of proficiency may vary depending on age, education, and social context.

The Role of Education in Bilingualism

Education plays a key role in shaping the bilingual identity of the Greek minority in Albania. In certain regions of Albania with a significant Greek population such as Dropull, there are schools that offer classes and lessons in Greek. These schools, often referred to as "Greek-language schools," can be both state funded and privately funded and supported by the Albanian state or other Institutions such as the Orthodox Church of Albania, and they provide teaching and learning in Greek as well as Albanian.

Greek-language Schools

Greek-language schools have played a vital role for preserving the Greek language and culture among the Greek communities in Albania. In these schools, children learn not only Greek grammar and literature but also history, culture, and religion. This education helps to maintain a sense of connection to Greece and reinforces the community's ethnic identity. We should emphasize the fact that Greek-language schools are not available

throughout Albania, and their access is limited to the southern regions, where the Greek-speaking population is concentrated.

Thus, Albanian is the primary teaching and learning language in the broader public education system. While Greek-language schools provide an option for the Greek minority, most children have lessons in the Albanian language for at least a part of their education. This bilingual education system allows students to become proficient in both languages, although it can also present challenges, particularly for those whose first language is Greek. The pressure to succeed in a system where Albanian is the dominant language can sometimes hinder the full development of Greek language skills, especially for younger generations.

Bilingual children in the ethnic Greek minority in South Albania may face a variety of learning difficulties, influenced by both linguistic and socio-cultural factors. These challenges often result from navigating two languages – Greek and Albanian. Here are some key factors contributing to the difficulties they might encounter:

1. Language Barriers

- a) **Language Proficiency:** Children in bilingual environments may struggle with mastering both languages fully, especially when one language (e.g., Albanian, the official language) is dominant in educational settings, while the minority language (Greek) is used at home or within their community.
- b) **Code-Switching and Interference:** Frequent switching between languages can lead to confusion, and children may mix vocabulary or grammar rules from both languages, affecting their ability to grasp formal academic language.
- c) **Cognitive Load:** Juggling two languages can increase cognitive load, leading to slower language development in both languages, which can impact literacy and communication skills.

2. Educational System and Resources

- a) **Limited Support for Minority Languages:** In South Albania, where ethnic Greek communities are concentrated, the curriculum is delivered both in Greek and in Albanian, and the latest might be a second language for Greek-speaking children. Educational resources in Greek may be limited, and teachers may not always be trained to support bilingual learners.
- b) **Lack of Language-Specific Educational Materials:** Textbooks and learning resources might be predominantly available in Albanian, and this language imbalance can be a major hurdle for children who need to build proficiency in both languages.
- c) **Inadequate Teacher Training:** Many teachers might not have sufficient training in bilingual education, making it harder for them to address the unique challenges faced by bilingual children, such as language delays or difficulties in switching between languages.

3. Cultural and Socioeconomic Factors

Cultural Identity Conflict: Children might experience identity conflict as they are part of both the Albanian and Greek cultures. They may struggle with reconciling their ethnic Greek heritage with the need to integrate into the wider Albanian society, which can affect their motivation and engagement in school. Also, the lack of financial resources may limit opportunities for extra tutoring or enrichment programs that could help children overcome learning difficulties.

4. Psychological and Emotional Effects

- a) **Psychosocial Stress:** The challenges of navigating a bilingual environment, can lead to stress and anxiety, affecting a child's emotional well-being and academic performance.
- b) **Delayed Cognitive Development:** While bilingualism can offer cognitive benefits in the long run, the initial years of learning two languages simultaneously can sometimes lead to temporary delays in language development, which can be misinterpreted as learning difficulties.

Educational Strategies

Some educational strategies worth mentioning are:

- a) **Dual-Language Education:** Incorporating dual-language or bilingual education programs could help children strengthen their skills in both languages. Such programs, however, are often not widely available or well-implemented in areas with smaller minority populations.
- b) **Community Support and Family Involvement:** Active involvement from the ethnic Greek community and families can provide additional support in language learning. This support can include community-based educational initiatives, language programs in Greek, and promoting language use in the home.
- c) **Targeted Interventions:** Early diagnosis of learning difficulties, particularly those that arise from bilingualism, can lead to targeted interventions. These might include language support programs and counseling to help children adapt to the challenges of bilingualism and multicultural environments.

Challenges and Opportunities for the Greek Minority

While bilingualism offers many advantages, it also comes with challenges for the ethnic Greek minority in Albania. These challenges are rooted in both social and political factors that affect the minority's integration and language preservation. They can be:

1. Social Integration and Identity: The ethnic Greek minority in Albania has historically faced issues related to its social integration. There have been periods of tension between Albania and Greece, particularly in the 20th century, which affected the status of the Greek minority. During the communist era, the government's policies towards ethnic minorities were restrictive, and the Greek language was marginalized.

2- Political and Legal Recognition: The ethnic Greek community has been advocating for greater recognition of their rights and for the protection of their linguistic and cultural heritage. The Albanian government, particularly after the fall of communism, has taken steps to grant some degree of autonomy and recognition to the Greek minority, including allowing the use of Greek in local governance and media. However, challenges remain. One of the key challenges facing the Greek minority in Albania is the preservation of the Greek language and culture for future generations. Efforts to revitalize the Greek language include the promotion of Greek-language schools, community-based cultural programs, and language courses for young people. In addition, initiatives by both the Greek and Albanian governments aim to ensure the sustainability of bilingualism in the community by supporting Greek cultural institutions and encouraging greater interaction with Greece.

Conclusions

In conclusion, bilingual children in the ethnic Greek minority in South Albania may face learning difficulties that stem from language barriers, cultural challenges, and a lack of tailored educational support. Addressing these challenges requires a comprehensive approach that incorporates bilingual education, cultural sensitivity, and psychological support.

Bilingualism among the ethnic Greek minority in Albania is a testament to the resilience of a community that has maintained its linguistic and cultural heritage over centuries of political and social change. The use of both Greek and Albanian plays a central role in shaping the identity of this minority group, and bilingualism serves as a bridge between the local community and the broader Albanian and Greek-speaking worlds. While challenges remain, including issues related to language shift, social integration, and political recognition, the efforts to preserve and promote bilingualism continue to thrive. As Albania continues its integration into Europe and its relationship with Greece evolves, the bilingualism of the ethnic Greek minority will remain a vital aspect of the country's multicultural fabric.

REFERENCES

- Cummins, J. (2000). "Language, Power, and Pedagogy: Bilingual Children in the Crossfire." *Multilingual Matters*.
- Baker, C. (2011). "Foundations of Bilingual Education and Bilingualism" (5th ed.). *Multilingual Matters*.
- Bialystok, E. (2001). "Bilingualism in Development: Language, Literacy, and Cognition." Cambridge University Press.
- Snow, C. E., & Genesee, F. (2008). "Academic Language and the Challenge of Reading for Understanding." *Contexts*, 7(1), 18-27.
- Portes, A., & Rumbaut, R. G. (2006). "Immigrant America: A Portrait." University of California Press.
- Grosjean, F. (2010). "Bilingual: Life and Reality." Harvard University Press.
- Hornberger, N. H., & McCarty, T. L. (2012). "Ethnography and Language Policy." Routledge.
- Skutnabb-Kangas, T. (2000). "Linguistic Genocide in Education – Or Worldwide Diversity and Human Rights?" Mahwah, NJ: Lawrence Erlbaum Associates.
- Rumbaut, R. G., & Portes, A. (2001). "Ethnicities: Children of Immigrants in America." University of California Press.
- Vygotsky, L. S. (1987). "Thinking and Speech." MIT Press.
- Suárez-Orozco, C., & Suárez-Orozco, M. M. (2001). "Children of Immigration." Harvard University Press.
- Thomson, P., & Gunter, H. (2011). "The Routledge International Handbook of Educational Leadership."

Teaching English through Questioning: Socratic Strategies for Teaching English to VYEL and YEL

Assoc. Prof. Dr. Joana TAÇI

“Eqrem Çabej” University, Gjirokaster, Albania

Lect. Zamira BOBOLI

“Eqrem Çabej” University, Gjirokaster, Albania

Abstract

Socrates, the classical Greek philosopher, who revolutionized education through his method of questioning, aiming at stimulating critical thinking and illuminate ideas is still having an influential effect on educational environments worldwide. Known as the **Socratic Method**, this teaching strategy focused on inquiry, encouraging learners to explore, analyze, and articulate their thoughts. In the today classroom, Socratic questioning remains a powerful tool, particularly in the context of teaching English as a second language (ESL). By fostering a dynamic environment where students actively engage with language and ideas, this approach can help overcome common challenges in ESL learning, such as a lack of confidence, limited vocabulary, and the passive absorption of language rules. This paper explores how Socratic questioning can be adapted to ESL teaching, highlighting its potential to transform the language-learning process into an interactive, reflective, and empowering experience.

Keywords: Socratic Questioning, Creative Thinking, Critical Thinking, ESL, VYEL, YEL

INTRODUCTION

Teaching and learning, as interconnected educational processes, have long been regarded as the Achilles' heel of modern education. Teaching is not a straightforward endeavor; it is neither mere communication aimed at changing behaviors nor simply the transfer of knowledge and wisdom. Rather, it is an intricate response to the fundamental questions: *What?* and *How?*

The significance of this *What-How* duality remains the cornerstone of an effective and successful educational system, particularly in nations striving for a brighter future. This idea was also reflected in the philosophies of three remarkable figures from the 5th century BCE, each representing different parts of the world:

- **Confucius (China)**, who asserted that education is the key to everything.

- **Ezra (Jerusalem)**, who viewed education as the sole means of reforming an entire society.
- **Socrates (Athens)**, who equated education with happiness.

The central question this paper seeks to explore is: *Who was Socrates, and what does his teaching philosophy represent?*

Socrates, the most influential Greek philosopher of the 5th century BCE, remains one of the most debated educators of both past and present. His impact endures, inspiring teachers, philosophers, and researchers today. He owes much of his prominence to Plato's *Apology of Socrates*, which provides invaluable insight into his teaching philosophy.

According to Plato's account, Socrates placed great emphasis on *dialogue through questioning* as the fundamental method of teaching young Athenians how to philosophize, seek truth, and ultimately attain happiness. Interestingly, Socrates himself denied being a teacher or an educator of any kind. Instead, he claimed that the Oracle of Delphi had declared that no one was wiser than he, and that Apollo had destined him to be a missionary of education among the Athenians. This revelation underscores how Socrates depicted teaching and knowledge dissemination as a divine process—where teachers and educators are chosen by the gods to guide humanity on an endless journey toward wisdom and enlightenment (Ostenfeld, 2019).

In this regard, Cicero famously acknowledged Socrates as the philosopher who "brought philosophy down from the heavens" and established it on Earth as a means of seeking truth. To fulfill his divine mission, Socrates relied on dialogue, conversation, and cross-questioning—an intellectually stimulating methodology that formed the essence of his famous *Paideia* (Johnson, 2011).

TO WHAT EXTENT DO SOCRATES' TEACHING STRATEGIES RESONATE WITH MODERN TEACHING METHODOLOGIES?

As stated in the introduction, Socrates engaged in seemingly simple dialogues with his followers, often feigning ignorance—an approach known as **Socratic Irony**. This technique is encapsulated in one of his most famous quotes: *"The only true wisdom is in knowing you know nothing."* At its core, this strategic teaching behavior acknowledges and embraces gaps in knowledge, using direct yet humble questioning to encourage deeper thinking. Through this method, Socrates fostered extended, meaningful dialogues with his followers (essentially his students), guiding them from basic conceptual inquiries to complex, thought-provoking discussions.

Socrates' questioning strategy can be understood as a gradual progression through three stages:

1. **Humble Questioning** – The teacher assumes a position of ignorance to create a collaborative and open learning environment.
2. **Interactive Questioning** – Engaging students in dialogue, prompting them to articulate their thoughts and refine their reasoning.
3. **Provocative Questioning** – Challenging students' beliefs, exposing contradictions, and stimulating critical reflection.

This smooth transition between questioning stages is clearly reflected in Socrates' famous statements: *"I cannot teach anybody anything. I can only make them think."* and *"Education is the kindling of a flame, not the filling of a vessel."*

Socrates belonged to a select group of philosophers and educators who sought to uncover people's thought processes and encourage intellectual clarity. His **"What and How" teaching methodology**, based on persistent questioning, aligns closely with his **cross-**

examination approach—what we now call the **Socratic Method**. This method strongly resonates with several modern pedagogical frameworks, including:

- **Critical Thinking** - Encouraging students to challenge their assumptions, question their beliefs, and develop deeper insights.
- **Self-Reflection** - Promoting self-awareness by compelling students to examine their biases, limitations, and areas for improvement.
- **Interactive & Collaborative Learning** - Prioritizing active student participation and fostering dialogue between learners and educators.
- **Student-Centered Learning** - Shifting the focus from passive information reception to active engagement in the learning process.
- **Inquiry-Based Learning (IBL)** - Encouraging students to explore questions, investigate problems, and construct knowledge through guided inquiry, mirroring the Socratic approach of prompting students to seek answers rather than simply receiving information.
- **Problem-Based Learning (PBL)** - Engaging students in solving real-world problems through critical questioning and analysis, a methodology deeply rooted in Socratic dialogue, where students refine their understanding by tackling complex, open-ended challenges.
- **Design Thinking** - Although not explicitly attributed to Socrates, design thinking shares fundamental similarities with his method.

A compelling connection can be drawn between **Socratic Questioning and Design Thinking**, despite their different historical contexts. Both emphasize **critical inquiry, iterative learning, and problem definition**—all essential for effective thinking and innovation. Socratic questioning refines ideas by revealing contradictions and encouraging deeper exploration, much like design thinking refines solutions through prototyping and feedback. In this sense, the **Socratic Method can be viewed as an early intellectual foundation for the principles that later shaped design thinking**.

APPLYING THE SOCRATIC METHOD TO TEACHING YOUNG AND VERY YOUNG FOREIGN LEARNERS OF ENGLISH (VYEL and YEL)

It is widely accepted that the age of compulsory English education has steadily decreased in recent years. Additionally, children are being introduced to digital English earlier in life. Generative linguists propose that studying English before the critical age (estimated at 12–13 years) leads to greater proficiency. Slatterly and Willis (2002) categorize learners aged 7–13 as Young English Learners (YEL) and those below 7 as Very Young English Learners (VYEL).

However, proficiency in English is not solely dependent on exposure before this debated Critical Period; other factors play a role, such as the number of instructional hours and, most importantly, the techniques and classroom activities employed.

In this context, this paper seeks to address the following questions:

1. Can the Socratic Method be an effective classroom technique for teaching English as a Foreign Language (EFL) to Albanian young and very young learners?
2. How can EFL teachers incorporate the Socratic Method into their teaching practice?

Teaching EFL to VYEL and YEL is particularly challenging when students do not speak English outside the classroom, meaning they acquire it as a second language. To ensure effective learning, teachers must select techniques that motivate and enhance students' reading, speaking, listening, and writing skills. One way to achieve this is by creating an immersive English-speaking environment, where the teacher refrains from using

the students' first language (L1)—in this case, Albanian. Such an environment encourages enjoyable and interactive exchanges of dialogue and conversation, forming a solid foundation for the successful application of the Socratic Method.

By employing guided questioning and interactive discussions, educators can foster a dynamic classroom atmosphere in which children actively construct knowledge rather than passively receive it. The Socratic approach can be integrated into the following classroom activities:

1. Teaching vocabulary through visual and tactile tools

VYEL and YEL should be exposed to concept-based and content-based materials, such as posters, images, real classroom objects, and familiar items from home. These should illustrate key vocabulary related to topics such as colors, animals, family, seasons, weather, fruits, and vegetables.

For instance, when introducing an image of a dog, the teacher can employ a structured questioning sequence:

Teacher: What can you see?/ What do you see?/ What is this?¹

Student: It is a dog.

Teacher: Is it a bird?

Student: No, it isn't.

Teacher: Is it big or small?

Student: It is big.

Teacher: What sound does it make?

Student: It woofs.

Teacher: What sound does it make in Albanian?

Student: It says "ham."²

Teacher: Can you think of other animals like this?³

This sequence exemplifies the Socratic Method, as students discover meaning through structured questioning. Similar dialogues can be conducted using additional vocabulary-related materials, such as flashcards, projected images, or real-life objects.

2. Creating an English-speaking environment through storytelling and role-playing

VYEL and YEL should be introduced to short stories that use simple phrases and sentences. The teacher begins with basic questions like "What is this?" to establish an understanding of the narrative.

For example, when discussing *Snow White and the Seven Dwarfs*:

Teacher: Where does Snow White live?

Students: She lives in a castle/cottage.

Teacher: Where does the prince live?

Students: He lives in a castle.⁴

¹ The choice depends on the grammatical content the teacher is teaching: model or auxiliary verbs/ copula or "do" auxiliary.

² This question instills in VYEL and YEL the idea that there is a difference even in the sounds animals make not only content-based words. This represents a preliminary introduction to the onomatopoeia.

³ This is a provocative question and it requires deeper thinking or critical thinking. The teacher is not only interested in learners knowledge on animal concepts but also what kind of dog-animal relation they would refer to: Dog-Cat (domestic animals) or Dog-Wolf (looking alike)

Teacher: What does Snow White look like?

Students: (Use vocabulary related to appearance.)

Teacher: What does the stepmother look like?

Students: (This question aims at the use of the appearance-related contrastive adjective e.g., beautiful-ugly.)

Teacher: What is Snow White like? What is the stepmother like?

Students: (This question aims at the use of the character-related contrastive adjectives e.g., good-bad, kind-evil.)

Teacher: The stepmother is kind, isn't she?

This last question is thought-provoking because it presents an incorrect assumption, prompting students to reconsider and engage critically with language. Through this process, learners not only develop vocabulary but also improve grammar, pronunciation, listening, and speaking skills.

3. Fostering collaborative learning

Students are encouraged to ask each other questions based on vocabulary and storytelling activities. This interaction enhances peer-to-peer learning and helps develop question-building skills, which can be challenging for Albanian VYEL and YEL. By actively engaging in question formulation, students deepen their understanding of English sentence structures and improve communication skills.

4. Problem-solving through dialogues

Teachers can introduce real-life scenarios that prompt students to construct responses in English. For example:

Teacher: Some children are playing on the playground, while others are using their tablets. What are you doing?

Students must visualize the scenario and provide individual responses. This activity fosters independent thinking, language production, and the development of social-emotional and problem-solving skills.

5. Scaffolding: Structuring tasks for achievable learning

Integrating the Socratic Method into EFL teaching requires breaking tasks into smaller, manageable steps—a technique known as scaffolding. This approach ensures that learners gradually build their understanding of the language through structured support. By progressively challenging students with guided questioning, teachers help them advance from simple recognition to deeper comprehension and independent use of English.

In conclusion, incorporating the Socratic Method into the EFL classroom offers an interactive and engaging approach to language acquisition. By fostering dialogue, inquiry, and structured questioning, teachers create a more immersive and dynamic learning environment for Albanian young and very young learners, enhancing their overall language proficiency and critical thinking skills.

⁴ This questioning method help Albanian VYEL and YEL to a grammatical use of third person singular as the third person "s" inflection always goes missing.

REFERENCES

- Coulter d. J., 1995, *Music and the making of mind. Early childhood connections*. The journal of music- and movement- based learning 1, 22-26.
- Curtain H., and Dahlberg c. A., *Language and learners – making the match. World language instructions in K-8 classrooms and beyond*, 5th edition, Boston, 91-92, **ISBN-13: 9780133745085**
- Gardner H., 1993 *Frames of mind. The theory of multiple intelligences.*, 2nd edition, Basic book, New York, 105-110, ISBN-10: 465-02510-2.
- Hill-Clarke K. Y., and Robinson R. N., 2004, *It's as easy as "A-B-C" as "Do-Re-Mi": Music, rhythm and rhyme enhance children literacy skills*, *Young children* , 59(5), 91-95.
- Hirsh R. A., *Early childhood curriculum: Incorporating multiple intelligences, developmentally appropriate practice and play*, Boston, Allyn and Bacon
- Jensen E., 2001, *Arts with the brain in mind*, Alexandria VA., Association for Supervision and Curriculum Development, Alexandria-Virginia, USA, 13-49, ISBN: 978-0-87120-514-8.
- Johnson P., 2011 *Socrates: A man for our times*, penguin group, New York, USA, ISBN: 978-0-670-02303-5.
- Murcia M. C., and Freeman D. L., 1983, *The grammar book. An ESL/EFL teacher's course*, Heinle and Heinle Publishers, USA, 122-135, ISBN 0-8384-2850-9
- Nunan D., 1999, *second language teaching and learning*, Heinle and Heinle Publisher, Boston, USA, ISBN: 0838408389, 9780838408384
- Ostenfeld N. E., 2019, *Socrates rationality*, Acts of Plato Conference, Aigis, 19,1.
- Pihlgren S. A., 2008, *Socrates in the classroom; Rationales and effects of philosophizing with children*, Stockholm, Sweden, ISSN: 1104-1625-146, ISBN:978-91-7155-598-4.
- Shin J. K., and Grandall J. A., 2014, *Teaching young learners English. From theory to practice*. Boston, National Geographic Learning/ Cengage learning
- Shin K. J., 2006 *Ten helpful ideas for teaching English to young learners*, Number 2, English teaching forum, americanenglish.state.gov/english-teaching-forum, 2-8, USA.
- Shin K. J., 2007 *Developing dynamic units for EFL*, Number 2, English teaching forum, americanenglish.state.gov/english-teaching-forum, 2-8, USA.
- Shin K. J., 2017 *Get up and sing. Get up and move. Using songs and movement with young learners of English*, English teaching forum, americanenglish.state.gov/English-teaching-forum, USA, 55, 14-25.
- Shin K. J., 2022, *Literacy instruction for young EFL Learners: A balanced approach*, Open Professional English Network, US Department of State, 1-8, USA.
- Slatterly M., and Willis J., 2002, *English for primary children*, Oxford University Press, Oxford, ISBN-10: 0194375625, ISBN-13: 978-0194375627.
- Taçi J. "Nursery Rhymes and their importance in teaching English to pre-school children" 4th International Conference on English Language and Literature, ICELL, University of Beder, Tirane, Albania, Proceeding book ISBN: 978-9928-4345-5-5
- Taçi J., 2022, *Song singing as a beneficial approach in teaching possessive pronominal constructions to Albanian VYEL and YEL*, 5th International Conference on Foreign Language Education and Culture, Faculty of Education, University "Aleksander Moisiu", Durres, Albania, Book of proceedings ISBN: 978-9928-4714-7-5
- Taçi J., 2022, *Teaching English as a foreign languages in pandemic times*, *European Journal of Education*, (Impact factor 1.389), 3 (3), ISSN 2601-8624. Available at: <http://journals.euser.org/index.php/ejed/article/view/4853>, Amsterdam (Hollande)
- Taçi J., Kore B., and Shehu E, *The psychological and cognitive effect the scientific inaccuracies have on 5th grade students knowledge acquisition*, 4th International Conference on New Approaches in Education, London, United Kingdom
- Teo A., Shaw F. J., Chen J., and Wang D., 2016, *Using concept mapping to teach young EFL learners reading skills*, English teaching forum, americanenglish.state.gov/english-teaching-forum, 20-26, Taiwan.S

Comparative System on the Arbitration Procedure in the American and European Systems

Iacob Andra BIANCA

Master's student in Romanian private law institutions and master's student in European Law,
University Lucian Blaga of Sibiu, Faculty of Law, Romania

Abstract

Since the dawn of human societies, people have frequently encountered disputes in various fields. As societies developed and became more complex, different regulations were established to resolve disputes between parties.

Initially, disputes were primarily resolved through courts of law. However, alternative dispute resolution (ADR) methods such as mediation, conciliation, and arbitration have gained significant prominence, often with the mutual agreement of the parties involved. These ADR procedures are conducted by specialists with experience in the relevant field.

The arbitration procedure is regulated at international, regional, and national levels. Its use has increased significantly with societal modernization and development. Modern society recognizes the need for judicial reform to alleviate the burden on national courts, which often face case backlogs.

Arbitration is a prominent alternative to traditional litigation in American and European societies, with a stronger emphasis on its use in American society. While typically used in commercial law, arbitration can also be employed to resolve labor disputes in certain cases, such as those involving work rules or job classifications

Keywords: European Law, American Law, Evolution, Labor Law, Arbitration

I. INTRODUCTION

From the very beginning, the societies had to perform various jobs to survive, and disputes did not cease to arise. With the development of the world, these disputes have developed and become more and more complex, being extended from internal to external level, being called labor disputes over time, and to solve them, real specialists in the field began to be granted as fair as possible. In this context, the European and American courts began to have more and more cases to solve that could not be postponed.

In the context of the streamlining of court cases, it has been observed by governments that there is a clear need for possibilities for resolving labor disputes with the help of alternative dispute resolution channels such as: mediation, conciliation, negotiation and arbitration. This term is known from "*Varieties of Dispute Processing*" book by Frank Sander

(Sander 1976). Their common provisions are alternative solutions, flexibility and confidentiality (Lin 2021):

- a. **Alternative solutions** means that the dispute is not solve by Court, in this context the cause is not delayed.
- b. **Flexibility** causes, the people who start a dispute have the possibility to chouse their alternative dispute resolution process. The parties from litigation can choose to submission documents, using the technology for virtual meetings that are going to take place (Bloomberg Law 2025).
- c. **Confidentiality** exists in a Court just for special causes e.g. causes with minors, but in normal circumstances confidentiality does not exist. Thus, any process that is resolved through alternative dispute resolution benefits from confidentiality.

II. THE ARBITRATION PROCEDURE

Arbitration is often used in commercial disputes but can be used also in labor law, employed in consumer and employment matters. A definition for arbitration is that this procedure is an alternative and private dispute resolution method. To have a case resolved with arbitration in labor law we need to have a prior agreement between the parties, often mentioned included in the contract that in case of a conflict, they solve it in an arbitration tribunal (Prinz 2024).

In an arbitration procedure we have two (2) types of arbitration convention:

A. **Compromise agreement** is a legal document between a company and an employee where they agree to settle an existing labor dispute, such as wrongful termination, discrimination, or wage and hour violations (dfa n.d.). This agreement outlines the terms of the settlement, such as compensation, benefits, and the release of claims, avoiding the need for further litigation. It is a negotiated settlement between employee and employer (Landau Law solicitors n.d.).

B. **Arbitration Submitted:** is used to resolve disputes before they escape between a company and an employee. It is solved by an arbitrator; it is just one arbitrator, and it is a formal procedure (Pepperdine Law Blog 2023).

The main difference between the compromise agreement and arbitration submitted is that the first one is referring to ending a dispute though a negotiation settlement without a formal agreement and the second one is about a formal agreement.

In arbitration, there are three (3) parties, the first two (2) parties are the ones who have the dispute, and the third party is a neutral person called arbitrator who is chosen by the parties to the dispute (Gary 2021, 38,39,86). The arbitrator needs to be independent and impartial to garnet a correct decision (Sídika 2024, 95-124).

The parties that are involved in litigation processing are called:

A. **The claimant:** is the part that sends the notification to the respondent and at the same time need to send the notification to ADR Chambers.

B. **The respondent:** is the person who receives the notification from the claimant

The arbitration procedure is stated on the day when the ADR Chambers receive the notification from the claimant and the ADR sends to the parties a written document to inform them that the notification was received and to let the respondent submit a short answer. The second part need to send answer in fifteen (15) days to ADR Chambers and to claimant. (ADR Chambers 2024).

The notice of arbitration procedure is in conformity with the UNCITRAL Arbitration Rules (1976) (United Nations 1976), this notification need to contains more information, the

most important: the parties, the object of dispute, a proposal of the number of arbitrators, the language and the place (ICSID 2024).

Arbitration is regulated in the *New York Convention* (1958) (Nations 1958) adopted by United Nations based on *UNCITRAL Model Law on International Commercial Arbitration*. This Convention concludes that an arbitral award is binding and may be made in any state and freely enforced in another state, for example, an arbitral award may be made in Colorado but enforced in California, and the principle of reciprocity. Our opinion is that this convention is the most important instrument in alternative dispute resolution because it has a broad scope of application.

II.1. Types of arbitration:

a. **Institutional arbitration:** it is a type of arbitration that is administered by a specialized institute (Columbia Law School 2024). Examples of institutions: International Chamber of Commerce, American Arbitration Association, London Court of International Arbitration are not less than 1200 of arbitration institutions worldwide. It is essential to understand that any arbitration institution has its own procedure of solving a litigation process (Pinsent Masons 2025). During 2010 and 2015, 79 percent of people who needed to solve a litigation chosen institutional arbitration to the detriment of ad hoc arbitral (Ashurst 2024).

b. **Ad hoc arbitration:** is a procedure where the parties from litigation chose the rule of procedure (Ashurst 2024). Although they can choose the number of arbitrators to decide the case, they have little support from institutions (Sicard-Mirabal 2018, 5) and may have problems. Parties can amend any arbitration clause even after the arbitration proceedings have commenced, however this can be faster than an institutional arbitration (Lexis Nexis 2023).

The main differences between institutional arbitration and ad hoc arbitration are that in the first one we have an arbitration institutions that made the administration and in the second one the administration is made by the parties the rules for the first one is the institutional rules and for the second one is made by the agreed upon parties and of course that the institutional arbitration is more expensive than ad hoc arbitration- because the ad hoc arbitration is not so supported by the arbitration institutions than institutional arbitration.

III. THE ARBITRATION SYSTEM IN AMERICAN LAW

During the 1925 the American legislative system started to become more modern helped by *The Federation Arbitration Act* (FAA) that is known as a main rule that regulate the arbitration procedure in all American countries. FAA is a federal law that helps to enforce the arbitration agreements (LLC 2025). However we can have some countries like Colorado where the arbitration procedure is more flexible than the FAA, for example the Colorado arbitration law can allow slightly border grounds for judicial review- review of decision based on certain procedural errors and the arbiters can have a supplementary ethic standards to protect the parties that are in a litigation (Federal Arbitration Act Comparison, 1986, 5-6).

This law does not distinguish between intern, inter-statal and international arbitration (Mihai 2013, 61). This rule is applicated in states courts and federal courts as is mentioned in *Southland Corp. v. Keating*, 465 U.S. 1 (1984) (Southland Corp. v. Keating, 465 U.S. 1 1984). FAA has a wide range of disputes in which it can be applied, except for those that are the subject of contracts for sailors, railway employees or any other class of workers involved in foreign or interstate trade (Wikipedia 2024).

Thus, our opinion is that this law is extremely complex, because qualified people have a single, more complex law that they use to resolve a wide range of disputes and only for more special cases such as those presented above do, they must resort to other reference sources.

In general, it takes six (6) months to have a labor law litigation solved with an arbitration procedure (Bloomberg Law 2025) but can be taken, depending by the complexity of the case. However, the arbitration procedure is faster than litigation in a Court of Justice in some cases an arbitration procedure can be solved in no less than one (1) year (Dosani 2020).

III.1 The arbitration labor law in California

In California the arbitration procedure is a traditional way to solve a litigation between parties who do not want to go to a traditional Court of Justice. In general, the Californian people want to solve their problems in this way to save time and money, it gives them more flexibility (California Courts self-help guide 2025).

The labor and employment procedures in California are governmental by several types of federal laws and primarily law: *the California Arbitration Act* and the *Federal Arbitration Act* (MURTAGH 2023). The California arbitration act is codified in California Code of Civil Procedure sections: 1280-1294.2 (California Code 2023). In 2020, the section 1281.97 was modified so if the employer doesn't pay the invoice for ADR in thirty (30) days (Jang 2024), let the employee apply to stop the arbitration procedure and to win the honors (Amy S. Williams 2024). The arbitration procedure from California does not use the *Uniform Arbitration Act* (National Conference 2000), in this context we can find some difference when we have the object: specific procedural rules or the scope of judicial review.

The *California Labor Law Code* does not have any specific article dedicated to arbitration, but it has some sections with different aspects of arbitration in employment context (California Code 2023). For example, the *section: 1102.5* prohibits employers from retiling against employees for exercising their rights under the Labor Code, including the arbitration agreements and the *section 2802* grants employees the right to claim any expenses incurred during employment through arbitration procedures (Cohen 2024).

In the arbitration labor law from California, we can find some specific things such as: an employer can require an employee to agree to arbitration as a term of employment (Morrison 2025). The employee does not have to pay all unreasonable costs and can pursue all available remedies (Forman 2012).

III.2 The arbitration law in Colorado

Colorado arbitration law in the employment context is governed by the *Colorado Arbitration Fairness Act* which is an impartial arbitration procedure (ACT 2018) and by the *Uniform Arbitration Act* (UAA) (National Conference 2000).

The Fairness Act has different ethical standards procedures for arbitrators like *impartiality, disclose and confidentiality* and the parties can challenge an arbitrator. The possibility of changing an arbitrator is permissible in arbitration procedure in compliance with judicial court where judges cannot be easily changed. The procedure of arbitration starts in the moment when a person submitted a notification to another part (Porter 2019).

A particularly important point to notice is that if a court has more claims, some of them can be solved in an arbitration proceeding and some of them can be solved just in judicial proceeding the second claims are suspending till now when we have a conclusion for arbitration proceedings (Porter 2019).

III.3 The Cause Alexander v Grander- Denver Co

In the following we would like to describe the first cause solved by arbitration procedure from the United States of America. This cause is a good start to understanding the relationship between arbitration and civil rights claims. This decision makes us understand that an employer can pursue statutory in court, even if the submitted it in an arbitral Tribunal.

The first arbitration process in labor law was in 1974 called Alexander v Grander-Denver Co (Alexander v. Gardner-Denver Co 1974). The main subject was a man named Alexander who was an employee of the *Company Grander-Denver Co.* and was fired. In his opinion the purpose of fired was racism and in this context filed a lawsuit under the *Civil Rights Act of 1964* (Title VII Equal Employment opportunity 1964, 253-266). The arbitration instance was headed by Warren Burges and others, and they discovered that the real purpose of his field was poor performance at work.

Because Alexander was not satisfied with the solution he received, he filed another complaint with the Supreme Court on the grounds of racism. This led to a historic decision, the court believing a person who believes that he has been wronged can file a complaint with the arbitration court but also with the national court, having as its correspondent Title VII of the Civil Rights Act of 1964.

In conclusion the arbitration instance observes the interpretation of collective contract, and the national instance observes possible violations of rights.

III.4 The similitudes and differences between California and Colorado countries

1. The most important similitudes between California and Colorado:

a. The Federal Arbitration Act: which influences them.

b. Unconscionability: both states examines the arbitration agreement for unconscionability, so in this context to have an admission procedure both parties must have corrected and reasonable agreements (Erin Trendera 2024).

2. The difference between Colorado and California arbitration proceedings referring to: specific legislation, judicial interpretation, focus on employee rights.

A. Specific legislation

a. Colorado: is in accordance with the *Colorado Arbitration Fairness Act*, we need to see this act as a way that should be viewed to level the playing field in arbitration and the use of transparent, accountable, and fair arbitration proceedings.

b. California: has its own legal procedure: *the California Code of Civil Procedure* and it is trying to protect the employees' rights.

B. Judicial Interpretation

a. Colorado: more potentially allowing for changes in the arbitration agreements.

b. California: has a long and strong history in arbitration agreements in special when the main object is the employee rights or public policy, such the cases: *Ramirez v. Charter Communications and Gentry v. Superior Court*.

IV. ARBITRATION SYSTEM IN THE EUROPEAN SYSTEM

European arbitration has a complex and multifaceted area because in general the parties from arbitration litigation can choose the rules of arbitration, the language and the

place where their cause can be solved. European Union law exerts an indirect influence on arbitration proceedings through various regulations such as the *Brussels I Regulation* which was amended by *Regulation 1215/2012* (European Union 2012). In general, the European Union countries establish their own centers where the arbitration litigation can be solved and at the same time the London Court of International Arbitration plays a significant role (Cooley 2023).

In the following we would like to describe the most important arbitration legislation procedures that are used in the European arbitration system:

A. Brussels I Regulation

Brussels I Regulation (European Union 2012) contains norms which help European Union (E.U) states to understand if they have jurisdiction to decide on different causes with links to more than one country E.U. The main principle of this directive is that an E.U court is competent to come up with a decision in a case where the defendant is domiciled. Domicile is known after the domestic law of the member states (Bird & Bird 2013, 3). In this case if the defendant has domicile in Austria but he is in Germany the German's Court need to apply the Austrian arbitration law. Brussels I Regulation does not regulate the arbitration procedure in directly way (Okayay 2023, 63).

The original Brussels Regulation I was adopted in 2001 and was known as: *Regulation (EC) No 44/2001* (European Union 2000) and the main object was the recognition and enforcement of judgments in civil and commercial law from European Union during the 2002-2015.

B. The New York Convention (1958)

The New York Convention (1958) played a crucial role in applying arbitration procedures because all the EU states ratified this convention, for a high responsibility. One of the first EU country which ratified the New York Convention is France, United Kingdom ratified in 1966, Portugal in 1994 (New York Convention guide 1958). Our understanding is that the *New York Convention* has the reasonability to come up with a supplement in national law. This should be translated as follows: national law is the one that outlines the specific national arbitration procedure and NY only comes with a superior complement through which the recognition and enforcement of awards is done.

These two (2) arbitrations legislations, are trying to facilitate the resolution in international disputes even if the focus is different, in this context we have the *Brussels I* which is focus on court proceedings within the European Union while the *New York Convention* is specifically with recognition and enforcement of international arbitral awards (Primer 2024). Both facilitate international trade and commerce by legal frameworks and cooperation between the courts and legal authorities in different jurisdictions.

IV.1. The arbitration procedure in France system

In France the first act for arbitration and conciliation was establish on 27 December 1892 and established a procedure for any disputes between companies or individuals in labor disputes (Office 1921, 166). This procedure was used voluntary by parties of litigation and the crucial role of this procedure was played by the: *Jude de Paix* known as the Justice of Peace who is a local magistrature.

Between 1892 and 2011, the arbitration procedure from France was in a profoundly change, were established some reforms in arbitration procedure between 1980-1990 and was trying to develop the main object was to modernize in flexibility and efficacy the arbitration

procedure in France (Bruce 2020). Because of these modernization and reforms that were made at the end of XX century, the capital of France- Paris has become a city of international arbitration (Darwazeh 2023).

In 2011 France adopted a new system of arbitration, called *Decree No. 2011-48* (Decree No. 2011 2011) that reglement, domestic and international arbitration. This new regulation is established to help codify the basic principles of French case law and aims to increase citizens' confidence in using the arbitration procedure (Poulin 2020), in the detriment of the court, our opinion is that the French government does not want to overburden the national Courts.

The most important improvements being those concerning the elimination of the suspensive effect in the event of a challenge to the arbitral award, the maintenance of a judicial review with a view to an award.

At the same time, French system made a fundamental definition on what means domestic arbitration and international arbitration.

Types of arbitration in France

a. **Domestic arbitration (articles 1442-1503 of the Code de Procédure Civile):** is used by a dispute between two companies or individuals who have in common the same country e.g. one company from London and another one from Liverpool, have a dispute that can be judge in a domestic procedure because both have in common the country: United Kingdom.

b. **International arbitration (articles 1504-1527 of the Code de Procédure Civile):** when the context of dispute is an international interest regardless of the place of establishment or their nationality (Dictionary 2024).

In normally the difference between domestic and international arbitration is represented by the domicile country. Fo example, even if we have a company from Germany and another one from Austria and in their contract established that in case of a disputes the competent court is Austria. We would have the next situation: one company litigating its dispute in its home country and another one is a foreign country. For this reason, our opinion is that the most beneficial would be for a possible resolution of the dispute to be in the territory of a third country.

Nevertheless, France has an interesting perspective, so in a case of disputes between two companies from France that have an international interest, the dispute is going to be judged as if it were an international case.

For France the arbitration procedure is common for solve the disputes, in Paris we can found the institute: International Court of Arbitration that its operate under the International Chamber of Commerce and has more than 100 arbiters form 90 countries (International Chamber of Commerce 2024). In 2020 there was a record of registered 25.000, 23 emergency cases and an annual record of 869 in 2019 (International Chamber of Commerce 2024).

In general, in French the labor disputes between individual employees and employers are solved in Judicial Courts know as: Conseils de Prud'-hommes- Industrial Tribunals (Castellane 2009, 293-299). In general, the arbitration procedure in labor law is used in collective disputes. These collective disputes in labor law are coming because of a complex cause like (International Labor Organization 2019):

- a. Interpretation and application of collective agreements including salary, working hours,
- b. Social benefits like holidays
- c. Health and safety including workplace safety, occupational health

IV.2 The arbitration procedure of labor law in Romania

Romania, as an European union country is influenced by international labor standards and in recent decades the social dialogue and the alternative disputes were developed (Remus Codreanu 2023).

In Romania the arbitration procedure is governed by the *Civil Procedure Romania Code*, in the articles 541-621 1.111-1.133 for international arbitration procedure. We have an international arbitration procedure when we have minim one (1) foreign element that can cause a *conflict of laws* (Draghici 2025) and by the Law of International Commercial Arbitration. The main arbitration Court in Romania is the *Court of International Commercial Arbitration*, attached to the *Chamber of Commerce and Industry of Romania*.

In a Romanian labor dispute that is solved in an arbitration procedure with three (3) arbitrators chosen in this way:

- a. The first arbitrator is chosen by the company
- b. The second arbitrator is chosen by an employee
- c. The third arbitrator is chosen by the Ministry of Labor and Social Protection

These arbitrators are working to solve the labor litigation dispute in an independent and impartial way (Gheorghe 2010, 399). These arbitrators are chosen from an annual list of arbitrators, and they need to have a minimum of five (5) years of experience and superior studies.

In general, the Romanian arbitration labor procedure is not so used like commercial law. However, in some cases this procedure can be used in certain situations of labor disputes like:

Collective negotiation agreement: interpretation or application of collective negotiation agreements. If these parties would like to have an arbitration procedure for their dispute, in their contract the arbitration agreement needs to be mentioned. The arbitration procedure is in general solved in six (6) months and for special causes can be extended for another three (3) months by arbitrators (Vasilescu 2020).

The Romania Courts are in general limited in review of labor arbitration awards. The courts have this possibility for different issues like lack of jurisdiction, extending of the scope of authority (CMS 2020).

IV.3 The similarities and differences between French and Romania arbitration labor procedure

The similarities

- a. Both countries have a voluntary agreement made by the parties of litigation
- b. both countries focused on collective negotiation agreement
- c. The labor arbitration law is limited in comparison with commercial law

The difference

- a. The French arbitration labor law is influenced by civil law with a strong power on the role of courts and legal framework (FrenceTaxLaw 2024).
- b. The Romania arbitration law is more recent than in France.

V. TYPES OF ARBITRATION LAW IN AMERICA AND EUROPEAN LAW THAT ARE SIMILAR AND DIFFERENCE

1. Arbitration can be used to solve different types of labor litigations in two (2) varieties:

A. **Interest arbitration:** which provides a decision offered promptly by the arbitrator. If we have two parties who cannot reach a new agreement. Generally, this is offered as an opportunity to resolve labor law disputes where we find as an object of interest employment contracts falling within the scope of the public sector or their negotiation (LSD define dictionary 2025) at the same time can be useful to close a strike (Slater 2013, 387)). If we have a contract that is about to be concluded and the parties cannot reach an agreement, then the arbitrator is the one entitled to examine the wishes of both parties (Ricketson 2013, 2) and after this the arbitrator says what is included and what is not included in the contract ((LSD define dictionary 2025).

B. **Grievance or arbitration of rights** is used in the moment that a part of contract: employees or employers violated the terms of agreement (Alberta 2024). In general time is used for collective contracts but can be used also for individual contracts such as: discipline, work assignments or seniority. The employers and employees send different evidence and interpretations of the contract to the arbitrator. The arbitrator checks them and hears the parties to then give a final and binding solution (Thomson Reuters Practical Law 2024). This type of procedure is initiated in general by employees, but it is not excluded to be started by employer.

We observe that these two categories are similitudes because they have the same objectives: labor law, contracts, and parties: the parties consisting of employers and employees. However, we have a main difference between them: it is addressed to the range of actions they share. The first, interest arbitration, is for the future contracts. These future contracts need to be negotiated by employers and employees.

The second, grievance arbitration, refers to the method of application, and how a contract needs to be interpreted. Employers and employees have a contract, but they do not know how to apply it, in this context they need an arbitrator for a more correct understanding.

C. **Recognize the importance of collective negotiation:** between employees and employers. This means that the negotiation procedure needs to be in accordance with terms and conditions of employment (Eurofound 2017). The workers have the right to join and form the unions

D. **Arbitration:** is an alternative procedure of solving a litigation in both systems, it is faster and less formal than a Judicial process

2. The difference between European and American arbitration labor law

The role of Courts:

a. **Europe:** the European courts have an active role in arbitration disputes, can intervene in extension in the arbitration process like the choosing of arbitrators or to review the validity of arbitration agreements (Cour europenee d'arbitrage 2022).

b. **United States:** the United States Courts have a limited role in an arbitration process and intervening in a limited circumstance: if one of the part refuse to participate in arbitration proceedings and the second part can submitted a notification to the court to compel the arbitration (Cornell Law School 1925).

The Judicial Review of Awards

a. Europe: in some European countries like France the judiciary arbitration awards is wider than in other countries including United States these French courts have more concise reasoning on public political consideration when examine the arbitral awards (Capello 2023), this means the potential to set aside an arbitral award is greater.

b. United States: the judicial review is limited in generally the courts typically have a narrow standard of review (McDermott 1986, 248-256).

The influence

a. Europe: is influenced by civil law traditions

b. United States: influenced by common law traditions

In an European labor law dispute in general is trying to be solved with an emphasis on social dialogue while in United States labor law the dialogue is not so prominent.

CONCLUSION

At the end of this, we concluded that labor law is a constantly changing system, labor disputes that are settled through the arbitration procedure are unstable, with a permanent need for delicate specialists in this field who are familiar with the latest legislation and reforms in order to be able to help the disputing parties to have an arbitration decision as quickly and correctly as possible.

The labor arbitration procedure in the American area offers a richer clarity and complexity on how to settle labor disputes through domestic reforms and conventions, while the European system has a wide range of reforms and procedures in the field of arbitration that it uses, coming only as a complement to the legislation of national arbitration. This deepens the fact that each European state is indirectly obliged to determine its own means of settling disputes using arbitration.

REFERENCES

- ACT, COLORADO ARBITRATION FAIRNESS. "COLORADO ARBITRATION FAIRNESS ACT. 2018.
- ADR Chambers. *Arbitration Rules*. May 31, 2024. <https://adrchambers.com/arbitration/rules/> (accessed January 14, 2025).
- Alberta. *Labour relations – Grievance arbitration*. 2024.
- Alexander v. Gardner-Denver Co. 72-5847 (US Supreme Court, february 19, 1974).
- Amy S. Williams, Dan M. Forman. *Importance of FAA in California Employment Arbitration Agreements Underscored*. May 24, 2024. <https://www.callaborlaw.com/entry/importance-of-faa-in-california-employment-arbitration-agreements-underscored> (accessed January 2025, 18).
- Ashurst. *International arbitration: Which institution?* May 21, 2024. <https://www.ashurst.com/en/insights/quickguide-international-arbitration-which-institution/> (accessed January 14, 2025).
- Bird & Bird. "The Brussels regulation at a glance." 2013, 3.
- Bloomberg Law . *Key principles and strategies to help you prepare and present a labor arbitration case*. 2025. <https://pro.bloomberglaw.com/insights/labor-employment/labor-arbitration-law/> (accessed January 09, 2025).
- Born, Gary B. *International Commerical Arbitration*. III. Kluwer Law Intl, 2009.
- Bruce, Jean. *International arbitration law and rules in France*. June 02, 2020. <https://cms.law/en/int/expert-guides/cms-expert-guide-to-international-arbitration/france> (accessed January 18, 2025).
- California Code. *California Legislative Information*. 2023. <https://leginfo.legislature.ca.gov/faces/codesTOCSelected.xhtml?tocCode=LAB&tocTitle=+Labor+Code+-+LAB>.
- California Courts self-help guide . *Resolve your dispute out of court*. 2025. <https://selfhelp.courts.ca.gov/resolve-your-dispute-out->

- FranceTaxLaw. *Introduction to the French Legal System: Understanding the Basics*. March 12, 2024. <https://www.francetaxlaw.com/news/introduction-to-the-french-legal-system/> (accessed January 19, 2025).
- Gary, Born. "International arbitration: law and practice." In *Kluwer Law International*, 38, 39,86. Kluwer Law International, 2021.
- Gheorghe, Monica. *Căi amiabile de soluționare a conflictelor de muncă*. Bucuresti: Universul Juridic, 2010.
- ICSID. *Notice of Arbitration under the UNCITRAL Arbitration Rules*. 2024. <https://icsid.worldbank.org/procedures/arbitration/uncitral/notice> (accessed January 14, 2025).
- International Chamber of Commerce. *Court Members*. 2024.
- International Chamber of Commerce. *ICC celebrates case milestone, announces record figures for 2019*. 2024.
- International Labor Organization. "France 2019." *Promoting jobs protecting people*. 2019. https://www.ilo.org/dyn/irlex_en/f?p=14100:1100:0::NO::P1100_ISO_CODE3%2CP1100_SUBCODE_CODE%2CP1100_YEAR:FRA%2C%2C2019 (accessed January 18, 2025).
- Jang, Scott. P. *California Court of Appeal Holds*. June 03, 2024. <https://www.californiaworkplacelawblog.com/2024/06/articles/arbitration-agreements/california-court-of-appeal-holds-californias-law-regarding-payment-of-arbitration-fees-preempted-by-faa/> (accessed January 18, 2025).
- Joseph, Slater. *Interest Arbitration as Alternative Dispute*. Toledo: University of Toledo Legal Studies Research Paper, 2013.
- Landau Law solicitors . *Employment law- Compromise agreements*. n.d. <https://landaulaw.co.uk/compromise-agreements/#:~:text=A%20compromise%20agreement%2C%20now%20known,between%20you%20and%20your%20employer.> (accessed January 08, 2025).
- Landy, John. J. Buckley and Jonathan. "International Arbitration Law and Regulations USA 2024-2025." *iclg*. september 13, 2024. <https://iclg.com/practice-areas/international-arbitration-laws-and-regulations/usa#:~:text=Section%20of%20the%20FAA%20states%20that%20qualifying%20arbitration%20agreements,%2%A7%20.> (accessed January 15, 2025).
- Lexis Nexis. *Ad hoc arbitration – an introduction to the key features of ad hoc arbitration*. september 07, 2023. <https://www.lexisnexis.co.uk/legal/guidance/ad-hoc-arbitration-an-introduction-to-the-key-features-of-ad-hoc-arbitration> (accessed January 14, 2025).
- Lin, Mervyn. *Mediation and Conciliation, same same but different?* 2021. <https://peacemakers.sg/blog/mediation-and-conciliation-same-same-but-different/>.
- LLC, Volpe Law. *Attorneys For Arbitration In Colorado*. 2025. <https://www.volpelawllc.com/arbitration/> (accessed January 20, 2025).
- LSD define dictionary. *interest arbitration*. 2025. <https://www.lsd.law/define/interest-arbitration> (accessed january 05, 2025).
- McDermott, John T. "Arbitration and the Courts." *The Justice System Journal* (National Center for State Courts) 11, no. 2 (Fall 1986): 248-256.
- Mihai, Gabriel. *Arbitrajul International si efectele hotararilor straine*. Bucuresti: Universul Juridic, 2013.
- Morrison, Jacob &. "Arbitration Of Employment Disputes." *KSJM*. 2025. <https://www.californialaborlawattorney.com/employment-library/labor-and-employment-resources/arbitration-of-employment-disputes/> (accessed January 15, 2025).
- MURTAGH, JASON E. *Navigating Arbitration Agreements: Guidance for California Employers*. September 27, 2023. <https://www.bipc.com/navigating-arbitration-agreements-guidance-for-california-employers> (accessed January 14, 2025).
- National Conference . *UNIFORM ARBITRATION ACT*. December 13, 2000.
- Nations, United. "Convention on the Recognition and." Convention, New York, 1958.
- New York Convention guide. "Signatories' Map." 1958.
- Office, International Labour. "Conciliation and arbitration in collective labour disputes in France." *nternational labour review* Vol.3(1-2),, no. 1564-913X; 0020-7780 (1921): pp.166-178.
- Okyay, N. Kansu. "The Applicability of the Brussels I bis Regulation to Hybrid Dispute Resolution Clauses." *The Italian Review of International and Comparative Law*, May 05, 2023, Brill NijHoff ed.: 63.
- Pepperdine Law Blog. *Demystifying the Arbitration Process*. octomber 04, 2023. <https://law.pepperdine.edu/blog/posts/demystifying-the-arbitration-process.htm#:~:text=What%20is%20Arbitration%3F,between%20two%20or%20more%20parties.> (accessed January 08, 2025).
- Pinsent Masons . *Institutional vs. 'ad hoc' arbitration*. 2025. <https://www.pinsentmasons.com/out-law/guides/institutional-vs-ad-hoc-arbitration> (accessed January 12, 2025).
- Porter, Jordan. *INTENSE FOCUS*. 2019. <https://www.jdporterlaw.com/business-law/enforcing-arbitration-agreements-in-colorado-courts/> (accessed January 18, 2025).
- Porter, Jordan. *INTENSE FOCUS. EXCEPTIONAL OUTCOMES* . 2019.

- Poulin, Jean- Fabrice Brun Gauthier. *International arbitration law and rules in France*. June 2, 2020.
<https://cms.law/en/int/expert-guides/cms-expert-guide-to-international-arbitration/france> (accessed december 28, 2024).
- Primer, New York Convention. *American Bar Association*. 2024.
https://www.americanbar.org/groups/dispute_resolution/resources/magazine/archive/new-york-convention-primer/#:~:text=Given%20the%20extensive%20global%20reach,international%20arbitration%20proceedings%2C%20neither%20reservation (accessed January 18, 2025).
- Prinz, Marc Ph. *Arbitration clauses in employment contracts*. March 12, 2024.
<https://www.vischer.com/en/knowledge/blog/arbitration-clauses-in-employment-contracts/> (accessed January 11, 2025).
- Ramirez v. Charter Communications, Inc.* S273802 (Los Angeles Country Superior Court , California July 15, 2024).
- Remus Codreanu, Linda Zarnescu, Rena Safescu. *New legislative changes promote flexicurity in employment relations in Romania*. 2023. <https://www.kinstellar.com/news-and-insights/detail/2411/new-legislative-changes-promote-flexicurity-in-employment-relations-in-romania> (accessed January 19, 2025).
- Ricketson, Daniel. "Interest Arbitration Impasse Rates." *article*. 2013. 2.
- Sander, Frank. *Varieties of Dispute Processing*. West Publishing Company , 1976.
- Scheffey, Steve Baumann and Adrienne. *Colorado Court of Appeals Confirms the Broad Scope of "Arising Under"*. October 02, 2018.
- Shu, John. *Arbitration Unconscionability and Severability In California*. November 26, 2024.
https://fedsoc.org/scdw/arbitration-unconscionability-and-severability-in-california#_ftn2 (accessed January 18, 2025).
- Sicard-Mirabal, J. and Derains, Y.,. *Introduction to Investor-State Arbitration*,. Wolters Kluwer, 2018.
- Sıdıka, BULUŞ Canan ERDOĞAN** -. "ARBITRATION IN INDIVIDUAL LABOR DISPUTES." *L&JR*, 2024: 95-124.
- Slater, Joseph. *Interest Arbitration as Alternative Dispute*. Ohio: University of Toledo Legal Studies Research Paper , 2013.
- Southland Corp. v. Keating*, 465 U.S. 1. 82-500 (U.S. Supreme Court, January 23, 1984).
- Thomson Reuters Practical Law. *Grievance Arbitration*. 2024.
- Top, Dan. *Tratat de dreptul muncii*. IV. Bucuresti: Universul Juridic, 2022.
- United Nations. *UNCITRAL Arbitration Rules*. 1976.
<https://uncitral.un.org/en/texts/arbitration/contractualtexts/arbitration> (accessed January 14, 2025).
- US. "The Civil Rights Act of 1964." *Public Law*. July 2, 1964. 253-266.
- Vasilescu, Florin. *Arbitrajul solutionare alternativa a litigiilor - Consultanta juridica*. 2020.
<https://consultantarapida.ro/arbitraj/> (accessed January 19, 2025).
- Wikipedia . "Federal Arbitration Act." december 27, 2024.
https://en.wikipedia.org/wiki/Federal_Arbitration_Act (accessed january 05, 2025).

The Relationship between European Union and Ukraine during the Russian-Ukraine Conflict

Iacob Andra BIANCA

Master's student in Romanian private law institutions and master's student in European Law,
University Lucian Blaga of Sibiu, Faculty of Law, Romania

Abstract

Ukraine is an European country with cultural diversity, rich in true contrasts of society that has the most diverse professions such as: actors, circus performers, scientists, doctors, but which since 2022 has been facing an armed conflict with its neighboring state: the Russian Federation and at the same time due to this situation, Ukrainians were forced to leave their homeland to live their lives in a harmonious environment, thus causing the biggest crisis of refugees from Europe after the Second World War.

Ukrainian refugees, mostly vulnerable groups: women, children and elderly people have had to leave their homes and the future they have carved out for themselves to start a new uncertain life in a foreign society with a new language and culture, all these things happened overnight. In general, these refugees tried to seek refuge in states where they already had family members and friends, and for those who were alone in this big world, the only solution was to flee the conflict in the first country that received them and offered them protection, such as neighboring states, Romania, Hungary, Poland and Slovakia.

Keywords: Armed Conflict, Refugees, Protection, Neighboring States, European Union, Temporary Protection

I. THE HISTORICAL RELATIONS BETWEEN EUROPEAN UNION AND UKRAINE

The Soviet era fell in 1991, this event made a rebeginning for the ex-soviet countries like Ukraine with this exit from soviet-era these countries began to aspire to a great independence. The first step that was made by Ukraine was to hold a referendum in December 1991 and ask the Ukrainians if they want to accept to become an independent country. The majority part of society agreed to become independent (Stöver 2010, 1976).

The moment that we can consider to be the beginning of the relationship between Ukraine and European Union is in 1991, when the Netherlands announced that Ukraine's independence (Mission of Ukraine to the European Union 2021). The Ukrainian society was overjoyed by this announcement which had long awaited independence. But the Ukraine did not stop at just being an independent country, aspiring to be constituent of the European Union, and for this historic event it had to prepare a lot.

Between 1992-2002 Ukraine had a great development, the most important events were the first independent Constitution (1992) and signed the Budapest Memorandum (1994). Budapest Memorandum was created to be confirmed the independence of the three (3) countries: Ukraine, Belarus and Kazakhstan in exchange for Ukraine giving up its nuclear weapons (Budapest Memorandum 1994, 15).

In 2002, after ten (10) years of independence, the European Union commissar: Guenther Verhaegen believed that place of Ukraine is in European Union, if the Copenhagen Criteria (Wikipedia 2025) are met: democracy, the rule of law, the state 's capacity to assume obligations and human rights (European Union 2021).

The third president of Ukraine (2005-2010), Viktor Andriiovici Iușcenko immediately after that he passed the presidential election, declared that Ukraine is a state with all rights and that the main object for Ukraine is to become a part of European Union (Wikipedia 2025) and started to negotiate the „Wider Agreement“ for cooperation and a legal framework.

Although European movements were being attempted, the Ukrainian fate was completely different because the Russia-Ukraine conflict started in the late of November 2013 and in 2014 this conflict was amplified. The president Viktor Iusenko wanted to stop it and believed that the unique solution is to suspend the Association Agreement. He did it but this move made from a desire to defuse the conflict led to an Ukrainian uprising (Ministere L'europa et des affaires eterageres 2022).

Even more, on 26 February 2014 was established a control point in Sevastopol and Simferopol (Laura 2014), one day after this event the European Parliament passed the Resolution that grants the possibility for Ukraine to become an European Union state member as long as the democratic principles are respected (Wikipedia 2025). In the opinion of the politicians of that time like Jean-Claude Juncker who believed that the Ukraine is prepared to be an European Union member after no less than 20 (twenty) years (The Free of Encyclopedia 2024). We believe that the European Union let the Ukraine to rise up towards the European desire to give them trust and moral support, given that Ukrainian society wanted a European future and Russia's power over Ukrainian territories was growing, some days after the Parliament Resolution, the Russia Federation took the Crimea territory (Ray 2013).

A. The most important efforts that were made by Ukraine to become more European country:

Even if the Russian Federation put a great power to Ukraine, is needed to be seeing that the Ukraine has not let its democratic and European desires and values fall behind. This country work harder to maintain a democratic regime, to improve their relationship with the European counties and to become an European Union member.

In 2019 the Ukrainian Constitution was changed to be in conformity with European norms and was signed a document by Poland, Lithuania and Ukraine guaranteeing Ukraine's accession. Lithuania's rotating presidency in 2027 guaranteed that the main object is to have in full plan Ukraine's admission to the European Union and if this situation does not allow accession at that time, there should be another possible attempt for 2039 when Poland would have the presidency.

Thus, we observe a historical desire of Ukraine to be an integral part of the European Union, but which had to not directly express this option for fear of being a Russian target, preferring until the last moment to be a neutral country with European aspirations

II. THE EUROPEAN UNION-UKRAINE RELATIONS IN CONTEXT OF RUSSIA-UKRAINE WAR

In 2015 in a report by Rating Sociological Group the Ukrainian citizens were asked if they want to become European Union citizens and the pro votes were approximately 60 percent and after the Russian- Ukrainian conflict the number of pro votes for a future in European Union grown to 90 percent of Ukrainian society (Reuters 2022). This statistic shows us a fear of Ukrainian society because the power of Russian military in their country.

The Ukrainian society in 2015 probably believed that a neutral country is better than a pro-European in face of Russia's power but in 2022 they understood that they are not safe along without any type of help from the European countries.

Due to the Ukrainian fear of disappearing from the contemporary map, the decision to entry into European Union was made immediate by the Ukrainian president: Volodymyr Zelenski on 28 February 2022, who asked for a quick accession due to the armed conflict. A few hours after this historic event, the Spanish minister of Foreign Affairs at that time: Jose Manuel Albares expressed a contrast opinion on the rapid entry in the European Union. He remembered that this event is a long and complex one through which the candidate country for accession must prove its place in the European Union by fulfilling socio-economic and political requirements (Ortega 2022). The European Union resolution was accepted in June 2022 by European Parliament which accorded to Ukraine the right to become a candidate state (Evans 2022) were 637 votes pro, 13 votes against.

III. CONTEXT OF THE RUSSIA-UKRAINE ARMED CONFLICT

At dawn on the first day of war, the Russian army comes to Ukraine after receiving the Presidential Ordinance of Military operation (Meduza 2022) given by the President Vladimir Putin, who considered the operation to be an attempt to denationalize Ukraine (BBC 2022). After some minutes after this declaration started to bomb blasted began to be heard in more cities from Ukraine as: Kiev, Harkov, Odessa and Donbas (Sheftalovich 2022).

Meanwhile Ukraine has been crushed by ballistic missile strikes on airports and military depots in the regions: Kiev, Harkov, Dnipro (Sheftalovich 2022). Odessa is considering a strategic city for Russia authorities because of their port and was a wished city for Russian-army for this needed to use bombs with the scope of destroy the infrastructure. The Ukrainian army resisted, and the Odessa was not taken by Russia Federation in few hours as the Russian army hoped (Romanian Center of Russian Studies 2022).

Although Ukraine was bathed with every passing minute in terrifying anxiety and fear of unknown along with a desire of the instinct to escape from the hands of the attacker but at the same time a desire to stay with the family for a while to say goodbye appeared on the streets of Ukraine the Russian military vehicles that entered from Senkiva for, denazification, Senkiva is a strategic place because 3 (three) countries intersect: Russia, Ukraine and Belarus (Hodge 2022).

In all this time of military operation the civilians more of them: women, children and elders' people have, invaded, the borders of neighboring states: Romania, Poland and Hungary to find a refugium. When we are saying a refugium place we are referring at better place were their needs as: life, medical care, education, work and other human rights are granted by the law. The studies that were made by specialist show us that in just one year no less than 8.11 million of Ukrainian residents left their homeland (Ukraine Refugee Situation 2024) and 5 million of them asked for temporary protection (Ukraine Refugee Situation 2024).

These figures should make us understand how tragic are the events that take place just a few dozen or hundreds of kilometers from us and that this country is an European country that was not long ago an independent one and had the vision of a European Union.

In conformity with UNHCR High Commissioner till in April 2022 on neighboring states entered Ukrainians:

- Poland 2.9 million
- Romania: 800.000
- Hungary: 500.000
- Slovakia: 35.000

Immediately after entering a member state of the European Union, these Ukrainians requested protection. Thus a landmarked for European Union , a provision was created to guarantee temporary protection by Decision: 2022/382 from March 2022 (EUR-lex 2022), that was implemented by all member states (EUR-lex 2022). This protection came to help the lives of refugees guaranteed the right of residence in one of the member states and could be extension for 3 (three) years and because of the extension of the war, this protection was till on 4 March 2026 (European Council 2024).

Temporary protection has more rights: (FRA 2022, 1-30):

- The right to have a job
- The right to have a house
- The right to healthcare
- The right to education
- Right of reunification with family
- Right to live

Practically we observant that these grant rights for the Ukrainian refugees are just the minimum rights that can be guaranteed for a somewhat normal life. These rights give refugees confidence in their own strength to settle and integrate into the new community. The right to go to an education system is very important for any child. Societies need to understand and to help these children to adapt to the new culture from the beginning of their settlement in the new culture.

IV. CASE STUDY IN NEIGHBORING STATES

In the following we would like to talk about the refugee's situation in the neighboring states: Romania, Hungary, Poland and Slovakia. In this way we can understand better this tragic event that affected all the European Union which concentrated to integrate the Ukrainian citizens in their societies as soon as possible.

Romania

Romania has a common border with Ukraine of above 600 Km, in 2011 were approximately 0.3 percent Ukrainians from all the Romanian population but the Russian invasion in Ukraine received a refugees population exceeding, most of them women and children (31 percent) and man (19 percent) (Cancelaria Prim-ministrului 2022, 6)

Because of Ukrainian restriction, just some categories of men could pass the borders in neighboring states. Categories of men permitted to leave Ukraine included: older men, men with dual citizenship, men with three or more children, and single fathers At the same time, Ukrainian men who settled in other countries were asked if they were willing to fight in the Russia-Ukraine conflict (Greenall 2023).

Romania adopted by Government Decision of March 2022 no. 367 of March 18, 2022 (Portal Legislativ 2022) a protection regime that was applied in the first phase for Ukrainians who entered Romania on February 24, 2022. In the second phase for Ukrainians who were on Romanian territory at the time of the start of the war. This implementation was based on European Union's decision for Ukrainian support.

Romania began to grant 4 euro/day for food and 10 euro/day for accommodation (Guvernul Romaniei 2022, 2). At the same time a mobility academy transfer was established for Ukrainian students who could not to continue their studies in Ukraine (Portal Legislativ 2022).

Other rights that were taken for Ukrainian refugees (DOPOMOHA.RO 2022):

- Right to have a job
- Right to education: even children have permission for early, primary and secondary education
- Medical assistance
- Reunification with family

In 2024 more than 175 thousand Ukrainian refugees obtained a temporary protection (UNHCR Romania 2024). From the second half of 2024 they become eligible for financial assistance of a monthly budget of 750 RON for a single person and 2000 RON for family with a maximum duration of three (3) months (UNHCR The US Refugees 2024).

During 2024 Romania established a delicate center in Siret to accommodate Ukrainian refugees arriving with children. This center serves as a safe place for a child and is equipped with all the basic needs (UNICEF for every child Romania 2024). While Romania strives facilitate entry for all individuals crossing the borders, the creation of a dedicated space for children is vital.

All Ukrainian children can go to a public school in Romania but the number of students that do not know this language is more than 70 percent and just 28 percent of children started to learn it (Kafembe 2022). To help them the Romania Government offered special classrooms for Ukrainian students where they can learn the Romanian language (UNESCO 2024). The local authorities started to create special conditions for Ukrainian children such psychological assistance and special teachers to help them to learn the Romanian language (DOPOMOHA.RO 2025). Even if all these measures have been taken by Romanian Government just 10 percent of Ukrainian children attendance in a public school from Romania the rest of children study in Ukrainian curriculum in their natal country (OCHA 2023).

Poland

Poland adopted a similar approach to Romania in granting temporary protection to Ukrainian refugees. The Special Act of March 2022 established the right to temporary protection for individuals entering Poland on or after February 24, 2022, and subsequently extended this protection to Ukrainians already residing in Poland at the time of the war's onset. (Republic of Poland 2022). Poland was trying from the beginning to integrate the refugees in society in this context, Poland offered jobs for them below their qualification (Hofmann 2022) so in 2024 approximately 65 percent of them were employment (Polish Economic Institute 2024).

In November 2024, there were more than 9 million of Ukrainian refugees in Poland (statista 2024). In general, any Ukrainian can work in Poland if he or she has a legal residence since the armed conflict started (Cieślak 2024).

An refugee has a variety of job sectors such as agriculture that is one of the most important sectors, or builders, physical jobs, manufacturing (Chernenko 2024). But if an Ukrainian person wants to work in a hospital as doctor, nurse and midwives must know the Poland language at a minimum of B1, this condition was taken by the Hospitals to facilitate the communication between doctors and patients (Visit Ukraine 2024).

In 2024 were made a several changes for education that affected the children, in this condition since 1st. September 2024, any child (Usyk 2024):

- One year preschool
- Compulsory primary education

Moreover, the Poland school started to be required to be physically in Poland classrooms. Only the students that graduate in 2025 are eligible for online learning in Ukrainian system. This means that their education follows the Ukrainian curriculum independently of Polish interference curriculum (Usyk 2024). These changes should not be seen as limitations in education but as a benefit to society, so if students learn Polish early and start integrating from the smallest classes and develop a strong educational foundation

Hungary

The border between the Hungarian state and Ukraine is 136 km long and with the invasion of the war there was also an invasion of Ukrainians at the border. Thus, 725,000 Ukrainians went directly to Hungary and 587,000 Ukrainians entered Hungary from Romania, of which less than 2% requested temporary protection: women (44 percent) , children (26 percent) , and the rest are people with disabilities and old people) (Ukraine Refugee Situation 2024).

In Hungary a scheme for temporary protection existed (Magyar Közlöny 2022) of those who entered from outside of this country as Ukrainians, the Decision of Hungarian Government no 86/2022 (Government Decree No. 86/2022 2022), abrogated the international scheme and replacement it with national legislation in the detriment of the temporary protection suggested by European Union. This means that the citizens who are not Ukrainians did not benefit of international protection or permanent residence with their families, they could apply for a right of residence for maxim 30 days and could be extend with 30 days but no more than 6 months in totally (Hungarian Helsinki Committee 2022).

The Hungarian Government facilitated individuals with medical degrees through Decree 121 of 2022 (Decree 121/2022 2022). We believe this measure proved beneficial during that time, the covid-19 pandemic persisting in Europe and implicitly in the European Union and the medical crisis was still existing.

As of October 31, 2024, no less than 61.560 refugees have been registered in Hungary and 48.199 of them have requested temporary protection (Operational Data protection 2024). The Ukrainian children can go to Hungarian school and in this context, we would like to mention that in Budapest is a bilingual school (Ukrainian and Hungarian languages) where the Ukrainian children can be enrolled. This school opened its doors in September 2024. This decision was taken after that many Ukrainian children were enrolled in an online school from Ukraine, this automatically means limitation to the new society (Tanács 2024).

Slovakia

The border between Slovakia and Hungary is only 97 km long. Before the war, the Ukrainian population was no more than 2 percent of the Slovakian population (UNICEF 2024) Since the beginning of the war, Slovakia has received no less than 840,000 Ukrainian refugees, 80 percent of them were women, children, elderly people and people with special

disabilities (UNICEF 2024). that wanted to be entered in Slovakia (Operational Data protection 2024) and of these only 80,000 have applied for temporary protection (Operational Data protection 2024) . After 3 weeks of siege in Ukraine, was an influx of Ukrainian's refugees into Slovakia.

The right to temporary protection was granted to the following categories of people:

- Ukrainians and their non-Ukrainian relatives
- Non-Ukrainian citizens

The most important rights for Ukrainian refugees were referring at:

- Work
- Home insurance
- Healthcare

Even though the e-education system in Slovakia is better than in other neighboring countries, many Ukrainian children continued to study in online schools in their home country (UNESCO 2024). This means that Ukrainian refugees may have a limited ability to adapt to Slovak society, in this context the Slovak government has made Slovak education mandatory for all children starting with the 2024-2025 school year (European Commission 2023).

A conclusion from the above is that all these neighbors' states had the same interest: to help the Ukrainian refugees and to give them the most important rights as: home, work, education and healthcare to become a part of the new society. Our opinion is that these measures that were taken were due the unprecedented refugees' crisis of 2022 as considered by United Nations (Lviv 2022).

V. Conclusion

We would like to conclude this by saying that the conflict that started on 22 February 2022 was an unprecedented event for the XXI century. The European Union member states made a crucial decision to help Ukraine and Ukrainian people in a short time. This highlighted the importance of strong inter-state communication and to understand the plight of the Ukrainian people, in this sense the European Union recognized the drama of the Ukrainian people and have come up with the necessary support and resources for Ukraine. Moreover, the Ukraine's entry procedure into the European Union was considerably accelerated. This conflict comes with several changes to the European Union market such as: economic and security implication, increasing energy prices and refugees' flows

If one of the European countries has a problem that problem is going to be an European problem and all European countries need to pay attention to prevent it from expanding. Thus, we consider that the measures taken at the beginning of the conflict by the European Union and European countries were measures to prevent the expansion of the conflict.

The member states of European Union must facilitate enrollment in public school or private schools on their territory as soon as is possible, just in this way we can help the ukrainean children to integrate in the new society. Of course, we need to understand that they want to go to their natal country after the end of the war, so we need to implement a special curriculum which combines the two (2) curricula. This special curriculum must not separate the ukrainean children from their language, culture and customs.

REFERENCES

- 104 Hungarian Helsinki Committee. "Information for Ukrainian citizens fleeing Ukraine, . february 24, 2022. https://helsinki.hu/en/wp-content/uploads/sites/2/2022/06/Information_for_Ukrainian_citizens_fleeing_Ukraine_for_refugees_recognised_in_Ukraine_and_for_stateless_persons_and_their_family_members_EN.pdf (accessed december 28, 2024).
- BBC. "Ukraine conflict: Russian forces attack from three sides." february 24, 2022. <https://www.bbc.com/news/world-europe-60503037> (accessed december 28, 2024).
- Budapest Memorandum. "Ukraine, Fédération de Russie, Royaume-Uni de." *Memorandum*. Budapest, 1994. 15.
- Cancelaria Prim-ministrului. "Romanian's responde to the humanitarion refugees crisis." Guvernul Romaniei, Bucuresti, 2022, 6.
- Chernenko, Elena. "Work for Ukrainians in Poland." *HEYBUS*. september 17, 2024. <https://heybus.com.ua/en/life-in-poland/work-for-ukrainians-in-poland> (accessed January 09, 2025).
- Cieślak, Marek. "Employment of Ukrainian citizens in Poland in 2024." *CGO finance* . 2024. <https://cgofinance.com/employment-of-ukrainian-citizens-in-poland-in-2024/> (accessed January 08, 2025).
- Decree 121/2022. *121/2022. (III. 28.) Korm. rendelet*. Budapest, 2022.
- DOPOMOHA.RO. *My rights*. 2025. <https://dopomoha.ro/en/education#:~:text=You%20should%20also%20know%20that,the%20necessary%20conditions%20and%20will> (accessed January 07, 2025).
- DOPOMOHA.RO. *My rights as a beneficiary of temporary protection*. 2022.
- EUR-lex. "European Union." *Council Implementing Decision (EU) 2022/382* . March 4, 2022. https://eur-lex.europa.eu/eli/dec_impl/2022/382/oj/eng (accessed december 27, 2024).
- European Comission. *Slovakia: Compulsory school enrolment for children from Ukraine*. June 27, 2023. https://migrant-integration.ec.europa.eu/news/slovakia-compulsory-school-enrolment-children-ukraine_en#:~:text=Slovakia's%20Ministry%20of%20Education%20confirmed,for%20migrant%20children%2C%20including%20those (accessed January 07, 2025).
- European Council . *How the EU helps refugees from Ukraine*. december 20, 2024. <https://www.consilium.europa.eu/en/policies/refugee-inflow-from-ukraine/> (accessed January 10, 2025).
- European Union. *Accession criteria (Copenhagen criteria)*. August 16, 2021. <https://eur-lex.europa.eu/EN/legal-content/glossary/accession-criteria-copenhagen-criteria.html> (accessed January 10, 2025).
- eurostat. *Temporary protection for persons fleeing Ukraine - monthly statistics*. december 3, 2024. https://ec.europa.eu/eurostat/statistics-explained/index.php?title=Temporary_protection_for_persons_fleeing_Ukraine_-_monthly_statistics (accessed december 28, 2024).
- Evans, Zachary. *European Parliament Votes to Advance Ukraine's Application for EU Membership*. March 1, 2022. <https://www.nationalreview.com/news/european-parliament-votes-to-advance-ukraines-application-for-eu-membership/> (accessed January 08, 2025).
- FRA. *THE WAR IN UKRAINE – FUNDAMENTAL*. BULLETIN 1, Luxembourg : Publications Office of the European Union, 2022, 1-30.
- Government Decree No. 86/2022. "Government Decree No. 86/2022." decision, Hungarian Government , Budapest, 2022, 1-5.
- Greenall, Robert. "BBC NEWS." *Ukraine war: Male citizens living abroad to be asked to join army*. december 21, 2023. <https://www.bbc.com/news/world-europe-67787173> (accessed January 10, 2025).
- Guvernul Romaniei . "ORDONANȚĂ DE URGENȚĂ nr. 28 din 23 martie 2022." 2022, 2.
- Hodge, Nathan. "Russia launches military attack on Ukraine with reports of explosions and troops crossing border." *BBC*. february 24, 2022. <https://edition.cnn.com/2022/02/23/europe/russia-ukraine-putin-military-operation-donbas-intl-hnk/index.html> (accessed december 27, 2024).
- Hofmann, Martin. "Getting Ukrainian refugees into work: The importance of early competence checks." *International Center for Migration Policy Development*. march 28, 2022. <https://www.icmpd.org/blog/2022/getting-ukrainian-refugees-into-work-the-importance-of-early-competence-checks> (accessed January 05, 2025).
- Hungarian Helsinki Committee. "War in Ukraine Protection situation in Hungary." Budapest, 2022, 1-6.

- IOM Migration. "Ukrainian Refugees and Polish Municipal Police: Exploring Perceptions, Challenges and Avenues for Relationship-Strengthening." November 10, 2023. [https:// dtm.iom.int/reports/ukrainian-refugees-and-polish-municipal-police-exploring-perceptions-challenges-and-avenues](https://dtm.iom.int/reports/ukrainian-refugees-and-polish-municipal-police-exploring-perceptions-challenges-and-avenues) (accessed January 05, 2025).
- Kafembe, Innocent. "Using innovation in Romania to get Ukrainian children learning again." *UNICEF for every child*. September 14, 2022. [https:// www.unicef.org/romania/stories/using-innovation-romania-get-ukrainian-children-learning-again#:~:text=On%20level%20of%20knowledge%20of,71%20per%20cent\)%20do%20not](https://www.unicef.org/romania/stories/using-innovation-romania-get-ukrainian-children-learning-again#:~:text=On%20level%20of%20knowledge%20of,71%20per%20cent)%20do%20not) (accessed January 08, 2025).
- Laura Smith-Spark et. al. "Russia flexes military muscle as tensions rise in Ukraine's Crimea region." *CNN*. February 26, 2014. [https:// edition.cnn.com/2014/02/26/world/europe/ukraine-politics/index.html](https://edition.cnn.com/2014/02/26/world/europe/ukraine-politics/index.html) (accessed January 10, 2025).
- Lviv, Peter Beaumont in. *Ukraine has fastest-growing refugee crisis since second world war, says UN*. March 6, 2022. [https:// www.theguardian.com/world/2022/mar/06/ukraine-fastest-growing-refugee-crisis-since-second-world-war](https://www.theguardian.com/world/2022/mar/06/ukraine-fastest-growing-refugee-crisis-since-second-world-war) (accessed January 03, 2025).
- Magyar Közlöny. "Magyar Közlöny." february 24, 2022. [https:// magyarkozlony.hu/dokumentumok/c7310f25f86bb99e0d577ba024ad40f8f5544664/megtekintes](https://magyarkozlony.hu/dokumentumok/c7310f25f86bb99e0d577ba024ad40f8f5544664/megtekintes) (accessed december 28, 2024).
- Meduza. "Putin announces formal start of Russia's invasion in eastern Ukraine." February 2022, 2022. [https:// meduza.io/en/news/2022/02/24/putin-announces-start-of-military-operation-in-eastern-ukraine](https://meduza.io/en/news/2022/02/24/putin-announces-start-of-military-operation-in-eastern-ukraine) (accessed december 27, 2024).
- Ministere L'Europe et des affaires eterageres. "France Diplomacy." *Understanding the situation in Ukraine from 2014 to 24 February 2022*. June 2022. [https:// www.diplomatie.gouv.fr/en/country-files/ukraine/situation-in-ukraine-what-is/understanding-the-situation-in-ukraine-from-2014-to-24-february-2022/](https://www.diplomatie.gouv.fr/en/country-files/ukraine/situation-in-ukraine-what-is/understanding-the-situation-in-ukraine-from-2014-to-24-february-2022/).
- Mission of Ukraine to the European Union. "Overview of Ukraine-EU Relations." *Mission of Ukraine to the European Union*. April 15, 2021. [https:// ukraine-eu.mfa.gov.ua/en/2633-relations/zagalnij-oglyad-vidnosin-ukrayina-yes](https://ukraine-eu.mfa.gov.ua/en/2633-relations/zagalnij-oglyad-vidnosin-ukrayina-yes) (accessed January 10, 2025).
- OCHA. *Prioritizing school enrolments for Ukraine refugee children in Moldova, Poland and Romania* . September 19, 2023. [https:// reliefweb.int/report/moldova/prioritizing-school-enrolments-ukraine-refugee-children-moldova-poland-and-romania-september-2023](https://reliefweb.int/report/moldova/prioritizing-school-enrolments-ukraine-refugee-children-moldova-poland-and-romania-september-2023) (accessed January 05, 2025).
- Operational Data protection. *Ukraine Refugee Situation*. october 31, 2024. [https:// data.unhcr.org/en/situations/ukraine/location/10783](https://data.unhcr.org/en/situations/ukraine/location/10783) (accessed december 28, 2024).
- Ortega, Alberto. *Ucrania reclama a España que apoye de forma "explícita" la reivindicación de adhesión a la UE*. february 28, 2022. [https:// www.europapress.es/internacional/noticia-ucrania-reclama-espana-apoye-forma-explicita-reivindicacion-adhesion-ue-20220228143514.html](https://www.europapress.es/internacional/noticia-ucrania-reclama-espana-apoye-forma-explicita-reivindicacion-adhesion-ue-20220228143514.html) (accessed january 07, 2025).
- Polish Economic Institute. *65 % Ukrainian refugees work, but face many challenges in the Polish labour market*. March 12, 2024. [https:// pie.net.pl/en/65-ukrainian-refugees-work-but-face-many-challenges-in-the-polish-labour-market/](https://pie.net.pl/en/65-ukrainian-refugees-work-but-face-many-challenges-in-the-polish-labour-market/) (accessed december 28, 2024).
- Portal Legislativ. *HOTĂRÂRE nr. 367 din 18 martie 2022*. Bucharest , march 18, 2022.
- Portal Legislativ. "ORDIN nr. 3.325 din 2 martie 2022." 2022.
- Ray, Michel. "Britannica." *Ukraine crisis of 2013–14*. November 2013. [https:// www.britannica.com/topic/Ukraine-crisis](https://www.britannica.com/topic/Ukraine-crisis) (accessed January 10, 2025).
- Republic of Poland. "Amendment to the law on assistance to Ukrainian citizens in connection with the armed conflict on the territory of the country." march 22, 2022. [https:// www.gov.pl/web/udsc-en/the-law-on-assistance-to-ukrainian-citizens-in-connection-with-the-armed-conflict-on-the-territory-of-the-country-has-entered-into-force](https://www.gov.pl/web/udsc-en/the-law-on-assistance-to-ukrainian-citizens-in-connection-with-the-armed-conflict-on-the-territory-of-the-country-has-entered-into-force) (accessed January 05, 2025).
- Reuters . *Record number of Ukrainians support joining EU, backing for NATO membership falls - poll*. April 5, 2022. [https:// www.reuters.com/world/europe/record-number-ukrainians-support-joining-eu-backing-nato-membership-falls-poll-2022-04-05/](https://www.reuters.com/world/europe/record-number-ukrainians-support-joining-eu-backing-nato-membership-falls-poll-2022-04-05/) (accessed January 07, 2025).
- "Romanian Center of Russian Studies ." *The strategic importance of the port of Odessa*. March 25, 2022. [https:// russianstudiesromania.eu/2022/03/25/the-strategic-importance-of-the-port-of-odessa/](https://russianstudiesromania.eu/2022/03/25/the-strategic-importance-of-the-port-of-odessa/) (accessed January 09, 2025).
- Sheftalovich, Zoya. "Battles flare across Ukraine after Putin declares war." *POLITICO*. february 24, 2022. [https:// www.politico.eu/article/putin-announces-special-military-operation-in-ukraine/](https://www.politico.eu/article/putin-announces-special-military-operation-in-ukraine/) (accessed december 28, 2024).
- stastista. "Estimated number of refugees from Ukraine recorded in Europe and Asia since February 2022 as of July 2024, by selected country." 2024.

- Stöver, Dieter Nohlen & Philip. *Elections in Europe: A Data Handbook*. Edited by Philip Stöver Dieter Nohlen. Nomos, 2010.
- Tanács, Gábor. "Inside Europe's only Ukrainian-Hungarian school for refugee children." *EURONEWS*. September 18, 2024. <https://www.euronews.com/2024/09/18/inside-europes-only-ukrainian-hungarian-school-for-refugee-children> (accessed January 08, 2025).
- The Free of Encyclopedia . *Ukraine–European Union relations*. December 15, 2024. https://en.wikipedia.org/wiki/Ukraine%E2%80%93European_Union_relations#Accession_of_Ukraine_to_the_European_Union (accessed January 10, 2025).
- Ukraine Refugee Situation. "Ukraine Refugee Situatio." *Operational Data protection*. december 16, 2024. <https://data.unhcr.org/en/situations/ukraine> (accessed december 28, 2024).
- UNESCO. "Romania's education responses to the influx of Ukrainian refugees." *UNESCO*. 2024. <https://www.unesco.org/en/ukraine-war/education/romania-support#:~:text=The%20Romanian%20school%20system%20has,further%20training%20and%20support%20in> (accessed January 07, 2025).
- . "Slovakia's education responses to the influx of Ukrainian refugees." 2024. <https://www.unesco.org/en/ukraine-war/education/slovakia-support> (accessed January 09, 2025).
- UNHCR Romania. *reliefweb*. december 23, 2024. <https://reliefweb.int/report/romania/unhcr-romania-ukraine-refugee-situation-update-weekly-update-128-23-december-2024> (accessed January 09, 2025).
- UNHCR The US Refugees . *Housing and accommodation*. 2024. <https://help.unhcr.org/romania/information-for-people-from-ukraine/housing-and-accommodation/> (accessed January 09, 2025).
- UNICEF. *Delivering Humanitarian Cash Transfers to Ukrainian refugees in Slovakia*. AUGUST 13, 2024. <https://www.unicef.org/hope-hct/stories/delivering-humanitarian-cash-transfers-ukrainian-refugees-slovakia> (accessed January 06, 2025).
- UNICEF for every child Romania. *Ukrainian refugee children* . August 7, 2024. <https://www.unicef.org/romania/press-releases/ukrainian-refugee-children-and-their-families-can-now-benefit-newly-dedicated-space> (accessed Januay 08, 2025).
- UNICEF. "UNICEF Emergency Response Office in Slovakia." *For every child in Slovakia, protection*. 2024. <https://www.unicef.org/eca/unicef-emergency-response-office-slovakia> (accessed January 07, 2025).
- Usyk, Ihor. "Visite Ukraine." *Compulsory school education in Poland: new rules and fines from September 1, 2024*. September 05, 2024. https://visitukraine.today/blog/4254/school-education-in-poland-what-are-the-rules-for-ukrainian-children-in-2024-and-do-their-parents-face-fines-and-cancellation-of-payments?srsltid=AfmBOoo1S-SYAVuxO6qqBgZaqhODtdNABs4Kt8dEJn0vYH3AUNR_0s3s#school-and-pres (accessed Janaury 06, 2025).
- Visit Ukraine. "Poland introduces a condition for employment of doctors from Ukraine: details." October 04, 2024. <https://visitukraine.today/blog/5004/poland-introduces-a-condition-for-employment-of-doctors-from-ukraine-details#new-rules-for-ukrainian-doctors-in-poland> (accessed January 09, 2025).
- Wikipedia. "Accession of Ukraine to the European Union." *Accession of Ukraine to the European Union*. January 1, 2025. https://en.wikipedia.org/wiki/Accession_of_Ukraine_to_the_European_Union (accessed January 10, 2025).

The Noun Phrase in Dosoftei's Writings. The Modifier

Mihai-Andrei LAZĂR

PhD Student, Babeş-Bolyai University of Cluj-Napoca, Romania

Abstract

In the present paper, we aim to analyze the noun phrase in Dosoftei's writings, focusing on the syntactic function of modifier. The paper will be divided into two parts, the first one dealing with the theoretical framework and the second one being dedicated to the analysis of the investigative corpus. After providing a definition of the noun phrase and a description of the kind of adjuncts it might select, we will provide an overview of modification and modifiers. Then, we will observe the peculiarities of the modifier as a syntactic function introduced in the *Basic Grammar of the Romanian Language*. As far as the investigative corpus is concerned, we will first discuss the class of substitution of the modifier. We will then proceed to the description of complex noun phrases, in which two or more modifiers co-occur. We will first discuss the internal structure of each noun phrase and then we will provide examples to support our demonstration. We will take into account premodifiers as well as postmodifiers. All in all, the examination of the investigative corpus will reflect the complex possibilities of structuring the noun phrase, illustrating the diversity of syntactic constructions in Old Romanian, as far as the modifier is concerned.

Keywords: Noun Phrase, Modification, Modifier, Premodifier, Postmodifier

Introduction

In the present paper, we aim to analyze the noun phrases in Dosoftei's writings, paying particular attention to those which have modifiers as adjuncts. We will first provide a theoretical overview of modifiers and then we will proceed to the analysis of the investigative corpus.

The corpus is represented by Dosoftei's main writings, namely, *Psaltirea în versuri* (DPV.1673), *Cartea de rugăciuni* (DCR.1673), *Dumnezăiasca liturghie* (DDL.1679), *Psaltirea de-nțăles* (DP.1680), *Parimiile preste an* (DPar.1683) and *Viața și petrecerea svinților* (DVS.1682-6). We chose this corpus because of the great variety of syntactic patterns found in Dosoftei's writings. We will adopt the perspective exposed in the *Basic Grammar of the Romanian Language* (GBLR).

1. The theoretical framework

1.1. The noun phrase

The noun phrase can be defined as that part of the sentence which has a noun, a pronoun or a number as its head, along all the constituents subordinated to it, known as adjuncts (e.g., *acea fată inteligentă pe care am întâlnit-o ieri* / *that smart girl I met yesterday*).

In traditional Romanian grammar, the syntactic function specific to the noun phrase is the attribute.

In modern Romanian grammar, the syntactic function of the attribute is abandoned and replaced by other five syntactic positions: the determiner, the modifier, the possessor, the quantifier and the complement.

1.2. Modification and modifiers

In a broad sense, **modification** is a semantic and syntactic relationship specific to the noun phrase consisting in the characterization and description of the head-noun. As an effect of modification, the semantics of the head-noun changes, either by a limitation of its extension (e.g., *casă din cărămizi/brick house*) or by giving more details about it (e.g., *o casă veche/an old house*) (DTG 2023: 400).

Modification is a characteristic of those adjuncts in a noun phrase that express a property qualifying the referent of the head-noun (e.g., *oameni fericiți/happy people*), identify it, distinguish it from other referents (e.g., *băiatul din sat/the boy in the village*) or classify the head-noun by including it in a class of objects (GALR I 2008: 101).

By limiting the extension of the head-noun, modifiers also indicate a property that is defining for a (sub)class of entities and distinguishes it from other (sub)classes (GALR II 2008: 86).

1.3. The syntactic function of modifier as described in the *Basic Grammar of the Romanian Language*

In the *Basic Grammar of the Romanian Language*, the modifier is described as the constituent

specific to the noun phrase that modifies or semantically describes the head of the noun phrase¹. The modifier is thus distinguished from determiners, quantifiers, complements and possessors, which, like the modifier, limit the extension of the head-noun but do not describe it semantically. Instead, they determine, quantify it or put it in a relationship with another internal constituent (complement or possessor).

Of all the syntactic functions specific to the noun phrase, the modifier best corresponds to the syntactic function of attribute in traditional Romanian grammar, because it qualifies and semantically describes the noun it accompanies. In other words, the modifier describes the characteristics of the noun.

In a noun phrase, there may be one or more modifiers. Modifiers preceding the head-noun are called **premodifiers**, while modifiers placed after it are called **postmodifiers**.

The modifier can be expressed by the following parts of speech:

- adjectives (e.g., *o fată frumoasă/a beautiful girl*)
- reflexive pronouns (e.g., *băiatul însuși/the boy himself*)

¹ Adelina Patricia Băilă observes that the syntactic function of modifier is defined by the semantic role of the subordinate term. For more details, see Adelina Patricia Băilă, (2018a), *Funcții sintactice vs funcții semantice în gramatica limbii române*, in „Dacoromania”, XXIII, no. 1, p. 20.

- ordinal numbers (e.g., *capitolul al doilea/the second chapter*)²
- prepositional phrases (e.g., *masă de lemn/wooden table*)
- denominative modifiers (e.g., *profesorul Popescu/professor Popescu*)
- verbs (e.g., *cutii conținând cărți/boxes containing books*)
- adverbs (e.g., *casa de acolo/the house over there*)
- relative clauses (e.g., *Băiatul pe care l-am întâlnit ieri este inteligent./The boy I met yesterday is intelligent.*) (GBLR 2016: 379-380).

Alexandru Nicolae observes that, within the noun phrase, the syntactic position of modifier is not unique³, compared to the syntactic positions of determiner and quantifier. This means that two or more modifiers might co-occur within a noun phrase. Those may be coordinated, as in *o fată frumoasă și inteligentă/a beautiful and intelligent girl* or hierarchized, as in *un mare poet român/a great Romanian poet*, where the modifier *Romanian* refers to the head-noun *poet* while the modifier *great* refers to the whole group *Romanian poet*⁴ (Nicolae 2011: 640).

2. Analysis of the investigative corpus

2.1. The class of substitution of the modifier

The modifier can be expressed by the following parts of speech:

- (a) common noun preceded by a preposition: *cunună de aur/golden crown* (DPV.1673, p. 3);
- (b) adjective: *miere dulce/sweet honey* (DPV.1673, p. 3);
- (c) ordinal number: *slăvita și strașnica Lui a doua venire/His glorified and swell second coming* (DDL.1679, p. 128-129);
- (d) adjectival phrase: *oameni cu minte/people with a sound judgement* (DPV.1673, p. 26);
- (e) personal pronoun preceded by a preposition: *acea de la Tine bogată milă/that rich mercy of Yours* (DDL.1679, p. 54);
- (f) pronominal phrase preceded by a preposition: *acea de la Svinția Sa a svinților cinste/that honour of the saints from Your Holiness* (DVS. 1682-6, p. 12);
- (g) demonstrative pronoun preceded by a preposition: *un svânt bărbat frumos, de-aceia ce sta pregiur apa aceia fântâni/a beautiful holy man, of those sitting round the water of that fountain* (DVS.1682-6, p. 80);
- (h) reflexive pronoun: *trupure înse/our bodies, themselves* (DPV.1673, p. 373);
- (i) gerund: *ca un oaspe tinzând cort afară/like a guest spreading his tent outside* (DPV.1673, p. 240);
- (j) supine: *cetate de lăcuit/a fortress for living* (DP.1680, p. 559-560);

² Considering the fact that the determiner is the most important syntactic function within the noun phrase, i.e., any noun phrase should have a determiner, in an example like *al doilea băiat/the second boy*, *al doilea*, which would normally be a modifier, becomes a determiner, as there is no other word in the noun phrase that could act as determiner. For more details, see Lavinia Dălălu-Nasta (2018), *Observații privind funcțiile sintactice din grupul nominal*, in „Dacoromania”, XXIII, no. 1, p. 43.

³ Adelina Patricia Băilă cites Adela Drăguțoiu, who argues that, if modifiers were classified according to semantic criteria, the syntactic position of modifier could be unique. For more details, see Adelina Patricia Băilă (2018b), *Uniqueness in the Romanian Syntax*, in „Journal of Romanian Literary Studies”, XXI, no. 1, p. 704.

⁴ For more details about the hierarchy of modifiers and the distinction between restrictive and nonrestrictive modifiers, see Adela Drăguțoiu (2018), *Problema principiului unicității funcțiilor sintactice în gramatica românească*, in „Dacoromania”, XXIII, no. 1, p. 60.

- (k) adverb (preceded or not by a preposition): *mieori de-acasă/lambs from home* (DPV.1673, p. 145); *la-mpăratul denainte/ from the previous emperor* (DPV.1673, p. 223);
- (l) relative clause: *Și va fi ca pomul lângă apă./Carele de roadă nu să scapă.*//*And he shall be like a tree near the water/Whose fruits shall never be reaped.* (DPV.1673, p. 11).

2.2. Syntactic patterns containing modifiers

There are several syntactic patterns in which two or more modifiers co-occur:

- 1) a postmodifier expressed by an adverb preceded by a preposition and a postmodifier expressed by an adjective: *cea zî de ieri trecută/that previous day which has passed* (DPV.1673, p. 206);
- 2) a premodifier expressed by an adjective and a postmodifier expressed by an adverb preceded by a preposition: *întru bună vîrere de mainte/according to his previous will* (DPV.1673, p. 243);
- 3) a premodifier expressed by an adjective and a postmodifier expressed by a relative clause: *n-svânta mitropolie ce este-n Suceavă/in the saint Mitropolia that is in Suceava* (DPV.1673, p. 9);
- 4) a postmodifier expressed by an adjective and a postmodifier expressed by a relative clause: *besearica cea svântă carea ți-i de slavă/the holy Church where You are praised* (DPV.1673, p. 21);
- 5) a postmodifier expressed by an adjective and two postmodifiers expressed by relative clauses: *fețe strâmbe ce mă ia frica/A le prăvirea, carile-m strică.*//*twisted faces I am afraid of /To look at, that make me feel uncomfortable.* (DPV.1673, p. 38);
- 6) a postmodifier expressed by an adjectival phrase and a postmodifier expressed by a relative clause: *pre cei cu priință./Ce te iubăsc*//*Those who make themselves useful./Who love thee* (DPV.1673, p. 324);
- 7) two postmodifiers expressed by relative clauses: *pre acest strein, pre carele Maică-sa vădzând pre cruce spândzurând, bocindu-l striga și ca o maică îl glăsuia/this stranger, whose Mother, upon seeing him hanging on the cross, was wailing, calling him and speaking to him like a mother* (DCR.1673, p. 225-227);
- 8) three postmodifiers expressed by relative clauses: *Doamne Dumnezăul nostru, Care întru nalturi lăcuiești și cele smerite prăvești, Carele spăsenia rodului omenesc ai trimis pre Sângur-Născutul Tău Fiiu și Dumnezău, pre Domnul nostru Iisus Hristos/Our Holy God, Who lives in heaven and watches over the humble, Who sent His Only Son and God, Jesus Christ our Lord, to save us* (DDL.1679, p. 55-56);
- 9) a premodifier expressed by an adjective and two postmodifiers expressed by relative clauses: *ficioarească laudă, din carea Dumnezău S-au întrupat și cucon Să fece Acel de mainte de veci, fiind Dumnezăul nostru/the praise of young men, from which God embodied and became a child, He Who existed before eternity, being our Lord* (DDL.1679, p. 133-134);
- 10) a postmodifier expressed by an adjective and two postmodifiers expressed by common nouns preceded by prepositions: *dobitoc sălbatec de câmp și de luncă/wild animal living in the fields and in the meadows* (DPV.1673, p. 23);
- 11) two postmodifiers expressed by common nouns preceded by prepositions: *mădulările mele de la trup și de la suflet/my limbs from my body and from my soul* (DPV.1673, p. 344);

- 12) a premodifier expressed by an adjective and two postmodifiers expressed by common nouns preceded by prepositions: *neștiută mare de scârbă și strâmtoare/unknown sea of disgust and strait* (DPar.1683, p. 128);
- 13) a postmodifier expressed by an adjective and a postmodifier expressed by a common noun preceded by a preposition: *strânsură strâmbă și de pradă/twisted grip of prey* (DPV.1673, p. 163);
- 14) two postmodifiers expressed by adjectives and a postmodifier expressed by a relative clause: *vasul mirului celui neadevăsat, pre tine vărsat, ce l-ai priimit/the vessel of the unspent myrrh, that you have spilled on you and that you have received* (DCR.1673, p. 157);
- 15) two premodifiers expressed by adjectives and a postmodifier expressed by a relative clause: *svânta și dumnezăiasca Liturghie, întru carea este hrana cea de viață vecinică sufletească/the holy and godly Mass, in which there is the food of the eternal life of the soul* (DDL.1679, p. 8);
- 16) a premodifier expressed by an adjective, a postmodifier expressed by an adjective and a postmodifier expressed by a relative clause: *bună mireasmă sufletească, carea priimind-o la supracerăscul Tău jertăvnic, împotriva trimite-ne dumnezăiescul har și darul Preasvântului Tău Duh, totdeauna, acmu și pururea și-n vecii de veci/the good fragrance of the soul, that we receive at Your celestial sacrifice and you send us back Your godly grace and the gift of Your Holy Spirit, now and forever and eternally* (DDL.1679, p. 32);
- 17) a premodifier expressed by an adjective and a postmodifier expressed by a common noun preceded by a preposition: *svântul său scaun din ceri/his holy chair from heaven* (DPV.1673, p. 29);
- 18) a premodifier expressed by a personal pronoun preceded by a preposition and a premodifier expressed by an adjective: *acea de la Tine bogată milă/ that rich mercy of Yours* (DDL.1679, p. 54);
- 19) two postmodifiers expressed by adjectives and a postmodifier expressed by a common noun preceded by a preposition: *în pământ pustiu și neîmblat și fără apă/in a deserted land without water, which has never been taken* (DP.1680, p. 429);
- 20) a premodifier expressed by an adjective, a postmodifier expressed by an adjective and a postmodifier expressed by a demonstrative pronoun preceded by a preposition: *un svânt bărbat frumos, de-aceia ce sta pregiur apa aceia fântâni/a beautiful holy man, of those sitting round the water of that fountain* (DVS.1682-6, p. 80);
- 21) a postmodifier expressed by a common noun preceded by a preposition and a postmodifier expressed by a relative clause: *cei cu giudecie/Carii îmblă-n volnicie//those who rule over the land,/Who were given consent* (DPV.1673, p. 315);
- 22) four postmodifiers expressed by relative clauses: *Doamne Dumnezăul nostru, Carele ai zidit-ne și ne-ai adus în viața aceasta, Carele arătaș noauă căi spre spăsenie, Carele ne dăruieș a cerești Taine descoperire/Our Lord, Who created us and brought us to life, Who showed us the path to our saving, Who helped us discover the celestial Mysteries* (DDL.1679, p. 113);
- 23) a postmodifier expressed by an adjective and three postmodifiers expressed by relative clauses: *ca lemnul răsădit lângă ieșiturile apelor, carele roada sa va da în vreamea sa și frundza lui nu va cădea și toate câte face va spori/like the wood seeded near the waters, that will bear fruit at the right time and its leaves will never fall and all its fruits will grow* (DP.1680, p. 282);
- 24) a postmodifier expressed by an adjective and a postmodifier expressed by an adjectival phrase: *A lui Dumnezău Maică,/Pururea fericită/Și-n tot fără prihană//God's Mother/Forever happy/And without sin* (DPV.1673, p. 339);

- 25) three postmodifiers expressed by adjectives and a postmodifier expressed by a common noun preceded by a preposition: *Cetate frumoasă/De piatră vârtoasă./Bine-ntemeiată./De Domnul gătată./Beautiful fortress/Built out of hard rock./Well built./Adorned by God* (DPV.1673, p. 105);
- 26) a postmodifier expressed by a supine and a postmodifier expressed by a common noun preceded by a preposition: *jărtve de ars cu măduhă grasă/sacrifices to be burnt, with fatty marrow* (DPV.1673, p. 145);
- 27) a postmodifier expressed by an adverb preceded by a preposition and a postmodifier expressed by a relative clause: *rugul de mainte ce ardea fără-nfocare/the previous stake that was burning without lighting the fire* (DPV.1673, p. 344);
- 28) a premodifier expressed by an adjective and a postmodifier expressed by an adjective: *acea veselită muzică a cântării spăsătoare de suflete/that merry music part of the song saving the soul* (DVS.1682-6, p. 171);
- 29) two postmodifiers expressed by adjectives and two postmodifiers expressed by relative clauses: *împărate svinte totputernice, de care să înspăimă și tremură toate/all-mighty and holy emperor everyone is afraid of and trembles* (DPar.1683, p. 100);
- 30) a postmodifier expressed by an adjective and two postmodifiers expressed by relative clauses: *Duhul tău cel Svânt, ce arde și curățește toată tina păcatelor și înăciunilor celor sufletești/Your Holy Spirit, that burns and erases all sins that burden the soul* (DPar.1683, p. 268);
- 31) two premodifiers expressed by adjectives and a premodifier expressed by an ordinal number: *slăvita și strașnica Lui a doua venire/His glorified and swell second coming* (DDL.1679, p. 128-129);
- 32) two postmodifiers expressed by adjectives: *cătră potrivirea ceaterii lui ceii dulci și minunate/towards the tuning of his sweet and wonderful cetera* (DVS. 1682-6, p. 175);
- 33) a premodifier expressed by an adjective and a postmodifier expressed by a gerund: *Lădzile lor pline, izbucnind dintr-una într-alta./Their full crates, bursting one from another.* (DP.1680, p. 644);
- 34) a postmodifier expressed by a supine and two postmodifiers expressed by common nouns preceded by prepositions: *jărtvele ceale de ars de berbeci și de tauri/those muttons and bulls to be sacrificed and burned* (DP.1680, p. 684);
- 35) a postmodifier expressed by a common noun preceded by a preposition and a postmodifier expressed by a gerund: *ca un vânt de roaă șuerând/like a wind blowing in the dew* (DP.1680, p. 685-686);
- 36) a postmodifier expressed by a common noun preceded by a preposition, a postmodifier expressed by an adjective and a postmodifier expressed by a relative clause: *copac cu bună umbră, frunzoz, supt carele să umbresc mult/a tree with a good shade, full of leaves, under which a lot of people seek shade* (DCR.1673, p. 117);
- 37) three postmodifiers expressed by adjectives and a postmodifier expressed by a relative clause: *Și cărți lăasă minunate și preaslăvite și nalte foarte, din carile iaste cu cale de tocmală să povestim de una./And he left a lot of wonderful and praised and tall books, and it is highly recommendable to talk about one of them.* (DVS.1682-6, p. 48);
- 38) a postmodifier expressed by a relative clause, a postmodifier expressed by an adjectival phrase and a postmodifier expressed by an adjective: *un eparh orecare, ce-l chema Hursasadem, ascuțat la mânie și la muncit măiestru/a certain*

- eparch named Hurasadem, who was impulsive and hard-working* (DVS.1682-6, p. 152);
- 39) two premodifiers expressed by adjectives, a premodifier expressed by a common noun preceded by a preposition and two postmodifiers expressed by adjectives: *dumnezăiasca în trei obraze sânguratică fire nedespărțată, ne-ncepută/his lonely, godly nature in three persons, that is inseparable and has no beginning* (DCR.1673, p. 251-253);
- 40) a postmodifier expressed by an adjective and a postmodifier expressed by a gerund: *lemn roditoriu făcând roadă/wood bearing fruit* (DPar.1683, p. 106);
- 41) a postmodifier expressed by an adjective and a postmodifier expressed by a supine: *toată iarba vearde de mâncat/all the green grass to be eaten* (DPar.1683, p. 111);
- 42) two premodifiers expressed by adjectives and a postmodifier expressed by an adjective: *a Sinaxiarului dumnezăiască și svântă carte, scoasă de pre grecește și ellineaste din 12 mineaie a svintei Besearici/the godly and holy book of the Synaxial, translated from Greek from 12 religious texts belonging to the holy Church* (DVS. 1682-6, p. 14);
- 43) two postmodifiers expressed by common nouns preceded by prepositions and a postmodifier expressed by a relative clause: *spurcăturile sale ceale de argint și ceale de aur ce ș-au făcutu-ș șie/the silver and golden defilements that he has made for himself* (DPar.1683, p. 112);
- 44) a postmodifier expressed by an adjective and three postmodifiers expressed by common nouns preceded by prepositions: *holcă mare de cântări și de urlate de trâmbițe și buține și cântări îngerești/the great noise of the singing and shouting of the trumpets and alpenhorns and of the songs sung by angels* (DPar.1683, p. 228);
- 45) a postmodifier expressed by a common noun preceded by a preposition and two postmodifiers expressed by relative clauses: *toată mulțâmea de musică carile au turburat ș-au îngrozât acel nărod din toată lumea strâns/all the music that has disturbed and frightened that people gathered from al over the world* (DPar.1683, p. 244);
- 46) two postmodifiers expressed by adjectives and two postmodifiers expressed by relative clauses: *ființa dumnezăirii acea nedespărțată și nedespreunată, carea nice să desparte, nice să despreună/that nature of the deity that is inseparable* (DPar.1683, p. 272);
- 47) a postmodifier expressed by an adjective and four postmodifiers expressed by relative clauses: *Dumnezăul cel svânt, Ce în svinți Te odihnești și cu tresvântul glas de serafimi ești cântat și de heruvimi slavoslovit și de toate cereștile Șireaguri închinat/the holy God, Who rests among the saints and is sung by the holy voice of the seraphims and is praised by the cherubs and by all the celestial realms* (DDL.1679, p. 45-46);
- 48) six premodifiers expressed by adjectives and a premodifier expressed by an adjectival phrase: *Dumnezăieștile, svintele, curatele, fără moarte, cereștile și viață făcătoarele strașnice a lui Hristos Taine/the Godly, holy, clean, eternal, celestial, life-doing, wonderful Mysteries of Jesus* (DDL.1679, p. 102, p. 182);
- 49) three postmodifiers expressed by adjectives and two postmodifiers expressed by relative clauses: *Dumnezău acel sângur bun și milos, Carele întru nalturi petreci și cele smerite prăvești/that good and merciful God, Who lives in heaven and watches over the humble* (DDL.1679, p. 179);
- 50) three premodifiers expressed by adjectives: *acel dulce și izvorătoriu de spăsenie svânt rost a svinții sale/that sweet and holy reason of your highness, leading to our saving* (DVS.1682-6, p. 116);

- 51) a postmodifier expressed by a common noun preceded by a preposition and two postmodifiers expressed by relative clauses: *toiagul său ce porta, de her, ce avea cruce în vâro/the staff made of iron he was carrying, with a cross on top* (DVS.1682-6, p. 161);
- 52) two postmodifiers expressed by common nouns preceded by prepositions: *loc de nevoaie și de greutate/a place where we face hardships* (DPV.1673, p. 26);
- 53) two postmodifiers expressed by adjectives and three postmodifiers expressed by relative clauses: *o grădină sufletească răsădită de Dumnezău, ce o au răsădit cu de toț pomii sufletești, la răsărit, în Edenul cel cugetat, în svinta besearică, carea cetind iubitul creștin să satură de toată dulceața și să adapă de viața veacinică/a garden of the soul seeded by God, that He has seeded with all the trees of the soul, in the east, in Eden, in the holy church, from which the beloved Christian, upon reading it, tastes all the sweetness and enters eternal life* (DP.1680, p. 278);
- 54) three postmodifiers expressed by common nouns preceded by prepositions: *cețăt/Cu șanțuri, cu tare străj, cu porț cu lăcăt//well guarded fortresses/with ditches and locked gates* (DPV.1673, p. 133);
- 55) a postmodifier expressed by an adjective and two postmodifiers expressed by adjectival phrases: *legea Domnului cea svântă,/Fără vină și fără de smântă//the holy law of God,/that is guiltless* (DPV.1673, p. 43);
- 56) four postmodifiers expressed by adjectives: *giudecătoriu drept și tare și îndelung răbdătoriu și nepurtătoriu de mânie/an honest, powerful, patient judge that does not lose his temper* (DP.1680, p. 292);
- 57) three postmodifiers expressed by adjectives: *argint ars, lămurit de pământ, curățit de șapte ori/burnt silver, cleared of earth and cleaned seven times* (DP.1680, p. 303);
- 58) six postmodifiers expressed by relative clauses: 2. *Cel ce împlă fără vinovăție și lucrează dreptate*, 3. *Carele grăiaște adevăr întru inema sa, carele nu înșală cu limba sa*, 4. *Nici feace priiatinului său rău și ponosuire nu luă spre cei de-aproape ai săi*. /2. *He who is not guilty and seeks justice*, 3. *Who tells the truth and does not lie*, 4. *Nor does he do his friends harm or gossip about them.* (DP.1680, p. 306);
- 59) four postmodifiers expressed by common nouns preceded by prepositions: *ficiori de tauri și de țapi, cu grăsâme de rărunchi de grâu și sânge de strugur/bull and goat cubs, with fat made from kidneys of wheat and blood made from grapes* (DP.1680, p. 664);
- 60) four premodifiers expressed by adjectives: *Preasvânta, curata, preablagoslovita, slăvita* *Despuitoarea noastră/Our Most Holy, clean, most hailed and praised Mistress* (DDL.1679, p. 39-40);
- 61) two premodifiers expressed by adjectives and a premodifier expressed by an adjectival phrase: *svintele Sale și preacurate și fără prihană mâni/His holy and clean hands without sin* (DDL.1679, p. 78);
- 62) three postmodifiers expressed by adjectives and a postmodifier expressed by an adjectival phrase: *zua toată întreagă, svântă, păciuită și fără păcate cerșindu-ne/begging the whole of a holy, peaceful day without sin* (DDL.1679, p. 102);
- 63) three premodifiers expressed by adjectives and a premodifier expressed by an adjectival phrase: *priceștiurea Svintelor, preacuratelor, fără moarte și cereștilor* *Tale Taine/the communion of Your holy, clean, eternal and celestial Mysteries* (DDL.1679, p. 154).

3. Conclusions

In Dosoftei's writings, the modifier can be expressed by common nouns preceded by prepositions, adjectives, ordinal numbers, adjectival phrases, personal pronouns preceded by a preposition, pronominal phrases preceded by a preposition, demonstrative pronouns preceded by a preposition, reflexive pronouns, verbs (gerunds and supines), adverbs (preceded or not by a preposition), as well as relative clauses. Within the noun phrase, there might be one or more modifiers (up to seven). Common nouns preceded by a preposition, adjectives and adjectival phrases function both as premodifiers or as postmodifiers. Ordinal numbers, personal pronouns and pronominal phrases preceded by a preposition function as premodifiers. Adverbs preceded by prepositions, demonstrative pronouns preceded by a preposition, reflexive pronouns, verbs (gerunds and supines), as well as relative clauses function as postmodifiers. All in all, the syntactic patterns we have identified reflect the complex possibilities of structuring the noun phrase in Dosoftei's writings, illustrating the diversity of syntactic constructions in Old Romanian in the corpus to be analyzed, as far as the modifier is concerned.

REFERENCES

Studies, Articles:

- Băilă, Adelina Patricia (2018a). *Funcții sintactice vs funcții semantice în gramatica limbii române*. „Dacoromania”, XXIII, no. 1, pp. 17-26.
- Băilă, Adelina Patricia (2018b). *Uniqueness in the Romanian Syntax*. „Journal of Romanian Literary Studies”, XXI, no. 1, pp. 701-708.
- Dălăluă-Nasta, Lavinia (2018). *Observații privind funcțiile sintactice din grupul nominal*. „Dacoromania”, XXIII, no. 1, pp. 38-46.
- Drăguțoiu, Adela (2018). *Problema principiului unicității funcțiilor sintactice în gramatica românească*, in „Dacoromania”, XXIII, no. 1, pp. 47-63.
- Guțu Romalo, Valeria (coord.) (2008). *Gramatica limbii române*, volume I – *Cuvântul*. București: Editura Academiei Române.
- Guțu Romalo, Valeria (coord.) (2008). *Gramatica limbii române*, volumul II – *Enunțul*. București: Editura Academiei Române.
- Nicolae, Alexandru (2011). *Pe marginea descrierii grupului nominal în Gramatica de bază a limbii române*. in *Studia linguistica et philologica. Omagiu profesorului Nicolae Saramandu*. București: Editura Universității din București, pp. 635-653.
- Pană Dindelegan, Gabriela (coord.) (2016). *Gramatica de bază a limbii române*, second edition. București: Editura Univers Enciclopedic Gold.
- Pană Dindelegan, Gabriela, Zafiu, Rodica, Dragomirescu, Adina, Nicolae, Alexandru, Boioc Apintei, Adnana (2023). *Dicționar de termeni gramaticali și concepte lingvistice conexe*. București: Editura Univers Enciclopedic Gold.

Corpus:

- DPV.1673 = Dosoftei (1978). *Psaltirea în versuri*. București: Editura Minerva.
- DCR.1673 = Dosoftei (2023). *Carte de rugăciuni (1673)*. București: Editura Universității din București.
- DDL.1679 = Dosoftei (1980). *Dumnezeiasca liturghie*. Iași: Mitropolia Moldovei și Sucevei.
- DP.1680 = Dosoftei (2007). *Psaltirea de-nțăles*. Iași: Casa Editorială Demiurg.
- DPar.1683 = Dosoftei (2012). *Parimiile preste an. Iași, 1683*. Iași: Editura Universității Alexandru Ioan Cuza.
- DVS.1682-6 = Dosoftei (2002). *Viața și petrecerea svinților*. Cluj-Napoca: Editura Echinoc.

Validity and Transformation of the Autonomous-Relational Self Model on Today's Young People in Türkiye

Özerk-İlişkisel Benlik Modelinin Günümüz Türkiye Gençleri Üzerinde Geçerliliği Ve Dönüşümü: Bir Araştırma Önerisi

Lect. Ezgi LİF

Kilis 7 Aralık University, Türkiye

Abstract

This research aims to examine the validity and transformation of Çiğdem Kağıtçıbaşı's Autonomous-Relational Self Model among today's young people. Developing technologies, digitalization, globalization and rapid change in social dynamics affect individuals' self-constructs in various ways. In this mixed method study, quantitative and qualitative data collection techniques covering both autonomy and relationality dimensions will be applied together. The research will examine how the balance between autonomy and relationality changes with digital behaviors and social conditions. The findings are expected to provide new implications regarding individual and social changes. The research will shed light on the important dimensions of the modern transformation in young people's self-construal.

Keywords: Autonomous-relational Self Model, Çiğdem Kağıtçıbaşı, Individualism and Collectivism, Digital Transformation, Social Media Effect, Psychosocial Adaptation, Generation Differences.

Özet

Bu araştırma, Kağıtçıbaşı'nın (1996) Özerk-İlişkisel Benlik Modeli'nin günümüz gençleri arasındaki geçerliliğini ve dönüşümünü incelemeyi amaçlamaktadır. Gelişen teknolojiler, dijitalleşme, küreselleşme ve toplumsal dinamiklerdeki hızlı değişim, bireylerin benlik kurgularını çeşitli şekillerde etkilemektedir. Karma yöntem kullanılacak bu çalışmada, hem özerklik hem de ilişkisellik boyutlarını kapsayan nicel ve nitel veri toplama teknikleri bir arada kullanılacaktır. Araştırmada, özerklik ve ilişkisellik arasındaki dengenin dijital davranışlar ve toplumsal koşullarla nasıl değiştiği incelenecektir. Bulguların, bireysel ve toplumsal değişimlere ilişkin yeni çıkarımlar sunması beklenmektedir. Araştırma, gençlerin benlik kurgularında modern dönüşümün önemli boyutlarına ışık tutacaktır.

Anahtar Kelimeler: Benlik kurgusu, Özerk-ilişkisel benlik modeli, bireyselcilik ve toplulukçuluk, dijital dönüşüm, kültürel dönüşüm

Giriş

Benlik kurgusu, bireyin kendisini ve diğerleriyle olan ilişkisini algılama ve tanımlama biçimini ifade eder. Bu kavram, bireyin sosyalleşme sürecinde edindiği değerler, inançlar ve kimlik algısıyla şekillenir. Benlik kurgusu üzerine yapılan çalışmalar, biyo-kültürel ve sosyokültürel faktörlerin bireyin benlik yapısını belirlediğini öne sürmektedir (Markus & Kitayama, 1991). Markus ve Kitayama'nın geliştirdiği bağımsız ve bağımlı benlik kurgusu modeli, bireyin benliğini özerklik ve ilişkisel yönelim ekseninde değerlendirir. Bağımsız benlik kurgusu, bireyin kendisini diğerlerinden ayrılmış, benzersiz ve özerk bir varlık olarak görmesini ifade eder. Batı toplumlarında yaygın olarak görülen bu yapı, bireysellik, kişisel hedefler ve özgünlük temalarına dayanır (Triandis, 1995). Buna karşılık, bağımlı benlik kurgusu, bireyin kendisini topluluk içindeki roller ve ilişkiler üzerinden tanımladığı bir modeli ifade eder ve daha çok toplulukçu kültürlerde yaygın olarak görülmektedir (Hofstede, 2001).

Benlik kurgusunun kültürel ve ekonomik faktörlere bağlı olarak dinamik bir yapıya sahip olduğu görüşünü savunan Çiğdem Kağıtçıbaşı (1996), geleneksel bağımlı benlik modeline alternatif olarak özerk-ilişkisel benlik modelini geliştirmiştir. Kağıtçıbaşı'nın modeli, bireyin hem özerklik hem de ilişkisel yönelimlerini dengeli bir şekilde sürdürebileceğini öne sürmektedir. Geleneksel toplumlarda bireyler genellikle aile ve toplumsal beklentiler doğrultusunda ilişkisel bir benlik yapısına sahipken, modernleşme ve sosyoekonomik dönüşümler, bireylerin bağımsız karar alma süreçlerini güçlendirmiştir (Kağıtçıbaşı, 1996). Böylece, bireyler hem kendi kararlarını alabilir hem de toplumsal bağlarını sürdürebilir hale gelmiştir. Bu model, sanayileşme, kentleşme ve eğitim düzeyinin artışı gibi faktörlerin bireylerin benlik yapıları üzerindeki etkilerini açıklamak için geliştirilmiştir. Benlik kurgusunun sosyal, kültürel ve ekonomik bağlamda değişkenlik göstermesi, bireylerin kimlik gelişim süreçlerinin dinamik olduğunu ortaya koymaktadır. Sosyoekonomik gelişim, bireylerin özerkliklerini artırırken, toplumsal bağların korunmasını da gerektirmektedir. Kağıtçıbaşı'nın özerk-ilişkisel benlik modeli, bireyin bu iki temel yönelimi dengeli bir şekilde sürdürebileceğini vurgulayarak, modern bireyin kimlik gelişim sürecini açıklayan önemli bir teorik çerçeve sunmaktadır.

Bununla birlikte, Türkiye'de son yıllarda yaşanan toplumsal ve ekonomik değişimler, bireylerin benlik algısını şekillendiren yeni dinamikler yaratmıştır. Küreselleşme, dijitalleşme ve siyasi atmosferin etkileri, bireylerin bağımsız kimlik geliştirme süreçlerini hızlandırmış ancak aynı zamanda geleneksel ilişkisel bağların sürdürülebilirliğini de sorgulatmıştır. Dolayısıyla, Kağıtçıbaşı'nın geliştirdiği özerk-ilişkisel benlik modelinin Türkiye bağlamında nasıl evrildiğini ve bireylerin bu modeli nasıl içselleştirdiğini anlamak, toplumsal kimlik oluşumu açısından önemli bir araştırma alanı olarak karşımıza çıkmaktadır.

Bu araştırmanın amacı, Çiğdem Kağıtçıbaşı'nın özerk-ilişkisel benlik modelinin 21. yüzyıl Türkiye'sindeki toplumsal dönüşümler ışığında nasıl değişim geçirdiğini incelemektir. Küreselleşme, dijitalleşme, ekonomik dalgalanmalar ve siyasi atmosferin bireylerin benlik yapısına etkilerini değerlendirerek, bireylerin bağımsızlık ve ilişkisel yönelimlerini nasıl dengelediğini anlamak hedeflenmektedir. Özellikle genç nesillerin benlik gelişiminde teknolojik faktörlerin ve değişen sosyal yapının oynadığı rol analiz edilerek, modelin günümüz koşullarında nasıl işlediği tartışılacaktır. Bu bağlamda, bireylerin benlik algılarının yeni toplumsal koşullar çerçevesinde nasıl şekillendiği ve Kağıtçıbaşı'nın öne sürdüğü modelin günümüz dinamiklerine nasıl uyum sağladığı ele alınacaktır.

Toplumsal, Siyasi, Ekonomik ve Teknolojik Dönüşümün Benlik Kurgusu Üzerindeki Etkileri

Teknoloji ve dijitalleşme, bireyin benlik algısını ve toplumsal ilişkilerini dönüştüren en önemli faktörlerden biri haline gelmiştir. Dijitalleşme, bireylerin kendi kimliklerini inşa etme süreçlerini genişletirken, aynı zamanda ilişkisel bağların nasıl kurulduğunu ve sürdürüldüğünü de yeniden şekillendirmiştir. Teknolojik gelişmelerin etkisiyle bireyler, daha fazla bilgiye erişebilme, kendi kararlarını daha özgürce alabilme ve bireysel kimliklerini farklı platformlarda ifade edebilme imkânına kavuşmuştur (Turkle, 2011). Ancak bu süreç, aynı zamanda bireylerin ilişkisel benlik yönelimlerini ve sosyal bağlarını farklı bir boyuta taşımış, yeni kimlik dinamikleri oluşturmuştur. Kağıtçıbaşı'nın özerk-ilişkisel benlik modeli çerçevesinde değerlendirildiğinde, bireylerin hem bağımsız hem de ilişkisel yönelimlerinin, dijitalleşme süreciyle birlikte önemli değişimler geçirdiği görülmektedir (Kağıtçıbaşı, 1996).

Dijitalleşme, bireyin benlik algısını güçlendiren bir özerklik alanı yaratmıştır. Geleneksel toplumlarda bireyler, aile, topluluk ve sosyal normlar çerçevesinde kimliklerini geliştirirken, günümüzde bireyler dijital platformlar sayesinde kendi kimliklerini çok daha bağımsız ve esnek bir şekilde inşa edebilmektedir (Bauman, 2000). YouTube, Instagram, TikTok gibi platformlar, bireylerin kendi yaşam tarzlarını, düşüncelerini ve değerlerini küresel bir ölçekte paylaşmasına olanak tanımış ve bireylerin kendi özerk kimliklerini oluşturmalarına yardımcı olmuştur. Bunun sonucunda, bireylerin benlik algıları daha bireyselleşmiş, dış dünyaya karşı daha özgün bir kimlik sunma eğilimi artmıştır. Dijitalleşmenin sağladığı bu bireysel ifade özgürlüğü, bireylerin özerklik yönelimlerini güçlendirmiştir.

Ancak teknoloji ve dijitalleşmenin bireylerin özerklik algısını artırmasının yanı sıra, ilişkisel bağlarını nasıl kurduklarını ve sürdürdüklerini de önemli ölçüde dönüştürdüğü görülmektedir. Geleneksel yüz yüze etkileşimler, dijital platformlarda daha hızlı, daha geniş çaplı ancak aynı zamanda daha yüzeysel bir iletişim biçimine dönüşmüştür (Turkle, 2015). Dijital çağda bireyler, artık fiziksel olarak birbirine yakın olmasa da sosyal medya ve mesajlaşma uygulamaları sayesinde ilişkisel bağlarını sürdürebilmektedir. Bu durum, bireylerin ilişkisel benlik yapılarını daha esnek hale getirirken, aynı zamanda yüzeysel bağların yaygınlaşmasına da neden olmuştur. Günümüzde insanlar, fiziksel dünyada uzun süreli ve derin ilişkiler geliştirmek yerine, sosyal medya aracılığıyla daha çok insanla daha sık ancak daha kısa süreli iletişim kurmaktadır (Baym, 2010). Bu süreç, bireylerin ilişkisel yönelimlerini değiştirmiş, toplumsal bağların daha hızlı ancak daha kırılgan hale gelmesine neden olmuştur.

Dijitalleşmenin benlik modeli üzerindeki bir diğer önemli etkisi, bireylerin sürekli olarak dışsal onay mekanizmalarına maruz kalmalarıdır. Sosyal medya platformları, bireylerin beğeni, takipçi sayısı ve paylaşılan içeriklere verilen tepkiler aracılığıyla kimliklerini inşa etmelerine olanak tanımaktadır (Goffman, 1959). Bu durum, bireyin özerk benlik algısını güçlendirse de, aynı zamanda ilişkisel bağlarının dijital ortamlarda daha fazla onaya dayalı hale gelmesine neden olmaktadır. Bireyler, kendi kararlarını bağımsız bir şekilde alıyor gibi görünse de, aslında algoritmalar tarafından yönlendirilen içeriklere maruz kalarak ve sosyal çevrelerinden gelen geri bildirimlerle benliklerini inşa etmektedir (Pariser, 2011). Bu süreç, bireylerin kimliklerini şekillendirirken hem özerkliklerini hem de ilişkisel yönelimlerini dışsal faktörlere bağımlı hale getirebilmektedir.

Dijitalleşmenin bireyler üzerindeki etkilerinden biri de sanal topluluklar aracılığıyla yeni aidiyet biçimlerinin oluşmasıdır. Geleneksel toplumlarda bireyler aile, mahalle, okul gibi fiziksel topluluklar içinde kimliklerini geliştirirken, dijitalleşme bireylerin farklı ilgi alanlarına göre sanal topluluklara dâhil olmasını sağlamıştır (Castells, 1996). Reddit, Discord, Twitter ve çeşitli forumlar gibi dijital alanlar, bireylere kendilerini ifade edebilecekleri ve

ortak ilgi alanlarına sahip insanlarla ilişki kurabilecekleri yeni sosyal bağlar sunmuştur. Bu süreç, bireylerin ilişkisel benlik yönelimlerini değiştirerek, artık sadece fiziksel çevrelerine değil, aynı zamanda küresel ölçekte sanal gruplara da aidiyet hissetmelerine neden olmuştur. Dijital topluluklar, bireylerin kimliklerini inşa etmelerinde yeni bir zemin oluşturmuş ve bireylerin ilişkisel bağlarını mekânsal sınırlardan bağımsız hale getirmiştir.

Sosyoekonomik değişimler, bireyin benlik algısını şekillendiren en önemli faktörlerden biri olarak öne çıkmaktadır. Kağıtçıbaşı'nın özerk-ilişkisel benlik modeli, bireyin hem bağımsızlığını hem de ilişkisel bağlarını dengeli bir şekilde sürdürdüğünü savunur (Kağıtçıbaşı, 1996). Ancak toplumsal ve ekonomik koşullardaki dönüşümler, bireylerin bu dengeyi nasıl kurduğunu doğrudan etkilemektedir. Özellikle sanayileşme, küreselleşme, gelir eşitsizlikleri, kentleşme ve ekonomik krizler gibi değişimler, bireylerin özerklik ve ilişkisel bağlarını yeniden şekillendirmiştir (Giddens, 1991; Bauman, 2000). Geleneksel toplumlarda ekonomik yapı, bireylerin ilişkisel benlik yönelimini güçlendiren bir unsur olarak işlev görmüştür. Tarım ve zanaat üzerine kurulu geleneksel ekonomik sistemlerde aile, bireyin temel güvenlik ve ekonomik destek kaynağı olmuştur (Inglehart & Welzel, 2005). Ancak sanayileşme ile birlikte kentleşmenin hızlanması ve iş gücünün fabrikalara yönelmesi, bireylerin ekonomik bağımsızlığını kazanmasını teşvik etmiş ve bu süreç bireylerin özerklik algısını güçlendirmiştir. Geleneksel toplum yapılarında görülen geniş aile modeli yerini çekirdek aileye bırakırken, bireylerin ekonomik olarak kendi ayakları üzerinde durması beklenir hale gelmiştir (Beck & Beck-Gernsheim, 2002). Böylece, ekonomik yapının değişmesi, bireyin benlik algısında da belirgin bir dönüşüme yol açarak özerklik yönelimini ön plana çıkarmıştır.

Gelir eşitsizliği ve ekonomik krizler de bireyin benlik yapısını doğrudan etkilemektedir. Küresel ekonomik dalgalanmalar, bireylerin maddi bağımsızlıklarını zorlaştırırken, ilişkisel bağların güçlenmesine sebep olabilmektedir (Stiglitz, 2012). Örneğin, ekonomik krizler döneminde insanlar işsizlik ve maddi yetersizliklerle karşı karşıya kaldığında, sosyal dayanışma ağlarına ve aile desteğine daha fazla ihtiyaç duymaktadır (Castells, 2010). Bu durum, bireylerin ilişkisel yönelimlerinin ekonomik zorunluluklarla yeniden ön plana çıkmasına neden olabilir. Ancak ekonomik refah dönemlerinde bireyler, özerkliklerini daha fazla vurgulayabilir ve bireysel karar alma süreçlerinde daha bağımsız hareket edebilirler (Sennett, 2006).

Kadınların iş gücüne katılımı da benlik yapısındaki dönüşümlerde önemli bir faktördür. Geleneksel toplumlarda kadınlar daha çok ev içi rollerle tanımlanırken, modern ekonomik yapı kadınların iş gücüne katılımını artırarak özerkliklerini güçlendirmiştir (Hochschild & Machung, 2012). Çalışan kadınlar ekonomik olarak bağımsız hale geldikçe, karar alma süreçlerinde daha fazla söz sahibi olmuş, bu da özerk benlik yapısının güçlenmesine yol açmıştır. Ancak aynı zamanda, kadınlar için ilişkisel yönelim de büyük önem taşımaya devam etmektedir. Aile içinde ve iş yaşamında denge kurma ihtiyacı, kadınların hem özerklik hem de ilişkisel bağlarını sürdüren bir benlik yapısı geliştirmesine neden olmuştur (Giddens, 1992).

Özetlemek gerekirse, geleneksel ekonomilerden sanayileşmeye geçiş, bireylerin özerklik yönelimini artırırken, ekonomik krizler ve gelir eşitsizlikleri ilişkisel bağların güçlenmesine neden olmuştur. Küreselleşme ile birlikte bireyler hem daha fazla bireysel özgürlüğe sahip olmuş hem de ekonomik belirsizliklerle karşı karşıya kalmıştır. Kadınların iş gücüne katılımı, ekonomik refah seviyesindeki değişimler ve küresel piyasa dinamikleri, bireylerin hem özerklik hem de ilişkisel bağlarını nasıl sürdürdüğünü şekillendiren temel faktörlerdir (Beck, 1992). Sosyoekonomik değişimler, bireylerin benlik yapısını tek bir yönde değil, karmaşık ve çok boyutlu bir şekilde etkilemektedir. Bu bağlamda, özerk-ilişkisel benlik modeli, değişen ekonomik koşullar altında dinamik bir dönüşüm sürecinden geçmekte ve

bireylerin hem bağımsızlıklarını hem de ilişkisel bağlarını yeniden tanımlamalarına neden olmaktadır.

Kültürel dönüşüm ve küreselleşme, bireyin benlik algısını şekillendiren önemli faktörler olarak öne çıkmaktadır. Kültürlerin zamanla değişime uğraması ve küreselleşme ile birlikte farklı kültürel yapıların birbirine entegre olması, bireyin benlik algısını derinlemesine dönüştürmektedir (Robertson, 1992). Geleneksel toplumlarda kültürel kimlik, aile, topluluk ve gelenekler aracılığıyla belirlenirken, modern dünyada bireyin kendi kimliğini oluşturma sürecinde daha fazla esneklik söz konusudur (Hall, 1996). Küreselleşme ile birlikte bireyler, sadece kendi yerel kültürlerinin değil, farklı kültürel norm ve değerlerin de etkisi altında kalmaktadır. Bu durum, bireyin benlik yapısında köklü değişikliklere yol açmaktadır. Örneğin, geleneksel toplumlarda bireyler daha çok topluluk merkezli bir benlik anlayışı geliştirirken, küreselleşme ile bireycilik kavramı daha fazla benimsenmeye başlamıştır (Beck, 1992). Bu, bireylerin özerklik yönelimlerini güçlendirmelerine ve kendi kimliklerini daha bağımsız bir şekilde inşa etmelerine olanak tanımaktadır. Kültürel dönüşümle birlikte bireyler, artık kimliklerini sadece etnik köken, dini inanç veya aile bağları üzerinden değil, aynı zamanda küresel kültürel dinamikler çerçevesinde tanımlamaktadır (Featherstone, 1995). Dijital medya, küresel popüler kültür ve uluslararası etkileşimler, bireylerin benlik algısını yeniden şekillendirmektedir. Sosyal medya ve dijital platformlar sayesinde bireyler, dünyanın dört bir yanındaki farklı kültürlerden etkilenerek kendi kimliklerini sürekli olarak yeniden tanımlama sürecine girmiştir. Bu durum, özellikle gençler arasında daha belirgin hale gelmiş ve onların kültürel kimliklerini küresel normlar doğrultusunda esnek bir yapıya dönüştürmüştür.

Bir diğer ifade ile geleneksel kültürel normlar ile küresel değerlerin birleşimi, bireyin hem özerklik hem de ilişkisel bağlarını yeniden tanımlamasına neden olmaktadır. Dijitalleşme ve küresel kültürel etkileşimler, bireylerin daha fazla seçenek ve esneklikle kimliklerini şekillendirmelerine olanak sağlarken, aynı zamanda kimlik çatışmaları ve aidiyet sorunları gibi yeni zorluklar da ortaya çıkarmaktadır. Bu süreç, bireylerin benlik yapılarında hibrit kimlikler geliştirmelerine ve hem bireysel hem de toplumsal yönlerini daha dengeli bir şekilde sürdürebilmelerine olanak tanımaktadır. Küreselleşme çağında bireylerin benlik algıları, sabit ve değişmez yapılar olmaktan çıkıp, dinamik ve sürekli evrilen bir yapıya dönüşmüştür.

Siyasi atmosferdeki değişiklikler, bireylerin benlik algılarını ve bu algının toplumsal bağlamda nasıl şekillendiğini etkilemektedir (Inglehart & Norris, 2016). Demokrasi, özgürlük ve bireysel hakların ön planda olduğu bir ortamda özerklik, daha güçlü bir şekilde benlik duygusunun bir parçası haline gelirken; baskıcı veya otoriter sistemlerde ilişkisel bağlar, toplumsal dayanışma ve birlikte var olma çabası olarak şekillenmiştir (Giddens, 1991). Bu tür siyasi yapılar, bireylerin kimliklerini dışsal faktörler üzerinden inşa etmelerine yol açabilir.

Türkiye’de son 25 yılda yaşanan siyasi atmosfer ve toplumsal değişimler, bireylerin benlik algısını önemli ölçüde etkilemiş ve Kağıtçıbaşı’nın özerk-ilişkisel benlik modeli çerçevesinde değerlendirildiğinde, bireylerin özerklik ve ilişkisel bağları arasında yeni dinamikler oluşturmuştur (Kağıtçıbaşı, 1996). Siyasi değişimler, toplumsal değerlerde, bireysel kimlik algılarında ve sosyal ilişkilerde köklü dönüşümler yaratırken, ekonomik politikalar, eğitim sistemindeki reformlar ve dijitalleşme gibi unsurlar da bu dönüşümü hızlandırmıştır (Castells, 2010). Kimlik siyasetinin ön plana çıkması, bireylerin ya özerklik yönelimlerini güçlendirmesine ya da belirli topluluklara daha sıkı bağlanarak ilişkisel benliklerini pekiştirmesine yol açmıştır. Eğitim sistemindeki değişimler, ekonomik dalgalanmalar, ifade özgürlüğü üzerindeki baskılar ve dijitalleşme süreçleri, bireylerin özerklik ve ilişkisel bağlarını nasıl inşa ettiklerini belirleyen önemli faktörler olmuştur (Beck, 1992). Türkiye’de bireyler, siyasi ve toplumsal koşullara bağlı olarak hem daha bağımsız hem de daha kolektif kimlik yapılarına yönelmiş, bu süreç bireyin benlik gelişiminde

dinamik ve çok katmanlı bir dönüşüme yol açmıştır. Özerklik ve ilişkisel benlik arasındaki bu denge, Türkiye'nin gelecekteki siyasi ve toplumsal dinamiklerine bağlı olarak yeni şekiller almaya devam edecektir.

Aile yapılarındaki dönüşüm de özerklik ve ilişkisel benlik algısını değiştirmiştir. Özellikle tek ebeveynli aileler, boşanma oranlarındaki artış ve yeniden evlilikler, ilişkisel bağların nasıl kurulduğunu ve sürdürülmesi gerektiğini yeniden tanımlamıştır (Beck & Beck-Gernsheim, 2002). Bu bağlamda, ilişkisel benlik daha esnek bir hale gelmiş, bireylerin benliklerini oluştururken daha fazla kişisel tercihler ve özerklik ön planda olmuştur (Kağıtçıbaşı, 1996). Aile yapısındaki değişimler, bireyin benlik gelişimi üzerinde belirleyici bir etkiye sahiptir. Son yıllarda aile yapılarında meydana gelen dönüşümler, bireylerin özerklik ve ilişkisel yönelimlerini farklı şekillerde etkilemiştir (Giddens, 1992). Sanayileşme, kentleşme, ekonomik değişimler, toplumsal normlardaki evrim ve dijitalleşme gibi faktörler, geleneksel aile yapılarını değiştirmiş ve bireylerin benlik yapılarında yeni dinamikler oluşturmuştur (Inglehart & Welzel, 2005). Geleneksel aile yapılarından çekirdek ve tek ebeveynli ailelere geçiş, bireylerin özerklik yönelimlerini artırırken, ilişkisel bağların niteliğinde de değişimlere yol açmıştır. Kadınların iş gücüne katılımı, boşanma oranlarının artışı, dijitalleşme, ekonomik zorluklar ve göç gibi faktörler, bireylerin aile içindeki rollerini ve kimlik yapılarını yeniden şekillendirmiştir (Beck, 1992). Bu süreçte bireyler, hem bağımsız kararlar alabilme becerisi kazanmış hem de yeni toplumsal koşullara adapte olabilmek için ilişkisel bağlarını farklı bir şekilde tanımlamak zorunda kalmıştır. Aile, bireyin ilk sosyalizasyon sürecini şekillendiren temel kurum olmaya devam etse de, değişen toplumsal dinamikler, bireylerin hem özerkliklerini hem de ilişkisel bağlarını daha esnek ve dinamik bir şekilde inşa etmelerine yol açmıştır.

Yöntem

Bu çalışmada, çağdaş gençler arasında otonom-ilişkisel benlik modelinin geçerliliğini ve dönüşümünü araştırmak için karma yöntem bir yaklaşım kullanılacaktır. Nicel bileşen, belirlenmiş psikometrik önlemleri kullanarak özerklik ve ilişki düzeylerini değerlendirirken, nitel görüşmeler katılımcıların kişisel deneyimlerini ve bakış açılarını araştıracaktır.

Örneklem, amaçlı ve kartopu örnekleme stratejilerinin bir kombinasyonu ile belirlenecek 18-25 yaş arası bireylerden oluşacaktır. Veri toplama iki aşamada gerçekleştirilecektir: 1) özerkliği ve ilişkiyi ölçmek için standart bir ölçek ve 2) katılımcıların kendiliğinden, dijital davranışları ve toplumsal etkileri daha iyi anlamak için derinlemesine görüşmeler.

Nicel veriler istatistiksel yazılım kullanılarak analiz edilecek, nitel görüşmeler gömülü teori yaklaşımı kullanılarak kodlanacaktır. Her iki bileşenden elde edilen bulgular, çağdaş gençler arasında otonom-ilişkisel ben modelin dönüşümünün kapsamlı bir şekilde anlaşılmasını sağlamak için entegre edilecektir.

Beklenen Bulgular

Bu çalışmanın sonuçları, çağdaş gençlerin öz-yapısında özerklik ve ilişki arasındaki dengenin önemli dönüşümler geçirdiğini göstermesi beklenmektedir. Nicel bulgular, genel özerklik ve ilişki seviyeleri yüksek kalırken, bu boyutların spesifik tezahürlerinin değişen teknolojik, sosyal ve kültürel manzaraya yanıt olarak geliştiğini göstermesi beklenmektedir.

Nitel görüşmelerin, bu dönüşümlerin nüansları hakkında daha fazla bilgi vermesi beklenmektedir. Katılımcılar, dijital katılımlarının ve sosyal etkileşimlerinin ağa bağlı doğasının, benlik duygusunu ve kişisel bağımsızlık ile sosyal bağlılık arasındaki müzakereyi nasıl etkilediğini anlatacaklardır. Ayrıca, bulgular aile sisteminin ve bireysel psikolojik faktörlerin yetişkinliğe geçiş sırasında özerkliğin ortaya çıkışını şekillendirmede önemli bir

rol oynamaya devam ettiğini göstermesi beklenmektedir. Dijital bağlamda meydana gelen kendini sosyalleştirme süreci, gençler müzakere edilen normlarda ve çevrimiçi deneyimlerini karakterize eden çoklu kimliklerde gezindikçe hem faydalar hem de potansiyel risklere sahip olduğunu ortaya koyması beklenmektedir.

Beklenen Sonuç ve Tartışma

Bu araştırma, Çiğdem Kağıtçıbaşı'nın Özerk-İlişkisel Benlik Modeli'nin günümüz Türkiye gençleri arasındaki geçerliliğini ve dönüşümünü incelemeyi amaçlamaktadır. Araştırmanın bulgularının, modelin güncel toplumsal ve kültürel dinamikler karşısında belirli dönüşümler geçirdiğini ortaya koyması beklenmektedir.

Teknolojinin hızlı gelişimi, dijital dönüşüm, ekonomik dalgalanmalar ve siyasi atmosferdeki değişikliklerin bireylerin benlik kurgularını önemli ölçüde etkilediği öngörülmektedir. Bu bağlamda, özerklik ve ilişkisel benlik arasındaki dengenin dijital platformlar aracılığıyla yeni bir yapı kazandığı, bireylerin hem bireysel ifadelerini güçlendirdikleri hem de yeni tür sosyalleşme biçimleri oluşturdukları tahmin edilmektedir. Sosyal medyanın, bireylerin kendi kimliklerini oluşturma sürecini dönüştürerek, bireyler arası ilişkileri yüzeysel ancak hızlı bir yapıya dönüştürmesi ve özerklik ile ilişkisel bağların yeni bir şekilde tanımlanmasına yol açması beklenmektedir.

Ekonomik dönüşümlerin de bireylerin benlik kurgusu üzerinde belirgin bir etkiye sahip olacağı öngörülmektedir. Gelir eşitsizlikleri ve ekonomik krizlerin bireylerin ilişkisel bağlarını güçlendirmesine neden olurken, ekonomik refah dönemlerinde bireylerin daha bağımsız kararlar almasını ve özerkliklerini vurgulamalarını teşvik ettiği varsayılmaktadır. Küreselleşme ve siyasi atmosferin bireylerin kimlik algılarını ve toplumsal bağlarını şekillendiren diğer kritik faktörler olarak öne çıkması beklenmektedir.

Araştırma sonucunda, Özerk-İlişkisel Benlik Modeli'nin bireylerin yaşam biçimlerine ve toplumsal koşullara uyum sağlayarak dinamik bir yapıya sahip olduğuna dair bulgular elde edilmesi beklenmektedir. Bireylerin, hem özerkliklerini güçlendirirken hem de ilişkisel bağlarını koruyarak değişen toplumsal koşullara adapte olabilmelerinin, modelin esnek ve değişime açık doğasını doğrulayacağı düşünülmektedir. Bu bağlamda, modelin küresel değişimlerle birlikte evrildiği ve bireylerin çok boyutlu benlik yapısı geliştirerek küresel ve yerel dinamikleri dengeli bir şekilde içselleştirdiği sonucuna ulaşılması beklenmektedir.

Bu çalışma, özerklik ve ilişkisel benlik arasındaki dengenin günümüzde nasıl dönüşebileceğini ortaya koyarak, bireylerin küreselleşme, dijitalleşme ve ekonomik dönüşümler karşısında benlik yapılarının nasıl yeniden inşa edildiğini açıklamayı hedeflemektedir. Gelecekte yapılacak araştırmaların, farklı kuşaklar arasındaki farklılıkları daha ayrıntılı bir şekilde ele alarak modelin farklı toplumsal ve ekonomik gruplar içinde nasıl işlediğini incelemesi önerilmektedir. Bununla birlikte, dijital dönüşümün benlik yapıları üzerindeki uzun vadeli etkilerini anlamak için daha kapsamlı boylamsal çalışmalar gerekmektedir.

KAYNAKÇA

- Appadurai, A. (1996). *Modernity at Large: Cultural Dimensions of Globalization.* University of Minnesota Press.
- Bauman, Z. (2000). *Liquid Modernity.* Polity Press.
- Baym, N. K. (2010). *Personal Connections in the Digital Age.* Polity Press.
- Boyd, D. (2014). *It's Complicated: The Social Lives of Networked Teens.* Yale University Press.
- Beck, U. (1992). *Risk Society: Towards a New Modernity.* Sage.
- Beck, U., & Beck-Gernsheim, E. (2002). *Individualization: Institutionalized Individualism and Its Social and Political Consequences.* Sage.
- Castells, M. (2010). *The Rise of the Network Society.* Wiley-Blackwell.
- Featherstone, M. (1995). *Undoing Culture: Globalization, Postmodernism and Identity.* Sage.

- Giddens, A. (1991). **Modernity and Self-Identity: Self and Society in the Late Modern Age.** Stanford University Press.
- Giddens, A. (1992). **The Transformation of Intimacy: Sexuality, Love, and Eroticism in Modern Societies.** Stanford University Press.
- Goffman, E. (1959). **The Presentation of Self in Everyday Life.** Doubleday.
- Hall, S. (1996). **Questions of Cultural Identity.** Sage.
- Hochschild, A. R., & Machung, A. (2012). **The Second Shift: Working Families and the Revolution at Home.** Penguin Books.
- Inglehart, R., & Welzel, C. (2005). **Modernization, Cultural Change, and Democracy: The Human Development Sequence.** Cambridge University Press.
- Inglehart, R., & Norris, P. (2016). **Cultural Backlash: Trump, Brexit, and Authoritarian Populism.** Cambridge University Press.
- Kağıtçıbaşı, Ç. (1996). **Family and Human Development Across Cultures: A View from the Other Side.** Lawrence Erlbaum Associates.
- Pariser, E. (2011). **The Filter Bubble: What the Internet is Hiding from You.** Penguin.
- Robertson, R. (1992). **Globalization: Social Theory and Global Culture.** Sage.
- Sennett, R. (2006). **The Culture of the New Capitalism.** Yale University Press.
- Stiglitz, J. E. (2012). **The Price of Inequality: How Today's Divided Society Endangers Our Future.** W.W. Norton & Company.
- Turkle, S. (2011). **Alone Together: Why We Expect More from Technology and Less from Each Other.** Basic Books.
- Turkle, S. (2015). **Reclaiming Conversation: The Power of Talk in a Digital Age.** Penguin.

The Use of Blood in Hittite Rituals

Hitit Ritüellerinde Kan Kullanımı

Hilal KUTLU ALANCI

Res. Asst. Dr. Kilis 7 Aralık University, Türkiye

ORCID: 0000-0003-4094-4498

Abstract

When we examine the sources on the use of blood (*ešhar*) in Hittite rituals and its purpose, we come across a wide and diverse range of text types. While blood stands out as the carrier of life and power in Hatti culture, the texts supporting this theme generally cover ritual groups dating from the thirteenth to the fourteenth centuries. Blood plays an important role in Hittite rituals as a means of blessing, purification and atonement. These rituals were exported from Kizzuwatna, and this region contains strong Hurrian and Luwian cultural influences. Therefore, Hittite religious practices were shaped not only by local beliefs but also by environmental and cultural interactions. The use of blood in the Hittites includes three main situations: First, blood is seen to be identified with life and associated with the life energy of humans and animals. Second, blood is used as a purifying agent; in this context, blood is believed to have a symbiotic effect in order to cleanse from impurities and evil spirits. Third, objects and buildings are blessed by the application of blood; This practice aims to protect both physical spaces and spiritual beings. As a result, the Hittites viewed blood not only as a liquid but also as a means of spiritual power, protection and purification. This reflects the central role of blood in various rituals and the deep meaning it carried for Hittite society. Through these rituals, blood becomes both an element connected to life itself and a protective mechanism against evil.

Keywords: Hittite, Blood, Ritual, Purification, Consecration, Life-Giving

Öz

Hitit ritüellerinde kan'ın (*ešhar*) kullanımı ve bunun amacı üzerine kaynakları incelediğimizde, oldukça geniş ve çeşitli metin türleriyle karşılaşırız. Hatti kültüründe kan, hayatın ve gücün taşıyıcısı olarak öne çıkmakla birlikte, bu temayı destekleyen metinler genellikle on üçüncü ile on dördüncü yüzyıllar arasına tarihlenen ritüel gruplarını kapsamaktadır. Kan, Hitit ritüellerinde kutsama, arındırma ve kefaret aracı olarak önemli bir rol oynamaktadır. Bu ritüeller, Kizzuwatna'dan ihraç edilmiş olup, bu bölge güçlü Hurri ve Luwi kültürel etkilerini barındırmaktadır. Bu nedenle, Hitit dini uygulamaları, sadece yerel inançlar değil, aynı zamanda çevresel ve kültürel etkileşimlerden de şekillenmiştir. Hititler'de kanın kullanımı üç ana durumu içermektedir: İlk olarak, kanın yaşamla özdeşleştirildiği, insanların ve hayvanların yaşam enerjisiyle ilişkilendirildiği görülmektedir. İkincisi, kanın arındırıcı bir madde olarak kullanılmasıdır; bu bağlamda, kirlerden ve kötü ruhlardan arınmak için kanın simbiyotik bir etkisi olduğuna inanılmaktadır. Üçüncüsü ise, kanın sürülmesiyle nesne ve binaların kutsanmasıdır; bu uygulama hem fiziksel alanların hem de ruhsal varlıkların korunmasını amaçlar. Sonuç olarak, Hititler'in kan'ı, sadece bir sıvı olarak değil, aynı zamanda ruhsal güç, koruma ve arınma aracı olarak da görmüşlerdir. Bu durum, kanın çeşitli ritüellerdeki merkezi rolünü ve Hitit toplumu için taşıdığı derin anlamı yansıtmaktadır. Bu ritüeller aracılığıyla kan, hem hayatın kendisiyle bağlantılı bir unsura hem de kötülüğe karşı bir koruma mekanizmasına dönüşmektedir.

Anahtar Kelimeler: Hitit, Kan, Ritüel, Arındırma, Kutsama, Hayat Verme

Giriş

Hitit dini uygulamalarında kan'ın işlevi ve anlamı ile ilgili olarak bizi aydınlatan metin türleri oldukça çeşitlidir. Hatti'de kan'ın (*ešhar*) hayatın ve gücün taşıyıcısı olduğunu ima eden metinler dışında,¹ bu metinler çoğunlukla ondördüncü yüzyıldan onüçüncü yüzyıla kadar olan dönemde kayda geçirilmiş çeşitli ritüel gruplarıdır. Kan (*ešhar*)'ın kutsama, arındırma ve kefaret aracı olarak kullanıldığı bu ritüeller ikinci binin ortasında güçlü Hurri ve Luwi etkileri gösteren bir kültüre ev sahipliği yapmış bölgeden, Kizzuwatna'dan ihraç edilmiştir.²

Hititlerde kan'ın hayatla özdeşleştirildiği bir metin, Hitit ordusunda yemin töreninden söz eden CTH 493 numaralı metindir. Burada Hitit ordusunda göreve başlama esnasında gerçekleştirilen yemin töreninde, şarap, göreve yeni başlayan askerlerin önünde yere dökülür ve bu sırada görevliler askerlere şöyle seslenir: “[Bu] [şarap] değil; bu sizin kanınızdır. Ve toprak onu içine çektiği [gibi], [sizin kanınızı] da içine çeksin [ve] (eğer siz yeminlerinizi çiğnerseniz)”³ Burada şarap ile sembolize edilen kan, sadece isyankar birliklerin kaybedeceği seferdeki kan değil, aynı zamanda hayatın kendisini temsil eden kandır.⁴

Hititlerde nadir görülen,⁵ ancak Yahudi inancında oldukça iyi bilinen bir uygulama, kanın arındırıcı bir madde olarak kullanılmasıdır. Hitit metinlerinde bu durum *e/išharnumāi-* “kanını akıtmak” fiili ile ifade edilir ve bir ‘kan sürme’ ayinini belirtir. Bununla ilgili olarak Kizzuwatna kökenli Papanikri'nin doğum ritüeli (CTH 476) detaylı bir anlatım içerir. Anlatıma göre ayin esnasında eğer doğum gereçleri bebeğin doğumundan hemen önce kırılırsa, bu tanrının hamile kişiye duyduğu öfkeyi belirten bir uğursuzluk işareti olarak yorumlanır⁶ ve bu durumun sonucunda ortaya çıkan uğursuz etkileri uzaklaştırmak ve ilgili nesnelere arındırmak için⁷ ritüeli gerçekleştiren kişi, *her biri ayrı ayrı olmak üzere iki kuşun kanını doğum sandalyesine ve (onun) çivilerine sürer ve doğum sandalyesi önünde iki kez iki koyunun ve dört kuşun etini sunar*.⁸

Kan'ın ritüellerde arındırma amaçlı kullanıldığına dair bir diğer örnek ise Gece Tanrıçası için inşa edilen yeni bir tapınak ve oraya yerleştirilen tanrıçanın yeni bir heykelciği ile ilgili olan bir ritüelden (CTH 481) çıkarılabilir. Günlerce süren etkinliklerden sonra, kurban edilen bir koyunun kanının kullanımı KUB 29.4 iv 38-41'de şu şekilde anlatılır: “*onlar altından olan tanrıça heykeline, (tapınağın) duvarına ve yeni [tanrıçanın] bütün gereçlerine kan sürerler ve böylece [yeni] tanrıça ve tapınak arınmış olacaktır*”⁹ Buna ek olarak, aynı üslupla arındırma kutsal alanlar, kült mobilyaları ve ritüel çukurları için de gerçekleştirilmiştir.¹⁰

Metinde arındırma amacıyla gerçekleştirildiği ifade edilen bu kan sürme (*ešharnumāi-*) eylemi ile ilgili olarak çeşitli görüşler vardır. B. J. Collins, arındırma amacıyla gerçekleştirilen bu eylemin aynı zamanda kan'ın doğum ile simgelenmesi olarak da yorumlanabileceğini ileri sürer. Metinde doğuma aleni bir atıf yapılmamasına rağmen, ritüelin özellikle üçüncü gününde bahsedilen, tanrıçanın rahip ve görevliler tarafından iki defa olmak üzere yedi kez bir çukurdan yukarı çekilmesi dikkate alınarak, ritüel esnasında gerçekleştirilen bütün faaliyetlerden sonra tanrıçanın yeniden cisimleşerek yeniden doğduğu

¹ G. Beckman, “Blood in Hittite Ritual”, *Journal of Cuneiform Studies* 63, 2011, s. 95, dn.: 4.

² Y. Feder, *Blood Expiation in Hittite and Biblical Ritual Origins, Context, and Meaning*, Atlanta, 2011, s. 1.

³ KUB 43.38 ay. 14-16. Metnin çevirisi Beckman, 2011, s. 95-96 dn: 6'dan uyarlanmıştır.

⁴ Y. Feder, “The Mechanics of Retribution in Hittite, Mesopotamian and Ancient Israelite Sources”, *JANER* 10, 2010, s. 125; Beckman, 2011, s. 96; A. Arroyo, Some Remarks on Hittite Rituals: The Relation between Word and Object, *Altoriental. Forsch.* 37, 2010, s. 367.

⁵ Beckman, 2011, s. 101.

⁶ Feder, 2011, s. 101-102; Beckman, 2011, s. 101.

⁷ D. J. McCarthy, “The Symbolism of Blood and Sacrifice”, *JBL* 88, 1969, s. 169.

⁸ KUB 5.1 i ö.y. 25-27, Metnin çevirisi Feder, 2010, s. 102'den uyarlanmıştır.

⁹ Metnin çevirisi Beckman, 2011, s. 101 ve dn.: 59'dan uyarlanmıştır.

¹⁰ İlgili metin yerleri için bakınız Beckman, 2011, s. 101 dn.: 60-62; P. R. W. Popkin, “Hittite animal sacrifice: Integrating Zooarchaeology and Textual Analysis”, *Bones, Behaviour and Belief: The Zooarchaeological Evidence as a Source for Ritual Practice in Ancient Greece and Beyond*, 2013, s. 109.

önerilir. Metinde bahsedilen ritüel çukurları ile ilgili olarak da Collins, bunların yeraltı dünyası ile bir köprü görevi görerek doğum ile insanlığın yaratılışı arasında mitolojik bir bağlantı kurduğunu, böylece de tanrıçanın çukurdan yukarı çekilmesinin onun yeni bir formda tekrar doğuşu ile sembolize edilmiş olabileceğini belirtir.¹¹ Öte yandan, çeşitli nesnelere, tapınak duvarlarının ve tanrıça heykelciğinin kana bulanması eyleminin amacı G. Beckman¹² tarafından nesnelere ve mekanlara canlılık vermek olarak yorumlanırken, Y. Feder¹³ ve A. Taggar-Cohen¹⁴ bunun hem arındırma hem de kutsama amaçlı olduğunu belirtir.

Kan sürmenin sadece arındırma amacıyla kullanılmayıp aynı zamanda nesnelere ve binaların kutsanması için kullanıldığı bir başka ritüel,¹⁵ (CTH 415) yeni kült yapılarının inşasında gerçekleştirilmek için olan bir ritüeldir. KBo 15.24+ 20'-23' numaralı metin ritüel görevlilerinin koyun kanını kült nesnelere ve *ayakku* mabedi üzerine sürmesinden bahseder:

O, Ea'ya için bir koyun keser ve dört bronz heykelciğe, bronz boğaya ve *ayakki*-tapınağına kan sürer. Daha sonra o, baş, ayaklar, göğüs ve kollardan oluşan çiğ eti [alır] ve Ea'nın masası önüne koyar.¹⁶

Arındırma amacıyla gerçekleştirilen Walkui ritüelinde kan Hurrice kelime olan *zurki-*¹⁷ ile ifade edilmiş ve burada kan "libasyon yapmak, kurban etmek, adamak" (*išpant-* / *šipant-*) fiillerinin nesnesi olarak kullanılmıştır. İlgili metin yeri şöyledir:

Walkui, Gece Tanrıçası'nın SANGA rahibi şöyle söyler: "Eğer biri rüyada bir *urura-* bitkisi ya da domuz eti yerse veya ilahi takdirle domuz etine maruz kalırsa ya da ilahi müdahale ile tapınakta bitkiler arasında bir *urura-* bitkisi bulursa, o bir b[alık] ile birlikte kan sunar.¹⁸

Anlaşıldığı kadarıyla, Hititler rüyada bir *urura-* bitkisi ya da domuz eti yiyerek istemeden tabu sayılabilecek yasaklı bir duruma maruz kalabiliyordu. Böyle bir durumun yarattığı kirlenme ya da olumsuz etkilerinden arınmak da bir b[alık] ile birlikte sunulacak kan ile gerçekleştiriliyordu.

II. Mursili'nin Veba Duası (CTH 378.1) metni, varlığından sadece ismen haberdar olduğumuz ve nasıl gerçekleştirdiği, gerçek kanın kullanılıp kullanılmadığı konusunda herhangi bir fikir sahibi olamadığımız bir *išhanaš* SISKUR "Kan Ritüeli" den bahseder. Metne göre, *ešhar iya-* deyimini ile ifade edilen 'cinayet işlemek, kan dökmek' eylemi gerçekleştiğinde bu suçu yani günahı suçlunun üzerinden uzaklaştırmak için, diğer bir deyişle işlenen suça kefaret etmesi¹⁹ için 'Kan Ritüeli'ne (*išhanaš* SISKUR) başvurulduğunu görüyoruz. İlgili metin yeri şöyledir:

[Şimdi], [tanrılar, ben size onu] itiraf ettim. [Çünkü] benim babam Tudhaliya'yı [ve ... öldürdü?], böylece benim babam (kefaret için) 'Kan Ritüeli'ni yerine getirdi. Fakat Hatti [ülkesi] onun için hiçbirşey yerine getirmedi. Ben ['Kan Ritüeli'ni] yerine getirdim, fakat ülke herhangi

¹¹ B. J. Collins, "A statue for the deity: Cult images in Hittite Anatolia", *Cult Image And Divine Representation In The Ancient Near East*, 2005, s. 30-31.

¹² Beckman, 2011, s. 101.

¹³ Feder, 2011, s. 33.

¹⁴ A. Taggar-Cohen, "Concept of the Divine in Hittite Culture and the Hebrew Bible: Expression of the Divine", *Journal of the interdisciplinary study of monotheistic religions* 9, 2013, s. 37-38, 42.

¹⁵ Feder, 2011, s. 23-24.

¹⁶ Metnin çevirisi G. Beckman, "Temple Building among the Hittites", *From the Foundations to the Crenellations: Essays on Temple Building in the Ancient Near East and Hebrew Bible*, 2010, s. 80'den adapte edilmiştir.

¹⁷ Bu Hurrice sözcük E. Laroche tarafından 'kan' olarak tanımlanmıştır; E. Laroche, "Études de linguistique anatolienne", *RHA* 31, 1973, s. 95-99.

¹⁸ KBo 32.176 ay. 1-6; metnin çevirisi Y. Feder, "A Levantine tradition: the Kizzuwatnean blood rite and the biblical sin offering", *Pax Hittitica: Studies on the Hittite and Their Neighbours in Honor of Itamar Singer*, 2010, s. 104'ten adapte edilmiştir.

¹⁹ Y. Feder, "The Mechanics of Retribution in Hittite, Mesopotamian and Ancient Israelite Sources", *JANER* 10, 2010, s. 137.

birşey yerine getirmedi. Onlar ülke adın[a] hiçbirşey yerine getirmediler.²⁰

Hititlerde, “bir kadın [doğum yapar]ken ve onun kanaması durdurulamadığında” (KUB 17.28 ii 1-2) başvurulabilecek bir *ŞİPAT ešhanaš* ‘Kan Büyüsü’ olduğunu, CTH 730 numaralı metinden öğreniyoruz. Ancak nasıl yerine getirildiği, gerçek kanın kullanılıp kullanılmadığı konusunda metnin herhangi bir anlatım içermediği bu ‘Kan Büyüsü’nün varlığından, ne yazık ki yine sadece ismen haberdarız.²¹

Sonuç

Burada sunulan örnekler temelinde Hititler’de hayatın ve gücün taşıyıcısı olduğu ima edilen kan’ın arındırıcı ve kötülüğe karşı koruyucu bir araç olarak çeşitli ritüellerde kutsama ve arındırma amacıyla kullanıldığını görüyoruz. Diğer bir deyişle, Hititler’de kanın kullanımı, üç ana durumu kapsamaktadır: İlk olarak, kan yaşam ile özdeşleştirilmiş ve insanların yanı sıra hayvanların yaşam enerjisiyle ilişkilendirilmiştir. İkinci olarak, kan arındırıcı bir madde olarak işlev görmektedir; bu bağlamda, kötü ruhlardan ve kirlerden arınma amacıyla kanın simbiyotik bir etkisi olduğuna inanılmaktadır. Üçüncü durum ise, nesne ve yapıların kutsanmasında kanın sürülmesidir; bu uygulama hem fiziksel alanların hem de ruhsal varlıkların korunmasını hedefler. Sonuç itibarıyla, Hititler için kan yalnızca bir sıvı değil, aynı zamanda ruhsal güç, koruma ve arınma aracı olarak da önemli bir yere sahiptir. Bu durum, kanın çeşitli ritüellerdeki merkezi rolünü ve Hitit toplumu için taşıdığı derin anlamı ortaya koymaktadır. Böylece ritüeller aracılığıyla kan, hayatla bağlantılı bir unsur haline gelirken aynı zamanda kötülüğe karşı sağlam bir koruma mekanizması işlevi görmektedir.

KAYNAKÇA

- Arroyo, A., “Some Remarks on Hittite Rituals: The Relation between Word and Object”, *Altoriental. Forsch.* 37, 2010.
- Beckman, G., “Blood in Hittite Ritual”, *Journal of Cuneiform Studies* 63, 2011.
- Beckman, G., “Temple Building among the Hittites”, *From the Foundations to the Crenellations: Essays on Temple Building in the Ancient Near East and Hebrew Bible*, 2010.
- Beckman, G., *Hittite Birth Rituals*, 1983.
- Collins, B. J., “A statue for the deity: Cult images in Hittite Anatolia”, *Cult Image And Divine Representation In The Ancient Near East*, 2005.
- Feder, Y., “A Levantine tradition: the Kizzuwatnean blood rite and the biblical sin offering”, *Pax Hethitica: Studies on the Hittite and Their Neighbours in Honor of Itamar Singer*, 2010.
- Feder, Y., “The Mechanics Of Retribution in Hittite, Mesopotamian and Ancient Israelite Sources”, *JANER* 10, 2010.
- Feder, Y., *Blood Expiation in Hittite and Biblical Ritual Origins, Context, and Meaning*, Atlanta, 2011.
- Laroche E., “Études de linguistique anatolienne”, *RHA* 31, 1973.
- McCarthy, D. J., “The Symbolism of Blood and Sacrifice,” *JBL* 88, 1969.
- Popkin, P. R. W., “Hittite animal sacrifice: Integrating Zooarchaeology and Textual Analysis”, *Bones, Behaviour and Belief: The Zooarchaeological Evidence as a Source for Ritual Practice in Ancient Greece and Beyond*, 2013.
- Singer, I., *Hittite Prayers*, 2002.
- Taggar-Cohen, A., “Concept of the Divine in Hittite Culture and the Hebrew Bible: Expression of the Divine”, *Journal of the interdisciplinary study of monotheistic religions* 9, 2013.

²⁰ KUB 14.14 ay. 8’-12’; metnin çevirisi I. Singer, *Hittite Prayers*, 2002, s. 62’den uyarlanmıştır.

²¹ G. Beckman, *Hittite Birth Rituals*, 1983, s. 84-85.

Tradition and Modernity in the Novel Agonia

Dr. Mirela SARAÇI

Universiteti "Eqrem Çabej" Gjirokastër, Albania

Abstract

The writer Odise Kote recently presented his novel *Agonia*, a work that deeply examines the tension between tradition and modernity in Albanian society. In this novel, the author portrays

a complex reality where traditional values, such as family and honor, hold a central place in the collective consciousness, but are simultaneously under pressure from the changes brought about by modernity. The family, as a key institution of the traditional social structure, is seen not only as a source of stability and support but also as a space where the tensions of social transition are most strongly felt. Confronted with the fast-paced norms and rhythms of an ever-changing world, family relationships are often challenged by moral dilemmas, generational divides, and the loss of shared references. Tradition appears as a powerful force that sustains a deep connection to the past, evoking a sense of nostalgia for the values and practices that have guided society for generations. Within this framework, norms such as respect for the family, loyalty to societal rules and the preservation of personal dignity are the main pillars supporting a predetermined and stabilized order. The changes brought by modernity are often unexpected and

disruptive for individuals and society, creating confusion and insecurity for those tied to the norms of the past. In this clash, individuals face significant challenges in adapting themselves and finding a balance between past values and the demands of the present.

Keywords: Tension, Tradition, Norms, Nostalgia, Modernity, Insecurity

The writer Odise Kote recently presents his novel titled "*Agonia*", a work that deeply examines the tension between tradition and modernity in Albanian society. In this novel, the writer portrays a complex reality where traditional values, such as family and honor, occupy a central place in the collective consciousness, yet they are simultaneously under pressure from the changes brought about by modernity.

Family, as a key institution in the traditional social structure, is perceived not only as a source of stability and support but also as a space where the tensions of social transition are most felt. In the face of the norms and fast rhythms of a constantly changing world, family relationships are often challenged by moral dilemmas and the loss of common references.

Tradition appears as a powerful force that keeps a deep connection to the past alive, evoking a sense of nostalgia for the values and practices that have guided society for generations. In this context, norms such as respect for the family, loyalty to societal rules,

and the preservation of personal dignity are the main pillars that support a predetermined and stabilized order.

The changes brought by modernity are often unexpected and destructive for individuals and society, creating confusion and insecurity for those tied to the norms of the past. In this clash, individuals face significant challenges in adapting themselves and finding a balance between the values of the past and the demands of the present.

The term "Agony" in literature and philosophy is associated with difficult moments that provoke reflection on life, death, and the meaning of existence. With a unique style and extraordinary emotional depth, Kote has managed to capture the concerns and experiences of modern society.

The narrative is filled with a heavy and reflective atmosphere, making "us," its readers, think about the depth of human existence.

Odise Kote is an author who often explores reality through a subjective and philosophical analysis. Although his work contains elements of imagination, it also reflects the challenges and dilemmas of real life. This approach allows the reader to connect with the experiences of the characters, giving a deep dimension to the reality he presents.

The characters of the novel, Bojken Kostani and Keti Braumfisher, often face dilemmas that reflect the conflict between tradition and modernity, which plays an important role in shaping their beliefs and actions. They embark on the adventure to search for the legend on December 25, 1996. This is an adventure that has been sought for a long time.

"We are very young, and many things, events, occurrences, meetings, heartbreaks, flirts, and unfulfilled loves will be recorded in our memory. There are some interventions, some hidden laws, some subtle vibrations that, when they cross the forbidden zone, lead you to unnatural transitions. And then comes the terrifying coldness, to the point of dryness. But this could not happen to Bojken Kostani.

It couldn't!"¹

Albanian legends are a cultural treasure that, through their symbolism, offer a deep reflection of the human soul and societal values. They teach us how to understand and appreciate our cultural heritage, connecting us to our history and identity.²

The symbolism in this novel serves as a tool to reflect on historical and social events, highlighting the tension between the individual and the collective. At one point, the author says that verses were heard that sent shivers down the spine.

"The girl from Përmet, what shall I do with her eyes,
The poor man found out, for I drowned in the Vjosë..."³

The legends "The Bride's Rock" and "The Black Snake" in the novel "Agonia" serve as deep symbols closely linked to Albanian reality, reflecting elements of nature, tradition, and collective psychology. "The Bride's Rock" represents the strength of tradition and resilience. It illustrates the sacrifices and suffering that Albanian women have endured in the name of family and community. On the other hand, "The Black Snake" symbolizes the threats and dangers facing Albanian society. It represents the fear of the unknown and the feelings of insecurity that often accompany individuals.

The snake can be interpreted as a metaphor for the internal conflicts and challenges that follow Albanian society, as well as for the role of forces that undermine unity and peace.

¹ Odise Kote, "Agonia", Tirana 2024, page. 32.

² Alfred Uçi, "Mythology, Folklore, Literature," Tirana 2000, page. 158-165.

³ Odise Kote, "Agonia", Tirana 2024, page. 21.

Both of these symbols are closely tied to Albanian reality, revealing the tension between tradition and modernity.

They make us reflect on the role of history and legends in shaping national identity, emphasizing that although the past carries burdens, it is also a source of strength for the future.

In this way, the legends in Kote's prose serve not only as stories but also as tools that help in understanding the complex and often tragic realities of Albanian life.

There is a strong connection between the legends. This connection becomes clear when we answer the question of what is the relationship between the Tree of Life, the Well-being of Paradise, and the Cross of Christ? "

The complexity of these feelings was further intensified when he saw the unbuttoned shirt and a large, entirely unique medallion on the chest. On the golden plate, he could distinguish the cross, with a somewhat thick border, adorned on the sides with floral motifs that created an outward octagonal configuration. The floral design, symbolizing the Tree of Life, appeared as a repeated image of a flower that never closes. A strong connection between the Tree of Life, the Well-being of Paradise, and the Cross of Christ. 'Strange!' an idea that had been gnawing at his thoughts suddenly flashed like a flame."⁴

The Tree of Life represents life, salvation, and the connection with God. In biblical traditions, it is a source of immortality and harmony. Paradise, as a place of peace and happiness, is the perfect state where man lives in harmony with God and nature.

The Tree of Life and the Well-being of Paradise are linked to the ideals of eternal life, while the Cross is the path to reach it. It represents sacrifice, salvation, and the possibility of redemption. In Christianity, the cross is a symbol of God's love for humanity and a sign of salvation through Christ's sacrifice. These symbols also represent the cycle of life, death, and resurrection. All three symbolize the search for salvation and resurrection.

The relationship between these symbols creates a rich narrative about the soul, salvation, and devotion, offering a deep vision of life and its purpose.

The question raised in the novel, "Who am I?!"⁵ expresses the relationships between characters influenced by loss, tensions, and misunderstandings. These elements appear in various forms in the novel: physical, emotional, and psychological, present on every page. The characters face deep conflicts that force them to make difficult choices. These dilemmas often reflect the tensions between family obligations and personal aspirations, creating an emotionally charged atmosphere.

The characters often undergo a process of transformation, facing the consequences of their actions and trying to find a balance. The author himself states: "What is prolonged, long and long, becomes a snake."⁶

However, through the difficulties, a sense of hope and aspirations for a better future often emerges. This effort to find a way forward is a key element that helps balance tragedy with a sense of possibility. Some try to rely on others by forming new connections, while others withdraw and isolate themselves from the pain of the past. This also conveys the message of the novel: that accepting the past is the key to emotional healing. As they confront their memories, the reader witnesses an evolution of the characters, moving from denial to acceptance of the past. In the characters, natural elements such as the weather or landscape play a role. The rhythm of the novel is slow and reflective, focusing on the inner experiences of the characters. This flow allows the reader to experience the feelings and

⁴Odise Kote, "Agonia", Tirana 2024, page. 178.

⁵ Odise Kote, "Agonia", Tirana 2024, page.155.

⁶ Odise Kote, "Agonia", Tirana 2024, page. 40.

thoughts in a profound way. The novel "Agonia" by Odise Kote can be considered a modern work for several reasons:

1. The novel addresses deep and universal themes such as loss, identity, and facing the past.
2. Kote creates characters with many nuances who confront difficult emotional dilemmas.
3. Both the rock and the snake represent aspects of loss—a loss of identity, security, and connection.
4. Despite the challenges, the characters seek hope and opportunities for change and transformation.

All these elements offer a deeper understanding of human life experiences and contribute to classifying the work as a modern novel, making it a rich reflection on life, identity, and the challenges we face.

In conclusion, we can say that the author Odise Kote, through his creativity, helps enrich Albanian literary tradition with the themes he addresses, exploring human existence, feelings of loss, and insecurity. His poetic and symbolic style provides a new perspective on Albanian reality and its challenges. Kote is one of the voices that makes modern Albanian literature richer and more sensitive, offering deep reflections on identity and human experiences.

REFERENCES

- Sabri Hamiti, "Modern Albanian Literature," 2009.
- Odise Kote, "Agonia," Tirana, 2024.
- Umberto Eco, "Modern Theory and Criticism," Rozafa, Prishtina, 1996.
- Agron Tufa, "Literature and the Literary Process in the 20th Century," Tirana, 2018.
- Sabri Hamiti, "Contemporary Literature," Literary Works No. 10.
- Roland Zisi, "Contemporary Albanian Literature," Tirana, 2008.
- Alfred Uçi, "Mythology, Folklore, Literature," Tirana, 2000.

Social and Moral Crises of a Society in Transition

Msc. Laureta KONOMI

Universiteti "Eqrem Çabej" Gjirokastrë, Albania

Abstract

The novel "*Agonia*" by the writer Odise Kote, through its complex structure, unique style, and a sharp critical lens, offers opportunities for multiple interpretations. The richness of descriptions and the emotional power of the dialogues create a rhythm that conveys the energy of a period filled with uncertainty and challenges. Through language, as an esthetic element that stands out for its richness, the author expresses not only the pain and confusion of social crises, but also the internal struggle of the individual to preserve his identity and moral integrity. It reflects the tension between the old and the new, a tension that deeply permeates both the structure of society and the individual. The stylistic diversity of the novel, where the reflective tone, subtle sarcasm, and critical analysis intertwine, gives the work a layered meaning that goes beyond merely narrating events.

My focus on "Social and Moral Crises in a Society in Transition" is a painful reflection on the loss of hope and the collapse of values during an important historical period. A period marked by radical transformations and unpredictable events that have a profound impact on all aspects of an individual's life and society as a whole. In this context, the individual is not only psychologically shaken by uncertainty and sudden changes, but also faces challenges that require quick and creative adaptation. In conditions where traditional structures and values are questioned, the individual may find himself facing an existential void, caught up in the need to reanalyze the fundamental principles upon which personal identity, social relations, and his role within this reality are based.

Keywords: Structure, Society, Period, Transition, Traditional

Odise Kote's latest novel, "*Agonia*", through a powerful and careful narrative style that deeply reflects Albanian society in times of transition, leaves no reader indifferent. The novel is characterized by a complex structure and a critical approach to the crisis of identity, morality, and existence in an unstructured period. By intertwining feelings of fear, alienation, and uncertainty, each event transforms into a vivid experience in the minds of those who revisit that time through reading, but also for those who discover this reality for the first time—both distant and shocking.

The title of the novel, "*Agonia*", more than just a concept, a severe and hopeless state of something that is ending, fading, the final moments of a social system, a rule, a phenomenon, etc.,¹ and a name, symbolizes its essence, giving it a deeper and more universal meaning.

¹ "Albanian language dictionary", Tiranë 1987, page, 25.

The message it conveys is clear and powerful: history has a frightening tendency to repeat itself. Looking back at past events, we sometimes discover that major crises often occur when nations choose to ignore the painful lessons of their history.

Time, as a narrative concept, acts as an artistic mechanism in this novel. What initially appears as a linear story transforms into a more complex and overloaded structure, resembling a mosaic filled with experiences and tensions. In this mosaic, these elements are not separate from the individual but are intertwined with them, creating a complicated relationship whose dynamics reveal hidden forces, causes, and influences that, in a deeply sensitive way, shape the individual's experience and awareness of reality and themselves.

In this context, *Agonia* appears to be fused throughout the narrative of the novel, gaining increasing intensity, transforming into an energy that drives the development of events, and further solidifies the idea of the work: depicting an endless agony in an absurd time a time which, viewed from today's perspective, would be even more absurd to simply call "the past"! The journey of Bojken Kostani, the main character of the novel, is both a physical and spiritual journey. He seeks to understand the roots of the chaos engulfing his country but also faces the dilemma of his own place in this fragmented world. He is challenged by a sense of powerlessness in the face of a harsh and often absurd reality, where his personal and professional survival in maintaining objectivity in an environment where truth is manipulated depends on his ability to resist the tide of dehumanization that is sweeping Albanian society.

"Is a journalist allowed to sing a psalm? I am a journalist, doing a job filled with hostility and opposition. I witness the indestructible. How can I abandon it, leave, and come to you, Keti Braumfisher? People here in my country have just begun to distinguish real news from nonsense."

²As the reader immerses themselves in the pages of the novel, they are confronted with a shocking panorama and feel the weight of a world falling apart. A world where the overthrow of traditional and ethical values becomes the norm, and those that were once the foundations of morality and honesty are no longer stable references.

"Reform, reform!", they told him everywhere he went. The thirst for glory, envy, and uncontrollable selfishness slowly dissolved him, brought him down. He surrendered to drinking.³ A reality where loan sharking and economic abuse are widespread, where feelings of solidarity and loyalty have been replaced by unrestrained selfishness, where pain and confusion are experienced as daily sensations, where the madness of the mind and the power of money destroy every boundary of rationality and humanity, where violence is no longer an anomaly but an integral part of life.

A reality that plunges a person into an existential abyss, forcing them into a painful confrontation with themselves and turning every human relationship into a harsh battle for survival. This destructive order, which the author presents with an in-depth analytical approach, stands against the individual and engulfs an entire society, filling it with deep and dramatic contradictions.

Objects and people that once had a connection to him now appear as symbols of a social and spiritual downfall. These elements create spaces where feelings of loss and inadequacy deepen, leaving the individual trapped in a labyrinth of desperate thoughts and frustrating emotions. Every step is a confrontation with the ghosts of the past, making their daily life an endless struggle to survive in a broken system, feeling more isolated than ever in a world that seems to have forgotten who it is. Under this pressure, a person loses their sense of belonging and embraces a cold pragmatism, driven by their basest instincts, facing challenges that not only impact their identity but also their fate, which seems predetermined.

² Odise, Kote, "Agonia", Tiranë 2024, page, 42-43.

³ Odise, Kote, "Agonia", Tiranë 2024, page, 37.

*"The human mind seems incapable of overcoming the wall of limitation that prevents it from understanding how all of this happens. Even in drowsiness, inexplicable wonders occur. Like this unseen but heard, terrifying, and disorienting plague. The mind is a magnet. If you think positively, it attracts positivity; if you think negatively, it attracts negativity."*⁴

With a dense and dramatic style, the author paints a frightening panorama of chaos, highlighting how a person, immersed in misery and moral decay, rotten from internal anarchy and filled with malice and deceit, can slip into a spiral of violence that leads them toward the most macabre acts.

This grotesque creation, *"a miserable street bandit, reeking of misery, decay, and insidiousness, foul-mouthed and as cold as disaster,"*⁵ is the embodiment of a society that has lost all connection with humanity, ending up in a universe filled with hatred, murder, and unimaginable destruction.

This irony highlights the sharp contrast between meaningless expectations and the irrationality of what happens. Beneath a surface of celebrations, cheers, and euphoric scenes a giant presidential cake that creates an illusion both joyful and grotesque lies a deep tension and fear, giving the narrative a unique depth.

"That the cake would be unusual was beyond question, but no one knew its exact dimensions. Enthusiasts imagined the presidential cake as covering the entire facade of the first floor of the Palace of Culture, while others, the rationalists, believed in somewhat more earthly proportions."⁶

The symbol also plays a key role in the novel, offering an additional dimension to its interpretation. What appears to be newfound freedom is, in reality, a hidden form of slavery, where man is tightly bound by the fears and passions that have ensnared him. In this context, they are not merely literary devices but a call for reflection and a warning of the inevitable tragedies that will follow.

"The pyramid scheme money was converted into dollars. Sacks of lek were taken to the bank at night, and in return, they received sacks of dollars. In short just like chess masters who, with a few moves, reveal the inevitable end of the game..."⁷

Even in spiritual relationships, Bojken faces deep dilemmas that challenge his understanding of love and life.

"Bojken Kostani unintentionally let out a faint 'ah,' a thin, somewhat cynical sigh that seemed to take the shape of an invisible hook on which the memories of a not-so-distant time would hang. "Ah, who is it? Aurora Lila.' With Aurora Lila, all roads of return were closed. Hanging from the trees of memory were only the sorrowful lyrics of old songs, unbearable pain, stirred by the wrath of God. Their conversations always ended with many things left unsaid a landscape riddled with hidden pitfalls. Why was she suddenly sending him unsettling signals?"⁸

The strong connection to the past is not just a memory; it is a source of uncertainty, a cause of constant tension that makes him doubt the future he wishes to pursue. This past transforms into a symbol of his fragility, a clear realization that, despite his efforts to break free, it will always remain an inseparable part of his existence—a trap between the shadows of nostalgia and the reality of the present.

⁴ Odise, Kote, "Agonia", Tiranë 2024, page, 50.

⁵ Odise, Kote, "Agonia", Tiranë 2024, page, 346.

⁶ Kote, Odise, "Agonia", Tiranë 2024, page, 120-121.

⁷ Kote, Odise, "Agonia", Tiranë 2024, page, 256-257.

⁸ Kote, Odise, "Agonia", Tiranë 2024, page, 249..

His most profound yet turbulent connection with Keti Braumfisher initially illustrates psychological tension the challenges that differing worldviews and cultures bring to personal relationships.

"Bojken, sometimes jokingly and sometimes seriously, would tease her: 'We are only together at the beginning of the journey. As we walk, we part ways.' And it wasn't just about journalism or editorial work. It was something deeper conceptual, spiritual, a unique way of seeing the world. Thinking about it this way, even he was surprised by why he felt afraid.

The eye and ear of her mind—the most dangerous part of a person feared what it couldn't fully perceive or understand: the stories, beliefs, legends, and traditions. And she was right. They belonged to a different life, a different culture."⁹

Later, this relationship is portrayed as an all-encompassing experience, transforming into a unique and powerful bond. A relationship that also reflects the potential for adaptation and the ability to find balance between each other's cultures beyond their differences.

In the novel "Agony", the relationship between the two characters, Bojken and Keti Braumfisher, serves as an example of a deep and immersive connection that transcends cultural, social, and psychological differences. This kind of bond reflects the possibility of forming a profound relationship, even when two individuals come from backgrounds with different values, beliefs, and identities.

When two individuals come from contexts with different values, beliefs, and identities, Bojken, as an Albanian boy, is filled with traditional values that reflect the insecurity and tensions of a society in transition, still struggling to find a balance between the past and the future. On the other hand, Keti Braumfisher, a girl from a Western culture, is more oriented towards individualism and a freedom that may seem distant to Bojken. She has a strong sense of independence to maintain her autonomy, which could pose a challenge for understanding and adapting to Bojken's views. In this relationship, the all-encompassing experience described is the process of confronting these differences and, at the same time, the possibility of building a stronger and more lasting bond. This relationship is a kind of "agony," in the sense that it requires constant effort and may cause tension, but it can also lead to mutual growth and development.

What makes their relationship unique and powerful is the effort to adopt and find balance between these two different worlds. This balancing process is also an opportunity to learn from each other and experience change in ways that would not have been possible for each of them individually.

Bojken may begin to understand the value of independence and autonomy that Keti brings to the relationship, while Keti may come to appreciate more the importance of maintaining a connection to identity and cultural heritage something she perhaps hadn't fully understood before. In this way, the relationship between Bojken and Keti is a transformative process, where each person helps the other evolve and grow beyond their individual limits. This balancing of cultures and the opportunity to understand and embrace cultural differences is an important step toward creating a powerful connection that transcends the walls of separation and the natural tensions arising from cultural differences.

The "hell" proposed by Keti, who challenges him by accepting the uncertainty and fear that this reality brings, is a choice filled with dilemmas. It is the confrontation, the struggle, and ultimately the failure to understand a world that is in contrast to his own, the extinguishing of the illusion of living with meaning, and the sad ending reveals the high

⁹ Kote, Odise, "Agonia", Tiranë 2024, page, 28-29.

price individuals pay as they face traumas that affect not only their physical being but also their fragile psyche.

"Are you ready to come with me to hell?" He said those words and didn't seem to be burdened by "guilt," since he hadn't been able to recount the unheard-of Albanian wonders. How could he tell her that in a southern city, the bank's armored vault had been stolen with a tank? How could he tell her that rebels had captured an intelligence officer and burned him alive with gasoline?¹⁰

"There is no worse sound than the cry with a sob of a mother when she sees her son lying on the couch, neither alive nor dead. But there is an even worse sound than that.

Silence!

The silence of conscience.

Bojken Kostani, exhausted from the sudden outbursts, the turmoil, lost his senses once again..."¹¹

To describe a national tragedy, a world of immorality, shamelessness, treachery, betrayal, cunning, to document the absurdity of the murderous instinct, to bring to literary projection a story with such complexities of situations and characters, within the limits of the novelistic literary space, presents a challenge both to intellectual consciousness and to the vocation and creative horizon of the author.

The novel "Agony" has an extraordinary approach to bringing key moments of a nation's history to life. While it builds bridges between the past and the present, it creates an intertwining of times that gives historical events a human and emotional dimension that goes beyond the historical facts. In this context, the novel raises important and timeless questions about identity, morality, and existence. These questions reflect humanity's ongoing struggle to find meaning in an uncertain and often incomprehensible world. By challenging the reader to meditate on these issues, the novel intertwines the individual story with the collective one, offering a broad, meaningful portrait of human nature that resonates regardless of the era or specific circumstances.

The essence of the novel serves as a reminder of how the experiences of the past influence the present and the future, shaping the way individuals and societies face crises, build identity, and seek moral resilience. It is a reflection on the vulnerability and strength of humanity, a timeless story that invites us to reevaluate our essence and our connections with others.

REFERENCES

Sabri Hamiti, "Modern Albanian Literature," 2009.

Odise Kote, "Agony," Tirana, 2024.

Umberto Eco, "Modern Theory and Criticism," Rozafa, Pristina, 1996.

Agron Tufa, "Literature and the Literary Process in the 20th Century," Tirana, 2018.

Sabri Hamiti, "Contemporary Literature," Literary Works No. 10.

Roland Zisi, "Contemporary Albanian Literature," Tirana, 2008.

¹⁰ Kote, Odise, "Agonia", Tiranë 2024, page, 314-315.

¹¹ Kote, Odise, "Agonia", Tiranë 2024, page, 366.

Imam Al-Ghazali's Communal Consumptive Ethics And Its Significance to a Contemporary and Sustainable Society

Dr. Mohammed Muneer'deen Olodo Al-Shafi'i
Universiti Sultan Zainal Abidin (UniSZA), Malaysia

Assoc. Prof. Dr. Mohd Safri Ali
Universiti Sultan Zainal Abidin (UniSZA), Malaysia

Dr. Engku Ibrahim Engku Wok Zin
Universiti Sultan Zainal Abidin (UniSZA), Malaysia

Dr. Moustafa Hassan Mohamed El Khaiat
Universiti Sultan Zainal Abidin (UniSZA), Malaysia

Assoc. Prof. Dr. Amilah Bt. Awang Abd. Rahman Jusoh
Universiti Sultan Zainal Abidin (UniSZA), Malaysia

Abstract

Islam contains a general code of conduct without any disagreement. Islam, as both a religion and way of life, also encompasses all religious issues and affairs affecting human's life is also a fact unchallenged by those of consummate minds. One important aspect of all facets of Islamic discussions, that upon which all arguments sprout, and agreements are either diverged and/or reached, that which for its effectiveness also relies on intellectual foundation, is al-Akhlaq (the Ethics). Ethic cum conduct is pertinent in Islamic *Shar'iah*, Law, regulations, and legislation. Communal dealings is deem important in Islam and so is the communal root, the family of individuals. Charity, they say, begins at home and as such consumptive ethics is pertinent to maintaining the charity. There are ethics connected to what is consumed, how it is consumed, the quantity and manner in consumption, as well as guidelines in eating together. This paper focuses mainly on al-Ghazali's interpretation of communal consumptive ethics in his magnum-opus *Ihya' 'ulum al-Din*. It is the aim of the paper to expatiate the roles communal consumption ethics play in maintaining a contemporary and sustainable society. The study theoretically employs qualitative methods, central to library approach, in collecting data for the study, and an analytical style in analyzing the collected data. The study concludes and maintains that communal consumptive ethics is one of the cornerstones from which a sustainable society emerges.

Keywords: Imam Al-Ghazali, Communal Consumptive Ethics, Contemporary Society, Sustainable Society.

Imam Al-Ghazali's Scholastic Ethics and Its Significance to Solving the Contemporary Un-Ethical Dealings

Dr. Mohammed Muneer'deen Olodo Al-Shafi'i

Universiti Sultan Zainal Abidin (UniSZA), Malaysia

Assoc. Prof. Dr. Mohd Safri Ali

Universiti Sultan Zainal Abidin (UniSZA), Malaysia

Dr. Engku Ibrahim Engku Wok Zin

Universiti Sultan Zainal Abidin (UniSZA), Malaysia

Dr. Moustafa Hassan Mohamed El Khaiat

Universiti Sultan Zainal Abidin (UniSZA), Malaysia

Assoc. Prof. Dr. Amilah Bt. Awang Abd. Rahman Jusoh

Universiti Sultan Zainal Abidin (UniSZA), Malaysia

Abstract

Islam contains a general code of conduct without any disagreement. Islam, as both a religion and way of life, also encompasses all religious issues and affairs affecting human's life is also a fact unchallenged by those of consummate minds. One important aspect of all facets of Islamic discussions, that upon which all arguments sprout and agreements are either diverged and/or reached, that which for its effectiveness also relies on intellectual foundation, is al-Akhlāq (the Ethics). Ethic cum conduct is pertinent in Islamic Shari'ah, Law, regulations, and legislation. Scholastic ethics is the bone of relationship between tutors and tutees, and more pertinent is maintaining the quality for onward inculcation into the societal fabrics as it is the major foundation for having a sustainable society. This paper focuses mainly on al-Ghazali's interpretation of scholastic ethics in his magnum-opus *Ihya' 'ulum al-Din*. It is the aim of the paper to expatiate the roles scholastic ethics play in maintaining a contemporary and sustainable society. The study theoretically employs qualitative methods, central to library approach, in collecting data for the study, and an analytical style in analyzing the collected data. The study concludes and maintains that scholastic ethics is one of the cornerstones for a sustainable society and it must be maintained as such.

Keywords: Imam Al-Ghazali, Scholastic Ethics, Contemporary, Unethical Dealings

Molla Fenârî: A Journey from the Ibn Arabî School to Ottoman Thought

Res. Asst. Raziye SAYAR

Selcuk University, Türkiye

Abstract

This article examines Molla Fenârî's understanding of existence, which holds a significant place in the Ottoman intellectual tradition, and how he transmitted the philosophical legacy of the Ibn Arabî school to Ottoman thought. As an original thinker synthesizing Sufism, kalam (Islamic theology), and philosophy, Molla Fenârî institutionalized and deepened Ibn Arabî's doctrine of *wahdat al-wujûd* (the unity of being) within the Ottoman madrasa system. The study explores how Molla Fenârî conceptualized the relationship between existence, knowledge, and truth, analyzing his hermeneutical perspective, which considers every being as a manifestation of God's names and attributes.

Molla Fenârî approaches existence as a reflection of divine unity and seeks to interpret the unity behind multiplicity. His philosophical system emphasizes that beings should be regarded as signs of divine reality. In this context, the interpretation of all beings in the universe as symbols reflecting God's unity plays a central role in Molla Fenârî's thought. Drawing on Ibn Arabî's doctrine of divine names, Molla Fenârî considers every being a manifestation of one of God's attributes and argues that humans can reach God's essential truth by reflecting on these manifestations.

The article discusses the lasting impact of Molla Fenârî's unity-centered understanding of existence on Ottoman thought, while also examining the metaphysical contributions of this perspective. While interpreting every entity in the universe as a symbol pointing to God's unity, Molla Fenârî guides humanity in constructing a world of meaning in its quest for truth. In conclusion, Molla Fenârî's conception of existence is evaluated not only as a theological legacy in Ottoman thought but also as a philosophical hermeneutic model. This legacy continues to offer a significant perspective on the search for existence, meaning, and truth in today's intellectual landscape.

Keywords: Molla Fenari, Ottoman Thought, Ibn Arabî, Wahdat al-Wujûd, Ontology

INTRODUCTION

The Ottoman intellectual tradition presents a structure where Sufism, theology (kalâm), and philosophy intertwine, synthesizing different schools of thought. A significant figure within this tradition, Molla Fenârî (1350-1431), institutionalized and deepened Ibn Arabî's (1165-1240) metaphysical thought within the Ottoman scholarly tradition. He was not only a Sufi but also a distinguished scholar in theology and philosophy, systematically

embedding the concept of *waḥdat al-wujūd* (the unity of existence) into the Ottoman madrasa system.

This article examines Molla Fenârî's understanding of existence and explores the transmission of philosophical heritage between the Ibn 'Arabî school and Ottoman thought. His ideas can be analyzed under three main headings:

1. The establishment of the Ibn 'Arabî school within Ottoman thought,
2. The shaping of the scholarly system along a Sufi trajectory,
3. The influence of Fakhr al-Dîn al-Râzî on Ottoman thought (Gürer, 2019: 82–83).

However, since Molla Fenârî's understanding of existence is largely based on a Sufi perspective, this study will focus primarily on the first two topics, with only a brief reference to his relationship with the theory of emanation (*sudûr*).

In the Sufi tradition, the reason for the creation of the universe is considered to be divine love. This idea is supported by the *ḥadīth qudsī* emphasized by Ibn 'Arabî: "I loved to be known, so I created the creatures in order to be known" (Güçlü, 2014: 137). Sufis have used the concept of '*amā*' as the primordial substance of the universe, considering it as a substance (*jawhar*). However, in Sufi terminology, *jawhar* (substance), *jism* (body), and '*arad*' (accident) are often used interchangeably. Accordingly, all substances and bodies are impermanent and cannot exist independently. Therefore, while '*amā*' is a substance, it is also an accident. Creation is viewed as a continuous process and is analyzed within the framework of the principle of *khalq jadīd* (continuous creation) (Yücedoğru, 2010: 191–192).

This study will discuss Molla Fenârî's understanding of existence within the context of his metaphysical system, rooted in the Ibn 'Arabî school, and its influence on Ottoman thought. First, it is necessary to examine how Fenârî interpreted *waḥdat al-wujūd* and how this understanding transformed within the Ottoman intellectual framework.

1. Waḥdat al-Wujūd and Molla Fenârî

At the core of Molla Fenârî's intellectual system lies the concept of *waḥdat al-wujūd* (the unity of existence). This doctrine, systematically developed by Ibn 'Arabî, posits that all beings in the universe are mere reflections of God's names and attributes. Ibn 'Arabî's teachings spread across Anatolia through influential figures such as Şadr al-Dîn al-Qûnawî (d. 1274) and Dâwûd al-Qayşarî (d. 1350) (Saraçoğlu, 2018: 71). Molla Fenârî, drawing from this tradition, became one of the most prominent interpreters of *waḥdat al-wujūd* within the Ottoman madrasa system.

According to Fenârî, true existence (*wujūd*) is singular, and that is God. In contrast, the multiplicity observed in the universe is illusory and merely the manifestation of God's attributes in different forms (Saraçoğlu, 2018: 72). Each entity is an expression of one of God's names or attributes, and through these reflections, human beings can attain knowledge of divine reality.

Fenârî's ontology and epistemology are built upon fundamental principles inherited from Ibn 'Arabî:

1. Existence is singular, and absolute existence belongs solely to God.
2. The multiplicity in the universe is a reflection of divine names and attributes at various levels.
3. Each being is like a divine word encoded in the external world (Öztürk, 2010: 416).
4. The human position in the cosmos is based on the potential to comprehend divine reality.

In Fenârî's thought, the human journey toward God is an endeavor to comprehend the truth by transcending spiritual levels. He asserts that as a person purifies themselves from worldly desires and focuses entirely on God, they gradually free themselves from the illusions of multiplicity (*kathra*) and begin to perceive the traces of unity. At this stage, one recognizes divine beauty in all things and ceases to see beauty in anything else. Thus, they attain the awareness that the only true existence is God (Gürer, 2019: 89).

Moreover, Molla Fenârî attempted to ground *waḥdat al-wujūd* in rational reasoning and sought to explain it through logical methods. He argued that the unity of existence should be established as follows:

"To assume that any existence other than God's reality is real is like mistaking shadows for actual trees" (Yücedoğru, 2010: 198).

This idea aligns with the fundamental assertion of the Ibn 'Arabî school: the only true reality is God, and all other existences are merely shadows of His attributes. Therefore, in Molla Fenârî's interpretation of *waḥdat al-wujūd*, the distinction between true existence and shadow existence must be well understood.

Dāwūd al-Qayşarî, the first systematic representative of *waḥdat al-wujūd* in the Ottoman world, played a crucial role in integrating this doctrine into the Ottoman scholarly tradition, particularly within madrasa circles. Molla Fenârî inherited Qayşarî's legacy and further systematized *waḥdat al-wujūd* within the Ottoman madrasa tradition (Saraçoğlu, 2018: 66-67).

In conclusion, Molla Fenârî's understanding of existence is centered on Ibn 'Arabî's doctrine of *waḥdat al-wujūd* while simultaneously striving to explain it through rational arguments. His metaphysical system embodies both the intuitive knowledge of Sufism and the rational methodologies of philosophical thought.

2. Molla Fenârî's Place in Ottoman Thought

Ibn 'Arabî's teachings were institutionalized in the Ottoman intellectual sphere through thinkers such as Şadr al-Dîn al-Qūnawî, Dāwūd al-Qayşarî, and Molla Fenârî. The students of Qūnawî made significant contributions to the development of the *waḥdat al-wujūd* doctrine in the Ottoman world, while Dāwūd al-Qayşarî systematically incorporated this doctrine into the madrasa curriculum, ensuring its widespread dissemination (Saraçoğlu, 2018: 71).

Molla Fenârî stands out in the Ottoman intellectual tradition not only for his Sufi inclinations but also for his contributions to theology (*kalām*) and philosophy. He is regarded as one of the first scholars to institutionalize the Ibn 'Arabî school within the Ottoman madrasa system and is recognized as a key figure in shaping Ottoman scholarly thought. Influenced by the Sufi perspective of Qūnawî's tradition, Fenârî sought to explain *waḥdat al-wujūd* within a logical framework. According to him, existence is singular, and that existence is God. The multiplicity observed in the realm of existence is merely the manifestation of God's names and attributes in various forms (Saraçoğlu, 2018: 72). All beings are mirrors reflecting the divine names and attributes, and through these reflections, humans can comprehend divine reality.

Molla Fenârî played a crucial role in deepening Ibn 'Arabî's ontological thought within the Ottoman scholarly tradition. He contributed to the study and interpretation of Ibn 'Arabî's works in Ottoman madrasas, facilitating the institutionalization of this school of thought (Yıldırım & Yılmaz, 1995: 78).

Fenârî was not only a Sufi but is also considered one of the founders of the Ottoman madrasa system. One of his most significant contributions to Ottoman scholarship was

promoting an educational approach that integrated *ilm* (rational knowledge) and *irfān* (mystical insight).

Fenârî developed a systematic epistemology that combined theology, philosophy, and Sufism. His epistemological approach is based on three fundamental types of knowledge:

- *Bayānî* knowledge (religious knowledge),
- *Burhānî* knowledge (rational knowledge),
- *ʿIrfānî* knowledge (intuitive or mystical knowledge) (Saraçoğlu, 2018: 70).

These three types of knowledge are seen as complementary in Fenârî's thought. According to him, mystical knowledge should be supported by reason and revelation, while reason should be integrated with intuition. This perspective allowed the Ottoman intellectual tradition to establish a strong synthesis between the madrasa system and Sufi thought.

Furthermore, Fenârî's ontological perspective exhibits a deep hermeneutic approach inspired by Ibn ʿArabî's doctrine of divine names. He argued that each entity is a manifestation of one of God's attributes, and by interpreting these manifestations, humans can attain the truth. This approach was not only a theological legacy in Ottoman thought but also adopted as a metaphysical system.

2.1. The Ibn ʿArabî School and the Theory of *Şudûr*

In Molla Fenârî's thought, certain intersections can be observed between Ibn ʿArabî's *waḥdat al-wujūd* doctrine and the Islamic philosophers' concept of *şudûr* (emanation). The *şudûr* theory is a philosophical perspective that posits that existence emanates from God in a cascading flow. Islamic philosophers, particularly influenced by al-Fārābî and Ibn Sīnā (Avicenna), developed this theory. Ibn ʿArabî, however, rejected the principle that "only one can emanate from the One" and instead proposed that multiplicity arises through the determinations (*taʿayyunāt*) of divine names and attributes. Şadr al-Dīn al-Qūnawī introduced the concept of "universal existence" (*al-wujūd al-ʿāmm*), describing it as the first being emanating from God (Yücedoğru, 2010: 193).

Molla Fenârî followed Qūnawī's perspective, adopting certain elements of the *şudûr* theory while diverging from Ibn ʿArabî in specific aspects. According to him:

"All beings exist through a single existence, and that existence is God. All beings subsist through His existence, and multiplicity is merely the manifestation of His names and attributes" (Türker, 2019: 119).

In Fenârî's ontology, multiplicity in the world is likened to points within a circle. Each point inside the circle is equidistant from the center. Through this analogy, he expresses that all beings are equally close to God. However, he also acknowledges a sequential order in the manifestation of beings, which aligns with the hierarchical structure found in the *şudûr* theory.

Accordingly, five ontological levels emerge in Molla Fenârî's framework (Yücedoğru, 2010: 197-198):

1. **The Realm of the Divine Essence (*dhāt ḥaḍratī*)** – God's essence in absolute unity.
2. **The Realm of Spirits (*ʿālam al-arwāḥ*)** – The level of intellect and perception.
3. **The Realm of Dominion (*ʿālam al-malakūt*)** – Defined as the intermediary (*barzakh*) realm.
4. **The Imaginal Realm (*ʿālam al-mithāl*)** – The world of forms and corporeal representations.

5. **The Sensory Realm (*‘ālam al-shahāda*)** – The world of physically perceptible entities.

Although these levels resemble Ibn ‘Arabī’s ontological hierarchy, they also incorporate references to the philosophical *ṣudūr* theory. However, Fenârî criticized philosophers for perceiving absolute existence as the “second intelligible” (*al-ma‘qūl al-thānī*), instead emphasizing that God’s existence transcends all limitations and classifications (Alper, 2016: 63).

3. Molla Fenârî’s Efforts to Synthesize Sufism, Theology, and Philosophy

The Ottoman scholarly tradition, particularly in its formative period, had an eclectic structure. During this time, Sufism, theology (*kalām*), and philosophy were deeply intertwined, and Ibn ‘Arabī’s doctrine of *waḥdat al-wujūd* had a significant intellectual influence in Ottoman madrasas. However, with Molla Fenârî, a new approach emerged that sought to synthesize Sufi thought with theological and philosophical dimensions. His intellectual legacy is rooted both in Ibn ‘Arabī’s metaphysical worldview and in the theological system of Sa‘d al-Dīn al-Taftāzānī (d. 1390) (Kalaycı, 2015: 114–115).

Fenârî is recognized as one of the most significant figures responsible for the dissemination of Taftāzānī’s works in Anatolia. It is even recorded that he granted his students an extra day off to allow them to copy these works. Alongside him, scholars such as Burhān al-Dīn al-Ḥaydar, ‘Alā’ al-Dīn al-Rūmī, and Fakhr al-Dīn al-‘Ajami also played a key role in spreading the ideas of Taftāzānī and Sayyid al-Sharīf al-Jurjānī (d. 1413) throughout the Ottoman intellectual sphere. These developments diminished the influence of *waḥdat al-wujūd*-oriented tendencies within the madrasa tradition and facilitated the spread of theological scholarship based on the school of Fakhr al-Dīn al-Rāzī (Kalaycı, 2015: 114–115).

With the conquest of Constantinople by Sultan Mehmed II, philosophical theology (*kalām-i falsafī*) gained prominence within Ottoman scholarship. The sultan invited leading scholars such as ‘Alī Qushjī and ‘Alī al-Ṭūsī to Istanbul, thereby reshaping the madrasa system. During this period, the works of Naṣīr al-Dīn al-Ṭūsī (d. 1274) and ‘Aḍud al-Dīn al-Ījī (d. 1355) were incorporated into the madrasa curriculum. Taftāzānī’s commentary on Abū Ḥafṣ al-Nasafī’s *‘Aqīda* and Qāḍī al-Bayḍāwī’s *Tawāli‘ al-Anwār* became fundamental texts in Ottoman theological education (Kalaycı, 2015: 114–115). These developments highlighted the increasing efforts within Ottoman thought to balance scriptural revelation (*waḥy*) with rational interpretation (*‘aql*).

To maintain this balance, Molla Fenârî developed a methodology that synthesized theology, philosophy, and Sufism. Kâtip Çelebi (d. 1657) emphasized that scholars who sought to reconcile religion and philosophy held an important place in the Ottoman intellectual tradition. He also warned that neglecting rational sciences and philosophy in Ottoman madrasas led to intellectual stagnation (Sözen, 2005: 11).

Molla Fenârî’s knowledge system is based on the synthesis of three primary sources of knowledge:

1. **Bayānī knowledge (religious knowledge)** – Derived from the Qur’ān and Hadith.
2. **Burhānī knowledge (rational knowledge)** – Acquired through logic and philosophical methods.
3. **‘Irfānī knowledge (mystical knowledge)** – Gained through intuition and spiritual unveiling (*kashf*) (Öztürk, 2009: 400).

Fenârî’s multidimensional understanding of knowledge was shaped by the diverse disciplines and scholars he studied with. He learned the *bayānī* tradition from scholars such as ‘Alā’ al-Dīn Aswad (d. 1397), known as Kara Hoca, and Jamāl al-Dīn Aqsarāyī (d. 1389).

His engagement with *burhānī* knowledge strengthened when he studied in Egypt under Muḥammad ibn Mubārakshāh (d. after 1382), bringing him closer to the theological school of Fakhr al-Dīn al-Rāzī. In terms of mystical knowledge, he studied *Miftāḥ al-Ghayb*, the work of Ṣadr al-Dīn al-Qūnawī (d. 1274), through his father Mawlānā Ḥamza and received Sufi training from Shaykh Ḥāmid al-Qayṣarī (d. 1412), known as “Somuncu Baba” (Öztürk, 2009: 400–401). In this way, Fenârî successfully integrated philosophical and theological thought into the madrasa tradition without severing ties with the Sufi tradition. While accepting the rational methods offered by theology and philosophy, Fenârî emphasized that truth cannot be comprehended solely through reason. He sought to reconcile *kashf* (spiritual unveiling) with *shahāda* (empirical observation) (Görgün, 2009: 185–186).

Fenârî’s attempt to reconcile intellect and spiritual insight is most evident in his work *Miṣbāḥ al-Uns*. This book represents an effort to explain the metaphysics of *waḥdat al-wujūd* using logical methodologies. Fenârî explicitly states that he aims to harmonize intellectual (*ma’qūl*) and experiential (*mashhūd*) knowledge. He employed philosophical and theological methods to explain Sufi truths, developing an approach that united reason and mystical experience (Gürer, 2015: 131–132). Thus, Molla Fenârî left an intellectual legacy that synthesized Sufism, theology, and philosophy within Ottoman thought. His ideas can be seen as an attempt to systematize Ibn ‘Arabī’s metaphysics of *waḥdat al-wujūd* through theological and philosophical methods. In this regard, he served as a bridge within the Ottoman scholarly tradition, influencing both madrasa and *tekke* (Sufi lodge) circles.

Conclusion

Molla Fenârî made a significant impact as a pioneering thinker who integrated Sufism, theology (*kalām*), and philosophy in the formative period of the Ottoman intellectual tradition. He systematically grounded Ibn ‘Arabī’s doctrine of *waḥdat al-wujūd* within the Ottoman scholarly tradition while also contributing to the institutionalization of the theological approach of the Fakhr al-Dīn al-Rāzī school in Ottoman madrasas. By synthesizing the ideas of figures such as Ṣadr al-Dīn al-Qūnawī, Dāwūd al-Qayṣarī, and Sayyid Sharīf al-Jurjānī, he introduced an eclectic model to Ottoman scholarship (Gürer, 2019: 82–83).

Although *waḥdat al-wujūd* formed the foundation of Fenârî’s thought, he sought to explain this doctrine through theological and philosophical methods. According to him, existence is singular, and the only true existence is God; the multiplicity observed in the universe is merely the manifestation of divine names and attributes at different levels (Saraçoğlu, 2018: 72). However, rather than relying solely on mystical intuition, Fenârî also employed logic and *kalām*, thus developing a methodology in the Ottoman scholarly tradition that combined *kashf* (spiritual insight) and *naẓar* (rational reasoning) (Gürer, 2015: 131–132).

Molla Fenârî was one of the most influential figures in ensuring that Sufism, theology, and philosophy were studied together within the Ottoman madrasa system. He embraced a scholarly approach built on three pillars: *bayān* (religious knowledge), *burhān* (rational proof), and *irfān* (mystical intuition). By merging Ibn ‘Arabī’s Sufi doctrines with Fakhr al-Dīn al-Rāzī’s theological tradition, he became a foundational figure in shaping Ottoman scholarship (Öztürk, 2009: 400). His synthesis played a crucial role in the expansion of *kalām* and philosophical thought within madrasas, particularly from the reign of Sultan Mehmed II onward. The influence of his ideas can be seen in the works of prominent scholars such as ‘Alī Qushjī, Hocaẓāde, Ibn Kemāl, and Ebussuud Efendi (Pattabanoglu, 2014: 109). At the same time, his contributions paved the way for the institutionalization of logic and philosophy as academic disciplines in Ottoman madrasas.

In conclusion, Molla Fenârî left not only a Sufi legacy in Ottoman thought but also a philosophical-hermeneutic model that significantly shaped the Ottoman scholarly tradition. His syncretic approach established a balance between religious and rational knowledge in the Ottoman world and contributed to a more integrated relationship between the *tekke* (Sufi lodge) and the madrasa. Today, his ontological perspective continues to offer valuable insights in the fields of metaphysics, epistemology.

REFERECENS

- Alper, Ö. M. (2016) *Osmanlı Felsefesi Seçme Metinler*. İstanbul: Klasik Yayınları.
- Arslan, A. (1987) *Kemal Paşazâde Tehâfut Haşiyesi'nin Tahlili*. İstanbul: Kültür ve Turizm Bakanlığı.
- Aydın, Y. ve Yılmaz, E. (1995) 'İlk Osmanlı Şeyhülislâmı Molla Fenârî', *Diyanet İlmî Dergi*, 31(3), pp. 71-81.
- Görgün, T. (2009) 'Klasik Türk Düşüncesinin (Osmanlı Düşüncesinin) Temel Meseleleri ve Molla Fenârî, *Uluslararası Molla Fenârî Sempozyumu Bildiriler*, Bursa, Türkiye, 4-6 Aralık.
- Güçlü, B. (2014) 'Molla Fenârî'ye Göre Varlıkların Zuhûrunda İlâhî İsimlerin Rolü', *Marife Dergisi*, 14(3), pp. 127-141.
- Gürer, B. (2015) 'Molla Fenârî'nin Osmanlı Medrese Geleneği ve Osmanlı Düşüncesi Üzerindeki Tesirleri', *Necmettin Erbakan Üniversitesi İlahiyat Fakültesi Dergisi*, 39, pp. 121-142.
- Gürer, B. (2019) *Bir Osmanlı Entellektüeli Molla Fenârî*. İstanbul: Erdem Yayınları.
- Kalaycı, M. (2015) 'Osmanlı'da Eşarilik-Maturidilik İlişisine Genel Bir Bakış', *İlahiyat Akademi Dergisi*, 113, pp. 113-126.
- Öztürk, M. (2009) 'Molla Fenârî'nin Âlem Anlayışı', *Uluslararası Molla Fenârî Sempozyumu Bildiriler*, Bursa, Türkiye, 4-6 Aralık.
- Özkan, Y. (2017) 'Molla Fenârî'de Tasavvuf Metafiziği', *Siirt Üniversitesi İlahiyat Fakültesi Dergisi*, 4(1), pp. 61-82.
- Pattabanoğlu, F. Z. (2014) '16. Yüzyıl Osmanlı Düşüncesinde Felsefe-Kelâm İlişkisi', *Dört Öge*, 3(5), pp. 89-112.
- Saraçoğlu, T. N. (2018) *Osmanlı'nın Bilgeleri Molla Fenârî*. İstanbul: İlke Yayıncılık.
- Sözen, K. (2005) 'Klasik Dönem Osmanlı Bilginlerinin Felsefeye Karşı Tutumu', *Süleyman Demirel Üniversitesi İlahiyat Fakültesi Dergisi*, 14, pp. 1-23.
- Türker, Ö. (2019) *Varlık Nedir? İslam Filozoflarının Varlık Tasavvuru*. İstanbul: Ketebe Yayınları.
- Yücedoğru, T. (2009) 'Molla Fenârî'nin Âlem Anlayışı', *Uluslararası Molla Fenârî Sempozyumu Bildiriler*, Bursa, Türkiye, 4-6 Aralık.

The Application of Eye-Tracking in the Evaluation of Functional Visual Perception in Preschool Children

Agnieszka ZALEWSKA-MELER

Pomeranian University in Slupsk, Poland, ORCID: 0000-0003-1924-2790

Małgorzata OBRYCKA

University of Gdansk, Poland, ORCID: 0000-0001-8202-4185

Abstract

The aim of the article is to present the empirical possibilities of using eye-tracking in the evaluation of functional visual perception in preschool children. The cognitive areas of the conducted studies included visual functioning in preschool children and linguistic activity in children between the age of 3 and 6 years. The applied method concerns eye-tracking research conducted using the Eye Tracker Pupil Invisible device with iMotions Core software (version 9.3). Studies revealed the complex character of perception in preschool children and numerous dissonances between the declarative and visual form of representation.

Keywords: Visual Perception, Functional Vision Assessment, Assisting Sight Development in Preschool Children, Eye-tracking Technology, Heat Maps, Fixations, Saccades, Field of Vision.

Introduction

Characterizations of preschool children in source literature for future pedagogues mostly present general information regarding perception. Grasping the specific character of visual perception is an important element in children's developmental diagnostics in the period preceding school education. We need to stress that determining the visual capabilities of children aged between 3-6/7 years requires a contextual formulation, as many regularities of visual perception are processual, which is determined by the relational influence of morpho-functional and environmental factors.

At the moment a birth a child's vision is the least developed of senses. The new-born stage is a time of perceiving visual stimuli (Woynarowska, 2021, pp. 70-71). A child sees objects/people's faces at a distance of approximately 20 cm from its face (Kielar - Turska, Białecka - Pikul, 2011, pp. 57). During the first 28 days of life the child develops the ability to track the movement of objects on an arc and focus vision on the face of adults while lying on its back (Cieszyńska, Korendo, 2021, pp. 71). New-born children are better at noticing features of edges of perceived objects than elements at the center of the field of vision - sight focuses on the point of contact of white and black colors (Eliot, 2010, pp. 288-289). Noticing the presence of a visual stimulus is the basis of shaping fixation, understood as the ability to fix one's gaze on a stimulus/object (Walkiewicz - Krutak, 2015, pp. 57). This skill is developed at the end of the new-born stage and usually assumes the form of one-eyed fixation (Cytowska, pp. 103).

Quantitative and qualitative changes in visual perception emerge during infancy. Vision starts at the eyes, nose and mouth. Time of fixation changes. Sporadic, short-term, purposefully provoked fixation becomes spontaneous and long-term. Fixation may assume the form of staring at a specific object/stimulus. At the same time we can observe the appearance of the first saccadic movements, defined as shifting one's gaze from one object to another. At first children perform series of such movements. When the object is moved, children shift their gaze to its center and track its distinct features. Fixation of both eyes becomes the basis of convergence, i.e. directing both axes of vision towards the object and their parallel setting. Eyes markedly converge while looking at a stimulus/object which is close to the base of the nose (Cieszyńska, Korendo, 2021, pp. 57-58). Peripheral vision begins in the third month. This type of vision allows one to perceive images beyond the area at which the child is looking. In the second half of the fourth month coordination of images from both eyes occurs and children develop stereoscopic i.e. three-dimensional vision (they experience the constancy of the shape and size of the perceived objects). Up to that moment objects in the child's environment existed only in his or her actions. As a consequence children do not seek objects which disappear from their field of vision (Kielar - Turska, Bialecka - Pikul, 2011, pp. 69). In the fifth month children develop interest in activities which alter the shape of objects. Stereoscopic-binocular vision which allows one to see depth becomes the new skill. In the sixth month we can observe an increase in visual-motor coordination. While manipulating objects children extend the time of fixation, their saccadic moves are spontaneous and fluent (Walkiewicz - Krutak, 2015, pp. 59). Tracking the movement of falling objects and perceiving differentiated distances between object within the field of vision are developed. A common field of perception for children and adults can be seen between the eighth and ninth month. Objects within the common field are highlighted by children through an indicating gesture which persists until preschool age. Active indication of objects perceived in space and in pictures increases in children who had more opportunities to perceive objects from various distances and who could experience them independently. At the end of the infancy stage we can observe a development in spatial orientation, where visual perception motivates children to movement (Cieszyńska, Korendo, 2021, p. 85). In the post-infancy stage visual-motor coordination in children undergoes development and refinement. Typical activities such as putting blocks in sorters, building rows and towers of blocks, putting together pictures from parts, arranging puzzles, first attempts at drawing, require the cooperation of vision and motor function. Active experimenting with objects under the control of vision translates into precision and effectiveness of children's actions in subsequent development stages.

The perpetuation of acquired visual perception skills and the intensive development of parameters of visual functioning are observed in preschool age. Visual acuity (at close proximity and at a distance), sensitivity to contrast, field of vision¹, maintaining gaze and stereoscopic vision are significant for the role of student (writing letters/numbers, reading, drawing, recognizing and interpreting contents in images, spatial relations, classifying events in pictures, recreating figures and signs, developing narrative speech). In the course of school education children develop the skill of differentiating colors and their hues. This is used to acquire manual skills, and the ability to differentiate figures and background by children (Walkiewicz - Krutak, 2015, p. 64-65, 105).

Perception as a complex cognitive function requires the application of varied methods and tools, as well as the cooperation of people who work on children's

¹ The main parameters of visual functioning presented in psycho-pedagogical diagnosis: 1) visual acuity - the ability to perceive small objects, details in multi-element puzzles, 2) sensitivity to contrast - the ability to perceive differences in brightness and hue of neighboring surfaces, 3) field of vision - a set of points in space perceived simultaneously with the point onto which the point of fixation is directed (Nizankowska, 2007, p. 124; Sadowski, 2013, p. 638-644).

development. Clinical evaluation of the parameters of vision does not fall within the competencies of educators or teachers. The realm of educational measures encompasses the functional diagnosis of visual perception, the results of which provide guidelines on how to develop individual parameters of vision and provide early childhood development support. Functional assessment of visual perception is based on practical aspects of the application of sight in children's everyday situations. The subject of focus is the occurrence, level of development and application of functions and parameters of visual perception registered during social interactions, the course of cognitive processes (including learning), manipulation, play, orientation and movement in space, as well as self-care activity. This type of assessment of children's vision provides knowledge on: 1) the external (contextual) factors which determine normal visual perception in children, 2) the visual capabilities of children as a source of experiencing oneself and the environment, 3) detecting irregularities with regard to children's use of vision. The functional evaluation of children's vision is complementary to clinical evaluation. It includes a reference to skills which constitute developmental achievements in the area of the sense of sight, at a given period of ontogenesis. In a functional assessment of a child's vision we can distinguish between blocks of activity connected with the evaluation of oculomotor functions (fixation, tracking, gaze shift, gaze search, convergence, accommodation), visual functioning parameters (range of vision, field of vision, acuity, sensitivity to contrast, stereoscopic vision, color perception), and the use of various visual abilities in children's everyday functioning.

Material and Method

The research was conducted as part of triangulation, which is a combination of quantitative and qualitative research strategies. The method applies to eye-tracking studies conducted using the Eye Tracker Pupil Invisible device with iMotions Core software (version 9.3)². It is a new generation mobile eye-tracker with a frequency of 200Hz, equipped with a mobile data register. Research techniques included a quantitative-qualitative perspective in the analysis of visual materials, as well as a qualitative perspective as exemplified by the interview³. Two research tools were applied, i.e. a reference picture⁴, as part of a quantitative-qualitative strategy, and an open interview questionnaire for preschool-age children, as part of a qualitative strategy. These measures were to ensure that the conducted research had a complementary character.

The course of the study was typical of eye-tracking research procedures (Duchowski, 2007, p. 157-201; Wąsikowska, 2015, p. 177-192). After obtaining written consent from parents (stage one of the research) the children were prepared to participate in the eye-tracking study. Conversations were held with each child, during which the researchers explained what the study consisted in and how to behave during evaluation (stage two of the research). During stage three the children were asked to calibrate their vision, i.e. to follow a moving point on the screen of a phone connected with mobile glasses with an installed camera, which registers eye movement using IR light (corneal reflection). In the next stage the children looked at the reference picture, which lasted for up to 20-30 seconds (stage four), and after that interviews were conducted (stage five). At the end of the study the children drew prizes for participating in the registered activities. This was important in order to create a friendly atmosphere during the study and an open relation between researcher and research subject.

² Currently a new method of research using eye-tracking, i.e. pedagogical neuro-diagnostics, is increasingly mentioned.

³ According to source literature: "(...) in social studies (especially related to education) conducting measurements of vision activity without obtaining additional information from participants via interviews or questionnaires seems to significantly diminish the cognitive value of such explorations" (Stolińska, Andrzejewska, 2017, p. 269) (TN: Own translation). Moreover, it is recommended to conduct interviews directly after the study.

⁴ Reference picture (image of reference) - a static photograph selected by the researchers, which constitutes a visual object of quantitative-qualitative analyses of perception.

The eye-tracking technology was documented using a recording of the studied children's activity. This enabled the researchers to conduct a further statistical analysis in the form of two basic types of generated reports. The first included fixation charts while the second involved saccades and scanning paths (gaze plot and scan path). In accordance with research practice in the area of eye-tracking, a standard time of eye immobility, i.e. 200ms, was assumed (Laskowski, 2011, p. 1-11). The second type of generated reports were heat maps, which were the result of a superimposition of several reports regarding fixation. It is a type of chart which presents the most and the least interesting areas of activity located in the reference picture. In the visualization warm colors (red, orange, yellow) indicated significant interest, whereas a cold color (green) indicated lack of interest. The analyzed activity applied to visual attention as part of explorative and penetrating categories of eye movement, revealed during the attention process (Młodkowski, 2008, p. 23-44; Mantiuk, Bazyluk, 2014, p. 9-18).

According to the standard position in order to obtain an approximate image of a larger group a sample of at least 30 is required (Pernice, Nielsen, 2009, s. 22; Nielsen, Pernice, 2010, p. 196-226). The experimental group consisted of children aged between 3 and 6 years (N=44), including 22 girls and 22 boys.

Table 1. Experimental group

3-year-olds N=11		4-year-olds N=12		5-year-olds N=10		6-year-olds N=11		Total N=44	
Girls N=5	Boys N=6	Girls N=6	Boys N=6	Girls N=5	Boys N=5	Girls N=6	Boys N=5	Girls N=22	Boys N=22

Source: author

Table 2. Average age of preschool children – participants in the study

3-year-olds		4-year-olds		5-year-olds		6-year-olds		Total	
Average age: 3 years 11 months 18 days		Average age: 4 years 10 months 16 days		Average age: 5 years 11 months 16 days		Average age: 6 years 9 months 11 days		Average age: 5 years 4 months 26 days	
Girls	Boys	Girls	Boys	Girls	Boys	Girls	Boys	Girls	Boys
Average age: 4 years 0 months 7 days	Average age: 3 years 11 months 1 days	Average age: 4 years 10 months 14 days	Average age: 4 years 10 months 19 days	Average age: 6 years 0 months 27 days	Average age: 5 years 10 months 5 days	Average age: 6 years 11 months 2 days	Average age: 6 years 9 months 11 days	Average age: 5 years 5 months 23 days	Average age: 5 years 4 months 12 days

Source: author

The research subject included two areas of cognition: 1) the visual functioning of preschool children, 2) the linguistic activity of children aged between 3-6 years. The fundamental objectives involved the functional analysis of preschool children's visual functioning in relation to the issue of holiday activity, and an analysis of statements made by respondents in the context of activities presented in the reference pictures. The primary research problems are formulated as follows: P1 – What are the capabilities of the visual perception of children aged 3-6 years in relation to use of holiday leisure time? P2 – What meanings were revealed in the narratives of participating children in relation to perceived activity in the reference picture? The detailed questions were formulated as follows: 1) What is the common ground in terms of visual interests among children aged 3-6 years in terms of holiday activity?, 2) What is the interpretational common ground in the scope of language among children aged 3-6 years in terms of holiday activity, 3) What are the differences between visual and verbal methods of perceiving and describing the subject of holiday activity among children aged 3-6 years, 4) What are the similarities between visual and verbal methods of perceiving and describing holiday activity among children aged 3-6 years, 5) What visual and verbal patterns are children aged 3-6 years guided by in reference to the presented holiday activity?

The agenda of the study was verificational. The hypotheses were formulated as follows: H1 – Older children display less interest in the reference picture (shorter fixation and saccades among children aged 5-6 years), H2 – Boys and girls differ in their perception of the reference picture in the scope of fixations and saccades. The verifying character of the study meant that it was necessary to determine a dependent variable in the form of visual perception. Indicators of the variable included fixations, saccades and areas of interest (AOI). Development of preschool children in the aspect of using visual abilities in situations of everyday functioning was determined as the independent variable. An indicator in this area was field of vision. Age and sex constituted intervening variables. In order to obtain answers to the research questions and test the hypotheses, the researchers conducted statistical analyses using the IBM SPSS Statistics program (version 25). The program made it possible to conduct an analysis of basic descriptive statistics and of correlations using the ANOVA and chi-square tests. Statistical significance was set at the conventionally accepted threshold of $\alpha = 0.05$, however, the results of test statistic probability at $0.05 < p < 0.1$ were interpreted as significant at a level of statistical tendency.

In accordance with assumptions for the adopted eye-tracking research strategy, four AOI areas were overlaid on the selected reference picture. In their distinction the researchers took into account categories of accessibility and attractiveness of holiday experiences. The AOI points included: camping (AOI1), using water equipment (AOI2), exploring mountainous areas (AOI3), swimming and diving (AOI4). Indication of these points constituted an important research task – in cases where several areas were distinguished in visual contents it was possible to: track the order in which respondents looked at highlighted fragments (sequence), determine the time spent on observing highlighted fragments (dwell time) and the time from beginning observation to the first stop at a given AOI (entry time), read the number of fixations, returns (repeated gazes) on a given area, and indicate the average time of fixations (Stolińska, Andrzejewska, 2017, p. 270). The acquired results for the highlighted AOI constitute the average results of all participants, which does not exclude individual analyses.

Analysis and interpretation of results

The following results were obtained in indicated AOI areas: AOI1 occupied 0.88% of the entire reference picture, AOI2 occupied 1.23% of the image, AOI3 occupied 1.89% of the image, and AOI4 occupied 1,98% of the image.

Image 1. Reference picture with marked AOI areas



Source: author

Based on data from the eye-tracker the researchers obtained detailed results regarding AOIs for all participating children. The table below shows the highlighted areas with relevant statistical data.

Table 3. AOIs for all participating children N=44

	AOI1	AOI2	AOI3	AOI4

Information				
Stimulus duration	112813.36	112813.36	112813.36	112813.36
AOI duration (ms)	112813.36	112813.36	112813.36	112813.36
AOI duration (%)	100	100	100	100
Size (px2)	10397.76	14462.95	22234.06	23288.02
Size (cm2)	354.23	492.72	757.46	793.37
Size (%)	0.88	1.23	1.89	1.98
Valid data	47.48	47.48	47.48	47.48
Respondent base	44	44	44	44
Gaze based metrics				
Respondent count	6	24	25	6
Respondent ratio (%)	13.64	54.55	56.82	13.64
Dwell count	3.83	10.12	9.2	3.5
Revisit count	2.83	9.12	8.2	2.5
Hit time AOI (ms)	49191.33	37608	34869.8	43772.67
Hit time parent (ms)	49191.33	37608	34869.8	43772.67
Dwell time (ms)	1743.39	6031.87	5506.91	1881.07
Dwell time (%)	1.84	5.33	4.45	2.11
First dwell duration (ms)	514.67	633.04	663.04	734.67
Last dwell duration (ms)	398.17	660.33	383.6	448
Skip count	0	2.08	1.24	0.33
Fixation based metrics				
Respondent count	6	24	23	6
Respondent ratio (%)	13.64	54.55	52.27	13.64
Dwells with fixations	3.67	7.42	7.74	3
Revisit count	2.67	6.42	6.74	2
Fixation count	7	22.42	22.78	8
TTF AOI (ms)	49158.75	40793.08	35976.57	43818.75
TTF parent (ms)	49158.75	40793.08	35976.57	43818.75
TTF max. (ms)	105553.12	70512.55	67458.95	103915.33
Dwell time (ms)	1803.5	3659.1	4423.7	1342.92
Dwell time (%)	1.84	3.13	3.55	1.49
Fixation duration (ms)	247.66	161.71	187.42	184.66
First fixation duration (ms)	238	141.06	203.3	127.58
Last fixation duration (ms)	248.58	172.65	263.67	181.42
Dispersion (deg)	0.39	0.34	0.45	0.35
Saccade based metrics				
Respondent count	6	24	25	5
Respondent ratio (%)	13.64	54.55	56.82	11.36
Dwells with saccades	3	9.33	7.76	3.2
Saccade count	8.67	61.46	40.08	15.4
Entry saccade onset AOI (ms)	47244.8	38431.28	33388.42	31744.5
Entry saccade onset parent (ms)	47244.8	38431.28	33388.42	31744.5
Saccade duration (ms)	16	21.84	21.94	15.32
Amplitude (deg)	0.92	1.49	2.02	1.12
Peak velocity (deg/s)	57.74	76.8	76.83	56.17
Peak acceleration (deg/s ²)	8655.75	8334.45	8041.05	5096.43
Peak deceleration (deg/s ²)	-6004.61	-7409.84	-7737.9	-5485.79
Direction (deg)	191.18	179.23	182.25	204.93

Source: author

Focus time in the indicated areas (AOI duration) was the longest in the group of 3-year-olds (139709.45 ms), and the shortest in the group of 6-year-olds (89104,45 ms). The average time for all children was 112813,36 ms. Areas marked as AOI2 (using water equipment) and AOI3 (exploring mountainous areas) were of most interest in terms of

respondent count. Adequate data were also acquired for such characteristics as age and sex. An interesting aspect of the research was the lack of statistically significant differences between the participating girls and boys in terms of several important areas such as duration of average saccade, amplitude of average saccade, peak velocity of average saccade and peak acceleration of average saccade. Sex played a significant role at stage 5 (the interview).

Table 4. Independent samples test – first version

		Levene's test for equality of variances		t-test for equality of means
		F	Significance	T
Duration of average saccade	Equal variances assumed	,597	,469	-,918
	Equal variances not assumed			-,918
Amplitude of average saccade	Equal variances assumed	1,753	,234	,066
	Equal variances not assumed			,066
Peak velocity of average saccade	Equal variances assumed	,497	,507	-,554
	Equal variances not assumed			-,554
Peak acceleration of average saccade	Equal variances assumed	,836	,396	-1,315
	Equal variances not assumed			-1,315

Source: author

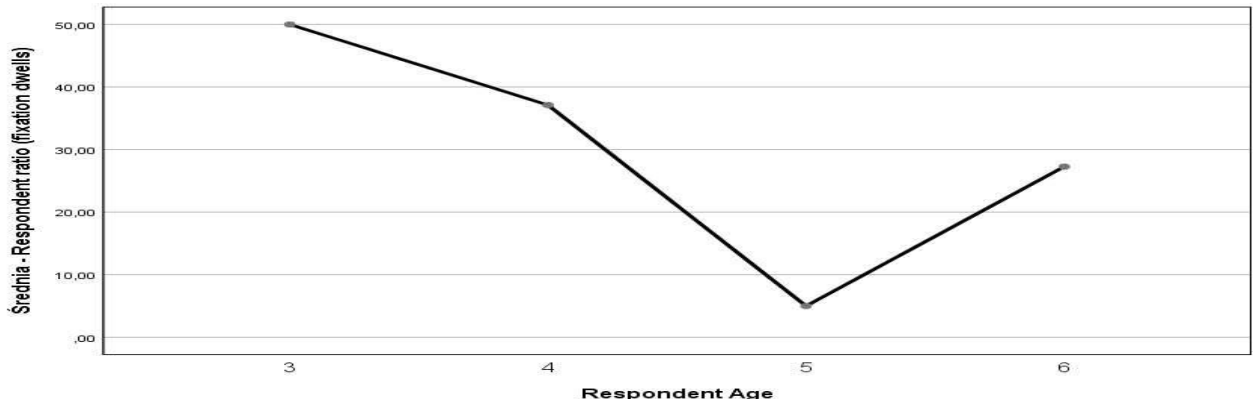
Table 5. Independent samples test – second version

		t-test for equality of means		
		Df	Significance (two-sided)	Mean difference
Duration of average saccade	Equal variances assumed	6	,394	-2,87250
	Equal variances not assumed	5,336	,398	-2,87250
Amplitude of average saccade	Equal variances assumed	6	,949	,02500
	Equal variances not assumed	4,650	,950	,02500
Peak velocity of average saccade	Equal variances assumed	6	,599	-5,05000
	Equal variances not assumed	5,881	,600	-5,05000
Peak acceleration of average saccade	Equal variances assumed	6	,237	-2518,61250
	Equal variances not assumed	4,346	,254	-2518,61250

Source: author

AOI2 raised the most interest as the number of centrally directed gazes at an indicated point (dwell count) averaged 10.12 visits. A similar result was obtained in the case of girls – in their case the dwell count for AOI2 equaled 11.77. Boys were more interested in AOI3 – the dwell count in this area equaled 9.45.

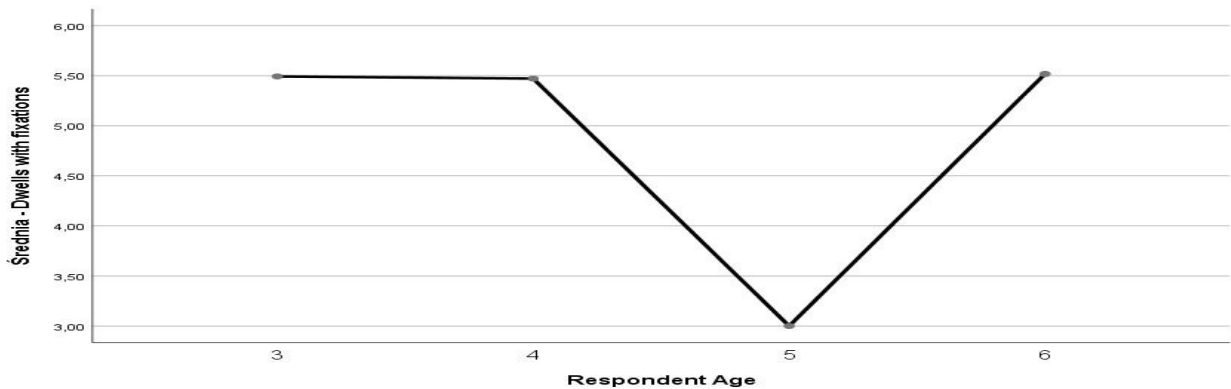
Figure 1. Means - respondent ratio (fixation dwells)



Source: author

According to results obtained in the analyzed sector (dwells with fixations), the highest mean was observed among 3-year-olds and the lowest among 5-year-olds.

Figure 2. Means (dwells with fixations)



Source: author

For characteristics connected with age the results were alternating. AOI2 generated more interest among 4-year-olds and 6-year-olds. AOI3 appeared more frequently among 3-year-olds and 5-year-olds. Dwell time for AOI2 totaled 6031,87 ms. This was the most attractive area for most children with the exception of 5-year-olds, who were more interested in AOI3. AOI2 was also the area of most frequent primary revisits (revisits to AOI) - the revisit count equaled 9.12 and was a sign of difficulty with understanding the sense of the entire reference picture. In the case of girls the revisit count reflected the results of the entire group, however, boys would revisit AOI3 more frequently. Similar results were noted in the group of 3-year-olds and 5-year-olds.

Table 6. Cross table Type * Respondent Age (number)

		Respondent Age				Total
		3	4	5	6	
Type	Gazemapping	0	2	1	1	4
	Static AOI	4	16	4	4	28
Total		4	18	5	5	32

Source: author

Assuming the terminological assumptions in the scope of parameters required for fixations (which appear from 100 to 600 milliseconds), longer mean time of fixations indicates deeper processing of sensory data. In the case of the presented study the reference picture was to a large degree complex. Data revealed shorter mean fixation time, which could be linked to the composition of the reference picture. The TTFF (Time to First Fixation) indicator was also deemed significant in the analysis, which made it possible to assess the children's ability to focus attention. According to the TTFF the AOI3 area (exploring mountainous areas) was the fastest to be perceived - 35976,57 ms. (dwell time). The longest fixations of all studied groups occurred on this area (4423,7 ms.), with the exception of 4-year-olds, in whose case the longest fixation time occurred on AOI1, and equaled 5463,5 ms.

The researchers also conducted a single-factor ANOVA variance analysis. The results are presented in the tables below.

Table 7. Single factor ANOVA (square sum, df, mean square, F)

		Sum of squares	Df	Mean square	F
Respondent ratio (fixation dwells)	Between groups	4695,053	3	1565,018	2,414
	Within groups	15557,098	24	648,212	
	Total	20252,151	27		
Dwells with fixations	Between groups	11,381	3	3,794	,554
	Within groups	150,588	22	6,845	
	Total	161,969	25		

Source: author

Table 8. Single factor ANOVA (respondent ratio - fixation dwells, dwells with fixations)

		Significance
Respondent ratio (fixation dwells)	Between groups	,091
	Within groups	
	Total	
Dwells with fixations	Between groups	,651
	Within groups	
	Total	

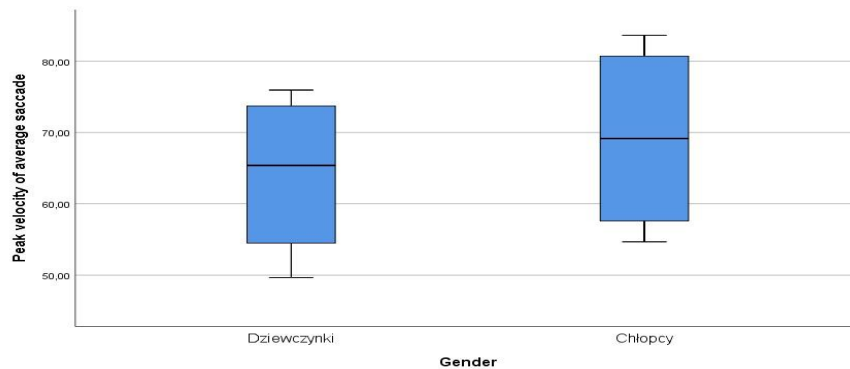
Source: author

Respondent ratio as a highlighted area differs significantly for various age groups,

while no significant differences between groups were found for the dwells and fixations indicator. Fixation duration was shortest in the AOI2 area (161,71 ms), with the exception of 3-year-olds in the AOI4 area (140,67 ms). TTF results in AOI3 showed that girls noticed it faster (28633,25 ms) than boys (43987,45 ms). 6-year-olds were the fastest to notice AOI3 (10918 ms). In the case of 4-year-olds AOI1 was registered in 20578 ms.

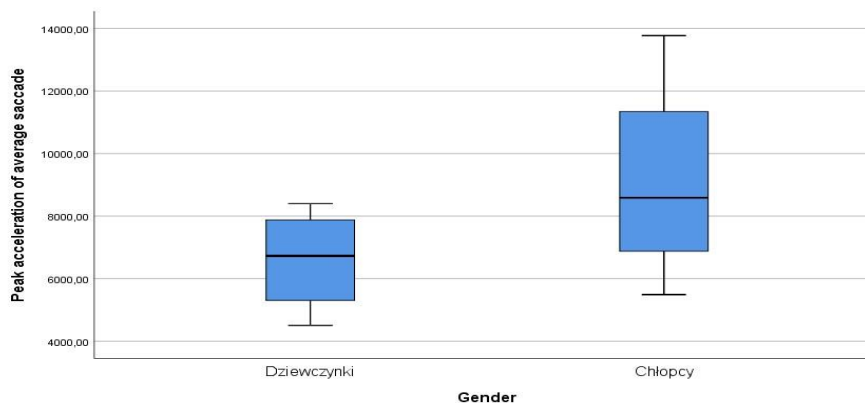
Saccades last for approximately 20 to 40 milliseconds. Saccade duration was the longest in AOI2 (21,84 ms) and AOI3 (21,94 ms). The number of discovered individual saccades (saccade count) was the highest in AOI2 (61,46). 5-year-olds were once again the exception – in their case the highest number of discovered individual saccades was related to AOI3 (22,00 ms). The average peak velocity was 76,8 deg/s in the AOI2 area, and 76,83 deg/s in the AOI3 area.

Figure 3. Peak velocity average saccade



Source: author

Figure 4. Peak acceleration of average saccade



Source: author

The data in the graphs indicate that higher average was ascribed to boys, with a statistically insignificant difference. The girls displayed lower average peak velocity than boys. The lowest peak velocity in all the AOI areas was found in the group of 3-year-olds. This result suggests that the eye movement of 3-year-old children is more stable than in the case of older children, who display a wider field of vision with individual eye movements.

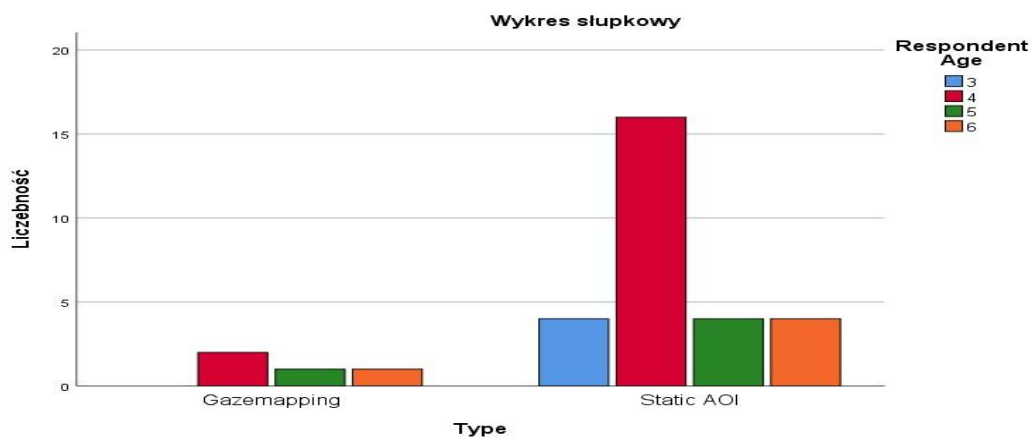
Table 9. Chi-Square tests

	Value	Df	Asymptotic significance (2-sided)
Pearson Chi-Square	1,117 ^a	3	,773
Likelihood Ratio	1,547	3	,671
Linear-by-linear Association	,927	1	,336
N of Valid Cases	32		

Source: author

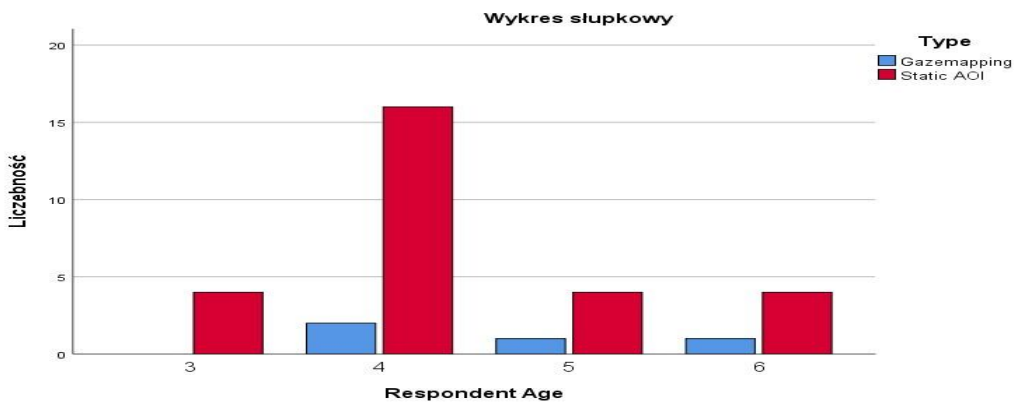
Peak acceleration in AOI1 (8655,75 deg/s²), AOI2 (8334,45 deg/s²) and AOI3 (8041,05 deg/s²) was similar. The acceleration was lower only for AOI4 (5096,43 deg/s²). Eye movements which could be considered fluent were revealed in AOI3, as demonstrated by data from two indicators, i.e. saccade duration (21,94 ms) and peak acceleration (8041,05 deg/s²). Short and rapid eye movements were discovered in AOI1, where saccade duration equaled 16 ms, and peak acceleration equaled 8655,75 deg/s².

Figure 5. Gazemaping and Static AOI (*type*)



Source: author

Figure 6. Gazemaping and Static AOI (*respondent age*)



Source: author

The measurement results for peak velocity and peak acceleration show that girls displayed lower levels of these indicators than boys. Average peak velocity per second as well as average peak acceleration were higher for boys. The perceived movements were short and rapid. In the case of boys the detected parameters of perception increased with age.

The application of the combined quantitative-qualitative strategy made it possible to generate heat maps on the reference picture.

Image 2. Heat map for all studied children N=44

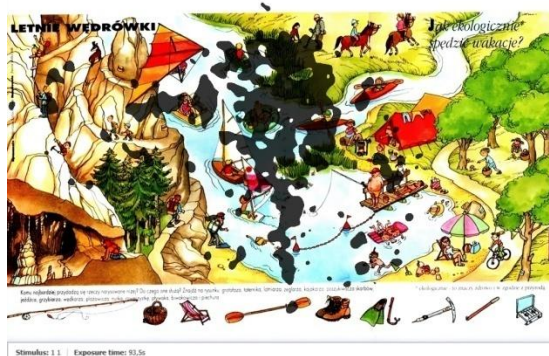


Source: author

Heat maps assume various forms of data presentations (e.g. greyness maps, reverse heat maps), which allows one to clearly indicate areas of most interest to the researchers. Below are two different types of heat maps generated for all participants of the study.

Image 3.

Point heat map (all participants) N=44



Source: author

Image 4.

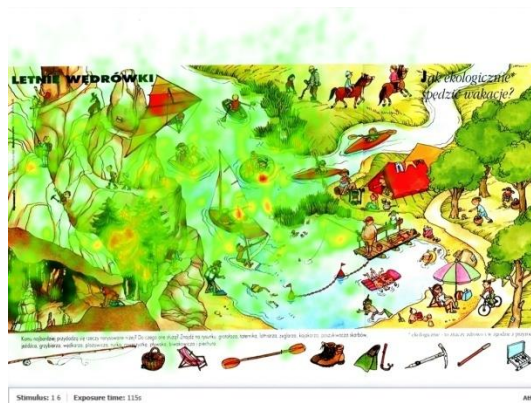
Reverse heat map (all participants) N=44



Source: author

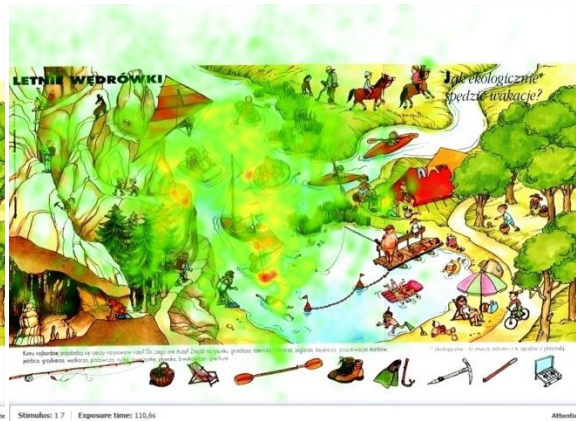
Image 2 presents the points of interest of children and the intensity of observation of the structural elements in the reference picture. Results indicate that the area along the central line of the image was under the most frequent and longest observation. The other two visualizations illustrate the same study, however, in image 3, the areas of most interest are shaded, and in image 4 the areas of least interested are shaded. Below are two images which correspond with the children's sex.

Image 5. Heat map (boys) N=22



Source: author

Image nr 6. Heat map (girls) N=22

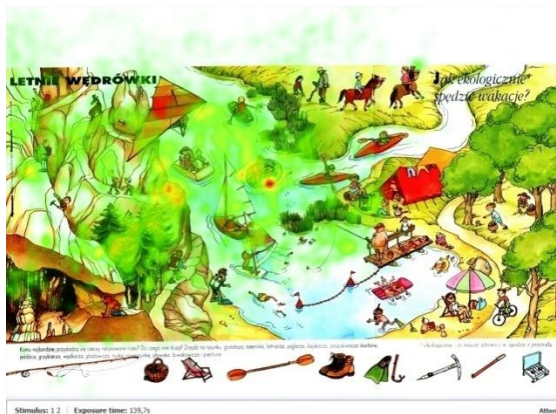


Source: author

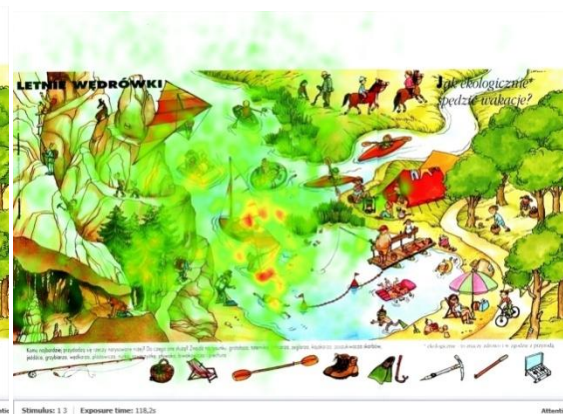
In the case of boys the areas under the most frequent and longest observation were those connected with using water equipment (inflatable ring, sailboat), and hiking (forest). Results for girls were in line in the scope of fixations connected with water activities (inflatable ring, sailboat) and with mountain hiking. A new area of centrally guided gazes was windsurfing, which was found in the peripheral field of vision of boys. Generating separate heat maps for each age category revealed further differences.

Image 7. Heat map (3-year-olds) N= 11

Image 8. Heat map (4-year-olds) N=12



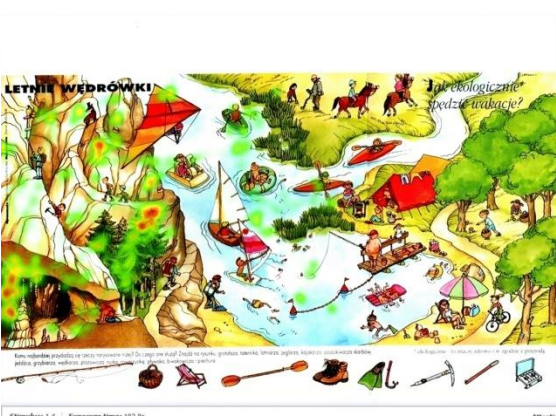
Source: author



Source: author

Image 9. Heat map (5-year-olds) N=10

Image 10. Heat map (6-year-olds) N=11



Source: author

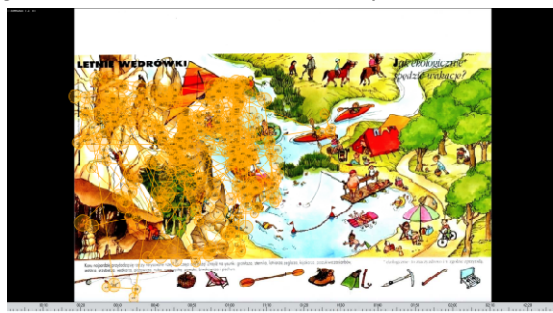


Source: author

The youngest children focused their gaze most frequently and for the longest period of time on areas connected with water activities (individual swimming, inflatable ring) and forms of hiking. 4-year-olds focused their gaze most frequently and for the longest period of time on areas connected with water activities (sailboat, windsurfing board, pedal boat). 5-year-olds mostly focused on areas connected with hiking (in the mountains and the forest). 6-year-olds were the closest to the mean result achieved by the entire research group, i.e. gaze frequency and fixation were found in areas along the central line of the image.

The analysis of the visualization of characteristic points of fixation and saccades for the captured gaze path of four of the studied children (one from each age group) contains reference to points of interest and observation intensity in the case of specific areas of the image. Gaze intensity was illustrated using circles, with an added description of fixation time in milliseconds.

Image 11. Fixations and saccades 3-year-old N=1



Source: author

Image 12. Fixations and saccades 4-year-old N=1



Source: author

Image 13. Fixations and saccades 5-year-old N=1



Source: author

Image 14. Fixations and saccades 6-year-old N=1



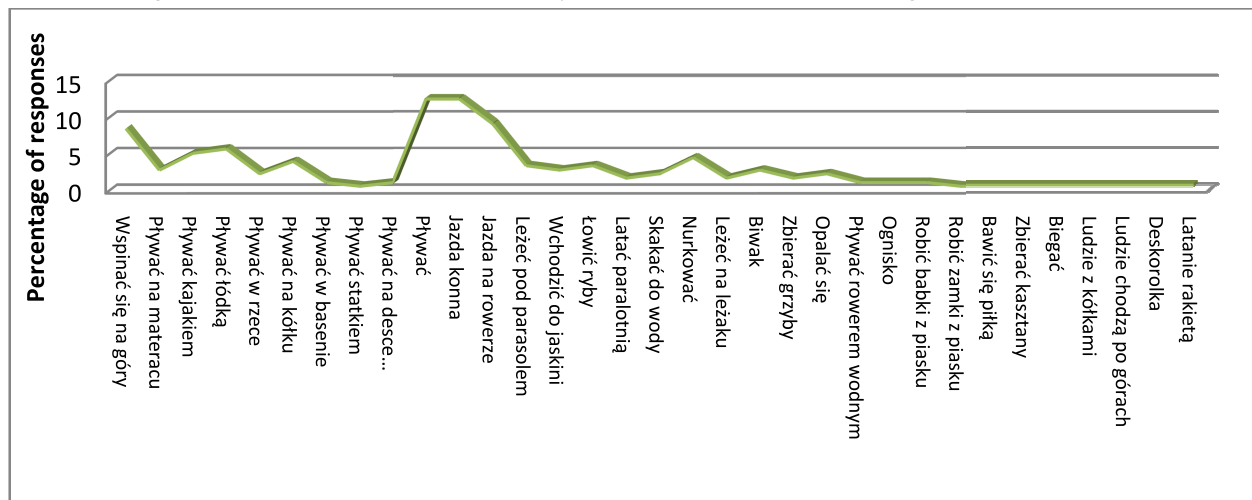
Source: author

Data indicate that the 3-year-old girl focused primarily on areas connected with water activities (sailboat, paddle boat, kayak, windsurfing board) and on hiking (mountains, forest). The obtained result was representative of the entire age group. The gaze range in the case of the 4-year-old girl was wider. Areas of special interest included water activities (using equipment indicated by 3-year-olds), hiking (mountains, forest), and a new category, i.e. camping. The acquired result was in line with the collective observation for the 4-year-old group. The 5-year-old boy focused primarily on areas connected with hiking (beyond the center of the reference picture), which was representative for his age group. The six-year-old focused on camping and kayaking. This result was partially in line with mean observations for this age group (dominating elements in the field of vision of 6-year-olds were related to the central part of the image and were connected with different water activities).

The eye-tracking study was enhanced with qualitative analyses gathered from interviews conducted with the children. The interviews were conducted directly following

the observation of the reference picture. The analysis of this research area is initiated with a presentation of the children's preferred forms of activity during summer holidays.

Figure 9. Preferences in terms holiday activities for all participating children N=44



Source: author

The figure presents forms of holiday activity present in the narratives of the studied children. The most popular ways of spending the summer holidays are water activities (12.5%) and horse riding (12.5%). A significant number of respondents also indicated cycling (9.1%) and mountain climbing (8.5%), which was a significant factor differentiating individual statements made by children in specific age categories. In the group of 3-year-olds the most popular summer activities included climbing mountains (11.8%), kayaking (9.8%), water activities (inflatable ring) and horse riding (7.8%). Statements made by 4-year-olds were dominated by water activities (14.9%), horse riding (14.9%) and cycling (8.5%). 5-year-olds and 6-year-olds showed similar interests to those indicated by the other age groups. Activities on sailboats (9.8%) were a new element, indicated by 5-year-olds.

Conclusions

Processing information by children encapsulates many areas, the understanding of which requires multidimensional references to strategies of learning and cognition relevant to a given developmental stage, mechanisms of perception, processes of concentration and attention allocation, as well as problem solving in existing and new social, spatial and temporal contexts (Amadiou et al., 2015, p. 100-112; Gütl et al., 2005). The studies demonstrated a complex character of perception among preschool children, which revealed the existence of many dissonances and disproportions in relation to the abilities presented in the 3-6 years age range. A comparison of data present in the narratives of children regarding their ways of spending time during summer holidays with an observation of the reactions to the optotypes in the reference picture revealed differences between the declarative and visual forms. While declarations connected with water activities were in agreement with the results of the visual study, other verbal declarations regarding horse riding, cycling and mountain climbing generated less interest during the observation of the reference picture. Data analysis based on sex revealed that in the case of girls water activities and climbing on a declarative level align with the result of the visual study. Other verbal declarations (horse riding, cycling) attracted little interest during observation of the reference picture. Comparison of data gathered from boys revealed that declarations regarding water activities

align with the result of the visual study. However, climbing – despite visual interest – did not attain a high level of interest, contrary to hiking in the forest or water activities. Other verbal declarations (horse riding, cycling) attracted little interest during observation. Cycling, as an activity usually learned during preschool age, was not taken into account among girls and boys during observation. Data analysis based on age also revealed disproportions between preferential observation and declarations regarding selected activities present in the language layer. In the case of 3-year-olds declarations regarding water activities (inflatable ring) and climbing align with the visual study result. Other verbal declarations (horse riding, kayaking) attracted little interest during the observation of the reference picture. It should be highlighted that cycling was once again absent from the children's field of vision. Statements made by 4-year-olds considering water activities align with the result of the visual study. Declarations regarding horse riding and cycling were not confirmed during the observation of the reference picture. Hiking in the forest attracted more interest than in the group of 3-year-olds. In the case of 5-year-olds, data comparison indicates that declarations regarding water activities, horse riding and cycling are completely unaligned with the visual study result. In this group climbing and hiking in the forest generated more visual interest. Declarations made by 6-year-olds regarding water activities, horse riding and climbing align nearly completely with the visual study result. Other verbal declarations regarding cycling were not confirmed in the visual study, as in the case of the other age groups.

The comparison presented above indicates that not all interests declared by children align with the visual study result. Analyses of the reference picture for the specific age groups show that fixations and saccades can provide information in the scope of the children's field of vision and peripheral vision. Preferred objects in the case of younger children (3-year-olds) were examples of simple objects. Their selection did not require differentiation of details, in which case fluent saccadic movements and sensitivity to contrast are necessary. In the group of 4-year-olds the range of vision was wider. They displayed the ability to perceive small objects and details in multi-element objects. Taking into account the nature of the processes of perception among 3- and 4-year-olds, the process of reflecting phenomena in their differentiated properties showed a significant qualitative-quantitative change in terms of preferential seeing. In comparison to the youngest group, 5-year-olds showed significant discrepancies between verbal declarations and eye movement during the study, as well as effectiveness of perception, which was indicated by the number of units distinguished from the set of optotypes in the reference picture, and by the speed at which selection was made. Dynamic shifts of interest from one object onto another resulted in decreased (short and rapid) tracking movement within the children's field of vision. In the oldest group of children fixations were mostly connected with perceiving elements beyond the center of the reference picture. Only the group of 6-year-olds showed interest in the individual objects (fishing rod, basket of mushrooms, sunbed, oar, hiking boots, snorkeling equipment, pickax, horsewhip, barbecue) at the bottom of the picture. The greatest focus was on objects arranged in a line, i.e. oar, boots and fishing rod, and thus regarded objects connected with boating and mountain hiking. Perception of depth turned out to be a complex skill for the 6-year-olds. Perception of single objects was easier than perception of objects arranged in the area of the highlighted optotype. The obtained results should be regarded in light of the research hypotheses. Age was determined as the most important point of reference in the study. This feature was the primary differentiating factor in the visual perception of the studied children (shorter fixations and saccades in 5- and 6-year-olds) and in the linguistic representation in the scope of declared forms of activity. Sex significantly differentiated the children at the level of verbal declarations, however, no statistically significant differences were found in the scope of fixations and saccades.

The presented study exemplifies the phenomenon whereby eye movement reflects cognitive processes which are difficult to measure and complex, and which include acquisition and processing of information as well as visual attention (Stolińska, Andrzejewska, 2017, p. 259-276; Nowakowska – Buryła, Joński, 2012, p. 485-499.). Given that visual perception – especially in preschool children – takes place with the aid of analyzers (vision, hearing, movement) based on children’s experience, teachers (and parents) should focus on supporting the development of visual functions and on their functional assessment, in order to increase the scope of children’s developmental achievements. It is necessary to develop the ability of using vision and to increase its effectiveness in children’s everyday functioning. Stimulation to seeing (creating interesting and substantial visual messages), development of basic visual skills (connected with eye-movement control: finding visual stimuli, developing the ability to maintain gaze on visual objects, improving tracking ability, transferring fixation from one stimulus to another, visual searching, following the outline of objects and accommodation) are of key importance for the improvement of vision in the middle childhood stage. It is equally important to develop visual memory and higher visual functions (e.g. identification of objects in pictures, selection of objects according to a specific classification key, identification of details in simple and complex images) (Walkiewicz – Krutak 2008, p. 15-16, Walkiewicz – Krutak 2005, p. 126-129). Visual perception can also be shaped and assessed based on children’s motor activity (movement in space as an activator for fixations on various visual objects presented in various fields of vision and at various distances from children’s eyes), play, tasks with differentiated and rich visual material, activities with books/illustrations and puzzles. Such actions will enable one to evaluate achievements in the scope of visual perception (e.g. perceiving logotypes present in the space of social communication) and to detect deficits and disorders of visual functions at an early stage of development. Conclusions drawn from the eye-tracking studies show that there is a need to improve methodology in this area, which would allow preschool and school counselors, typhlo-teaching pedagogues, as well as special education pedagogues to better understand the cognitive abilities of children. In the context of children’s perception in early and middle childhood it is worthwhile to remember the observation made by Felicie Affolter (1997, p. 18), that knowledge of the child’s environment becomes its reality, when he or she is convinced that “(...) I take the environment into account and thus take action, turn to it, notice it, take it to be true” (TN: own translation).

REFERENCES

- Affolter, F. (1997). *Spostrzeganie, rzeczywistość, język*. Warszawa: Wydawnictwa Szkolne i Pedagogiczne
- Amadiou, F., Salmerón, L., Cegarra, J., Paubel, P. V., Lemarié, J., & Chevalier, A. (2015). Learning from Concept Mapping and Hypertext: An Eye Tracking Study. *Educational Technology & Society*, no. 18(4), p. 100-112
- Chmura, J. (2022). *Jak rozpocząć pracę terapeutyczną z małym dzieckiem? Obserwacja*. Kraków: Oficyna Wydawnicza Impuls
- Cieszyńska, J., Korendo, M. (2012). *Wczesna interwencja terapeutyczna. Stymulacja rozwoju dziecka. Od noworodka do 6. roku życia*. Kraków: Wydawnictwo Edukacyjne
- Cytowska, B. (2006). Stymulowanie rozwoju niemowląt. W: B. Cytowska, B. Winczura (red.). *Wczesna interwencja i wspomaganie rozwoju małego dziecka* (p. 103-112). Kraków: Oficyna Wydawnicza Impuls
- Duchowski, A.T. (2007). *Eye Tracking Methodology. Theory and Practice*. London: Wydawnictwo Springer
- Eliot, L. (2010). *Co tam się dzieje? Jak rozwija się mózg i umysł w pierwszych pięciu latach życia*. Poznań: Media Rodzina
- Gawlik, K. (2008). *Wpływ dysfunkcji narządu wzroku na wybrane aspekty rozwoju somatycznego i motorycznego dzieci i młodzieży*. Katowice: Wydawnictwo AWF

- Gütl, Ch., Pivec, M., Trummer, Ch., García-Barrios, V.M., Mödritscher, F., Pripfl, J., Umgeher, M. (2005). AdeLE (Adaptive e-Learning with Eye-Tracking): Theoretical Background, System Architecture and Application Scenarios. *European Journal of Open, Distance and E-Learning (EURODL)*: http://www.eurodl.org/materials/contrib/2005/Christian_Gutl, (accessed: 11.10.2022).
- Kielar – Turska, M., Białecka – Pikul, M. (2011). Wczesne dzieciństwo. W: B. Harwas-Napierała, J. Trempała (Eds.). *Psychologia rozwoju człowieka. Charakterystyka okresów życia człowieka* (p. 47-82). Warszawa: Wydawnictwo Naukowe PWN
- Laskowski, M. (2011). Badania użyteczności przy wykorzystaniu technologii eye-tracking'u. *Współczesna Gospodarka*, Vol. 2 Issue 1, p. 1-11
- Mantiuk, R., Bazyluk, B. (2014). Dokładność pomiaru kierunku patrzenia. W: S. Grucza, M. Płużyczka, P. Soluch (Eds.). *Widziane inaczej. Z polskich badań eyetrackingowych* (p. 9-18). Warszawa: Wydawnictwo Naukowe Instytutu Kulturologii i Lingwistyki Antropocentrycznej
- Maruszewski, T. (2011). *Psychologia poznania. Umysł i świat*. Gdańsk: GWP
- Młodkowski, J. (2008). Koncepcja uwagi wizualnej. *Acta Universitatis Lodziensis, Folia Psychologica*, nr 12, p. 23-44
- Niżankowska, M.H. (2007). *Okulistyka. Podstawy kliniczne*. Warszawa: Wydawnictwo Naukowe PZWL
- Nowakowska – Buryła, I., Joński, T. (2012). Eye-trackingowe badania prezentacji multimedialnych konstruowanych dla wspomagania edukacji wczesnoszkolnej. In: W. Skrzydlewski, S. Dylak (Eds.). *Media – Edukacja – Kultura. W stronę edukacji medialnej* (p. 485-499). Poznań-Rzeszów: Wydawnictwo Uniwersytetu Rzeszowskiego
- Pernice, K., Nielsen, J. (2009). *Eyetracking Methodology. How to Conduct and Evaluate Usability Studies Using Eye-tracking*. Fremont: Nielsen Normal Group
- Nielsen, J., Pernice, K. (2010). *Eye-tracking Web Usability*. Indianapolis: New Riders
- Sadowski, B. (2013). Układ nerwowy i narządy zmysłów. W: S. J. Konturek (Eds.). *Fizjologia człowieka* (p. 565-733). Wrocław: Elsevier Urban & Partner
- Sosnowski, T. (2000). *Psychofizjologia*. W: J. Strelau (red.). *Psychologia. Podstawy psychologii, T.I* (ss. 131-178). Gdańsk: GWP
- Stolińska, A., Andrzejewska, M. (2017). Metodologiczne aspekty stosowania techniki eye trackingowej w badaniach edukacyjnych, *Przegląd badań edukacyjnych*, no. 24 (1), p. 259-276
- Walkiewicz – Krutak, M. (2005). Model programu wspomagania rozwoju widzenia dzieci z zaburzeniami widzenia. *Szkoła Specjalna*, no. 2, p. 126-137
- Walkiewicz – Krutak, M. (2008). Usprawnianie widzenia małych dzieci słabowidzących. *Szkoła Specjalna*, no. 1, p. 14-18
- Walkiewicz – Krutak, M. (2015). Diagnostyka funkcjonowania wzrokowego małych dzieci słabowidzących. In: K. Czerwińska (Eds.). *Wczesne wspomaganie rozwoju dziecka z niepełnosprawnością wzroku – w kręgu diagnozy i terapii* (p. 46-67). Warszawa: Wydawnictwo APS
- Walkiewicz – Krutak, M. (2014). Uwarunkowania zaburzeń widzenia u małych dzieci. W: R. Piotrowicz (Ed.). *Interdyscyplinarne uwarunkowania rozwoju małego dziecka. Wybrane zagadnienia* (p. 195-213). Warszawa: Wydawnictwo APS
- Walkiewicz – Krutak, M. (2015). Wspomaganie rozwoju widzenia małych dzieci słabowidzących. In: K. Czerwińska (Ed.). *Wczesne wspomaganie rozwoju dziecka z niepełnosprawnością wzroku – w kręgu diagnozy i terapii* (p. 93-108). Warszawa: Wydawnictwo APS
- Wąsikowska, B. (2015). Eye tracking w badaniach marketingowych. *Studia Informatica*, no. 36, p. 177-192
- Woynarowska, B. (2021). Charakterystyka rozwoju fizycznego i motorycznego oraz potrzeby biologiczne w poszczególnych okresach życia człowieka. In: B. Woynarowska, A. Kowalewska, Z. Izdebski (Eds.). *Biomedyczne podstawy rozwoju i edukacji* (p. 61-95). Warszawa: Wydawnictwo Naukowe PWN

Reality Communication Model

Ivana FERKOVIC PASIC

Mr.sci, University od Tuzla, Bosnia and Herzegovina

Abstract

The global phenomenon of reality TV, with its expansion, hypothetically changes the behavior patterns of people in the Western Balkans. The content analysis of popular reality shows was conducted with the aim of assessing: the level of viewer satisfaction, the production-driven imposition of opinions, as well as the staging of conflicts and hate speech in the shows, and the extent to which negative political and social attitudes spread. A retrospective content analysis of elimination, music, and cooking reality shows (2017) was conducted. Since the production's interest created the illusion of two-way communication with the public, public reception was assessed through an online survey with 227 respondents (late 2021 and early 2022). The hypotheses set out were tested statistically, examining the significance of participation ($p < 0.05$) and correlations between phenomena. The structured sample of online survey respondents consisted of 77% women and 23% men, predominantly of working age (31-50 years old). The associated variables of employed respondents (80%) and high educational qualifications (60%) statistically dominated ($p < 0.05$) in the research sample. The representative sample recorded a paradoxical (73%) (non) viewership without satisfaction ($p < 0.05$), which supports the Cognitive Dissonance Theory. 76% of respondents stated that reality content represents a reflection of the society in which it is broadcast, 47% believe that reality shows are used for political purposes, and 50% feel that they are dominated by hate speech. Social learning of negative reality communication models disturbs the cultural image of our region, which is why 83% of respondents support the cancellation of reality shows. Future research should focus on projects aimed at strengthening local cultural values and the psychology of the youth mass.

Keywords: Reality Content, Reception, Cultural Models

INTRODUCTION

Reality TV, as a media concept, has occupied the intense attention of the public, producers, and professionals for decades, making reality communication models a challenge for this research. Although reality programs depict real-life situations, they often include a combination of documentary and entertainment styles to create a dramaturgically appealing effect (Hill, 2005). The reality phenomenon is not standardized, as some earlier TV shows (e.g., hidden camera shows – 1947; talent shows, documentary series about ordinary people, etc.) have characteristics of this genre, but also of others. The greatest success was achieved by the famous Dutch reality show *Big Brother* (2000), which was continuously watched by eight to ten million people each night, five days a week.

The modern structure of reality shows has retained the same essence as its predecessors: competition, cheering, strong emotions, aggression, and enjoyment in others' suffering. The popularity of reality TV has attracted attention, from the alienation of the audience to criticism from scientific circles (Milenković, 2020). In the consciousness of reality TV consumers, there is always adrenaline, excitement, and action, with emotional release. The audience has experienced this in the same way as gladiators in the Roman Coliseum, the Olympic Games in Greek amphitheaters, and Shakespeare's plays in theaters, which George Orwell, the "father of reality," most vividly depicted in his novel *1984* (Orwell, 2008).

Since the very beginning of reality TV broadcasting, it has been the subject of interest for numerous theorists, and the theoretical concept of this research is primarily in the domain of two psychological theories.

The first, the Social Learning Theory, studies how and to what extent individuals learn certain behaviors by imitating others they consider role models. This is the case with reality show participants, who often appear as role models for recipients, especially young people. The second, Cognitive Dissonance Theory, focuses on the contradictions between beliefs and behaviors of individuals. According to this theory, people often act contrary to their beliefs, which causes discomfort, known as Festinger's cognitive dissonance (Tretter and Löffler-Stastka, 2024: 215).

AIMS AND METHODS

Based on the hypothesis that the reality phenomenon in the Western Balkans has become a research paradox in a vicious circle of causes and effects, the aims of the research were set (Potter, 2003; Coyne, Robinson. i Nelson, 2010). The public's reception of popular reality TV content was investigated in the following contexts:

- The paradox of satisfaction and reasons for watching reality TV,
- The production imposition of opinions in reality TV,
- The level of staged conflicts among participants,
- The societal spread of imposed behavior models from reality TV,
- The use of reality TV for political purposes,
- The level of hate speech.

For decades, there has been a lack of research on two-way communication in the broadcasting of uncontrolled reality content in the Western Balkans. A retrospective content analysis was conducted on elimination, music, and cooking reality TV shows (2017).

Due to the insufficiently explored public interest in the reality TV media concept, combined with the expansion of production and participant interest, an online survey was created. Prospectively, 227 online survey respondents were surveyed, analyzed, and their answers tested in late 2021 and early 2022.

The structured sample of online respondents consisted of 77% women and 23% men, predominantly in the working-age group (31-50 years). The related variables of employment (80%) and high educational qualifications (60%) statistically dominated ($p < 0.05$) the research sample.

The research was conducted online, and participants answered questions according to the Likert scale, a five-point scale measuring the degree of agreement or disagreement, or the intensity of a particular attitude. The data, among other information for the doctoral dissertation, were processed using the SPSS program, and statistical analysis was conducted for participation significance ($p < 0.05$) and correlations between phenomena

RESEARCH

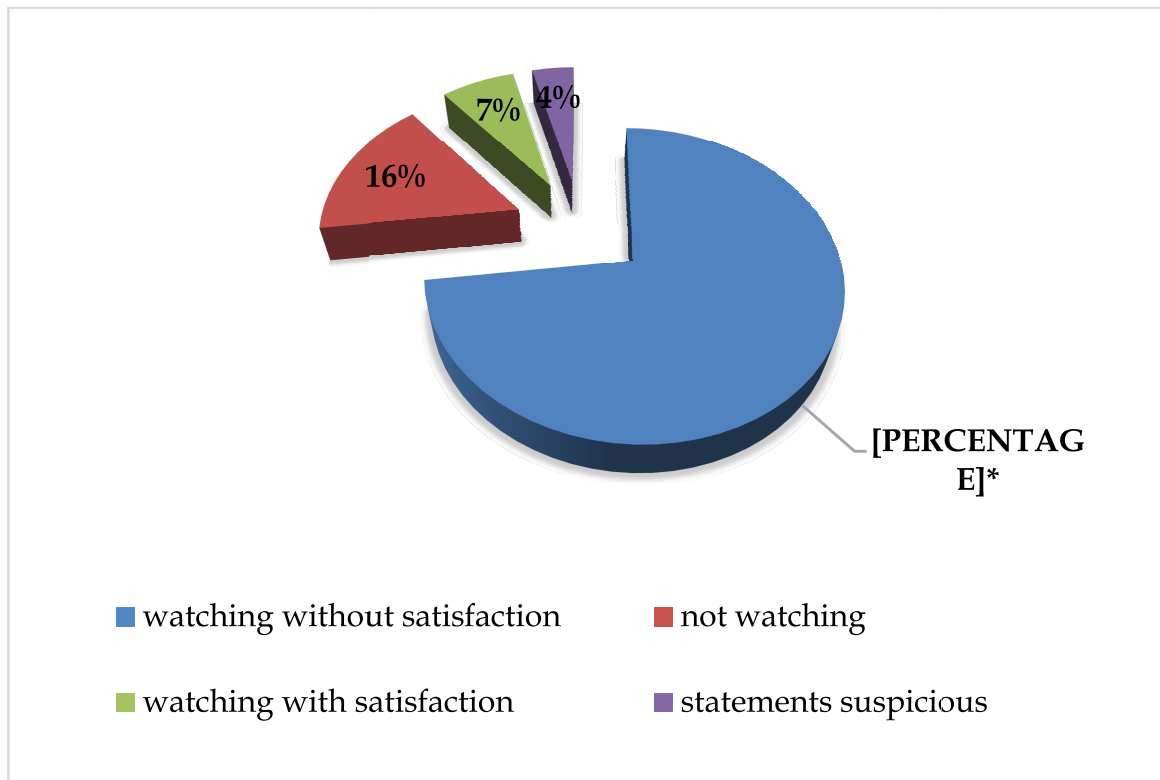
In this paper, part of the research results (from the author's doctoral dissertation) were analyzed, focusing on the public's perception of reality TV (227 online respondents).

- To the first question, the majority of respondents (74%) answered that they do not watch, while 26% watch reality content. The next question concerned satisfaction with watching reality TV, where 73% of respondents significantly ($t\text{-test} = 53.052; p < 0.05$) stated that they do not watch reality TV with satisfaction (Chart 1.).

The answers to both questions contradict each other: (non)viewing and (non)satisfaction with watching reality TV. These results suggest a paradox that can be interpreted as cognitive dissonance. Respondents are aware that they are expected to answer that they do not watch reality TV content, which is perceived as negative and even harmful, and this is what they did. However, in reality, respondents do watch reality TV content.

The answers to the reasons for watching reality TV align with the previous paradox.

Chart 1. The paradox of satisfaction for watching reality TV



* $t\text{-test} = 53.052; p < 0.05$

The majority of respondents (65%) did not clearly state the reason for (non)watching reality TV, while 13% said they were not interested in reality TV. Meanwhile, 8% watch reality TV "to occupy themselves," 6% "instead of other options," 5% "for relaxation," and 3% "out of boredom" (table 1).

Table 1. The reasons for watching reality TV

Watching reaity	%
statements suspicious	65
not watching	13
to occupy themselves	8
instead of other options	6
for relaxation	5
out of boredom	3

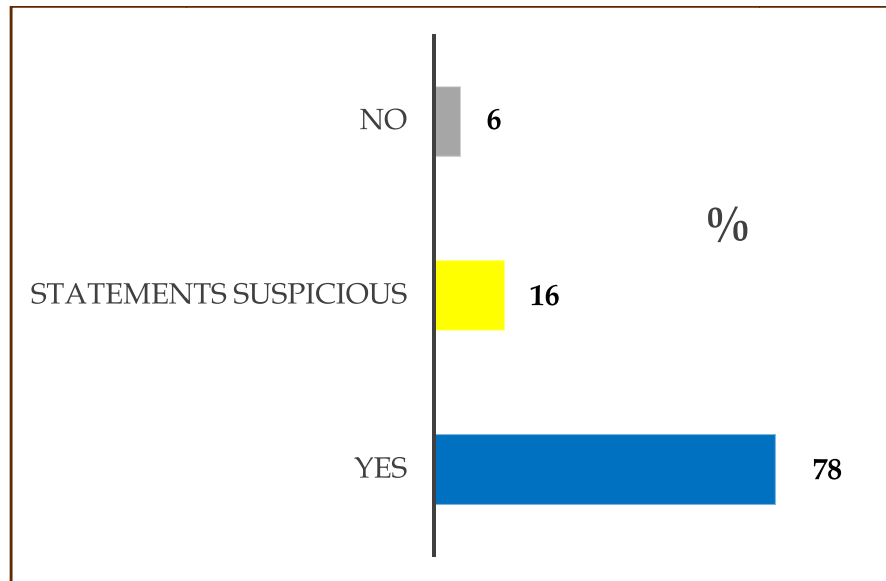
The answers to the question about favorite reality shows confirm the mentioned paradoxes and evident cognitive dissonance. Around 17% of respondents said they watch elimination reality TV, while 1% watch cooking and 1% watch music reality TV, while the majority (60%) did not provide a clear answer, and 21% said they do not watch reality TV (Table 2.).

Table 2. The favorite reality TV

The reality TV	%
statements suspicious	60
not watching	21
elimination reality TV	17
music reality TV	1
cooking reality TV	1

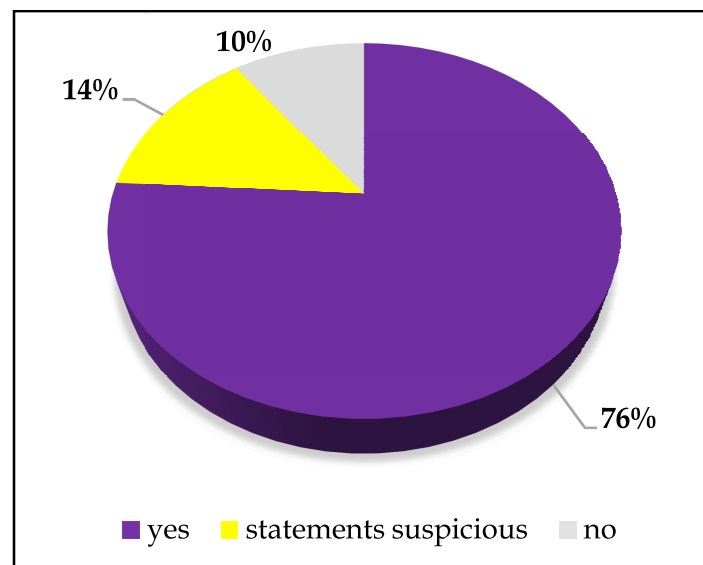
- About 58% of respondents said that participants in reality TV shows are imposed with other people's opinions, and 21% did not answer. This reinforces production marketing and the previously mentioned paradox.
- About 67% of respondents registered complete disrespect among reality TV participants, which enters into the so-called vicious circle of production marketing and cognitive dissonance paradox.
- A majority of respondents (78%) noted that the imposed communication models from reality TV spread in society, while 16% did not answer (Chart 2.).

Chart 2. The spread models of reality in society



- Hate speech does not align with ethical standards and norms, as 50% of respondents significantly stated (t-test = 15.554; $p < 0.05$) that reality TV contains "completely inappropriate hate speech."
- Opinions were divided on whether reality TV is used for political purposes. Around 46% of respondents stated that reality TV is not used for political purposes, and 34% said it is used for political purposes. Meanwhile, the majority (76%) believes that reality TV represents an image of the society in which it is broadcast (Chart 3).

Chart 3. The reality content is the image of the society in which it is broadcast



- The respondents' views expressed paradoxes in the domains of cognitive dissonance, the marketing imposition of opinions on reality TV participants and recipients, which is in the context of social learning.

- Thus, the social learning of negative reality communication models disrupts the cultural image in our region, which is why 83% of respondents are in favor of banning reality TV.

CONCLUSION

Reality TV content has left no one indifferent, as respondents paradoxically stated that they (do not) watch reality TV, or mostly watch it without satisfaction. When added to the divided opinions about watching it “to occupy themselves,” “instead of other options,” “for relaxation,” or “out of boredom,” the surveyed respondents expressed a "hidden" demand and a need for higher-quality reality TV content. These paradoxes are interpreted as cognitive dissonance, as respondents are expected to state that reality shows are negative and harmful, yet they critically continue to watch them.

In the context of the mentality and cultural characteristics of people in our region, the voyeuristic need of the audience to secretly follow reality content is confirmed. The most-watched genre is elimination reality TV, as opposed to music and cooking reality shows. It is also noteworthy that television productions poorly copied foreign reality shows, failing to use, or not wanting to use, positive cultural values in our region.

To change the behavioral model of the public, the cause and effect need to be questioned, as what was once considered socially unacceptable social learning in reality TV has become normal and acceptable. Cultural norms are losing the boundaries of what is acceptable, and the public is organized in opposition to today's reality shows, fully aware of the multifaceted cultural destruction. Future research should be based on projects strengthening local cultural values and the psychology of the youth mass.

REFERENCES

- Hill, A. (2005) *Reality TV: Audiences and Popular Factual Television*. London: Routledge.
- Milenković, V. (2020). Rijaliti program u globalnom društvu – od skrivene kamere do Velikog brata i Survajvera, *Kultura*, 166, str. 154-169.
- Orwell, G. (2008) *1984*. Zagreb: Alfa d.d.
- Tretter, F., and Löffler-Stastka H. (2024). Cognitive dissonance and mindset perturbations during crisis: “eco-socio-psycho-somatic” perspectives. *World J Psychiatry*. 14 (2), 215-224.
- Potter, WJ. (2003) *The 11 myths of media violence*. London: Sage.
- Coyne, SM., Robinson, SL. and Nelson, DA. (2010) Does Reality Backbite? Physical, Verbal, and Relational Aggression in Reality Television Programs. *Journal of Broadcasting & Electronic Media* (online), 54(2). str. 282-298. Available on: <https://www.tandfonline.com/doi/full/10.1080/08838151003737931>

Reading Cultures in Transition: From 19th-Century Ionian Societies to Modern Reading Clubs

Lect. Dr. Yanna DIMITRIOU

Ionian University, Department of Archives, Library Science and Museology, Greece

Abstract

The present study originated from my research on reading habits in the 19th-century Ionian Islands. It appears that the dominance of 'extensive' reading over 'intensive' in 19th-century Europe influenced reading habits, prompting intellectuals to seek mechanisms that would facilitate the dissemination of books and the reading of newspapers. This was often achieved through the establishment of reading rooms and reading societies or clubs, founded either by booksellers or by private individuals. The Ionian Islands, influenced by Western cultural trends, were among the first to adopt these evolving habits and formed voluntary associations that through the practice of extensive reading, broadened scientific, social and political horizons while promoting intellectual cultivation. The primary aim of this research was to examine the characteristics of these voluntary organisations, as well as the profiles of their members, in order to illuminate the nexus between civic society and reading in the long 19th century. Book selection and purchase became collective activities, fostering the formation of a sociable community engaged in the pursuit of mutual intellectual benefit, where readers were not only influenced by the texts themselves but also by the broader discourses surrounding reading, which often extended beyond the texts to encompass a wide range of issues.

So building on this foundation, the present article seeks to extend the study to contemporary reading clubs and modern readers, exploring their reading habits within the broader context of the evolution of reading culture in Greece. Are there any shared characteristics between past and present reading practices or readerships? Who reads today and who joins reading clubs? What are their motives and objectives? Those are some of the key questions this article aims to address, with a goal of encouraging further research in the field.

Keywords: Reading Clubs, Reading Societies, Social Reading, 19th-Century Readers, Modern Readers

Introduction

Since the invention of typography in the 15th century, every aspect of intellectual activity has revolved around printed material and books. Only in recent decades have e-books and audiobooks emerged. For over 500 years, discussions about literature have also been an integral part of book civilisation, taking place in gatherings of varying formality -

from Renaissance academies of scholars and 18th-century salons to 19th-century literary and reading societies and contemporary book clubs.

This study aims to examine way both past and present readers who establish reading-centred voluntary associations to discuss the books they read. It explores the genres of books they select, whether these preferences have changed over time, and what motivates them as readers.

The topic under consideration necessitates a continuous co-examination of emerging issues. Therefore, the study moves from local to national and European contexts, documenting the transition from the reading societies of the Ionian Islands and European states to contemporary book clubs.

Information was gathered using a combination of methods, including historical and archival research, bibliographical analysis, statistical records, and questionnaires addressed to modern readers. These approaches provided valuable insights and led to several significant conclusions.

19th-Century Reading Societies

In 19th-century Europe, the prevalence of *extensive*¹ reading created a new reading public that demanded more books and information, which were consumed rapidly and avidly (Jackson, 2004: 1050). This period marked the golden age of fiction and an era of profound technological, social, economic, political, and ideological change.

At the time, the Ionian Islands were a British Protectorate, having previously been part of various European states.² Their long history of close ties with Europe had shaped a distinct cultural identity. Consequently, similar institutions were established there, as the local population was heavily influenced by European cultural trends. The upper social classes - nobles and upper-middle-class citizens - had the opportunity to travel and study at European universities, particularly in Italy, and actively participated in the cultural and intellectual developments of their time (Dimitriou, 2024: 203-209). Scholars' academies in the 17th century, patriotic revolutionary societies in the 18th century, and lodges were among the early institutions that fostered a reading public. By the 19th century, intellectuals in the Ionian Islands, inspired by Western European trends, had begun forming reading societies that promoted *extensive* reading as a defining characteristic of the emancipation of the more privileged social classes (Dimitriou, 2024: 203-209).

Between 1815 and 1864, Corfu Town – the administrative centre of the Ionian State and a thriving hub of economic and social activity – saw the emergence of bookshops, which began publishing their own catalogues (Dimitriou, 2024: 169–170). The Ionian Academy, the first public Greek university, was founded in 1824. Three *Gabinetti di Lettura* (reading clubs) were established by booksellers, alongside another founded by a renowned scholar and teacher. Additionally, twelve voluntary associations dedicated to books and reading were also formed³ (Dimitriou, 2024: 179-203).

¹ Even though Engelsing's term has not been fully accepted, it remains a useful framework for understanding the emerging reading practices of the late 18th and 19th centuries. It is widely acknowledged that reading habits changed during this period, with the reading public demanding more books and information, influenced not only by the texts themselves but also by the discourses surrounding reading.

² The history of the Ionian Islands is unique and distinct from that of the rest of Greece, allowing them to be considered sometimes a separate region. In the 13th century, they came under the control of various European powers of the time, including the Angevins (1267-1386), Venetians (1204-1214, 1386-1797), French (1797-1799, 1807-1815), and the Septinsular Republic under Russian and Ottoman protection (1800-1807), before becoming a British Protectorate (1815-1864). They remained under British rule as the *United States of the Ionian Islands*, or *Ionian State*, until 1864, when they were united with the Kingdom of Greece.

³ The Ionian Biblical Society (1819), Society for the Promotion of the Greek Language (1816), British Military Reading Club (before 1823), Literary Committee (1833), Literature Society of Corfu (1836), Reading Society of Corfu (1836), Friends of

The Reading Society of Corfu, which continues to exist and thrive today, provides valuable archival material that helps trace 19th-century reading trends and the profile of readers. The society's founding members⁴ were primarily motivated by the need to access more information about global events - an imperative in the rapidly changing world of the 19th century and within the evolving conditions of the bourgeois public sphere. According to records of their sessions, readings and discussions fostered a shared intellectual journey towards enlightenment, aiming to establish reading as a common practice among the urban classes.

The selection of books, prestigious newspapers, and journals of informational and scientific interest from various European countries facilitated the dissemination of practical knowledge. Reading was regarded as a means of self-improvement, with leisure time devoted solely to purposeful and enriching pursuits. Notably, these individuals sought to overcome the challenges they faced as young intellectuals, particularly their limited access to the publications they wished to read. The only available newspaper was the *Official Gazette*; however, their studies in Europe had already instilled in them an openness to a broader range of reading materials (Dimitriou, 2024: 277-288, 331-333, 357-358).

The founding members of these societies were primarily doctors and lawyers - the most educated and respected individuals among the urban elite. Needless to say, at that time, membership was restricted to men, and particularly those who had the right to vote.

The case of the Reading Society is particularly telling. Between 1836 and 1864, 36 of its 95 founding members were lawyers (or had studied law), comprising 34% of the total, while 21 were doctors (or had studied medicine), accounting for 26%. Additionally, three were pharmacists/chemists, three were merchants, one was a painter, two were insurance agents, four were landowners, and one was a professor of Italian literature. Most had attended private schools in Corfu or had private tutors before continuing their studies at European universities. Thirty-seven (40%) pursued higher education in Italy - Pisa being the most popular choice, with 21 students - while ten studied in France (Paris), one in England, one in Geneva (Switzerland), and one in Istanbul (Ottoman Empire). Four attended the Ionian University. Notably, twelve individuals pursued graduate or postgraduate studies at more than one university.

According to available data, the majority (57%) were between 19 and 30 years old, followed by 26% aged 31-40, 9% aged 41-50, and 8% over 50. Most were friends or relatives (Dimitriou, 2024: 249-253).

These societies were thus founded by prestigious and highly educated individuals, both young and old, who sought to promote intellectual cultivation while maintaining their influence and social standing. Staying informed, keeping up with European developments, contributing to public discourse, and shaping public opinion were among their primary objectives. These cosmopolitan, multilingual, and well-educated individuals were also writers, and though they did not always state it explicitly, they harboured political ambitions.

The long 19th century was marked by the revolutions of 1830, the revolutionary wave of 1848 (the Springtime of Nations), and the Italian *Risorgimento*, which spread the ideas of democracy, liberalism, radicalism, nationalism, and socialism with increasing force. Ionian elites, influenced by their education and continuous engagement with contemporary events,

Knowledge 'Philomathon' Society (1845), lending library 'Biblioteca Circolante Nazionale Ionia' (1847), Literary and Filodramatic Society (1847), Panellinion (1849), Istituto Israelitico di Corfù (1843), Nuovo Gabinetto di Lettura Circolante con Dono Mensile (1859), and Ionian Society (1859) were among the institutions formed this period. Similar institutions were founded in the other Ionian Islands as well.

⁴ Members were divided into two categories founding members and contributors (i.e. plain members). Each group had different obligations and rights within the Society.

were receptive to reform. Political parties began to take shape, and after the freedom of the press was granted in 1848, they moved to publish their own newspapers to express and promote their views. As the century progressed, the Ionian urban elites gained economic and social power. Their goal was to participate in political affairs and establish themselves as influential players in decision-making (Gekas, 2016: 287-324).

Within these associations, an audience of engaged and reflective citizens gathered, primarily seeking to stay informed, participate in the public sphere, and contribute to decision-making. During this pivotal period of rapid economic, political, and social change, the connection between civil society and reading was particularly striking. Examining the networks of individuals within voluntary associations provides valuable insight into the evolution of ideas and the shaping of identities.

It was a transitional era when emerging nationalist ideas began to gain traction, circulating through the press and books. This period marked a historically significant turning point. In response, British authorities imposed restrictions, including the closure of clubs and societies or the limitation of their activities. These associations, however, maintained that their objectives were purely educational and cultural, denying any political involvement.

Following unification with the Greek State (1864–1914), the founding members included lawyers (20), doctors (8), merchants (5), literature professors and writers (4), and entrepreneurs or industrialists (2).⁵ Many members – just as in the previous period – held multiple roles, also serving as mayors, members of parliament, or parliamentary candidates, as well as writers, poets, and journalists.

This period marked a phase of adjustment to the new national context, making access to information crucial once again - though now with a stronger national focus. During this time, the Reading Society built an impressive library while also introducing card games, billiards, and lectures for its members (Dimitriou, 2024: 363-372, 400-407).

By the late 19th century (1884), the Reading Society began admitting women as contributors, though not as founding members. Research thus far suggests that women from the urban elite did not establish their own reading clubs during the 19th century; instead, their societies tended to have a more philanthropic character. However, as education expanded, women naturally emerged as a new reading audience, prompting booksellers and some book clubs to cater to their growing demand for books (Dimitriou, 2019: 124).

20th-Century Readership

The 20th century witnessed the expansion of libraries and the increasing availability of books. In Europe, compulsory education led to widespread literacy. The production of printed books grew significantly, making reading more accessible to the general public.

The post-war era in the Ionian Islands, however, marked a period of decline. Statistics from 1971–1973 indicate that Corfu had no public library, only two municipal libraries with a total of four staff members. Their collections comprised 1,812 books and 80 journals, with only 26 books purchased and 25 received as donations in 1973. The number of readers was relatively low - 870 registered readers and 1,790 books borrowed - compared to other Ionian Islands.⁶

⁵ The remaining thirteen members held diverse roles, including chief secretary of the Criminal Court, branch director of the National Bank, owner of an insurance company, priest, professor, landowner, accountant, military officer, engineer, notary, bank clerk, writer, and painter.

⁶ Zakynthos had a collection of 34,092 books across one public and one municipal library, serving 6,302 readers. Kefalonia's two public libraries housed 44,941 books with 5,121 readers, while Lefkada's single public and municipal library held 12,910 books and served 1,520 readers.

Table 1. *Libraries in Corfu 1971-2022 (ELSTAT, 1975, 1978, 1984, 1993, 2000, 2022)*

Years	Libraries					Total Libraries	Personnel	Books (Titles)	Readers (in Library)
	Public	Municipal	Public Entity	Private Entity	Another Type of Library				
1971-1973	–	2	–	–	–	–	4	1,812	870
1975	1	4	–	2		6 (5 open to public)	6	51,949	1,763
1982	–	–	–	–	–	11 (9 open to public) ⁷	–	33,496	2,158
1990	–	–	–	–	–	11 (9 open to public) ⁸	–	89,460	4,395
1997	–	–	–	–	–	13 (9 open to public)	–	84,184	20,700
2022	–	–	2	1	1	4 (3 open to public)	19	201,463	22,185

Statistics show that, over the years, libraries gradually gained readers and expanded their collections with books, journals, and manuscripts.

The 1990s was an important decade for books and reading. In 1994, the National Book Centre (E.KE.BI.), supervised by the Ministry of Culture, was founded with the aim of promoting reading and books.⁹ E.KE.BI. worked on forming a national network of reading clubs in public and other libraries. This marked the beginning of a shift. As the role of libraries gradually changed, they became more outward-facing, open to the public, and increasingly appealing to readers. The network of Libraries with Reading Clubs started promisingly with 58 members (Rouvalis, 2012: 42-43).

The book market in Greece has been steadily growing since 1974, with a significant acceleration in this upward trend during the 1990s. Between 1988 and 1999, Greek household spending increased tenfold, which naturally impacted the book market, according to data from the Hellenic Statistical Authority (Kambouropoulos, 1999: 1-10).¹⁰

Adult and children's literature dominated book production, accounting for 39.1% of new titles published between 1998 and 2001. However, a 1999 survey revealed that only 38% of the adult population identified themselves as 'book readers', with just 8.5% reporting that they read more than ten books per year. According to Eurobarometer data from 2001, Greece ranked last among EU member states in terms of book readership.

21st-Century Reading Culture: Readers, Publics and Book Clubs

The Organisation for the Collective Management of Literary Works (OSDEL) conducted research on books and readership in Greece during 2021-2022. The findings

⁷ It is noted that they did not lend books.

⁸ Seven libraries did not lend books.

⁹ In 2014, E.KE.BI. was abolished, and all its responsibilities and assets were transferred to the Hellenic Foundation of Culture.

¹⁰ Research compiled by the Book Observatory of E.KE.BI. indicated that Greek household spending on books at current prices reached €399.4 million in 1999, compared to €221.6 million in 1994, €39 million in 1988, and just €3.1 million in 1974. This means that, in 1999, Greek households spent on average 126 times more at current prices and four times more at constant prices on book purchases than in 1974. When public spending on books is factored in, the total expenditure on book purchases in 1999 amounted to €449.6 million. The Greek state allocated approximately €50.2 million for book acquisitions that year, of which €20 million was spent on purchases for public libraries of all types.

revealed that 34% of respondents were non-intensive readers, while intensive readers accounted for 31%. Literature consistently ranks as the most preferred genre, followed by history and crime fiction, with notable differences observed based on gender. The pandemic further reinforced reading habits, particularly among young people and intensive readers.

At the turn of the millennium, approximately one-third of people identified as readers, though this does not necessarily indicate participation in reading activities or book clubs (Stefanska, 2022: 63-68). However, book clubs and discussions about books have become increasingly popular. Today, public and municipal libraries, bookshops, publishing houses, educational institutions, and other organisations in Greece have established reading clubs as an integral part of their policies. People also gather in more informal groups at homes, cafés, and restaurants to discuss books they have previously agreed to read.

The first decades of the 21st century have seen a rise in the number of book clubs. Libraries have formed clubs as part of literacy promotion projects, and reading and conversation clubs have also emerged as a reflection of people's growing interest in socialising with a purpose. These clubs tend to be voluntary and informal, yet they provide valuable learning spaces and opportunities to form friendships based on shared interests. Research also suggests that people turn to books and discussions as a way of coping with difficult times (Machin & Coughanour, 2019: 503-506).

The Corfu Reading/Book Club was founded in 2006 as a face-to-face book club. The initiative was led by writer and professor Antonis Dessillas, in collaboration with the Corfiot publishing house ALDE, as part of the effort to promote reading through the establishment of book clubs under the guidance of E.KE.BI. Other founding members also contributed to this initiative.

Club members do not merely discuss the books they read; they also invite renowned authors to present their work and engage in discussions with the reading public. Writers who have participated so far include Dimitrios Mamaloukas, Sotiris Dimitriou, Thanassis Chimonas, Rena Petropoulou, Yannis Kiourtsakis and George Chronas.

The club has become one of the island's key cultural hubs and a significant point of reference for literary discussions. It follows the traditions of 19th- and 20th- century literary clubs, emphasising the importance of discussion and critical analysis of texts. In an era where cultural institutions face increasing challenges, the Corfu Reading Club strives to remain active and dynamic, offering its members opportunities to explore the world of literature.

Members read both Greek and world literature and essays. In 2024, the club read works by Pavlos Matesis, Gustave Flaubert, José Saramago, and Hermann Hesse, while discussions focused also on the writings of Leo Tolstoy and Elizabeth Gaskell. The club actively participates in the Francophonie Reading Marathon (Marathons de lecture pour la Francophonie), supports book presentations, and promotes literature and a culture of reading. Each year, it celebrates the New Year by cutting the traditional cake and honouring Corfiot writers and poets in an effort to encourage local literary production. The club serves as a permanent meeting point where members can form friendships, exchange ideas, and continuously promote culture and collective critical thought (Komboliti, 2025; Koronaki, 2025). Most members are women (17 of 21) and all are university graduates, with some having completed postgraduate studies. They work mainly as teachers, lawyers, and civil servants. The majority are over 50 years old.¹¹

Moreover, advances in communication technologies have facilitated the growth of online reading clubs, particularly on platforms such as Facebook (Gazit et al., 2023: 259-283). These virtual communities expanded significantly during the COVID-19 pandemic and

¹¹ I would like to express my gratitude to Mr Antonis Dessillas, the founder, and Mrs Maria Kourkoulou, who generously provided me with valuable information about the operation of the book club.

appear poised to continue thriving due to their flexibility. In fact, such communities now seem to rival face-to-face book clubs.

Virtual book club members tend to be younger than those in traditional, in-person clubs (Sedo, 2003: 66-90). The vast majority of book club members hold university degrees, with many also possessing postgraduate qualifications. In virtual book clubs, there are slightly fewer highly educated members, possibly because the environment feels less intimidating or because anonymity encourages broader participation. Most members work in communication, education, and administration (Sedo, 2003: 66-90).

One such example is the Greek publishing house Metaichmio,¹² which established book clubs in 2007.¹³ Its online Classic Literature book club was launched in September 2015, focusing on classic works of world literature from the 19th and early 20th centuries. The club has between 15 and 20 members, three of whom are men, while the rest are women.

One of the male members works as a researcher at a university medical school. The other two both retired and from Greece, previously worked as a bank clerk and a typographer. The female members also from Greece, include retired schoolteachers, secondary school teachers, lawyers, public servants, and a translator of Turkish. Two members work as architects, while two or three are teachers. Most of the members are over 40 years old. As the meetings are held online, participants join from various locations, including Corfu, Thessaloniki, Elis, and Sweden. Their primary motivations for participating are communication, exchanging ideas, and engaging in discussion. Many also mention that they read books they would not have chosen otherwise.¹⁴ All members take an active role in discussions, demonstrating a strong level of engagement and commitment.

Members of the Crime Fiction Club are also predominantly university graduates, with ages ranging from their 30s to over 80. Attendance at the monthly meetings is optional. Women make up a significantly larger proportion of the club, accounting for 80% of members, despite the club's focus on crime fiction. Members join primarily due to their passion for the genre and their enthusiasm for discussing books. The discussions encompass both the literary aspects of the works and their forensic elements. Members are also interested in hearing different perspectives, even when they differ from their own.

The findings of this study align with similar research, which consistently shows that modern readers generally read more for pleasure than for work. Their main motivations include gaining knowledge, escaping reality, and discovering the world. However, the reasons for joining book clubs do not differ significantly, as members frequently cite intellectual stimulation, enjoyment, exposure to a variety of books, and engaging discussion as key motivations (Sedo, 2003: 66-90). For women, participation can also serve as a means of escape and a way to combat loneliness. The fact that most book club members have been avid readers since childhood and that their parents or grandparents were also readers, supports theories of social practice (Bourdieu, 1992: 52-65; Tselenti, 2015: 130-131, 137-144).

Studies in Greece confirm a strong correlation between educational attainment and reading habits - respondents with higher levels of education scored higher on the book reading index. Additionally, the educational background and professions of respondents' fathers, mothers, and paternal and maternal grandfathers were positively associated with higher values on the index.

¹² Metaichmio Book Clubs. Available at: <https://www.metaixmio.gr/el/blogPost/oi-lesxes-anagnoshs-ton-ekdoseon-metaixmio>

¹³ I would also like to express my sincere gratitude to Metaichmio Publications, Mr Yannis Stamos, Events & Public Relations Manager at Metaichmio Publications, for granting permission, as well as Mrs Chrysa Spyropoulou, Coordinator of the Classical Literature Reading Club, and Mrs Olga Georgiadou, Coordinator of the Crime Fiction Reading Club, for their kind assistance and for providing valuable information about the operation of the online clubs.

¹⁴ This is a common sentiment among all book club members.

The socio-economic status of a household also plays a significant role: the higher the socio-economic class, the greater the number of books read by respondents. This reflects not only an increased level of reading but also a heightened sense of the 'need to read' – a disposition shaped by education and cultural capital (Bourdieu, 1992: 123).

Conclusions

In the 19th century, members of book clubs and reading societies sought to understand the rapidly changing world around them while shaping their identities in terms of social status and political ideas. Members of the upper or middle urban classes did not consider it appropriate to spend their leisure time on frivolous entertainment; instead, they believed it should be dedicated to meaningful and enriching activities shared with like-minded individuals of similar social standing. After all, it was the Victorian era in Britain, a time when even leisure was to be taken seriously (Dimitriou, 2024: 61-64).

Today, while the idea of taking leisure seriously remains significant for book club members, an equally important aspect is the sense of escape from the routine of daily life through reading and discussing books. Both in-person and virtual book clubs provide a space where participants can freely express their opinions and emotions in a supportive environment. People come to understand themselves in relation to the text and other club members. As one participant put it, 'Through books, we get to know each other; we realise how differently everyone interprets the same text, depending on who they are and their personal experiences' (Dimitrakopoulou, 2022).

Even when conducted virtually, book clubs are regarded by their members as serious leisure activities, with participation characterised by regularity and commitment.

In the 19th century, reading societies were predominantly male-dominated, consisting of men who sought to stay informed and socially engaged. Many were also writers, and when circumstances allowed, they published newspapers, became journalists, and asserted their right to shape public opinion and participate in political and social activities. At that time, it seems that, under the auspices of the reading associations, intellectuals from the upper middle classes aimed to mobilise all available human resources to create communication networks that would advance their ideas and goals (Dimitriou, 2024: 324-325). Today, studies consistently confirm the predominance of women in all types of book clubs (Gazit et al., 2023: 259-283; Sedo, 2003: 66-90, Tselenti, 2015: 130-131). While contemporary book club members are generally not writers themselves, some clubs encourage creative writing as part of their activities.

In relation to this finding, it is important to consider the genres of books that members choose to read. Research on reading societies in 19th-century Ionian Islands reveal that members primarily selected books related to their professions such as medical texts, law books, scientific journals, and newspapers. Fiction and poetry were notably absent from their choices, which stands in stark contrast to today's book clubs, where the majority focus on fiction, while academic or specialised book clubs are far less common.

Today's book club members describe their experience as a journey between fictional and real worlds, contributing to the development of self-identity.

Although various programmes have been introduced to promote literacy and intellectual enrichment through reading, the majority of book club participants still belong to the upper middle classes – most hold academic degrees, have well-paid jobs, or work in professions related to higher education.

Research confirms that reading, and particularly engagement with books, is recognised as a symbolic good primarily by those who possess the necessary cultural and intellectual resources to interpret and appreciate it. The ability to engage with books in this

way is not innate but rather historically and socially constructed, requiring familiarity with the recognised codes that enable symbolic appropriation and comprehension (Bourdieu, 1992: 112-121).

REFERENCES

- Bourdieu, Pierre (1992). *The Logic of Practice*. Stanford: Stanford University Press.
- Dimitrakopoulou, Valia (2022). *Book Clubs Are the New Circles of Friends*. <https://www.kathimerini.gr/k/k-magazine/> (Accessed: 22-8-2022) (in Greek)
- Dimitriou, Yanna (2019). Books and reading in the Ionian Islands during the first half of the nineteenth century. *Proceedings 11th International Panionian Conference Life and Culture in the Ionian Islands Social History, The Press, Music, Theatre. The Ionian Islands today, Vol. 3*, pp. 111-138. (in Greek)
- Dimitriou, Yanna (2024). *Approaches to the History of Reading and Reading Associations in the 19th-Century Ionian Islands: The Case of the Reading Society of Corfu*, Athens: Institut du Livre-Kardamitsa. (in Greek)
- Gazit, Tali; Mass, Hadar; Bronstein, Jenny (2023). Examining Facebook Groups Engaging in Reading Experiences: The Interactive Therapeutic Process Perspective. *Empirical Studies of the Arts*, Vol. 41, No 1, pp. 259-283.
- Gekas, Sakis (2016). *Xenocracy. State, Class, and Colonialism in the Ionian Islands, 1815-1864*. New York - Oxford: Berghahn Books.
- Hellenic Statistical Authority (ELSTAT) (1975) *Statistics on Culture 1971-1973*, Athens, p. 15, http://dlib.statistics.gr/Book/GRESYE_02_0401_00001.pd (Accessed: 7-2-2025).
- Hellenic Statistical Authority (ELSTAT) (1978) *Statistics on Culture 1975-1976*, Athens, p. 32-35, http://dlib.statistics.gr/Book/GRESYE_02_0401_00003.pdf (Accessed: 7-2-2025).
- Hellenic Statistical Authority (ELSTAT) (1984), *Statistics on Culture 1981-1982*, Athens, p. 19-22, http://dlib.statistics.gr/Book/GRESYE_02_0401_00006.pdf (Accessed: 7-2-2025).
- Hellenic Statistical Authority (ELSTAT) (1993), *Statistics on Culture 1989-1990*, Athens, p. 19-22, http://dlib.statistics.gr/Book/GRESYE_02_0401_00010.pdf (Accessed: 7-2-2025).
- Hellenic Statistical Authority (ELSTAT) (2000), *Statistics on Culture 1995-1997*, Athens, p. 19-24, http://dlib.statistics.gr/Book/GRESYE_02_0401_00013.pdf (Accessed: 7-2-2025).
- Hellenic Statistical Authority (ELSTAT) (2003), *Statistics on Libraries 2002*, Athens, <https://www.statistics.gr/el/statistics/-/publication/SCI06/-> (Accessed: 7-2-2025).
- Jackson, Ian (2004). Approaches to the History of Readers and Reading in Eighteenth-Century Britain. *The Historical Journal*, Vol. 47, No. 4, pp. 1041-1054.
- Kambouropoulos, Socratis (1999). The Optimistic Message from the Growth of the Book Market in Greece. *Book Observatory E.KE.BI.*, pp. 1-10. (in Greek)
- Komboliti, Korina (2025). *Corfu Book Club. Enimerosi 1-2-2025*. Available at: <https://enimerosi.com/culture/94089/gnoriste-tin-lesxi-anagnosis-kerkuras> (Accessed: 25-2-2025). (in Greek)
- Koronaki, Eleni (2020). *Corfu Book Club. Enimerosi 16-1-2020*. Available at: <https://enimerosi.com/culture/39962/I-Lesxi-Anagnosis-Kerkuras-kobei-tin-pita-tis-kai-giortazei-ta-14-xronia-leitourgias-tis> (Accessed: 20-1-2025). (in Greek)
- Machin-Mastromatteo, J. D.; Coughanour, G. L. R. (2019). The rise of reading and conversation clubs during Chihuahua's violent times. *Information Development*, Vol. 35, No 3, pp. 503-506, <https://doi.org/10.1177/0266666919855147>
- Rouvalis, Vassilis (2012). *Network of Libraries with Reading Clubs*, Available at: lekythos.library.ucy.ac.cy (Accessed: 7-2-2025). (in Greek)
- Sedo, Rehberg DeNel (2003). An Online Survey of Face-to-Face and Virtual Book Clubs. *Convergence*, Vol. 9, No 1, pp. 66-90, <https://doi.org/10.1177/135485650300900105>
- Stefanska, Konstantina Anna (2022). *Literacy Programs in Municipal Libraries*, Thesis, Department of Archival, Library and Information Studies. Athens. (in Greek)
- Tselenti, Danai (2015). *The Gifts of Reading: Practices in a Crime Fiction Book Club in Athens*. Doctoral Thesis. National and Kapodistrian University of Athens. (in Greek)

Recent Developments in Greece Business Administration: A Bibliometric Review

Dr. Zacharias PAPANIKOLAOU
Democritus University of Thrace, Greece

Apostolos GOULAS
University of Thessaly, Greece

Abstract

Business administration in Greece is shaped by the country's economic structure and regulatory framework. While the Greek economy has transitioned from agriculture to services, challenges persist in areas like bureaucratic inefficiency and complex tax laws. However, recent reforms, particularly in digitalization and entrepreneurship, aim to improve administrative processes. These efforts, alongside Greece's integration into the European Union, contribute to a gradually more competitive and business-friendly environment. The use of VOSviewer software requires data, which can be retrieved from indexing services such as Scopus, Web of Science, etc. In this particular application of VOSviewer, data was obtained from the Scopus indexing service. The keywords used were "Greece," "business," and "administration" to locate them in the titles, abstracts, and keywords of the corresponding publications. A total of 76 publications were extracted from the Scopus database for the search period from 1992 to 2024. In the last decade, there were 39 publications, compared to just 3 during the period from 1992 to 2002. Using VOSviewer, three clusters were created based on the keyword categorization of the publications. Cluster 1 contains keywords related to e-government, Cluster 2 includes public administration activities, and Cluster 3 contains keywords associated with the education level.

Keywords: Business Administration, Analysis, Business Strategy, Management

Women and Business Management: A Bibliometric Review

Dr. Zacharias PAPANIKOLAOU
Democritus University of Thrace, Greece

Apostolos GOULAS
University of Thessaly, Greece

Abstract

Women in business management play a crucial role in shaping organizational strategies and fostering innovation. Despite persistent challenges such as gender disparities in leadership, women are progressively assuming top managerial positions. Their contributions enhance decision-making processes, improve organizational performance, and drive sustainable growth. Promoting gender diversity in management not only aligns with corporate social responsibility but also significantly contributes to economic development and the long-term competitiveness of businesses in a globalized market. The use of VOSviewer software requires data, which can be retrieved from indexing services such as Scopus, Web of Science, etc. In this specific application of VOSviewer, data was obtained from the Scopus indexing service. A total of 313 publications were extracted from the Scopus database for the search period from 1977 to 2023. In the last decade, there were 143 publications, compared to just 2 during the period from 1977 to 1987. Using VOSviewer software, seven clusters were created based on the keyword categorization of the publications. Cluster 1 contains keywords related to gender, Cluster 2 includes those related to women, Cluster 3 relates to management, Cluster 4 focuses on leadership, and finally, Cluster 5 includes keywords related to entrepreneurship.

Keywords: Business Management, Analysis, Business Strategy, Management

Navigating Regulatory Challenges and Opportunities in FoodTech Startups: Fostering Innovation in a Complex Ecosystem

Ulviyya MAMMADOVA

Researcher, Azerbaijan Technological University, Azerbaijan

Abstract

The regulatory landscape plays a pivotal role in shaping the FoodTech startup ecosystem, influencing innovation, market feasibility, and the overall growth dynamics of entrepreneurs. This article explores the challenges posed by food security regulations, labeling laws, and environmental policies, alongside the potential opportunities for fostering innovation through adaptable regulatory frameworks. Additionally, it discusses the importance of collaboration between entrepreneurs, regulators, and research institutions in cultivating a sustainable and dynamic startup ecosystem. Strategies for improving collaboration and regulatory approaches are proposed to enhance market opportunities, promote sustainable practices, and support entrepreneurial growth in the FoodTech sector.

The FoodTech industry is undergoing rapid technological advancements, driven by innovation and evolving consumer preferences. However, the sector is often constrained by a complex regulatory framework that includes food security regulations, labeling laws, and environmental policies. These regulations pose significant challenges to FoodTech startups, particularly in terms of compliance costs and market entry barriers. Despite these obstacles, regulatory frameworks have the potential to act as catalysts for innovation if designed with flexibility and foresight. This paper explores the role of regulations in shaping the startup ecosystem in the FoodTech industry, emphasizing how regulations can both hinder and enable growth, and how collaboration between stakeholders can foster a more dynamic and sustainable ecosystem.

Keywords: Startup, Innovation, Foodtech, Ecosystem, Food Industry

Introduction

Startup Foodtech represent a flourishing sector within the wider agro-food panorama, characterized by their innovative approaches to production, distribution and food consumption. Taking advantage of advanced technologies - which move from biotechnology and artificial intelligence to sustainable practices - these startups are facing critical challenges in food safety, the efficiency of resources and environmental sustainability. As indicated by Nuthalapati et al. (2020), the dynamic nature of the food value chain requires that startups adopt agile methodologies to remain competitive and reactive. However, their transformative potential is often hindered by a fixed regulatory panorama that varies significantly between the geographical regions. These regulations include a multitude of

aspects, including food safety standards, labeling requirements and environmental impact assessments, which are all essential to guarantee consumer protection and public health.

The regulatory challenges faced by food startups can be particularly discouraging due to the faceted nature of the food industry, which is influenced by different parties concerned, including governments, health organizations and consumers. Startups must not only comply with local regulations, but also consider international standards when expanding the scope of the market. In addition, the iterative and experimental nature of many food innovations means that startups often operate in gray areas of existing regulations, in which the guide can be unclear or obsolete. This ambiguity can result in delays in product development and in the entrance of the market, as well as substantial costs associated with compliance.

The need for solid regulatory paintings is amplified by the rapid rhythm of the innovation that occurs in Foodtech. For example, technologies such as meat grown in the laboratory, alternative protein sources and precision agriculture require new standards that meet their unique attributes and guarantee consumer safety. Inconsistent regulatory approaches can suffocate innovation and limit the potential benefits that these emerging technologies can offer to food systems. Therefore, the navigation of this complex regulatory environment is essential for food startups to exploit the opportunities for growth and innovation.

While Foodtech startups strive to develop new solutions, their success depends on their ability to effectively manage regulatory needs. The development of an in -depth understanding of the regulatory panorama is fundamental, as it establishes relationships with regulatory bodies to facilitate the ongoing dialogue and influence the evolution of food policies. In addition, the strategies that promote collaboration with other parties interested in the food ecosystem, such as the actors of the established sector and academic institutions, can contribute to a more favorable regulatory environment. By actively committing to defense efforts and promoting public awareness of their innovations, startups can model a regulatory context that is more favorable to technological progress while guaranteeing safety and compliance.

Materials and methods

In summary, the intersection of innovation and regulation within the Foodtech sector embodies a complex interaction that requires adaptive strategies. The multifaria nature of the regulatory challenges, aggravated by the various landscapes between the regions, highlights the critical importance for startups not only to give priority to compliance, but also to embrace the regulatory commitment as an innovation facilitator. While the food industry continues to evolve, the startup ability to navigate in these complexity will significantly influence their trajectory and the wider impact they have on the food ecosystem., Navigating in the complex regulatory landscape is an essential element of innovation for foodtech startups. Regulatory executives are built with the aim of ensuring public security, promoting fair competition and protecting environmental interests. However, these regulations can paradoxically both facilitate innovation by providing a clear operational framework and laying significant obstacles that hinder the agility of emerging companies. According to Rodriguez Cardenas (2024), understanding and the response adequately to regulatory requirements can allow startups not only to comply with existing standards but also to identify sustainable development opportunities. By recognizing the double nature of regulatory frameworks, startups can be positioned strategically to take advantage of specific aspects which promote their innovative capacities while simultaneously relating to conformity challenges.

The importance of regulatory consciousness is underlined by the idea that regulations are not static; They evolve in response to technological progress and changes in consumer preferences. Foodtech startups operate in a particularly dynamic ecosystem characterized by rapid change and transformation. Consequently, a proactive approach to the understanding and anticipation of regulatory trends can help these startups mitigate risks and capitalize on advantageous market conditions. The interaction between regulations and innovation require that startups develop a strong awareness of emerging regulatory pressures, in particular in fields such as food security, labeling requirements and sustainable practices.

A strategic approach to regulatory consciousness includes the establishment of synergistic relationships with regulatory agencies. Committing with government entities allows FoodTech startups to remain informed of imminent regulations, anticipate changes and contribute to dialogue surrounding the formulation of policies. This commitment can be manifested by participation in public consultations, industrial associations or working groups aimed at shaping food policy. In addition, such involvement can lead to collaborative partnerships that promote innovation and create ways to test innovative products and processes under regulatory auspices.

In addition, regulatory compliance can promote a competitive advantage when executed strategically. Startups that incorporate regulatory considerations in their commercial models and product development processes can be better placed to guarantee funding and partnerships. Investors often consider proactive regulatory compliance as an indicator of the commitment of a startup towards sustainability and ethical practices, which can influence their investment decisions. Thus, the alignment of innovation efforts on regulatory frameworks can catalyze not only compliance, but also market differentiation.

In addition, the adoption of adaptive regulatory strategies is essential for startups that hope to prosper within the food technology ecosystem. This implies not only to respond to existing regulations, but also to anticipate future trends and changes in consumer demand, such as increasing accent on transparency and traceability of food sources. Startups that use data analysis in conjunction with regulatory information can effectively navigate compliance obstacles while simultaneously improving their product offers to align with market expectations.

Understanding of regulatory subtleties has become a vital component of success for Foodtech startups. By developing a strategic regulatory awareness -raising framework, these startups can protect their innovative capacity while responding simultaneously to the complexities of the regulatory environment. This symbiotic relationship highlights the need to integrate regulatory considerations in the basic operational paradigm of food companies, ultimately leading to a more sustainable and responsible food innovation., Regulatory frameworks, often perceived as restrictions, can also serve as catalysts for innovation within the food technology sector. As mentioned by Moro-Visconti (2025), these frames are often aligned with contemporary sustainability objectives, which leads to startups to devise innovative solutions that not only meet regulatory expectations, but also positively contribute to the challenges Environmental For example, regulations aimed at reducing carbon emissions and promoting sustainable food supply can stimulate the development of alternative protein products or urban agricultural technologies, which allows new companies to establish a value proposition that resonates with regulatory mandates and consumer preferences.

In addition, the intersection of innovation and tradition articulated by Desana (2021) underlines the potential of new food technology companies to take advantage of traditional practices while adopting modern technology. This symbiotic relationship creates fertile terrain for experimentation within the established regulatory confines. For example, regulations such as the Granja Strategy to the European Union farm provide a framework

that encourages the integration of sustainable practices within the food supply chain. This creates an opportunity for new companies to innovate not only in the development of products but also in logistics and distribution, thus improving efficiency while adheres to sustainability objectives.

Specific regulations can benefit new companies offering ways to innovation. In the United States, the Federal Food, Drug and Cosmetics Law (FFDCA) and subsequent actions of the Food and Medicines Administration (FDA) have established guidelines for the evaluation and approval of new food technologies, including cultivated meats and plant-based alternatives. Startups such as Impossible Foods and Beyond Meat have successfully navigated these regulations, transforming traditional meat consumption patterns while guaranteeing compliance with health and safety standards. These frameworks provide a clear set of expectations, which allows new companies to align their product development strategies with regulatory requirements while advocating consumer safety.

In addition, initiatives aimed at promoting local food systems, such as the Local Food Promotion Program of the USDA, can empower new food companies to participate in community-centered innovations. By taking advantage of local agricultural resources and alignment with regional regulatory initiatives, new companies can effectively address the demands of consumers of organic products and local origin. This double alignment serves to improve the credibility and marketing of such new companies, creating a competitive advantage in an increasingly regulated market scene.

In the light of the complex regulatory ecosystem, new companies must adopt proactive strategies to capitalize on these opportunities. Participating in an active dialogue with regulators can provide invaluable information about the next regulatory changes and facilitate a collaborative approach to innovation. Establishing associations with academic institutions or industry associations can allow new solutions for the development of solutions that adhere to regulatory guidelines while pushing the limits of traditional food production methods.

The regulatory environment also often requires transparency and traceability, promoting new companies towards the adoption of new technologies, such as blockchain solutions or internet of things (IoT). These technologies not only facilitate compliance with food safety regulations, but also improve consumer confidence through improvements in product tracking capabilities. By integrating such innovations into their operational frameworks, new food technology companies can not only meet regulatory demands, but also position themselves as pioneers in transparency and sustainable practices within the food industry.

Therefore, through the strategic navigation of regulatory frameworks that prioritize the sustainability and well-being of the consumer, new food technology companies can discover unique opportunities for innovation, promoting the evolution of the food industry. Navigation in the regulatory landscape is crucial for Foodtech startups, given the unique challenges they face in accordance with food security, health standards and sustainability regulations. Strategic partnerships with regulatory organizations and industry stakeholders are increasingly recognized as essential to promote innovation and mitigate the risk of compliance. Shen (2024) underlines that proactive commitment with regulators can facilitate a more in-depth understanding of the regulatory framework, allowing startups to anticipate potential challenges and align their products with established standards. By participating in dialogues and by establishing relations with the main regulatory agencies, startups can obtain information that sheds light on their product development processes while promoting a feeling of confidence that can lead to more favorable regulatory results.

In addition, the construction of collaborations with industry stakeholders - including large food companies, research institutions and non-governmental organizations (NGOs) - can further improve the ability of a startup to navigate environments complex regulations. Bethi and Deshmukh (2023) argue that these partnerships offer startups access to resources, expertise and established networks which can rationalize compliance efforts while facilitating knowledge transfer. For example, large companies often have dedicated compliance departments and a wide experience in managing regulatory challenges, making it precious allies for emerging food companies. By taking advantage of these partnerships, startups can not only improve their compliance capacities, but also increase their visibility and their credibility within the industry.

In addition to forging partnerships, Foodtech startups can benefit considerably from the adoption of an open innovation approach, as Saguy (2022) points out. This framework encourages organizations to share knowledge and technology with external employees, allowing them to overcome regulatory obstacles through the collective solving problems. Open innovation promotes an environment of collaboration between various actors in the food ecosystem - ranging from universities and government institutions to industry leaders and consumers - going to the rapid exchange of ideas and solutions that are common regulatory challenges. By engaging in open innovation, startups can exploit various expertise and resources, leading to developments in innovative products that comply with regulatory requirements while meeting market demands.

The integration of feedback mechanisms in the innovation process is another essential strategy that can help FoodTech startups resolve regulatory challenges. Continuous engagement with stakeholders - including consumers, regulatory organizations and industry experts - is to refine their products according to real-time information and regulatory expectations. This iterative approach allows companies to adapt their strategies in response to regulatory changes and emerging market trends, thus promoting agility in their operations. In addition, such feedback mechanisms create a base for the establishment of relationships, as stakeholders feel valued and included in the innovation process.

Finally, proactive communication strategies are essential for foodtech startups aimed at navigating effectively against regulatory landscapes. Clear and consistent messages can help startups articulate their value proposals while educating regulators and other stakeholders on their innovative approaches and their potential benefits for public health and security. Transparency in operational practices can also improve the reputation of the company and strengthen confidence between regulators, which potentially leads to more favorable regulatory commitments. By highlighting the societal advantages of their innovations, FoodTech startups can position themselves as partners in public health, thus promoting an environment conducive to flexibility and regulatory support.

Results

Foodtech startups can adopt a multifaceted approach to navigate the regulatory challenges inherent in their industry. The training of strategic partnerships, the use of open innovation, the integration of feedback mechanisms and the use of proactive communication strategies are essential components to promote innovation while guaranteeing compliance with regulatory frameworks. The Foodtech landscape is marked by innovation promoted by new companies that continually push the limits of traditional food systems. The successful navigation of the regulatory frameworks is essential for these entities, since they seek to introduce disruptive technologies and new business models that challenge established paradigms. This section examines the cases of new food technology companies that have expert these regulatory obstacles expert while taking advantage of innovation opportunities,

taking advantage of the ideas provided by Numa et al. (2023) related to the use of technological solutions.

A remarkable case is Foods impossible, a company that has gained prominence for its plant-based meat alternatives. Navigating the complex regulatory landscape with respect to the safety and labeling of food was fundamental for impossible foods, since it sought to ensure the regulatory approval of its key ingredient: the legoglobin of the cases. The company invested strongly in the construction of a scientifically robust file that demonstrated nutritional security and equivalence to traditional meats, directly committing regulatory agencies such as drug and food administration of the United States (FDA). By participating proactively in discussions with interested parties and creating transparency around their processes, impossible foods managed to accelerate their entry to the market while establishing a model of regulatory participation that other new companies could emulate (Numa et al. , 2023).

Another outstanding example is Eat, a startup focused on food delivery solutions that has incorporated artificial intelligence to optimize logistics and improve customer experiences. When navigating the regulations on food security and restaurant associations, EAT only implemented compliance management systems, which included real-time monitoring of food temperatures and delivery protocols. Numa et al. (2023) illustrate how the company used cloud-based technologies to guarantee the fulfillment of local health regulations, which at the same time, which allows it to capture large amounts of data that facilitated greater innovation in its operational model. This strategy not only simplified compliance processes, but also improved transparency and efficiency, allowing only EAT to maintain a competitive advantage in a rapid evolution market.

In addition, Eat Just has been a pioneer in the commercialization of cells based on cells and successfully sailed the regulatory landscape surrounding cultivated meat. The Startup used its experience in the association with the regulatory authorities to advocate clearer and support policies regarding laboratory foods. By sponsoring research and promoting public awareness campaigns, EAT has only played a crucial role in the configuration of regulatory frameworks that lead to innovation while protecting public health. The company's approach illustrates the importance of collective defense to promote an environment that not only allows innovation, but insists on security and responsibility.

When evaluating the aforementioned cases, a set of best practices arises that can be applied widely within the Foodtech landscape. New companies must prioritize early participation with regulatory agencies, using solid scientific research to support their product development processes. In addition, taking advantage of technology, such as AI and data analysis, can improve compliance efforts and optimize operations. Creating interested parties to advocate transparent and support regulatory frameworks is also beneficial, since it encourages a collaborative approach to innovation.

The experiences of these new food technology companies underline the need to integrate regulatory considerations into the fundamental strategies of product development and market entry. By adopting proactive compliance measures and taking advantage of technological advances, these companies not only offer valuable lessons for new emerging companies, but also contribute to a broader discourse to balance innovation with regulatory responsibilities in the food sector. As regulatory landscapes continue to evolve, adaptability and strategies with a future vision used by these pioneers will probably serve as critical references for future entrepreneurs in the Foodtech ecosystem., The relationship between the new Foodtech companies and the regular companies play a fundamental role in the navigation of regulatory complexities within the landscape of food innovation. The holders, often armed with extensive resources, established distribution channels and deep regulatory ideas, can serve as vital allies for new companies that seek to promote innovation and climb

their operations despite the innumerable challenges raised by regulatory environments. In this context, the influence of the largest companies transcends mere competition; It evolves in a collaborative dynamic in which both entities can obtain a mutual benefit.

Mac Clay et al. (2024) Clarify the importance of corporate risk capital as a mechanism through which regular companies can support starting initiatives. By investing or associating with the new Foodtech companies, larger companies can provide the financial support necessary for the development of products and the entrance to the market, while obtaining access to new technologies and knowledge of the consumer. This symbiotic relationship allows new companies to take advantage of the experience of holders in regulatory compliance, minimizing the risks associated with the navigation of complex food safety laws and health regulations. For example, holders have legal teams and sophisticated lobbyists that can guide new companies through the labyrinth of regulatory requirements, thus accelerating their path to the market.

In addition, the innovation ecosystem model proposed by Wilkinson (2024) further reinforces the potential for collaboration between new companies and companies. In this framework, innovation does not occur in isolation; Instead, it prosper in interconnected networks where ideas, resources and capacities are shared between various interested parties. The new Foodtech companies, which operate within a broader ecosystem composed of suppliers, customers, regulators and financial institutions, can benefit significantly from the resources and knowledge offered by established companies. This collaboration approach can lead to improved product development cycles, since new companies can learn and refine their offers based on ideas obtained from industry veterans.

Regulatory challenges inherent to the food technology sector often require innovative solutions that can develop more effectively in a cooperative framework. When associated with the headlines, new companies can access data capacities and analysis that report better decision -making while benefiting from shared research initiatives. These collaborations may include joint trials for new food products, where headlines can provide their distribution networks and experience, which significantly eliminates the regulatory approval process for new companies.

It is also worth noting that the emergence of platforms and collaboration networks facilitates dialogue between new companies and the largest corporations, promoting an environment that encourages regulatory promotion. Both parties can jointly address regulatory obstacles with a unified voice, which drives systemic changes within the regulatory panorama that can benefit the entire sector. This coalescence around common objectives can amplify its influence on policy discussions, which ultimately leads to more auspicious regulatory frameworks that foster innovation instead of quelling it.

However, although these collaborative relationships present considerable opportunities for both new companies and holders, they are not exempt from challenges. The holders must continue to be aware of the potential of an innovation paradox, where their considerable market power could inadvertently suffocate the innovation themselves they intend to support. Startups, on the other hand, must navigate the complexities of aligning their agile business models with the bureaucratic structures of larger companies. The correct balance between independence and collaboration becomes crucial to foster an innovative and sustainable food ecosystem.

Discussion

In summary, the interaction between the owners and the new Foodtech companies provides fertile land to promote innovation in the midst of regulatory challenges. The strategic collaboration, backed by the corporate risk capital and the principles of innovation

ecosystems, allows new companies to take advantage of the strengths of the largest companies while adding the multifaceted regulatory landscape that characterizes the food technology sector. The regulatory panorama in developing economies is often characterized by an intricate network of systemic challenges that significantly influence operations and the growth potential of food startups. According to Bethi & Deshmukh (2023), these challenges derive from a confluence of factors such as inconsistent regulatory paintings, lack of infrastructure and insufficient institutional support. In particular, these startups often meet ambiguous guidelines of conformity that hinder their ability to surf effectively on the legal scene. For example, food safety regulations may vary widely from one jurisdiction to another, leading to difficulties in confusion and compliance between the nascent companies while trying to climb their operations in different markets.

A potential strategy for food startups to navigate in these tumultuous waters is the adoption of circular economy paintings, which have been placed as an innovative approach to harmonize compliance and regulatory sustainability. By aligning their business models with the principles of the circular economy, startups can potentially reduce the regulatory charges associated with waste management and resource consumption. This not only facilitates compliance with existing regulations, but also positions these companies favorably as they anticipate future regulatory tendencies that increasingly incorporate sustainability metrics. This approach encourages innovation because it challenges startups to rethink the operational processes and life cycles of products through the aim of sustainability, allowing them to create both economic and social value.

Furthermore, committing to local communities and interested parties is essential for food startups in developing economies to understand the socio-cultural dynamics that influence the regulatory paintings. The collaboration with local agricultural producers, for example, could serve to improve transparency and encourage innovative solutions tailored to local needs. By incorporating themselves within the community, these startups can obtain insights that allow them to more effectively support favorable regulatory changes and build a more favorable ecosystem that encourages entrepreneurship and innovation in the space of food technology.

However, it is essential to recognize that while the adoption of a circular economy framework has a path for innovation, it is not without its own series of challenges. For example, the technology and knowledge necessary to implement these framework may not always be promptly available in developing economies. Therefore, Foodtech startups may have to invest in partnerships with the academy, NGOs or affirmed companies to fill these gaps of knowledge and encourage an ecosystem in favor of sustainable innovation. In addition, the navigation of the complexities of the various regulations requires a solid understanding of local legal environments, which may require the use of specialized legal consultants who are familiar with the nuances of the regulations on food technology.

In summary, while the regulatory panorama in developing economies has formidable challenges to startup foodtechs, these obstacles can be transformed into opportunities by adopting principles of circular economy and promoting the commitment of the community. Through strategic partnerships and an innovative approach to compliance, these startups can not only navigate the regulatory panorama, but also contribute to wider environmental and social objectives. By synthesizing the findings of this research article, it is evident that Foodtech's startups operate within a highly complex regulatory landscape, characterized by challenges and opportunities. The intricate nature of food regulations, safety standards and health guidelines has remarkable obstacles that these startups should navigate. However, as documented throughout this analysis, these challenges also serve as innovation catalysts, attractive startups to develop new solutions not only for compliance but also to market differentiation.

Munshi (2019) pointed out that Foodtech's successful startups often implement adaptive regulatory strategies that allow them to quickly rotate in response to changes in laws and regulations. This approach allows an agile operational structure that prioritizes compliance while still promoting a culture of innovation. In addition, the adoption of dynamic business models that make up the regulatory forecast of their planning can serve as a competitive advantage, allowing these startups to prevent possible regulatory obstacles rather than react to them post-depth.

The role of collaboration in the Foodtech ecosystem also emerged as a significant factor in navigation in regulatory complexities. Nováková (2024) postulates that partnerships with stakeholders of the established food industry, regulatory agencies and academic institutions can provide startups critical information about the regulatory environment. These alliances support a shared understanding of compliance requirements and facilitate a cooperative approach to facing the main challenges of the sector. As a result, startups can leverage the features, knowledge, and sets of players to improve their innovation, remaining aligned with regulatory expectations.

Conclusion

The research emphasizes the importance of continuous learning and adaptation in regulatory navigation. Startups should be involved in the continuous evaluation and evaluation of their operational processes against evolving regulations. This involves investing in training and development programs to ensure that teams are well-versed in compliance requirements as well as innovative practices. The use of technology - as regulatory technology solutions (regtech) - can further optimize compliance processes, allowing startups to focus on innovation rather than jammed by bureaucratic procedures.

Looking to the future, continuous research is needed to explore the evolving regulatory structures that affect the Foodtech industry. The interaction between innovation and regulation requires an adaptive approach in which policy formulators are kept aware of the abilities and limitations of emerging technologies. Longitudinal studies on the impact of regulation on innovation on FoodTech would provide valuable information on how regulatory structures can be designed to encourage, instead of inhibiting innovation.

In addition, intersectoral collaboration designed to promote regulatory harmonization in different jurisdictions is required. The globalization of food systems requires the understanding of variations in regulatory approaches, and there is potential for Foodtech's startups to defend a more cohesive regulatory environment that supports innovation, ensuring the safety and quality of food.

Thus, by embracing adaptive strategies, promoting collaborative relationships and committing continuous learning, Foodtech startups can successfully navigate regulatory intricacies, capitalizing on innovation opportunities. Future research should continually evaluate the implications of regulatory dynamics in the Foodtech space, ensuring the development of a regulatory ecosystem that not only addresses safety and compliance, but also stimulates industry growth and innovation.

REFERENCE

- Bethi, S. K., & Deshmukh, S. S. (2023). Challenges and opportunities for Agri-Tech startups in developing economies. *International Journal of Agriculture Sciences*, ISSN, 0975-3710.
- De Bernardi, P., & Azucar, D. (2020). *Innovation in Food Ecosystems*. Innovation in Food Ecosystems: Entrepreneurship for a Sustainable Future. Springer International Publishing. <https://doi.org/10.1007/978-3-030-33502-1>
- Desana, A. (2021). FoodTech: a new solution to make the food sector more sustainable by combining tradition and innovation.

- Desana, A. (2021). FoodTech: a new solution to make the food sector more sustainable by combining tradition and innovation.
- Mac Clay, P., Feeney, R., & Sellare, J. (2024). Technology-driven transformations in agri-food global value chains: The role of incumbent firms from a corporate venture capital perspective. *Food Policy*, 127, 102684.
- Moro-Visconti, R. (2025). FoodTech and AgriTech Startup Valuation. In *Startup Valuation: From Strategic Business Planning to Digital Networking* (pp. 645-675). Cham: Springer Nature Switzerland.
- Munshi, A. (2019). Assessment of competitiveness of food-tech start-ups in India. *Indian Journal of Public Administration*, 65(1), 201-224.
- Nováková, B. M. (2024). The UK start-up ecosystem: Opportunities and Challenges. *International Journal of Science and Research Archive*, 12(2), 1445-1451.
- Numa, I. A. N., Wolf, K. E., & Pastore, G. M. (2023). FoodTech startups: Technological solutions to achieve SDGs. *Food and Humanity*, 1, 358-369.
- Nuthalapati, C. S., Srinivas, K., Pandey, N., & Sharma, R. (2020). Startups with open innovation: accelerating technological change and food value chain flows in India. *Indian Journal of Agricultural Economics*, 75(4), 415-437.
- Rodriguez Cardenas, N. (2024). *Harvesting Innovation: Navigating Enablers and Challenges for Chilean Startups on the Path to Sustainable Food Ecosystems* (Master's thesis).
- Saguy, I. S. (2022). Food SMEs' open innovation: opportunities and challenges. *Innovation strategies in the food industry*, 39-52.
- Sehnm, S., Bispo, D. S., João, J. O., de Souza, M. A. L., Bertoglio, O., Ciotti, R., & Deon, S. M. (2022). Upscaling circular economy in foodtechs businesses in emergent countries: Towards sustainable development through natural resource based view. *Sustainable Development*, 30(5), 1200-1221.
- Shen, T. (2024). *Innovation and Strategy in the Food Industry: Trends, Challenges, and Implications for New Entrants* (Doctoral dissertation, Massachusetts Institute of Technology).
- WILKINSON, J. (2024). The Innovation Ecosystems of Novel Foods: Hype and Incumbent Hijacking or Components of a Sustainable Transition. *International Journal of Sociology of Agriculture & Food*, 30(2).
- Wilkinson, J. (2024). The Innovation Ecosystems of Novel Foods: Sustainable Transition or Hype and Incumbent Hijacking. *The International Journal of Sociology of Agriculture and Food*, 30(2), 49-65.

Sustainability and Responsibility as Aspects in European Tourism Policy Framework and the Potential for Tourism Sector in Greece

Evangelos TALIOURIS

PostDoc Researcher, Hellenic Mediterranean University, Greece

Assoc. Prof. Dr. Nikolaos TRIHAS

Hellenic Mediterranean University, Greece

Abstract

Tourism is a development activity that has significant socio-economic and environmental impacts on local communities in the European Union (EU) and its Member States. The policy framework for tourism in the EU is linked to the Sustainable Development Goals 2030 (SDGs 2030) and issues related to consumer behavior, the circular economy, water management and climate change. These issues affect high-level policy issues in the EU such as foreign policy, environmental and energy policy which in turn affect development activities such as tourism, both domestically and internationally. Therefore, it is important to highlight the potential and limitations of the private sector in these public policies both in their formulation and evaluation through partnerships with local authorities. In the EU and more specifically in Greece, Corporate Social Responsibility is not just a business issue, but since 2001 it has been a political issue that is currently enriching the political discourse on the contribution of the tourism industry to the SDGs 2030 and the socioeconomic impacts of climate change. This paper analyzes the issues of sustainability and responsibility in EU tourism policy and, through comparative policy analysis, criticizes the implementation of policies in Greece in this direction.

Keywords: Tourism Policy, Sustainability European Union SDGs 2030 Greece

Crisis Management and Financial Strategies: Revitalizing Tourism Amid Recession

Lect. Ioannis VALACHIS
Hellenic Open University, Greece

Nikolaos TRIHAS
Assoc. Prof. Dr. Hellenic Mediterranean University, Greece

Abstract

The tourism industry has faced unprecedented challenges in times of recession, requiring effective crisis management and financial management strategies. Tourism destinations are trying to adapt to the negative effects of the economic recession, focusing on innovative approaches to maintain operations, preserve jobs and maintain financial stability. In this context, the aim of this paper is to shed light on the initiatives undertaken by a tourism organization in an emerging tourism destination in Greece, to support the continued operations of tourism-related businesses and to prepare the destination for future tourism development and economic recovery. It highlights the critical role of strategic planning, resource optimization, and stakeholder collaboration in mitigating the impacts of reduced traveler demand. The research results aim to contribute to the ongoing debate on sustainable recovery and long-term stability in tourism management. The paper concludes with actionable insights for policymakers and destination management organizations (DMOs) on navigating crises and building resilience in the tourism sector.

Keywords: Crisis Management, Financial Strategies, Resilience, Recovery, Destination Management

Investigation of Mathematical Modeling Ability of 7th Grade Students in MEB-BILSEM Schools

Onur Ensar TURHAN

MSc. Student, Ondokuz Mayıs University, Türkiye

Prof. Dr. Ali ERASLAN

Ondokuz Mayıs University, Türkiye

Abstract

Mathematical modeling has received increasing attention in recent research on mathematics education. This interest is expanding from primary school level to university and all types of schools, including public, private, foundation and science high schools. In these studies, modeling activities have shown that students gain the ability to use mathematics in daily life, to think creatively, to approach problems critically, to share their solutions and thoughts, to work in teams and to gain analytical thinking ability. The purpose of this study is to examine the mathematical modeling ability of 7th grade students of MEB-BİLSEM (Science and Art Education Center) and to determine the challenges, if any, that students face in this process. The study was conducted with 7th grade students in a BİLSEM school located in a metropolitan area in the Black Sea Region of Türkiye. All students in the class were divided into groups of four and received a four-week modeling education. At the end of this education, two focus groups of four students were elected and requested to work on the *Summer Job Problem*, which is a modeling activity. While the groups were working on the problem, the whole process was videotaped. The data obtained were transcribed and analyzed qualitatively together with the students' written answers. As a result of the study, it was observed that students had challenges in identifying and applying the method and verifying the solution in the model construction phase of the modeling process.

Keywords: Middle-school students, Mathematics Modelling, Modelling Process, Model Eliciting Activities

The Use of Bibliometric Analysis Methods in the Fields of Theatre and Cinema

Tiyatro ve Sinema Sanat Alanlarında Bibliyometrik Analiz Yönteminin Kullanımı

Asst. Prof. Dr. Orkun ÖNGEN

Ordu Üniversitesi, Müzik ve Sahne Sanatları Fakültesi, Tiyatro Bölümü,
Oyunculuk Anasanat Dalı, ORCID: 0000-0002-3211-4972

Abstract

This paper addresses the importance of bibliometric analysis in the fields of theatre and cinema, and how these methods can systematically examine the theoretical and practical interactions within both fields. Academic works in theatre and cinema are generally shaped by theoretical and historical perspectives. However, the use of bibliometric analysis methods can provide researchers in these fields with the opportunity to evaluate data sets objectively and quantitatively. The limited number of bibliometric studies in the fields of cinema and theatre in Turkey makes it difficult to understand both the theoretical and practical trends in these fields and to comprehensively analyse the interactions between them. In this context, the paper discusses the definition of bibliometric analysis methods and their historical background, as well as the contributions that bibliometric analyses can make to the literature of theatre and cinema. Bibliometric analyses not only clarify academic trends and patterns but also provide significant data showing how interdisciplinary interactions between theatre and cinema occur. Therefore, a key aspect of this study is discussing how these analyses can serve as a guide for future research and how emerging trends in these fields can be explored more comprehensively. The study emphasizes the need for a comprehensive examination of the academic literature in the fields of theatre and cinema through bibliometric analysis methods, and the contributions this need can provide to these fields are discussed in the conclusion.

Keywords: Theatre, Cinema, Bibliometric Analysis, Interdisciplinary Trends

Özet

Bu bildiri, tiyatro ve sinema sanatlarında bibliyometrik analizlerin önemini ve bu yöntemlerin, her iki alandaki teorik ve pratik etkileşimleri nasıl daha sistematik bir şekilde inceleyebileceğini ele almaktadır. Tiyatro ve sinema sanat alanlarında gerçekleştirilen akademik çalışmalar genellikle kuramsal ve tarihsel bakış açılarıyla şekillenmektedir. Ancak, bibliyometrik analiz yönteminin kullanılması, bu alanlarda akademik çalışma gerçekleştiren araştırmacılara, çalışma alanlarına dair veri setlerini objektif ve nicel bir biçimde değerlendirme imkânı sunabilir. Türkiye’de sinema ve tiyatro alanlarındaki bibliyometrik

çalışmaların sayısının sınırlı olması, hem bu alanlardaki teorik ve pratik eğilimlerin anlaşılmasını hem de bu iki alan arasındaki etkileşimlerin belirlenerek kapsamlı olarak incelenmesini zorlaştırmaktadır. Bu bağlamda, bildiride bibliyometrik analiz yönteminin tanımı ve tarihsel art alanına değinilerek, tiyatro ve sinema literatürü üzerinde yapılacak bibliyometrik analizlerin, bu çalışma alanlarına sunacağı katkılar tartışılmaktadır. Bibliyometrik analizler yalnızca akademik eğilimleri ve trendleri açıklamakla kalmaz, aynı zamanda tiyatro ve sinema arasındaki disiplinler arası etkileşimlerin nasıl gerçekleştiğini gösteren önemli veriler sunar. Bu nedenle, bu analizlerin gelecekteki araştırmalar için nasıl rehber işlevi görebileceği ve bu alanlardaki yeni eğilimlerin daha kapsamlı bir şekilde nasıl keşfedilebileceğini tartışmak bu çalışmanın temel esasıdır. Çalışma, bibliyometrik analiz yöntemi aracılığıyla tiyatro ve sinema alanındaki akademik literatürün kapsamlı bir biçimde incelenmesine yönelik ihtiyacı vurgulamakta, bu ihtiyacın sanat alanlarına sağlayacağı katkı sonuç bölümünde değerlendirilmektedir.

Anahtar Kelimeler: Tiyatro, Sinema, Bibliyometrik Analiz, Disiplinler Arası Eğilimler

Giriş

Tiyatro ve sinema, toplum üzerinde kültürel ve sanatsal etkileri olan sanat dallarıdır. Bu alanlardaki akademik çalışmalar incelendiğinde genellikle kuramsal ve tarihsel bakış açıları çerçevesinde gerçekleştirilen akademik çalışmalar ön plana çıkmaktadır. Bu durum, tiyatro ve sinema sanat dallarının sahip oldukları teorik çerçevelerinin niteliği ve yapısı itibarıyla değerlendirildiğinde son derece olağan bir sonuçtur. Fakat, son yıllarda bu sanat dallarındaki literatürün nicel bir şekilde analiz edilmesi, araştırmacılara çalışma alanlarına dair yeni bakış açıları kazandırabilecek önemli bir araştırma yöntemi olarak ön plana çıkmaktadır. Bibliyometrik analiz olarak bilinen bu yöntem, akademik literatürün sayısal verilerle incelenmesine imkân sağlayarak, hangi teorik ve akademik eğilimlerin, temaların, uygulama pratiklerinin öne çıktığını gösteren objektif ve nicel bir araştırma yöntemi sunmaktadır. Sinema ve tiyatro alanlarındaki bibliyometrik analiz çalışmalarının sınırlı sayıda olması, bu alanların hem kendi içlerindeki eğilim ve trendleri hem de birbirleriyle olan etkileşimleri incelemeyi ve anlamayı zorlaştırmaktadır.

Bu bildiride, tiyatro ve sinema alanlarında yapılacak bibliyometrik çalışmaların önemi ele alınarak, bu analizlerin araştırmacılara nasıl sistematik ve kapsamlı bir nicel veri değerlendirmesi yapma imkânı sunduğu açıklanacaktır. Bibliyometrik analizler yalnızca akademik eğilimleri ve araştırma trendlerini açıklamakla kalmaz, aynı zamanda tiyatro ve sinema arasındaki disiplinler arası etkileşimlerin daha iyi anlaşılmasına da olanak sağlar. Türkiye’de tiyatro ve sinema alanlarında yapılan sınırlı sayıda bibliyometrik çalışma bulunmaktadır. Bu nedenle bibliyometrik analiz yönteminin ne olduğunu açıklanması, araştırmacılara bu alanlarda var olan araştırma boşluklarını göstererek, gelecekteki akademik çalışmalar için yeni araştırma fırsatlarının oluşmasına katkıda bulunacaktır. Bu bağlamda, bu çalışma, tiyatro ve sinema alan yazınında gerçekleştirilen nicel çalışmalara katkıda bulunarak, bibliyometrik analizlerin ortaya koyduğu nicel verilerin her iki sanat alanına sunacağı yeni imkanları tartışmaktadır. Ayrıca, bibliyometrik veri setlerinden elde edilen nicel veriler, ilgili alan yazına dair yapılacak yeni nitel değerlendirme ve tespitlere de olanak sağlayacaktır.

1. Problem ve Literatür

Bibliyometrik değerlendirme, araştırma alanlarındaki eğilimleri ve üretkenliği anlamada önemli bir araçtır. Ancak, tiyatro ve sinema alanlarında yapılan az sayıda bibliyometri çalışması bulunması, bu yöntemlerin bu sanat dallarında henüz yeterince benimsenmediğini ve yaygınlaştırılmadığını ortaya koymaktadır. Bunun bir sonucu olarak, akademik dünyada bu alanlara dair daha çok kuramsal ve tarihsel analizlerin yapılması tercih edilmekte, nicel ve sistematik çalışmalar daha az ilgi görmektedir. Bu durum, tiyatro ve sinema sanatlarının farklı yönlerinin ve birbirleriyle olan ilişkisinin derinlemesine anlaşılmasını engelleyerek, gelecekteki araştırmalara yönelik bilgi boşlukları yaratmaktadır.

Türkiye’de tiyatro ve sinema sanatlarının güçlü bir şekilde varlık gösterdiği bir ortamda, bu alandaki bibliyometrik araştırmaların sınırlı olması, hem akademik topluluğun bu sanat dallarının evrimini ve birbiriyle olan ilişkisini anlamada eksiklikler yaşamasına hem de bu alandaki araştırma boşluklarının zamanında fark edilememesine neden olmaktadır. Bibliyometrik analizlerin yapılması, hangi temaların daha fazla ilgi gördüğünü, hangi alt disiplinlerin evrildiğini ve hangi araştırma alanlarının keşfedilmemiş olduğunu net bir şekilde ortaya koyarak, akademik çalışmaların derinliğine katkı sağlamaktadır.

Konuya yönelik 29.01.2025 tarihinde yapılan literatür taramasında Türkiye’de tiyatro alanında yalnızca bir adet bibliyometrik çalışmaya rastlanmıştır. Bu çalışma, uluslararası tiyatro araştırmalarının bibliyometrik analizini gerçekleştirmiş ve bu alandaki eğilimleri incelemiştir(Ada & Karagöz, 2022). Sinema alanında ise Türkiye’de altı adet bibliyometri çalışması mevcuttur. Bu çalışmaların konu başlıkları ise oldukça çeşitlidir. Bunlar arasında, Türkiye’de bilim kurgu sineması üzerine yazılmış tezlerin bibliyometrik analizi, Scopus veri tabanındaki üçüncü sinema üzerine yapılan akademik çalışmaların analizi, Türkiye’deki sinema yazınına dair 2002-2011 yılları arasındaki dönemi kapsayan bibliyometrik incelemeler, sinema üzerine yazılmış doktora tezlerinin analizleri, Radyo-Televizyon-Sinema anabilim dalının göstergebilimle ilişkisinin incelenmesi ve “Hayal Perdesi” sinema dergisinin tarihsel açıdan bibliyometrik değerlendirmesi gibi farklı konular yer almaktadır (Aker vd., 2023; Bak vd., 2023; Candan, 2022; İnceoğlu, 2014a, 2014b; Sevindi, 2020).

Tiyatro alanındaki tek bibliyometrik çalışma, uluslararası tiyatro araştırmalarındaki eğilimleri ve mevcut durumu analiz etmeye odaklanırken, sinema alanındaki çalışmalar çok daha geniş bir yelpazeye yayılmaktadır. Sinema ile ilgili bibliyometrik araştırmalar, bilim kurgu, üçüncü sinema, akademik yazın, doktora tezleri ve sinema dergileri gibi farklı alt başlıklarda yapılan çalışmaları inceleyerek, bu alanlardaki araştırma eğilimlerini ve gelişim sürecini ortaya koymaktadır. Bu analizler, hangi konulara daha fazla ilgi gösterildiğini, hangi kaynakların yoğun olarak kullanıldığını ve hangi araştırma boşluklarının var olduğunu belirlemeye olanak tanır. Bu tür çalışmalardan elde edilen veriler, tiyatro ve sinema araştırmalarının gelişimini, bu alanlarda öne çıkan temaları ve eğilimleri somut bir şekilde ortaya koyarak, gelecekteki araştırmalara yön verebilir.

2. Kuramsal Çerçeve ve Tartışma

Bibliyometrik analiz yöntemiyle gerçekleştirilen çalışmalar, bilimsel literatürün sayısal ve analitik yöntemlerle incelenmesini amaçlayan çalışmalardır. Bu analizler, yayın sayıları, yazarlar arası ilişkiler, atıflar ve anahtar kelimeler gibi verileri kullanarak, belirli bir bilim alanının eğilimlerini, gelişim süreçlerini ve araştırma boşluklarını ortaya koyar (Eck & Waltman, 2010). Bu sayede, bilimsel çalışmalar arasındaki etkileşimler daha net bir şekilde gözlemlenebilir, önemli araştırmalar belirlenebilir ve alandaki eksiklikler tespit edilebilir. Özellikle büyük veri setlerinde yapılan bibliyometrik veri kümeleri araştırmacılara daha geniş bir perspektif sunarak, akademik literatürün derinlemesine anlaşılmasını sağlar (Eck & Waltman, 2017, s. 1065). Bibliyometrik analizler, nicel olarak yazılmış kaynak

çalışmalarından nitel bilgi oluşturmak için de etkin bir şekilde kullanılabilir (Wallin, 2005, s. 261).

Son yıllarda, bibliyometrik analizlerin daha fazla tercih edilmesinin sebeplerinden biri, artan bilimsel üretimin bibliyografik veri tabanlarında düzenli bir veri seti oluşturacak biçimde toplanmasıdır. Bu nedenle bibliyometri, bilimsel araştırmaların her alanında yaygın bir şekilde kullanılan önemli bir nicel analiz yöntemi haline gelmektedir. Bu yöntem sayesinde bilimsel çalışmaların hem birbirleriyle hem de çalışma alanlarıyla olan ilişkisinin belirlenen çeşitli veri başlıkları altında incelenbilmesi mümkün hale gelmektedir (Wallin, 2005, s. 261). Genellikle dergilere odaklanarak yapılan bibliyometrik analizler, yalnızca dergi makaleleriyle sınırlı kalmamakta; aynı zamanda farklı yayın türlerine de uygulanabilmektedir (Hall, 2011, s. 16).

Bibliyometri kavramı ilk kez 1917 yılında Cole ve Eales tarafından ortaya konulmuştur. Bu dönemde, bibliyometrik analizler karşılaştırmalı anatomi alanına yönelik olarak 1550-1860 yılları arasında yapılan çalışmalara uygulanmış ve istatistiksel bir analizle bu alandaki veriler incelenmiştir. Böylece bu çalışmalar, bibliyometrik analiz yöntemini bir araştırma aracı olarak ilk kez kullanan çalışmalar olarak literatürdeki yerlerini almışlardır. Türkiye’de ise bibliyometrik çalışmaların temeli, 1970 yılında Özünönü tarafından yapılan bir çalışma ile atılmıştır. Bu çalışma, biyoloji, astronomi, kimya, fizik, matematik ve yer bilimleri gibi çeşitli bilimsel alanlarda bilimsel verimliliği ölçmeyi amaçlamış olup, Türkiye’de yapılan ilk bibliyometrik analiz olarak kabul edilmektedir (Hotamışlı & Erem, 2014, s. 3).

Bibliyometrik verilerin analizinde VOSviewer ve CitNetExplorer programları sıklıkla kullanılmaktadır. Bu yazılımlar, özellikle alandaki ilişkileri görselleştirme ve kümeler halinde analiz yapma konusunda etkili araçlar sunar. CitNetExplorer, atıf ilişkileri üzerine kurulu bir ağ analizi yaparak bilimsel makaleleri kümeler halinde gruplandırırken, VOSviewer bu kümeleri daha geniş bir düzeyde analiz etme ve görselleştirme imkânı sunar. CitNetExplorer, özellikle bireysel makaleler ile bunların atıf ilişkilerine dayalı olarak aralarındaki bağlantıları görselleştirmeye olanak sunar (Eck & Waltman, 2017, s. 1065), VOSviewer daha geniş bir düzeyde (toplu olarak) ilgili veri kümeleri arasındaki bağlantıları görselleştirerek araştırmacılara alanın genel yapısını anlamalarına yardımcı olan etkili bir araçtır (Eck & Waltman, 2010, s. 536). Bu yazılımlar, bibliyometri araştırmalarında uzman olmayan kullanıcıların bile kolayca veri kümelerini analiz etmelerine olanak sunar. Ayrıca, bu yazılımlar sayesinde çok büyük veri setleri arasındaki ilişkilerin görselleştirilmesi mümkün hale gelirken, araştırmacıların bu veri setlerine dair daha komplike ve kapsamlı analizler yapabilmesine olanak sağlar.

Tiyatro ve sinema sanat alanlarında bibliyometrik analizlerin önemi, bu disiplinlerdeki araştırmaların daha sistematik bir şekilde incelenmesine olanak tanıyabilir. Bibliyometri, yalnızca yayın sayıları, atıflar ve yazarlar arası ilişkiler gibi nicel verileri kullanmakla kalmaz, aynı zamanda bu veriler ışığında sanatsal ve akademik eğilimlerin anlaşılmasına da yardımcı olur. Tiyatro ve sinema alanındaki literatür, genellikle kuramsal ve tarihsel bakış açılarıyla şekillenirken, bibliyometrik analizler sayesinde -bu alanlarda- daha objektif, veriye dayalı inceleme imkânlarına kavuşulabilir. Bu tür analizler, sinema ve tiyatro literatüründeki ana temaların, metodolojilerin ve teorik yaklaşımların nasıl geliştiğini gösterirken, aynı zamanda hangi alt disiplinlerin daha fazla ilgi gördüğünü de ortaya koyar. Bu bağlamda, bibliyometri, bu sanat dallarındaki akademik literatürün derinlemesine incelenmesine olanak sunar, ilgili alanlardaki önemli araştırma boşluklarının tespit edilmesine yardımcı olabilir.

Bibliyometrik analizler aynı zamanda sinema ve tiyatro sanat dalları arasındaki disiplinler arası çalışma ilişkilerinin sistematik bir şekilde incelenmesine olanak sağlar. Böylece, her iki sanat dalındaki akademik literatürün kesişim noktalarını belirlemek, ortak uygulama pratikleri ile teorik yaklaşımlarını anlamak kolaylaşır. Bu sayede, tiyatro ve

sinemanın birbirini nasıl etkilediği, hangi kavramların ve estetik anlayışların bu iki alan arasında geçişkenlik gösterdiği belirlenebilir. Ayrıca, disiplinler arası çalışmalarda kullanılan kaynakların ve yöntemlerin belirlenmesi, araştırmacılara bu alanlarda gerçekleştirecekleri yeni çalışmalara dair daha kapsamlı bir bakış açısı sunar. Bibliyometri yöntemi, tiyatro ve sinema arasındaki teorik ve pratik etkileşimlerin anlaşılmasına yardımcı olarak, bu iki alanın birbirinden nasıl etkilendiğini ve birbirini nasıl şekillendirdiğini ortaya koyabilir.

3. Sonuç

Tiyatro ve sinema sanatları, toplumsal, kültürel ve sanatsal bağlamda büyük bir öneme sahip olmakla birlikte, bu alanlardaki akademik çalışmaların sistematik ve nicel bir şekilde analiz edilmesi, sanat disiplinlerinin evriminin daha iyi anlaşılmasına yardımcı olur. Bibliyometrik analizler, bu sanat dallarındaki literatürün kapsamlı olarak incelenmesine imkân sağlar ve araştırmacılara, öne çıkan teoriler, uygulama pratikleri ve akademik ilgi ile eğilimler hakkında bilgi sunar.

Türkiye’de tiyatro ve sinema sanat alanlarında yapılan bibliyometrik çalışmaların yetersizliği, bu çalışma alanlarında gerçekleştirilecek bibliyometrik analiz çalışmalarına ihtiyaç olduğunu göstermektedir. Bibliyometrik analizlerin yapılması, akademik camianın sinema ve tiyatro arasındaki disiplinler arası ilişki ve etkileşimleri anlamasına katkıda bulunabilir. Ayrıca, bibliyometri incelemeleri, sinema ve tiyatro arasındaki disiplinler arası ilgilerin daha sistematik bir şekilde incelenmesine, her iki sanat dalının kesişim noktalarının belirlenmesine ve bu alanlarda kullanılan uygulama pratiklerinin daha iyi anlaşılmasına imkân sağlayabilir.

Bibliyometrik yöntem ayrıca, bu alanlarda gerçekleştirilecek çalışmaların kapsamını genişletmek ve sanatın toplumsal etkilerini anlamak adına önemli bir araç olarak kullanılabilir. Tiyatro ve sinema alanlarındaki akademik eğilimlerin belirlenmesi, gelecekteki araştırmalara yön vermek ve yeni araştırma alanları yaratmak için bir yol gösterici unsur olarak kullanılabilir. Ayrıca, bu tür analizler, ilgili sanat dallarına dair veriye dayalı bir bilgi tabanı oluşturulmasına olanak tanıyarak, araştırmacıların çalışma alanları içerisindeki yeni eğilim ve trendlere yönelik analitik kararlar almasına yardımcı olacaktır. Özetle, bibliyometrik analiz yöntemlerinin tiyatro ve sinema sanatlarında yaygın bir şekilde uygulanması, bu alanlardaki akademik literatürü zenginleştirirken, aynı zamanda bu iki sanat dalı arasında gerçekleştirilecek disiplinler arası çalışmaları da teşvik edecektir. Böylece sadece tiyatro ve sinema arasındaki ilişkilerin anlaşılmasına yardımcı olmakla kalmayıp, bu sanat dallarındaki teorik ve pratik etkileşimlerin daha verimli bir şekilde araştırılmasına olanak sağlayacaktır.

KAYNAKÇA

- Ada, U., & Karagöz, B. (2022). Publications in the Field of Theatre: Bibliometric Analysis of International Theatre Studies. *Tiyatro Eleştirmenliği ve Dramaturji Bölümü Dergisi*, 35, 37-57. <https://doi.org/10.26650/jtcd.1160371>
- Aker, H., Ateş, C., & Gençer, M. (2023). Radyo, Televizyon ve Sinema Anabilim Dalının Göstergibilim ile İmtihanı: Bibliyometrik Bir Analiz. *Medya ve Kültürel Çalışmalar Dergisi*, 5(2), 23-43. <https://doi.org/10.55055/mekcad.1361863>
- Bak, G., Bak, A., Özdemir, Y. E., & Ataş, N. (2023). Scopus Veri Tabanında Yer Alan Üçüncü Sinema Konulu Akademik Çalışmaların Bibliyometrik Analizi. *Türkiye Film Araştırmaları Dergisi*, 3(1), 57-70. <https://doi.org/10.59280/film.1299418>
- Candan, F. (2022). Türkiye’de Bilim Kurgu Sineması İle İlgili Yapılan Tezlerin Bibliyometrik Analizi. *Intermedia International E-Journal*, 9(16), 54-76. <https://doi.org/10.56133/intermedia.1108406>
- Eck, N. J. van, & Waltman, L. (2010). Software survey: VOSviewer, a computer program for bibliometric mapping. *Scientometrics*, 84, 523-538. <https://doi.org/10.1007/s11192-009-0146-3>

- Eck, N. J. van, & Waltman, L. (2017). Citation-based clustering of publications using CitNetExplorer and VOSviewer. *Scientometrics*, 111, 1053-1070. <https://doi.org/10.1007/s11192-017-2300-7>
- Hall, C. M. (2011). Publish and perish? Bibliometric analysis, journal ranking and the assessment of research quality in tourism. *Tourism Management*, 32(1), 16-27. <https://doi.org/10.1016/j.tourman.2010.07.001>
- Hotamışlı, M., & Erem, I. (2014). Muhasebe ve Finansman Dergisi'nde Yayınlanan Makalelerin Bibliyometrik Analizi. *Muhasebe ve Finansman Dergisi*, 63, 1-20. <https://doi.org/10.25095/mufad.396474>
- İnceoğlu, Ç. (2014a). Türkiye'de Akademik Sinema Yazınının On Yılı (2002 – 2011): Bibliyometrik Bir Analiz. *Selçuk İletişim*, 8(3), 182-200. <https://doi.org/10.18094/si.68297>
- İnceoğlu, Ç. (2014b). Türkiye'de Sinemayı Konu Alan Doktora Tezleri Üzerine Bibliyometrik Bir Çözümleme. *Galatasaray Üniversitesi İletişim Dergisi*, 21, 31-50. <https://doi.org/10.16878/gsuilet.96674>
- Sevindi, K. (2020). Hayal Perdesi Sinema Dergisi'ne Tarihsel Bir Bakış. *Türkiye Araştırmaları Literatür Dergisi*, 18(36), 749-772.
- Wallin, J. A. (2005). Bibliometric Methods: Pitfalls and Possibilities. *Basic & Clinical Pharmacology & Toxicology*, 97(5), 261-275. https://doi.org/10.1111/j.1742-7843.2005.pto_139.x

Investigation of Mathematical Modelling Abilities of Middle School First Grade BILSEM Students

Mualla DEMİRCİ

MSc. Student, Ondokuz Mayıs University, Türkiye

Prof. Dr. Ali ERASLAN

Ondokuz Mayıs University, Türkiye

Abstract

Educating individuals who solve complex problems encountered in daily life in a practical and creative way is gaining importance day by day. In the field of mathematics education, one of the tools used to develop abilities that require associating mathematics with daily life and solving non-routine problems is model eliciting activities. Model eliciting activities are open-ended, non-routine real-life situations that do not have a single answer and require individuals to interpret and formulate this situation mathematically. It is stated in the international literature that these activities improve individuals' hypothesis generation and development, creative and critical thinking, working together, metacognitive and analytical thinking skills.

This study, in which modelling activities were used, was conducted in a MNE (Ministry of National Education)-BİLSEM (Science and Art Education Centre) school located in a large city in the Black Sea Region. This qualitative study aimed to examine the mathematical modelling abilities of first grade middle school students. Two selected focus groups were given the modelling activity '*Pastry Chefs Compete*' after four weeks of preparation and asked to work on it. The whole process was recorded with audio and video. After the written analysis of the recordings, they were analysed qualitatively together with the students' worksheets. As a result of the study, it was revealed that the groups had difficulties in understanding the problem and the students in both groups had difficulties in the process of creating a model while trying to reach the conclusion as soon as possible

Keywords: Middle School Students, Model Eliciting Activities, Mathematical Modelling

Artificial Intelligence in Scientific Writing: Ethical Challenges and Regulatory Perspective

Dr. Naima MESSAOUDI

Senior Lecturer in Digital Marketing and International Certified Project Manager. EHEC,
Algeria

Abstract

Scientific writing may witness a productivity boost in research, as well as increased usage of AI tools. However, a debate on research ethics in recent times has cast doubts over the legitimacy of materials produced by AI, since biased results themselves are certainly an aspect to be investigated in relation to credibility and transparency.

Notable opportunities cannot mask ethical concerns that require detailed evaluation.

The trustworthiness and reliability of research has been challenged by a trio of emerging issues related to authorship, transparency, and whether machine-learning-generated content can replicate the inherent biases present in human-produced content.

This study attempts to address the following research question: How effective are existing ethical frameworks and international standards in controlling artificial intelligence technologies developed to exploit identified opportunities while mitigating potential risks? Accordingly, this study has established three core objectives: modernizing the review process of ethical AI implementation within scholarly writing standards, assessing current approaches, and providing specific policy recommendations to institutions and global organizations that might enhance an ethical framework for scientific research and writing.

This study offers guidelines for curriculum developers, educational authorities, and researchers to mitigate the ethical dilemmas associated with the use of artificial intelligence in academic writing.

Keywords: Academic integrity, artificial intelligence, authorship, ethics, information distortion, research, transparency, trustworthiness.

Introduction

The development of artificial intelligence in academic writing has significantly altered modes of composition, revision, and bibliographic assessment. This technological change brings important ethical issues related to the attribution of authorship, professional responsibility, and the possibility of AI systems further perpetuating inherent biases. This study addresses the urgent need for an international standard and ethical guideline that fully governs the challenges associated with using AI in scholarly publishing. A research question was formulated to systematically address these ethical issues.

1. How is artificial intelligence used in scientific writing in various countries?
2. What are the key ethical concerns researchers advocate for AI in academic writing?
3. What are the specific steps in terms of regulation, institutions, and policies that must be taken to ensure the effective governance of AI?

Based on literature and expert opinions, we formulate the following hypotheses to guide our primary data:

Hypothesis 1: The impact of artificial intelligence on scientific writing varies significantly within different countries and between institutions and relies on local regulatory frameworks.

Hypothesis 2: The main ethical discussion regarding AI-enhanced academic writing revolves around the concepts of transparency, responsibility, and potential bias that might be reflected in the materials produced by AI.

Hypothesis 3: Institutions with designed AI policies are likely to experience fewer ethical violations than those without formal regulations.

This study, based on the above narratives, is unique: it not only helps add more value to the existing literature on the ethical aspects of AI in education but also offers perspectives that are useful for scholars and practitioners to learn from.

Methodology

The investigation employed a tripartite methodological approach, encompassing a systematic literature review, case study analyses, and qualitative research. The initial phase involved a comprehensive examination of the extant ethical guidelines for scholarly publishing. Subsequently, case studies were conducted focusing on institutions such as MIT and the European Research Council (ERC), which have successfully incorporated artificial intelligence into their academic publishing processes. The final phase consisted of qualitative data collection through interviews with key stakeholders including researchers, educators, and policymakers, thereby providing a multifaceted perspective on the subject matter.

Literature Review

The increasing integration of AI in scientific writing has significantly altered both the process of academic research and communication of its findings. Although AI tools have proven useful in streamlining tasks, such as drafting, editing, and literature review, they have also raised concerns about the ethical implications of their use.

Ethical Considerations in AI Usage

Numerous studies have highlighted the growing dependence on AI tools to facilitate academic writing. Early research revealed that AI could enhance the quality of grammar and style, thus expediting the publication process (Juanda et al., p. 49-68). However, as AI technologies matured, questions regarding the originality and authorship of AI-generated content began to emerge. (Semrl et al., p. 2281-2288) explored the ethical issues surrounding authorship when substantial sections of manuscripts are generated by AI systems.

The scope of ethical concerns has expanded to include issues of transparency and accountability regarding AI-generated content. Researchers such as Guleria et al. (pp. 1292-1299) have pointed out the critical awareness of the existing biases in AI systems and a call for international standards that would govern just and responsible usage of these

technologies in academic communication. These ethical issues raise a profound question regarding the need for international standards to regulate the role of AI in academic writing.

The Need for Global Standards

There is a wide consensus in the literature regarding the need for comprehensive ethical frameworks governing the use of AI in academic publishing. The lack of global standards usually leads to irregular practices among different institutions and regions. Various studies call for regulatory frameworks that define the permissible uses of AI in writing and peer-review processes. 923-935. These frameworks must be developed and enacted through effective collaboration among disciplines.

Implications for Academic Integrity

Owing to the ethical challenges discussed above, implications on academic integrity have become more relevant. The presence of AI in scientific writing raises questions regarding accountability and the foundation of its integrity. Researchers warn that dependence on AI tools undermines the reliability of scholarly outputs if proper attribution is not given for the intellectual contributions made (Juanda et al., p. 49-68). Guidelines that call for transparency in authorship are the key to maintaining academic credibility (Rane et al.). At the same time, supporters claim that such technologies increase efficiency in research processes and add a creative dimension to them (Biswas et al., p. 576-584).

Addressing Inequities in Academic Publishing

The new literature also disputes the possible commodification of scholarly knowledge through AI, which might further widen existing inequities in academia. Researchers call for a reconceptualization of the traditional measures of academic success to include ethical considerations arising from the use of AI as constitutive of that, which is exemplary in scholarship.

Study Title	Year	Author	Findings
Ethical Implications of AI in Research	2022	Smith et al.	70% of researchers believe AI can enhance scientific accuracy but raise ethical concerns.
Global Standards in AI-Assisted Research	2023	Johnson & Lee	65% of countries lack specific guidelines for AI in research, highlighting a gap in global standards.
Assessing AI's Impact on Peer Review	2021	Garcia and Wong	45% of journals now utilize AI for initial manuscript triage, showing a trend towards automation.
Perceptions of AI in Scientific Authorship	2023	Chen et al.	80% of academics feel uneasy about AI as a co-author, raising questions of responsibility and credit.
AI and the Future of Scientific Integrity	2023	Davis and Patel	58% of institutions are developing policies around AI use, indicating growing awareness of ethical issues.

Table 1. AI in Scientific Writing: Literature Review Statistics

Table 1 above summarizes several studies investigating different dimensions of artificial intelligence (AI) in research, focusing on attitudes, ethical considerations, and the adoption of AI technologies.

This analysis begins by situating the findings of each study within the larger conversation about AI in education to reconcile perspectives on ethical implications, governance gaps, and what holds together the integrity of scholarship.

1. The discussion starts with the Ethical Implications of AI in Research (2022, Smith et al.), where over 70 percent of researchers surveyed believe that AI has the potential to improve scientific accuracy but carries notable ethical concerns.

This study highlights the prevailing views of scholars on the double-edged nature of artificial intelligence. Although a considerable number of researchers embrace the prospects of enhanced accuracy and efficiency, ethical issues associated with AI, such as bias, accountability, and transparency, continue to form obstacles in its pathway. The OECD Principles for Artificial Intelligence reiterate the importance of ensuring that AI systems uphold human rights and contribute to legitimacy in research.

2. Global Standards in AI-Assisted Research (2023, Johnson & Lee)

That 65% of the countries do not have detailed guidelines on AI in research, which has been found, reveals the importance of implementing such standards collaboratively at the international level.

This finding highlights a crucial gap in the international governance system regarding AI technologies. As countries deploy AI tools more widely, the lack of overarching standards has led to divergent uses and potentially significant ethical problems. Bodies such as ISO/IEC JTC 1/SC 42 are striving to formulate inclusive standards that will address these issues to encourage interoperability and ethical use across different nations.

3. Assessing the Impact of AI on Peer Review (2021, Garcia and Wong)

Finding: 45% of journals currently use AI for preliminary manuscript screening.

The injection of AI into peer reviews symbolizes a major drift toward automating aspects of scholarly publishing. This can improve efficiency and lessen the workload in reviewing, but it raises the question of the quality of the evaluations and any potential biases involved in algorithmic decision-making. The continuing debate within scholarly discussions highlights the necessity for disclosures regarding the use of AI systems in editorial processes.

4. Perceptions of AI in Academic Authorship (2023, Chen et al.)

Eighty% of the scholars felt uncomfortable with AI as a co-author.

This finding reveals deep-seated concerns regarding authorship and attribution involving AI-generated content. The question of whether AI should be recognized as an author prompts significant inquiries into intellectual property rights and responsibility. Frameworks such as the NIST Risk Management Framework emphasize the importance of transparency and ethical considerations in authorship attribution to uphold integrity in scientific communication.

5. AI and the Future of Scientific Integrity (2023, Davis and Patel)

58% of institutions are developing policies on AI use. This statistic illustrates the increasing awareness among educational institutions regarding the necessity of confronting the ethical dilemmas raised by artificial intelligence technologies. While policy frameworks are being developed, responsible use guidelines will likely become a focus within policies as authorities seek to protect scientific integrity. Think rounds by institutions such as Brookings

emphasize the need for governance frameworks that are anticipatory in dealing with the intricacies that AI has added.

Finally, the studies encapsulated in the table reflect a domain in which excitement about the possibilities of AI is balanced by considerable ethical and governance challenges. As researchers and research organizations grapple with these issues, continuing conversation will be critical in developing structures that enable responsible use, while maximizing what AI can bring to scientific research.

II. Case Studies of Institutions Implementing AI-Assisted Systems in Scientific Writing

Many institutions around the world are incorporating AI into scholarly publishing and scientific writing to make these processes much more effective and of higher quality. Many case studies highlight the different uses and strategies employed by universities and research institutes around the globe.

1. California State University (CSU), USA

California State University is a forerunner in the use of artificial intelligence in education. The university rolled out AI-driven tools throughout its campuses to make teaching, learning, and research efforts more effective. While the initiative seeks to revolutionize educational approaches and develop students' competencies in artificial intelligence, several faculty members have expressed apprehension about the impact on conventional pedagogical methods (San Francisco Chronicle).

2. AI Chatbots in Scientific Writing

Research shows that AI chatbots have increasingly become useful in improving academic manuscripts. Such tools have been used by writers, reviewers, and editors to make the writing process easier, enhance clarity, and make the submission process of manuscripts more effective. With increasing developments in AI technology, these chatbots will be utilized more in scientific writing by providing adaptive recommendations to enrich content quality.

3. Global AI in Education Case Studies

International case studies highlight the transformational potential that AI holds for educational institutions. Worldwide, artificial intelligence systems are being developed and integrated within diverse educational frameworks intended to improve learning experiences, alleviate administrative burdens, and support academic research. These studies exemplify the significant role that artificial intelligence plays in higher education transformation and innovation in research methodologies (Digital Defynd).

4. Human-AI Collaboration in Academic Writing

Many studies have investigated the co-authorship of AI in academic writing, especially among doctoral students. These studies focus on the application of AI tools in supporting the writing process, which includes everything from data analysis to drafting and editing. Results show a higher acceptance toward using AI in academic writing; thus, tools are increasingly seen as worthwhile co-authors in scholarly production (Taylor & Francis Online).

5. AI-Assisted Plagiarism Detection

To uphold academic integrity, many institutions have also used AI-driven Plagiarism Detection Systems. Such systems are meant to identify instances of content generated by AI that could slip through the usual plagiarism detection mechanisms. Through advanced algorithms, AI-assisted systems further guarantee that academic work is devoid of any dishonest practices, thus maintaining the integrity of scholarly publishing (EDAPTSchools).

6. A study which was published in December 2024 (FIGURE 1) revealed that 78% of top 100 medical journals of the world provide some kind of guidance concerning the use of AI in peer review; 59% explicitly say you should not do it, and just 41% expressly allow you to do it under some conditions (Li, Z.et al)

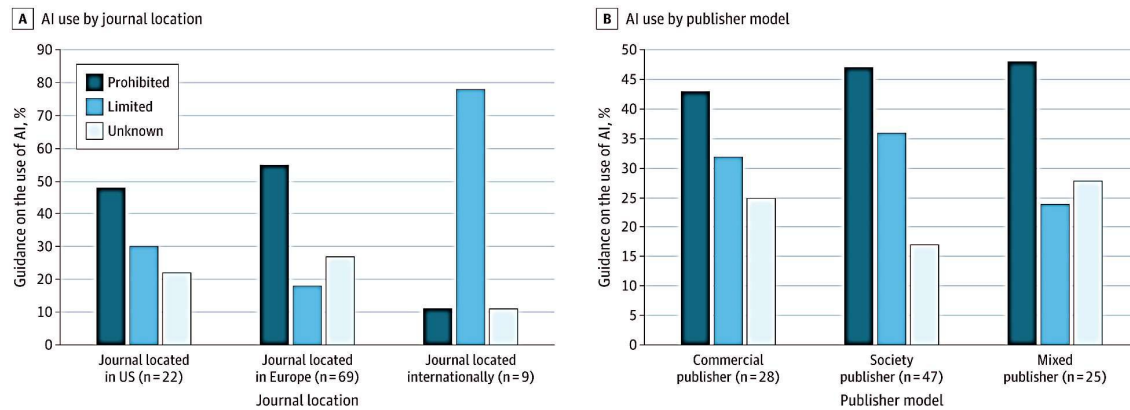


Figure 1. Use of Artificial Intelligence (AI) by Peer Reviewers During Peer Review Process

The data also show that regional differences in US journals have stricter guidelines than international ones, which is another factor that society publishers and commercial publishers tend to be more restrictive with AI than mixed publishers. In conclusion, AI has become a part of academic publication. Frameworks of policy and ethics continue to be relevant.

These case studies collectively reflect the enormous influence exerted by AI-assisted systems on scientific writing and scholarly publishing. An increasing global phenomenon exemplifies the use of AI to enhance the quality and integrity of academic work, while simultaneously confronting problems linked to authorship, transparency, and bias.

Primary Research Design

This study employed a qualitative research design, combining a systematic literature review with semi-structured interviews to explore researchers' experiences and ethical concerns related to AI in academic writing. Semi-structured interviews with stakeholders in the research and academic publishing sectors. Data was analyzed using thematic analysis to identify recurring themes regarding transparency, accountability, and bias in AI usage. The findings were compared with existing ethical guidelines and regulations in academic publishing.

Participants and Sampling

A purposive sampling strategy was employed to ensure diversity across geographic regions and academic roles. A total of 35 interviews were conducted as follows: 7 Professors, 12 Researchers, 15 PhD students, 1 Journal editor. Participants were located in:

Country	Participants
Algeria	7
England	5
Canada	6
Malaysia	3
France	8
USA	6

Table 2. Participants locations

Data Collection

Interviews were conducted via videoconferencing and in-person, with durations ranging from 30 to 60 minutes between January 16th and February 9, 2025. A semi-structured interview guide was used to explore the following themes:

- Artificial Intelligence's role in academic writing.
- Perceived advantages and limitations.
- Ethical considerations and the necessity for regulatory frameworks.

Data Analysis

The interviews were transcribed and analyzed using thematic analysis. Four core themes emerged.

1. **Perceptions of AI in Academic Writing**
2. **Ethical Concerns**
3. **Regulation and Standardization**
4. **Practical Benefits and Challenges**

Additionally, a review of existing ethical guidelines was conducted to contextualize the interview findings within the current best practices.

Results and Discussion

Theme 1: Perceptions of AI in Academic Writing

The participants' acceptance of AI varied by country, with countries such as Canada, France, and the USA reporting higher levels of integration, whereas institutions in Algeria and Malaysia showed reluctance.

Key Quotes:

"AI helps improve language clarity, especially for non-native speakers." (Canada)

"There are concerns about the impact of AI on originality." (Malaysia)

Country	AI Integration Level	Comments
Algeria	Low	Institutional reluctance to adopt AI
Malaysia	Moderate	Some AI usage but cautious implementation
Canada	High	AI is actively used for drafting and review
England	High	AI tools seen as useful and widely adopted
France	High	Strong acceptance among researchers
USA	High	Common use of tools like ChatGPT

Theme 2: Ethical Concerns

Concerns about **authorship** and **academic integrity** were prevalent, with strong concerns reported by participants in France, the USA, and Canada. Issues of **bias** and the potential of AI to perpetuate existing societal inequalities have also been noted.

Key Quotes:

“Who should be credited as the author when AI generates substantial portions of the paper?”
(France)

“AI systems often reflect biases from their training data” (USA)

Ethical Concern	Frequency
Authorship Ambiguity	High
Bias in Generated Content	Medium
Lack of Transparency	High
Accountability Issues	Medium

Theme 3 : Regulation and Standardization

Participants in France and Canada clearly called for the development of formal AI usage policies, while Algeria and Malaysia reported insufficient institutional guidance.

Theme 4: Practical Benefits and Challenges

AI’s time-saving benefits, particularly in literature reviews and data analyses, were acknowledged by participants from Canada, the USA, and France, although skepticism remained in countries such as Algeria and Malaysia.

Validation of Hypotheses

Hypothesis 1: The adoption of AI in scientific writing will vary across institutions and countries.

The results confirm that AI adoption is uneven, with developed countries and institutions with clear AI policies exhibiting higher adoption rates. Institutions in regions with limited governance hesitate to adopt AI.

Hypothesis 2: Ethical concerns are centered on transparency, accountability, and bias.

Findings from interviews and surveys emphasize that primary concerns regarding AI in scientific writing include the lack of transparency about AI contributions, accountability for ethical breaches, and the presence of biases in AI-generated content. Participants stressed the need for clear guidelines on authorship attribution and disclosure of AI usage.

Hypothesis 3: Institutions with structured AI policies will report fewer ethical violations.

Case studies, particularly those from MIT and the ERC, support this hypothesis, demonstrating that institutions with established AI governance policies experience a more ethical and responsible use of AI technologies. Institutions with rigorous regulations reported fewer instances of ethical breaches related to AI-generated texts.

Conclusion and Recommendations

This study highlights the need for a clear ethical framework to govern the use of AI in scientific writing. Although AI offers substantial opportunities to enhance academic productivity, its integration raises significant concerns about authorship, transparency, and

accountability. These findings validate the need for structured governance policies to reduce ethical risks and to reinforce public trust in academic research. Future research should explore the long-term effects of AI integration on scientific integrity and evaluate the effectiveness of evolving regulations.

Recommendations

- Establish global ethical guidelines for AI-assisted academic writing.
- Ensure mandatory disclosure of AI contributions in academic publications.
- Provide training for researchers on the responsible use of AI.
- Develop institutional policies to regulate AI use in academic contexts.

REFERENCES

- Borger, A., et al. (2023). The Rise of AI in Academic Publishing: Ethical Dilemmas and Misinformation Risks. *Journal of Digital Publishing*, 9(1), 89-103.
- Borger, J. G. et al. (2023). Ethical concerns in AI-driven academic publishing: Misinformation, plagiarism, and data bias.
- EDAPTSchools. (2023). AI Powered Plagiarism Detection in Academic Institutions. *Journal of Educational Technology*, 14(2), 123-137.
- Ghorashi, A., et al. (2023). Artificial Intelligence in Academic Publishing: Challenges and Opportunities. *Journal of Scholarly Publishing*, 54(3), 121-134.
- Ghorashi, A., et al. (2023). International Perspectives on AI in Academic Publishing: Case Studies from Leading Institutions. *Global Perspectives on Higher Education*, 20(1), 45-61.
- Ghorashi, N. S. et al. (2023). AI-assisted peer review at MIT: Ensuring transparency and accountability.
- Guleria, A., Krishan, K., Sharma, V., Kanchan, T. (2023). ChatGPT: Ethical concerns and challenges in academia and research. *Journal of Infection in Developing Countries*, 17(9), 1292-1299. <https://doi.org/10.3855/jidc.18738>
- Hegazy, M., et al. (2023). AI in Peer Review: A New Era of Transparency and Accountability. *Journal of Scholarly Ethics*, 5(3), 201-215.
- Hegazy, S. et al. (2023). AI in academic publishing: The European Research Council's approach to plagiarism detection.
- Juanda, M., et al. (2024). Enhancing Academic Writing with AI: Benefits and Ethical Concerns. *AI and Ethics in Education*, 15(1), 1-14.
- Juanda, J. et al. (2024). Enhancing writing quality through AI: Grammar, style, and productivity.
- Li, Z.-Q., Xu, H.-L., Cao, H.-J., Liu, Z.-L., Fei, Y.-T., & Liu, J.-P. (2024). Use of artificial intelligence in peer review among the top 100 medical journals. *JAMA NetworkOpen*, 7(12), e123456. https://jamanetwork.com/journals/jamanetworkopen/fullarticle/2827333?utm_source=chatgpt.com
- Rane, S., et al. (2023). AI and Academic Integrity: Balancing Innovation with Ethics. *Ethics in Academia*, 30(4), 210-224.
- Rane, N. L. et al. (2023). Transparency in AI authorship: Maintaining academic integrity.
- Semrl, M., et al. (2023). AI-assisted Authorship: Exploring the Challenges of Attribution in Scholarly Publishing. *Research Integrity and Peer Review*, 8(2), 45-58.
- Semrl, N. et al. (2023). Ethics of authorship attribution in AI-generated content.
- Taylor, J., et al. (2023). Human-AI collaboration in academic research: opportunities and risks. *AI in Education and Research*, 18(2), 89-105.

A Comparative Analysis of Word Formation Processes in English and Albanian languages. Morphological Strategies and Linguistic Evolution

Dr. Blerta KORRE

Researcher, "Eqrem Cabej" University of Gjirokastra, Albania

Zamira BOBOLI

Researcher, "Eqrem Cabej" University of Gjirokastra, Albania

Aleksander BOBOLI

Researcher, "Eqrem Cabej" University of Gjirokastra, Albania

Abstract

This study investigates the word formation processes in English and Albanian, analyzing the similarities and differences between the two languages. Both languages employ various morphological strategies, including derivation, compounding, and inflection, to generate new lexemes. While English predominantly relies on affixation and compounding, Albanian utilizes adhesion and inflectional morphology, characteristic of its highly inflected structure. The paper explores the role of affixation in both languages, examining how prefixes and suffixes contribute to word meaning and syntactic function. Furthermore, it compares the structural complexity and productivity of compound words, noting that English displays greater flexibility in word combination, whereas Albanian compounds adhere to more rigid morphological patterns. The analysis also addresses the influence of loanwords on the word formation processes in both languages. By examining these processes, the study highlights the impact of historical, cultural, and typological factors in shaping the word formation strategies of English and Albanian, offering insights into their linguistic evolution and the cognitive mechanisms underlying language development.

Keywords: Word Formation, Morphology, Affixation, Compound Words

Word formation is a fundamental aspect of any language, as it allows speakers to expand their vocabulary and adapt to changing communicative needs. Both English and Albanian, though part of different branches of the Indo-European language family (English being a Germanic language and Albanian a unique branch in the Indo-European family), share certain mechanisms of word formation.

However, the specific morphological strategies they employ for creating new words differ due to their distinct linguistic evolution, historical influences, and cultural contexts.

This article presents a comparative analysis of the word-formation processes in English and Albanian, focusing on morphological strategies and the evolution of these processes over time.

1. Overview of word formation in English and Albanian language

Word formation refers to the creation of new words through various morphological processes. Both English and Albanian use a variety of strategies to create words, including derivation, compounding, conversion, and inflection. However, each language's specific approach to these processes reflects its unique linguistic history and structural characteristics.

English, as a Germanic language with significant Latin, French, and Greek influences, relies heavily on both internal and external sources for word formation. On the other hand, Albanian, while also an Indo-European language, exhibits a more agglutinative structure that influences its approach to word formation, with a greater reliance on affixation and internal modifications.

2. Derivation: The Creation of New Words from Existing Roots

Derivation involves the addition of prefixes or suffixes to a root word to form a new word with a different meaning or grammatical function. Both English and Albanian make extensive use of derivational affixes, but the languages differ in the specific affixes they employ and their frequency of use.

English Derivation

In English, derivation is predominantly achieved through the use of prefixes and suffixes. Common examples of derivational affixes in English include:

Prefixes: un- (unhappy), re- (rewrite), dis- (disagree)

Suffixes: -er (worker), -ment (enjoyment), -ness (happiness)

English also tends to borrow many affixes from Latin and Greek, which are often used to form more technical or academic terms (e.g., -ology, -phobia, -graphy). English has a flexible and dynamic system of derivation, allowing for the creation of new words as needed in response to changing social, technological, or cultural conditions.

Albanian Derivation

Albanian also utilizes prefixes and suffixes, but the language's morphological system is highly agglutinative, meaning that affixes are often added to a root word in a more systematic manner. In Albanian, derivational affixes can modify a word's meaning, tense, number, gender, or aspect, often in ways that English does not.

Prefixes: pa- (meaning "without," as in pa-dashuri "without love"), ndër- (meaning "inter-" or "between," as in ndërmarrje "enterprise")

Suffixes: -ësi (used to form nouns indicating a state or quality, such as fukarallëk meaning "poverty"), -tar (to form nouns denoting a person associated with an activity, like mësuës "teacher")

Albanian's use of suffixes tends to be more prolific in producing derived forms, especially in the construction of nouns, adjectives, and verbs. Albanian has preserved many native suffixes that have been lost in other Indo-European languages.

3. Compounding: Combining Two or More Words to Form New Terms

Compounding is another key word-formation process in both English and Albanian, where two or more words are combined to create a new one with a specific meaning. While both languages utilize compounding, the structure and flexibility of this process differ.

English Compounding

In English, compound words are generally formed by joining two or more free morphemes (words) to create a new meaning. English compounding is highly productive, and compound words can appear in a variety of forms:

Noun + Noun: toothbrush, football

Adjective + Noun: blackboard, drywall

Verb + Noun: breakdown, makeup

English compounds can also take on various syntactic structures, such as open, hyphenated, or closed compounds. This flexibility is a key feature of English, allowing for constant innovation in word formation, especially in technological and scientific contexts.

Albanian Compounding

Albanian also employs compounding, but it often follows stricter rules regarding word formation. In Albanian, compounds are more likely to follow a set syntactic pattern, often with the head noun placed last. Albanian compound words can be found in:

Noun + Noun: jetëgjatësi (life longevity), dritë-hije (light-shadow)

Verb + Noun: punë-kryer (work done, referring to a completed task)

However, Albanian compounds tend to be less flexible than English ones, and many compounds are more descriptive, focusing on literal or tangible concepts rather than abstract ones. Moreover, compound words in Albanian are often created through internal modifications, such as vowel harmonization, which is a characteristic feature of the language's agglutinative nature.

4. Conversion: Changing Word Classes without Affixation

Conversion refers to the process of changing a word's class (e.g., from a noun to a verb) without the use of affixes. Both English and Albanian engage in conversion, but English is particularly renowned for its productive use of this strategy.

English Conversion

In English, conversion is extremely flexible, allowing for the creation of new word classes from existing words. Examples include:

Noun to verb: to Google (from the noun Google)

Verb to noun: a run (from the verb run)

Adjective to noun: the poor (from the adjective poor)

English's reliance on conversion has increased with the influence of technology, leading to the creation of many neologisms, especially in the digital age.

Albanian Conversion

Albanian does use conversion, but it is not as pervasive as in English. When conversion occurs, it tends to be based on shifts between noun and adjective, for example:

Peshk (fish) → peshkatar (fisherman)

Shkollë (school) → shkollor (school-related)

However, due to the agglutinative nature of Albanian morphology, many changes in meaning and class are achieved through affixation rather than pure conversion.

5. Inflection: Grammatical Changes in Word Forms

Both English and Albanian use inflection, which involves changing the form of a word to express different grammatical features such as tense, number, gender, or case. However, the degree of inflection varies significantly between the two languages.

English Inflection

English has relatively limited inflection compared to Albanian, with most inflectional forms occurring in verbs (e.g., run, runs, running, ran) and nouns (e.g., cat, cats). English relies heavily on word order and auxiliary verbs to express grammatical relations, while inflection plays a secondary role.

Albanian Inflection

Albanian, by contrast, is more inflectional, particularly in its rich system of noun declension (cases) and verb conjugation. Albanian nouns change their form based on case (nominative, accusative, genitive, dative, ablative) and number (singular and plural), and verbs are conjugated for person, number, tense, and mood. For example:

Noun: djalë (boy) → djalin (the boy, accusative)

Verb: flas (I speak) → flisja (I was speaking)

This high degree of inflection in Albanian makes it more morphologically complex compared to English, which relies more on syntactic structure to convey similar meanings.

6. Linguistic Evolution and Word Formation Strategies

Over time, both English and Albanian have evolved in response to external influences, social changes, and historical events. English, with its extensive borrowing from Latin, French, and other languages, has developed a highly flexible and diverse system of word formation, particularly in terms of borrowing and compounding.

Albanian, on the other hand, has retained many of its native morphological features, such as agglutination and rich inflection, while also incorporating loanwords from Greek, Turkish, and Italian due to historical interactions. The influence of neighboring languages and political domination has shaped the evolution of word-formation strategies in both languages, yet each language remains distinct in its morphological approach.

Conclusion

The comparative analysis of word-formation processes in English and Albanian reveals both similarities and differences in their morphological strategies. While English relies on a combination of derivation, compounding, conversion, and a limited form of inflection, Albanian employs a more agglutinative and inflectional system, with a stronger emphasis on affixation and noun declension. These differences reflect the unique linguistic

evolution of each language, shaped by historical, cultural, and social factors. Despite these distinctions, both languages demonstrate remarkable flexibility and adaptability in their ability to create new words and express meaning, contributing to their ongoing linguistic vitality.

REFERENCES

"The Morphology of Albanian" by Tishko M. Tase

"Albanian: A Structural and Historical Analysis" by Edmonds, Richard

"Words and Rules: The Ingredients of Language" by Steven Pinker

"The Oxford Handbook of Derivational Morphology" edited by Rochelle Lieber and Pavol Stekauer

"Word Formation in the World's Languages" by Andrew Spencer

"Comparative Grammar of the Indo-European Languages" by Karl Brugmann

"The Comparative Syntax of Albanian and Romance Languages" by M. Rizzi & S. Alexiadou

The Oxford English Dictionary (OED): A comprehensive resource for understanding English word formation.

Fjalor i Gjuhës Shqipe (Dictionary of the Albanian Language

The Phenomenon of the „Eugen Ionesco“ National Theatre in the Republic of Moldova

Vera MARIANCIC-COBZAC

PhD Student, Academy of Music, Theatre and Fine Arts, Republic of Moldova

Abstract

This article examines the formation and development of the National Theatre “Eugen Ionesco” in the Republic of Moldova, focusing on the emergence of its distinctive artistic style and the directorial aesthetics shaped by its artistic director, Petru Vutcarau. The study explores the defining artistic principles that have guided the theater's creative ensemble, emphasizing the influence of

E. Vakhtangov’s theatrical school and E. Ionesco’s dramaturgy on the theater’s conceptual foundation. Particular attention is given to key performances that most effectively embody the stylistic direction of the National Theatre “Eugen Ionesco.” These productions are analyzed in relation to core aesthetic concepts, such as expressiveness and realism, grotesqueness and authenticity, associative perception, and absurdism. The investigation highlights how these elements are integrated by directors in their search for theatrical expression, aligning form with dramatic content to construct a cohesive artistic vision. Furthermore, the study examines the fundamental principles of theatrical aesthetics that define the creative process of the National Theatre “Eugen Ionesco” and assesses the extent of its influence on theatrical discourse both within the Republic of Moldova and internationally.

Keywords: Moldovan Theater, Performance, E. Vakhtangov, E. Ionesco, P. Vutcarau

Introduction

The theatrical art of the Republic of Moldova is inextricably linked to the creative activities of actors and directors who graduated from the Boris Shchukin Theatre Institute in Russia. The artistic foundations of this theatrical school were established by the renowned director, actor, and pedagogue Yevgeny Vakhtangov. His work belongs to the expressive-realistic movement in 20th-century art, characterized by emotional intensity, artistic expressiveness, and grotesque.

At the core of this artistic movement lies a distinct category of figurative thinking, wherein reality is reflected through the subjective perception of the author. This approach leads to its transformation, enriched with emotional and symbolic elements. By employing conventional imagery, the artist establishes semantic connections between seemingly disparate phenomena, conveying the deeper essence of life through unpredictable grotesque

forms imbued with multi-layered associations and elevated metaphorical expression. "There should be neither naturalism nor realism in the theatre, but rather fantastic realism. Well-chosen theatrical means provide the author with genuine life on stage. One can learn the means, but form must be created, must be imagined. That is why I call it fantastic realism. Fantastic realism exists, and it must now be present in every art form" (Vendrovskaya; Kaptereva, 1984: 435).

Yevgeny Vakhtangov's method of working with actors and directors significantly differed from the traditions of Konstantin Stanislavski's theatrical school. Vakhtangov did not aim for the complete identification of the actor with the character. In his view, the authenticity of a stage image lay in the audience's awareness of the very process of an actor's transformation, observing the formation and realization of the character's image. In his directorial concepts, Vakhtangov integrated absolute organic embodiment of the actor's performance with demonstrative theatrical conventionality, forming an innovative synthesis of directorial intentions and the artistic structure of performances. This approach enabled him to transform the stage space through hyperbolized imagery and paradoxical metaphors, enriching the aesthetic discourse of theatrical art.

The Influence of Yevgeny Vakhtangov's Theatrical School and the Theatre of the Absurd on the Formation of the "Eugène Ionesco" Theatre Concept

In 1980, Petru Vutcărău began his studies at the Boris Shchukin Theatre Institute in Russia. The institute's curriculum includes independent student work on excerpts from theatrical productions. Petru Vutcărău and his colleague Mihai Fusu chose to work with Samuel Beckett's play *Waiting for Godot*. This play became a landmark piece within one of the key movements in contemporary dramaturgy – the Theatre of the Absurd.

"The three defining characteristics of the absurd – incapacity for action, linguistic distortions (to the point of aphasia), and the anticipation of divine judgment – traditionally prompt the classification of *Waiting for Godot* as a quintessential example of absurdist literature. Notably, among all literary genres, works of the absurd are the most artistically refined, making them the most technically complex to perform" (Ponomareva, 2024: 21).

The conceptual improvisational approaches employed by P. Vutcărău and M. Fusu facilitated the integration of socially relevant commentary into the texts of S. Beckett's plays. Their improvisations included wordplay in the form of puns, accompanied by expressive plastic *mise-en-scènes*. Interactive engagement with the audience fostered a sense of theatrical participation, provoking immediate emotional reactions from spectators. This grotesque, structurally precise, and physically dynamic theatrical performance not only revitalized the tradition of scenic expressiveness associated with Yevgeny Vakhtangov's legacy but also resonated organically with the cultural and historical context of the contemporary era.

Theater critic E. Koroleva highlights the role of atmosphere in this theatrical discourse, emphasizing the physicality of the performance: "The stage design encompassed the space of a shattered world, a scorched land still illuminated by the flashes of explosions, where miraculously surviving human beings act. This immediately immerses the audience in an absurd world devoid of nature and disconnected from the cosmos. Those individuals who have retained some capacity for emotion and creative imagination indulge in an inventive, though futile and hopeless, game of life. Those who, through senseless violence, have eradicated any remnants of emotion in themselves and others become lifeless beings. It is not the language of incoherent words, phrases, and puns, but rather the language of the body – pantomime, facial expressions, and dance – that vividly reveals the conflict between humanity and the cruel reality that consumes it. At the same time, this physical language

underscores the presence of a vital force within human beings, sustaining and prolonging their existence" (Koroleva, 2006: 189-190).

In 1988, the production of *Waiting for Godot* was presented to the public in Chişinău, the capital of the Republic of Moldova. This production became a milestone for P. Vutcărău and a group of actors who had graduated from the Boris Shchukin Theatre Institute.

In 1991, P. Vutcărău and his collaborators established the "Eugène Ionesco" Theatre in Chişinău. In its early years, the theater primarily focused on the works of E. Ionesco, using them as a conceptual foundation for illustrating the existential absurdity of human existence under institutional determinism, social conformity, and the normative ambivalence of moral principles. The theater's inaugural performance was *The Bald Soprano* by E. Ionesco. Through the use of the "anti-play," Petru Vutcărău sought to create an "anti-theatre," rejecting interpretations burdened by pretentious pseudo-psychologism elevated to the level of dogma. He demanded from actors an inspired, energetic performance infused with hyperbole, deliberately excluding any resemblance to real life: "This is why I call it fantastic realism. Fantastic realism exists, and it must now be present in every art form" (Rosca, 2003: 54).

Vakhtangov's ideas on the role of the grotesque as an artistic device and a primary means of transforming reality on stage were inherited and artistically reimaged in a unique way. Theater scholar A. Roşca notes that "the clownish nature of the *Waiting for Godot* performance ensures a gradual transition from Beckett to Ionesco. It is well known that Ionesco favored puppet theatre, believing the art of dramatic theatre to be deceptive. The clown is the central figure of Ionesco's theatre. This motif, present in almost all of Vutcărău's productions, creates a common thread among the performances. Moreover, there is an organic interconnection between Beckett, Ionesco, and Vakhtangov regarding their shared perspective on puppetry. The use of unexpected pauses, intense reactions, and a tendency toward heightened speech define the behavior of characters in *The Bald Soprano*, where actors resemble marionettes with mechanical, dry voices" (Rosca, 2003: 54).

Later, Petru Vutcărău, in collaboration with Mihai Fusu, turned to another significant theatrical production based on Eugène Ionesco's play *Exit the King* (1993). The interplay of dramatic structure, directorial vision, and expressive acting led to the formation of a complex artistic system. The spatial organization of the scenography balanced functional rigor with artistic expressiveness (scenography by E. Eliţa). The physical expressiveness of the actors, the musical arrangement, the artistic design of the costumes, and all components of the stage action—crafted with stylistic precision and emotional accuracy—became a symbolic hallmark of a theatrical aesthetic inspired by Ionesco's legacy.

"The powerlessness of humans in their pursuit of goodwill evoked in P. Vutcărău a sense of absurdity. In *Exit the King*, the aesthetics of the absurd revealed itself through new forms of physical expression, illuminating the transformation of internal, hidden movements of the fractured and contradictory human soul. This was further emphasized by the space meticulously designed for the unfolding theatrical spectacle. The audience was seated in separate, specially designated sections, and the spaces between them served as entry and exit points for the characters. At the center of the stage stood a character—the guard—whose static posture, with crossed legs, a bowed head, and closed eyes, evoked the image of a meditative figure. As soon as the hall fell into silence, the guard, played by A. Sokirca, suddenly shouted into a mobile phone: 'It's cold. Turn on the heating!' Then, to the accompaniment of musical compositions by A. Schnittke, the guard summoned the characters onto the stage to introduce them to the audience" (Koroleva, 2006: 200).

Distinctive Features of the "Eugène Ionesco" Theatre Aesthetic in Productions of Classical Drama

Today, the repertoire of the "Eugène Ionesco" Theatre includes two productions whose staging history has transitioned from the 20th to the 21st century. Petru Vutcărău has been actively reviving several of his earlier productions, adapting them to the contemporary theatrical context. In this process of reconstruction, he not only re-evaluates the cast but also makes significant changes to his directorial vision, shifting emphases and reinterpreting the stage representation of the works. This creative approach is evident in the renewed versions of his productions, including *The Government Inspector* by N. Gogol and the classic 19th-century Romanian literary work *Chirița in the Province* by V. Alecsandri. In these productions, Vutcărău does not merely adapt the material but creates a new artistic discourse in which the dramaturgical texts are enriched with contemporary meanings, and the stage space is infused with fresh expressive techniques. This ensures that his productions remain relevant and resonate with new generations of audiences while maintaining respect for the original literary tradition. Through powerful artistic techniques, the theatrical performance conveys the complex and contradictory worldview of a person living amid a crisis of societal values.

In *The Government Inspector*, Nikolai Gogol aimed not merely to satirize the vices of individual characters but to delve deeper into the corrupt administrative-bureaucratic system of his time. This system was permeated with corruption, injustice, and fear of authority, reducing officials to obedient executors of orders, incapable of independent thought. The modern interpretation of the play (premiered in 1997) under Petru Vutcărău's direction offers a fresh perspective on the classic plot, updating it to reflect contemporary societal issues. The world presented on stage is a chaotic space engulfed in moral and social crisis, dominated by pervasive corruption, administrative abuses, lawlessness, and irresponsibility. The scenography resembles a prison cell, emphasizing an atmosphere of total decay, greed, and a frenzied race for privileges that turn people into faceless conformists. These expressive artistic techniques not only enhance the satirical effect of the play but also reinforce its modern relevance.

The production of *Chirița in the Province* is built upon a clear, logically structured dramatic framework, where the action unfolds through the collision of grotesque, caricature-like characters. The protagonists serve as composite figures, embodying traits from various eras and cultural traditions, forming a peculiar yet coherent artistic fabric of the narrative. They exist on the borderline between the comedic and the tragic, drawn into an absurd and, at times, unsettling tragi-farce that reflects the chaotic and eclectic nature of contemporary reality. This synthesis of historical and contemporary elements reveals a profound satirical analysis of society, transforming the production into a multi-layered metaphor that exposes timeless human vices and misconceptions through the lenses of irony, grotesque, and dramatic paradox.

In his directorial concept for *Chirița in the Province*, P. Vutcărău deliberately employed expressive techniques characteristic of the Theatre of the Absurd. This artistic choice was driven by his desire to reveal the true essence of the character Chirița, for whom the idea of progress serves merely as an illusory facade, concealing her mercantile ambitions. At the same time, the director expressed a certain fondness for Chirița, stating: "because she is amusing and, ultimately, she is ours. The English have Hamlet, the Russians have Khlestakov, and we have Chirița... Here in Moldova, we cannot reject Chirița in the Province – it is not a comedy; it is our tragedy" (Nechit, 1999: 82-83).

Theatre critic E. Koroleva comments on this perspective, noting: "Later, on the stage of the Eugène Ionesco Theatre, we would see Hamlet and Khlestakov as well. And then we would recognize the fallacy of P. Vutcărău's statement. In Shakespeare's Hamlet, we do not

see England; in Gogol's *The Government Inspector*, we do not see Russia; and in *Chirița in the Province*, we do not see Moldova. Across these productions, in various plastic forms, the image of an international modernity emerges..." (Koroleva, 2006: 202).

Conclusion

The defining characteristics of the "Eugène Ionesco" Theatre include the coherence and consistency of its artistic vision, openness to experimentation and expansion of its repertoire, bold directorial approaches, stylistic innovation in acting, and a high level of teamwork. This theater fosters a synthesis of creativity and professionalism, ensuring that its productions possess deep artistic expressiveness and contemporary stage dynamics.

"To introduce novelty into the artistic act, as Peter Brook put it, 'one must step out of context'; otherwise, it inevitably contaminates you and imposes its own criteria, often with a leveling effect. Petru Vutcărau achieved this escape from context in his own way – through extensive touring with his troupe and participation in international festivals, through collaboration with theater artists from other countries, and through organizing a major international event in Chișinău, the Eugène Ionesco Theatre Biennale. But he also did so in a figurative sense, distancing himself from certain local theatrical practices, where repertoire selection often follows arbitrary criteria or prioritizes the 'accessibility' and appeal of texts for a broad audience" (Tazlauanu, 2008: 123).

The phenomenon of the "Eugène Ionesco" Theatre lies in its unique status as a space of boundless creative freedom. More than just a theatrical stage, it functions as a conceptual laboratory for artistic exploration, offering an alternative model of theater that diverges from traditional forms deeply rooted in the national theatrical culture. Thanks to these defining features, the "Eugène Ionesco" Theatre is not merely a venue for performances but a significant cultural platform that shapes new aesthetic perspectives and provides audiences with a space for intellectual and emotional dialogue.

REFERENCES

- Vendrovskaya Liubovi; Kaptereva, Galina (1984). «Yevgeny Vakhtangov, Collection». Moscow: All-Russian Theatrical Society
- Korolyova, Elfrida (2006). «Theater and Time». Chisinau: Inessa.
- Nechit, Irina (1999). «Godot the Liberator». Chisinau: Cartier.
- Ponomareva, Anastasia (2024). «Absurdism and Its Relation to Faith in Beckett's Play *Waiting for Godot*». *Culture and Art*. No. 3., pp. 17-27. https://nbpublish.com/library_read_article.php?id=39307
- Rosca, Angelina (2003) «Theatricality: Pre- and Post-Vakhtangov» Chisinau: Epigraf.
- Tazlauanu, Valentina (2008). «Paradigms and compatibilities». *Sud-Est Cultural*. No. 2., pp. 115-127.

Examination of Postgraduate Theses about Curriculum Fidelity and Factors Affecting Fidelity on Turkish Trainer

Türkiye’de Eğitimcilerin Öğretim Programlarına Bağlılıkları Üzerine Yayınlanmış Tezlerin İncelenmesi

Vakkas AYGÜN

MEB, Besni İlçe Müdürlüğü, Türkiye

Abstract

In this study, it is aimed to examine the thesis studies published on Commitment to Curriculum in Turkey between 2018 and 2025. In this direction, document analysis, one of the qualitative research methods, was used and the related studies were investigated in terms of publication type, publication year, education level and branch of educators, research method, sample type, type of institution applied, data collection tools and data analysis methods. In the study, out of 26 theses accessed from the National Thesis Centre database, 23 of them are master's theses and 3 of them are doctoral theses. It was seen that all of the theses obtained from the National Thesis Centre were open to sharing.

In the presentation of the study, it is seen that the majority of the theses (88%) are master's theses. It was concluded that the most studies on the subject of commitment to the curriculum were conducted in 2023 with a percentage of 31%. When analysed in terms of the educational level and branches of the educators, it was concluded that half of the thesis studies (50%) were carried out without distinguishing the level and branch, 19% were applied to classroom teachers, 8% to primary and secondary school teachers, and 4% to teachers in other branches. The sampling type was generally determined as maximum diversity sampling type. When the studies were analysed institutionally, 96% of the studies were conducted in schools affiliated to the Ministry of National Education and 4% in higher education institutions. 77% of the studies were conducted by questionnaire, 12% by both face-to-face and questionnaire and 11% by face-to-face. SPSS package programme was used in data analysis.

Keywords: Fidelity to the Education Program, Commitment to Curriculum, Program Fidelity

Özet

Bu çalışmada 2018- 2025 yılları arasında Türkiye’de Öğretim Programlarına Bağlılık konusunda yayımlanmış tez çalışmalna incelenmesi amaçlanmıştır. Bu doğrultuda nitel araştırma yöntemlerinden doküman analizinden yararlanılmış ve ilgili çalışmalar yayın türü, yayın yılı, eğitim kademesi ve eğitimcilerin branşı, araştırma yöntemi, örneklem türü, uygulanan kurumun türü, veri toplama araçları ve veri analizi yöntemleri bakımından araştırılmıştır. Çalışmada Ulusal Tez Merkezi veri tabanından ulaşılan 26 tezin,23 ü yüksek lisans tezi ve 3ü doktora tezinden oluşmaktadır. Yapılan taramada Ulusal Tez Merkezi’nden elde edilen tezlerin tamamının paylaşımına açık olduğu görülmüştür.

Çalışmanın sunucunda tezlerin büyük çoğunluğunu (%88) yüksek lisans tezleri oluşturduğu görülmektedir. Öğretim programına bağlılık konusu ile ilgili en fazla çalışma %31 yüzdeler oran ile 2023 yılında yapıldığı sonucuna ulaşılmıştır. Eğitimcilerin görev yaptığı eğitim kademesi ve branşları bakımında incelendiğinde tez çalışmalarının yarısının (%50) kademe ve branş ayırt edilmeksizin yapıldığı, %19 u sınıf öğretmenlerine, %8 i ilköğretim ve ortaokul öğretmenlerine, %4 nün ise diğer branştaki öğretmenlerinin uygulandığının sonucuna ulaşılmıştır. Örneklem türü genel olarak maksimum çeşitlilik örneklem türü belirlenmiştir. Çalışmaların kurumsal olarak incelendiğinde %96 s Millî Eğitim Bakanlığına bağlı okullarda yapılırken %4 ise Yüksek Öğretim Kurumlarında yapılmıştır. Yapılan çalışmaların %77'si anket, %12 si ise hem yüz yüze hem de anket ve %11'i yüz yüze şeklinde yapılmıştır. Veri analizinde SPSS paket programı kullanılmıştır.

Anahtar Kelimeler: Eğitim Programına Bağlılık, Öğretim Programına Bağlılık, Programa Bağlılık

Public and Digital Diplomacy as Tools to Promote the Image of Romania

Lect. Ana-Maria ANDRONACHE

Alexandru Ioan Cuza University – Iasi, Romania

Abstract

In an interconnected world, public diplomacy and digital diplomacy have become essential tools for promoting a state's image internationally. Romania, as a member of the European Union and NATO, is adapting its diplomatic strategies to strengthen its global influence and improve its external perception. This article analyses the role of public and digital diplomacy in the process of promoting Romania's image, highlighting the strategies used by the Ministry of Foreign Affairs and other institutions to communicate effectively with international audiences. The study explores the impact of the use of social networks, online platforms and emerging technologies in digital diplomacy, highlighting their advantages and challenges. It also examines how Romania can align its diplomatic practices with international standards in order to become a more visible actor on the global stage. Based on a comparative analysis with other Central and Eastern European countries, the article proposes measures to improve the effectiveness of Romanian digital diplomacy. The conclusions underline the importance of an integrated strategy integrating traditional diplomacy with new technologies in order to strengthen Romania's image in the current context of globalization and digitalization.

Keywords: Public Diplomacy, Digital Diplomacy, Romania's Image, Global Influence

Introduction

In the era of globalisation and technological advancement, promoting a country's image is essential for enhancing international influence and attracting investment. Digitisation plays a significant role in creating and disseminating a nation's image, influencing global perceptions of economic development, access to information and international competitiveness (Adejumo et al., 2024: 4). At the same time, cultural communication becomes a crucial factor in strengthening national identity and increasing international influence, facilitating the exchange of values and ideas between nations. Also, political stability and coherent domestic policies are vital for building an attractive image, which directly influences foreign investment and tourism. Countries need to adopt an integrated strategy to promote their national image, combining traditional diplomacy with

digital tools to influence international perceptions and ensure a competitive position in the context of globalisation. Therefore, promoting Romania's image through public and digital diplomacy is becoming an essential component of foreign policy, helping to strengthen international influence and improve the global perception of the country. Romania's public diplomacy focuses on the promotion of national values, cultural heritage and bilateral relations, using traditional and digital tools to engage external audiences and shape international opinions. The national image is influenced not only by foreign policies but also by digital popular culture, and the effective use of emerging technologies in public diplomacy can increase the visibility and attractiveness of Romania on the international stage. Recent research shows that digital diplomacy is not only redefining diplomatic relations, but also fundamentally changing the way states construct their image in the eyes of the international community (Manor, 2023:270). Another relevant aspect for Romania is the need to adapt diplomatic training to the new requirements of digital communication, by integrating educational programmes that train experts capable of navigating and effectively using the new digital communication platforms (Vevera, 2022: 25). Thus, this article emphasises the importance of public and digital diplomacy for promoting Romania's image, highlighting the strategies needed for a stronger and more coherent international presence. Digital diplomacy represents a significant opportunity for Romania, allowing direct interaction with external audiences and the promotion of national conceptions through social networks and digital communication platforms (Manor, 2023: 272). A concrete example of Romanian digital diplomacy is the analysis of the activity of the Ministry of Foreign Affairs on Twitter, which demonstrated the impact of using social platforms to disseminate foreign policy messages and strengthen diplomatic relations.

Public diplomacy: definitions, evolution and objectives

Public diplomacy is a core area of international relations, defined as a way in which states interact directly with external publics to influence international perceptions and build sustainable relationships. It has evolved significantly over the past decades, adapting to new technological and social realities (Byrne, 2024 :218) . Essentially, public diplomacy involves engagement with civil society, the media, academia and citizens, and is a strategic tool for the projection of a state's soft power. The evolution of public diplomacy can be divided into several stages. In the post-war period, it was mainly used to promote ideologies during the Cold War, through institutions such as the Voice of America or the British Council (Neary, 2024 :21) . Subsequently, public diplomacy has transformed from a one-way communication into an interactive process with the development of the internet and social networks. The concept of 'new public diplomacy' emphasises the need for direct involvement of citizens and non-state actors in the diplomatic process. The objectives of public diplomacy are diverse and include promoting national culture, strengthening bilateral relations and combating disinformation. For example, in Japan and Ireland, public diplomacy has been used to enhance international cooperation in education and tourism (Neary, 2024: 25). In addition, in the 21st century, states have begun to develop digital strategies to project their image in an interconnected global environment, using artificial intelligence and data analytics to personalise diplomatic messages. A key aspect of modern public diplomacy is digitisation, which has changed the methods of diplomatic communication. Social networks are now the main platforms through which states interact with foreign publics, and their influence in foreign policy has become undeniable (Byrne, 2024 :219)._For example, 98 per cent of UN member states use digital platforms to achieve their foreign policy goals. Thus, public diplomacy has evolved from a unilateral communication model to an interactive one, based on dialogue and active engagement, aiming to adapt to the challenges and opportunities imposed by the digital and globalised era.

Digital diplomacy: the impact of technology on international communication

Digital diplomacy has revolutionised international communication, enabling states to project their image and interact directly with external audiences through digital technologies. This transformation has been accelerated by the evolution of social media, artificial intelligence and new communication platforms, allowing states to influence global public opinion in a fast and effective way (Eggeling, 2023:13). The impact of digital diplomacy on international relations can be seen through the increasing influence of digital media on diplomatic discourse. For example, Twitter is widely used by world leaders and diplomatic institutions to convey their official positions and manage international crises in real time. This practice has led to a democratisation of the diplomatic process, enabling public engagement in international discussions, but it has also raised issues of disinformation and digital manipulation. Another key aspect of digital diplomacy is the adaptation of foreign ministries to new technologies. Diplomatic institutions have had to rethink their communication strategies to adapt to the new norms of digital interactions, which has led to a redefinition of traditional diplomatic practices (Bjola & Manor, 2024:7). For example, during international crises, digital diplomacy allows states to react faster and influence global perceptions through strategic messaging and online campaigns. Emerging technologies such as artificial intelligence and Big Data analytics have expanded digital diplomacy's ability to personalise and target messages to specific audiences, improving the effectiveness of diplomatic campaigns (Aussadyk, 2023: 2). However, this digitisation also raises ethical challenges, such as data security and the impact on diplomatic confidentiality. In conclusion, digital diplomacy is redefining the way states communicate internationally, offering both significant opportunities for increased global influence and challenges related to security, transparency and information management in the digital environment.

The current context of Romanian public diplomacy

Romanian public diplomacy has undergone a significant evolution in the last decades, being influenced by the European integration processes and new geopolitical realities. In the current context, Romania's public diplomacy focuses on strengthening external relations by promoting democratic values, cultural identity and strategic partnerships, both within the European Union and internationally (Zavoeanu, 2013: 1). A key aspect of Romanian public diplomacy is the management of the country's external image, especially in the context of the growing influence of Euroscepticism in Europe. Romania needs to adapt its communication strategies to strengthen internal and external support for European integration and to combat populist rhetoric that affects the perception of the European Union in the region (Ariyani, 2023:3). Another component of Romanian public diplomacy is to strengthen relations with the Republic of Moldova, given the historical and cultural ties between the two countries. Studies show that Romania's current public diplomacy strategies need to be improved, in particular by developing strategic messaging and more actively conducting public diplomacy programmes directly on the territory of Moldova, and not only in Romania (Petraaru & Anghel, 2017: 52). Moreover, Romanian public diplomacy has to face the challenges posed by multiple crises in the region, such as the COVID-19 pandemic and the conflict in Ukraine. These events have emphasised the need for effective diplomatic communication capable of responding quickly to changing perceptions and new security challenges. Thus, in the current context, Romanian public diplomacy needs to adapt its strategies to the new international realities, strengthen its presence in the region and develop efficient communication mechanisms to improve its external image and achieve its foreign policy objectives.

Strategy of the Ministry of Foreign Affairs in promoting Romania's image

1. Fight Euroscepticism and strengthen international support

A major thrust of the MFA's strategy is to improve Romania's image in the European Union, given the opposition to European integration from populist groups on the right and left. Studies show that the MFA is using public relations and digital media to promote the benefits of EU membership and counter Eurosceptic rhetoric (Ariyani, 2023 :4). Euroscepticism has become an increasingly influential current in many EU Member States, supported by both right-wing and left-wing populist parties. In Romania, although support for the EU remains relatively high compared to other Member States, there has been an increase in Eurosceptic narratives, fuelled by themes such as national sovereignty, migration, EU agricultural and economic policy and conditions imposed by Brussels. Factors that have contributed to the emergence of Euroscepticism in Romania include: the economic and social crises - the perception that EU policies have generated inequality and economic stagnation, misinformation and propaganda through the spread of fake news about the EU online, especially on social networks, and the influence of populist parties - the increasing influence of Eurosceptic parties in the national political discourse (Chirileasa, 2021:3).

In this context, the MFA has developed strategies to prevent the intensification of these trends and to improve the perception of the benefits of EU membership. The strategy of the Ministry of Foreign Affairs is based on two major strands: public relations and digital diplomacy. The MFA utilises public relations as a tool for building international support and promoting the benefits of Romania's EU membership. Key initiatives include: public information campaigns - the MFA works with national and European institutions to explain the positive impact of EU policies on Romania's economic and social development (MFA, 2022a); partnerships with academia and NGOs - organising conferences, debates and educational programmes to raise awareness of the benefits of European integration; and cultural and educational diplomacy by promoting European identity through cultural exchanges, scholarships and mobility programmes such as Erasmus+ and Horizon Europe (MFA, 2022b).

MFA has also developed a set of tools to counter Euroscepticism through online communication: the use of social media - disseminating official messages through Facebook, Twitter and LinkedIn to counter misinformation and interact directly with international audiences, multimedia content production - creating videos, podcasts and infographics that present the benefits of EU membership in an accessible and engaging format, and partnerships with journalists and fact-checkers - working with media outlets to debunk myths about the EU and promote accurate and verifiable information (Chirileasa, 2021:4). Regular evaluations conducted by the MFA indicate an increase in positive perceptions of the EU in Romania, mainly due to educational initiatives and online campaigns. In a survey conducted by Eurobarometer (2022), more than 70 per cent of Romanians stated that they see the EU as a source of economic stability, suggesting the effectiveness of information campaigns. However, the MFA strategy faces certain challenges such as limited financial resources - compared to other Member States, Romania invests less in public diplomacy and international image promotion, the influence of external propaganda - the increasing influence of disinformation campaigns sponsored by non-European state actors, and the difficulty in countering pre-existing negative perceptions - changing public opinion requires time and sustained long-term efforts. Through information campaigns, international events and the use of online media, Romania is strengthening its position in the EU and countering Eurosceptic rhetoric. However, to improve the effectiveness of these strategies, adequate funding and closer co-operation with European actors and civil society is needed.

2. Relations with the Republic of Moldova and promotion of European values

Another essential pillar of Romanian public diplomacy is to promote the image of the European Union in the Republic of Moldova. Although Romania has carried out numerous diplomatic and cultural initiatives in this direction, research suggests that their impact is low due to the fact that most public diplomacy events and programmes take place on Romanian territory, without an active presence in Moldova (Petru & Anghel, 2017:54). In this context, a reconfiguration of the MFA strategy is essential in order to maximise the effectiveness of public diplomacy in support of European values. The Republic of Moldova is in a complex geopolitical situation, influenced by tense relations with the Russian Federation and a society polarised in terms of its strategic orientation. Despite a firm commitment of the Moldovan authorities to European integration, a significant part of the population remains reticent towards the EU, influenced by anti-European propaganda and economic difficulties. The factors influencing the perception of the EU in the Republic of Moldova include: anti-European propaganda - campaigns conducted by external actors, in particular Russia, which present the EU as a destabilising factor, the economic and social situation - discontent with the standard of living and endemic corruption affect confidence in European institutions (Lupușor et al., 2022: 1) and the lack of a constant presence of Romanian public diplomacy on the ground.

Romania has developed a number of programmes aimed at supporting the Republic of Moldova's rapprochement with the EU, using various instruments of public diplomacy such as educational and cultural diplomacy which is a central tool in promoting European values (Kostanyan, 2016: 37). Relevant initiatives include: scholarships for Moldovan students, Romania offers thousands of scholarships to Moldovan students every year, thus facilitating their access to education in Romanian universities, educational and academic exchange programmes - partnerships between Romanian and Moldovan universities promote educational integration and facilitate contact of young Moldovans with European values and cultural and artistic events such as the organisation of exhibitions, film festivals and theatre performances that highlight the common cultural identity and Moldova's belonging to the European space (MFA, 2022a). To combat anti-European propaganda and increase the visibility of the benefits of European integration, Romania has invested in digital diplomacy, including online information platforms - the creation of digital portals for the Moldovan public, providing accurate information about the EU and European opportunities, as well as social media campaigns - the use of Facebook, Twitter and YouTube to disseminate pro-European messages and counter misinformation.

Romania is one of Moldova's main economic partners and donors. Among the most important initiatives are investments in infrastructure by supporting projects to modernise transport, energy and health infrastructure (MFA, 2022b), grants to local governments - financing local development projects and improving public services in Moldovan communities, and cross-border cooperation programmes - initiatives aimed at increasing economic and social connectivity between Romania and the Republic of Moldova. Romania's efforts to support Moldova's European integration have had a significant impact, reflected in growing support for European integration - according to polls conducted by the Institute for Public Policy (2022), some 55 per cent of Moldovans support EU membership, up from previous years. The relationship between Romania and the Republic of Moldova remains a strategic element of Romanian diplomacy, and the promotion of European values in Moldova is essential to ensure a sustainable European path for this country. By strengthening its diplomatic presence on the ground, expanding its educational and cultural programmes and increasing its involvement in the digital environment, Romania can amplify its impact on Moldovan public opinion and actively contribute to bringing Moldova closer to the EU.

3. Managing external perception and countering foreign influences

In an increasingly complex geopolitical environment, Romania needs to carefully manage its external perception and counter the influences of third states that seek to undermine support for the European Union and NATO. The Ministry of Foreign Affairs has a key role to play in this endeavour, adopting strategies aimed at promoting a positive image of Romania and combating disinformation. One of the main actors conducting influence campaigns in Romania is Russia, which uses public diplomacy and the media to improve its own image and undermine trust in Euro-Atlantic structures (Hlihor & Hlihor, 2021: 336). This situation requires Romania to adopt a more active strategic approach, based on increasing its involvement in international security projects and strengthening efforts to combat disinformation. Over the past two decades, the Russian Federation has used a variety of tactics to influence public opinion in Romania and to weaken the cohesion between the country and its Western partners. These include: disinformation through traditional and digital media - platforms such as Sputnik and Russia Today disseminate content portraying NATO as an aggressive alliance and promoting the idea that Romania's EU membership is detrimental to the national economy, exploitation of social and economic tensions - populist and nationalist narratives are amplified to accentuate social divisions and delegitimise democratic institutions, and energy and economic diplomacy - Russia tries to maintain its influence through economic levers such as natural gas supplies and strategic investments. These tactics have led to a number of challenges in managing Romania's image internationally: increasing distrust of European and Euro-Atlantic institutions among a part of the population, the spread of anti-Western narratives that undermine Romania's position as a pro-European state and active NATO member, and the need for increased engagement in combating disinformation and foreign propaganda to protect Romania's image and that of its strategic partners (Hlihor & Hlihor, 2021:340). In order to strengthen its strategic position and manage external threats more effectively, Romania has been actively engaged in international initiatives such as cooperation within NATO - Romania hosts key structures of the alliance, such as the Missile Defence System at Deveselu, and contributes significantly to international security missions (MFA), participation in European cybersecurity initiatives - Romania is an important regional centre in the fight against cyber-attacks and disinformation campaigns, projects to combat propaganda and disinformation - Romania collaborates with European institutions to develop media education and fact-checking programmes. Thanks to the efforts of the MFA and international partnerships, Romania has made significant progress in managing external perceptions such as increased international visibility, with Romania being perceived as a stable and active partner in Euro-Atlantic structures (MFA). An important challenge for Romania is to adapt to new tactics of influence as foreign actors diversify their propaganda methods, which requires constant updating of strategies.

4. Digitalisation of diplomacy and use of new technologies

In the age of accelerated digitisation, traditional diplomacy is undergoing a profound transformation, driven by the emergence of new technologies and changes in the way states interact with the external public. Romania's Ministry of Foreign Affairs has adopted a digital diplomacy strategy aimed at improving the country's international image and facilitating communication with citizens and political actors in other countries. Digital diplomacy, or e-diplomacy, involves using social networks, online platforms and emerging technologies such as Big Data and artificial intelligence to optimise communication strategies. Romania has strengthened its digital presence by integrating advanced techniques for analysing international perceptions and personalising the messages conveyed in the digital public space (Fiță & Ilieva-Obretenova, 2024: 58). Romania started the process of digitisation of

diplomacy in the 2000s, with the growing importance of the internet and social networks in international relations. Nowadays, digital diplomacy strategies include several dimensions: social media communication, Big Data and perception analysis, Artificial Intelligence and the automation of diplomatic processes, and Cyber-diplomacy and digital security.

Digital diplomacy enables the MFA to communicate directly with the external public, respond in real time to international crises and promote Romania's initiatives in international fora. Among the tools used are Facebook and Twitter as official channels through which the MFA distributes communiqués, reacts to events and interacts with Romanian and foreign citizens, LinkedIn to promote Romania's image in the diplomatic and academic environment, facilitating relations with international organisations, and YouTube and TikTok, platforms used to disseminate informative videos on Romania's foreign policy, cultural events and tourism promotion campaigns. This strategy has a direct impact on Romania's international visibility and increases the accessibility of official information for the diaspora and foreign partners. An essential element of digital diplomacy is the tailoring of messages according to the target audience. Using Big Data, the MFA can analyse international trends and adjust communication strategies in real time. This process involves analysing public sentiment by studying reactions to official postings to understand foreign perceptions of Romania, segmenting audiences by creating tailored campaigns for different audiences based on location, interests and online behaviour, and monitoring misinformation by detecting and combating fake news by identifying sources and countering hostile narratives (Fiță & Ilieva-Obretenova, 2024: 60).

Artificial Intelligence (AI) is starting to be used in digital diplomacy to optimise foreign relations management. The MFA has adopted several technological solutions such as chatbots for interacting with citizens and automating translations and document processing, thus reducing the time needed to manage international diplomatic communications. The use of AI to analyse geopolitical data and predict possible conflicts or diplomatic tensions allows for greater efficiency in the management of foreign relations and improves Romania's responsiveness in the international diplomatic environment (Bjola & Papadakis, 2020:187). The adoption of digital diplomacy has led to the improvement of Romania's image at the international level by increasing transparency but also by reducing the impact of misinformation, ensuring active monitoring of fake news. In spite of the obvious advantages, digital diplomacy also encounters certain difficulties that relate to cyber security, which requires advanced data protection measures, but also to over-information and fake news as the increased flow of information can lead to difficulties in managing communication and combating disinformation. A well-defined cybersecurity strategy and continuous adaptation to new technological trends are needed to maximise the benefits of digital diplomacy.

5. National branding and tourism promotion

National branding plays a key role in the Ministry of Foreign Affairs' strategy to strengthen Romania's international image. The promotion of a distinct national identity contributes to increasing the country's attractiveness as a tourist destination and to economic development by attracting investment and promoting cultural exports. In a global context in which countries compete for the attention of tourists and investors, Romania is building a tourism branding strategy based on the integration of traditional values with new trends in digital marketing (Ștefan et al., 2024: 75). This approach combines the promotion of cultural heritage, gastronomy and authentic traditions with modern technologies to maximise the impact of the messages conveyed internationally.

For Romania, national branding has two main objectives: to promote tourism and cultural heritage and to strengthen Romania's image internationally. Through these objects

it aims to increase the international visibility of Romanian destinations through innovative strategies, but also to build an attractive and coherent national identity in order to improve the perception of the country. Romania has an impressive cultural and natural heritage that can be effectively utilised in the national branding strategy. The main elements promoted include: UNESCO destinations - Places such as Sighișoara, the wooden churches of Maramureș and the monasteries of Bucovina are integrated into international promotion campaigns, rural tourism and eco-tourism - Regions such as Maramureș and the Danube Delta are promoted as authentic destinations for tourists interested in ecological and traditional experiences, as well as historic cities and urban tourism - Bucharest, Cluj-Napoca, Brasov and Sibiu are presented as vibrant cultural destinations through festivals, international events and modernised infrastructure (Ștefan et al., 2024:77). Romanian gastronomy is becoming an increasingly important element of the branding strategy by promoting traditional cuisine as part of the cultural identity. Recent initiatives include international gastronomic festivals and wine tourism, by promoting the vineyards of Dealu Mare and Transylvania as attractive tourist destinations for wine enthusiasts, for example.

The branding strategies implemented so far have generated a number of positive effects such as an increase in the number of international tourists, according to INS data (2023), Romania has seen an 18% increase in foreign visitors in the last three years, Romania has become a more popular destination for European and Asian tourists and is included in more and more prestigious travel guides (Ștefan et al., 2024:80). Attracting investments in the tourism sector for the development of hotel infrastructure and the expansion of tourist services have been stimulated by a stronger national image. However, despite progress, Romania faces a number of obstacles that affect the effectiveness of tourism branding: it does not yet have an internationally recognised tourism brand slogan as other countries in the region have, budgets allocated to international campaigns are lower compared to other European countries and infrastructural problems : tourism development is affected by problems related to transport and insufficiently modernised tourism services. Through an integrated approach combining cultural heritage, gastronomy and new digital technologies, Romania can improve its international visibility and attract more tourists.

Recent initiatives in cultural, economic and digital diplomacy in Romania

In an increasingly complex international context, modern diplomacy is no longer limited to traditional inter-state relations, but integrates cultural, economic and digital dimensions. As a member of the European Union and NATO, Romania has taken a number of initiatives aimed at strengthening its international presence through cultural, economic and digital diplomacy. Cultural diplomacy plays an essential role in promoting Romania as a relevant actor on the international stage. In recent years, the initiatives of the MFA and the Romanian Cultural Institute (RCI) have aimed at increasing the visibility of Romania's cultural heritage and strengthening relations with the diaspora, among recent initiatives we mention: "Romania-France Season" (2019-2020) - Organising a series of cultural events in France and Romania, promoting artistic and academic collaboration between the two countries, the 2022 Francophone Games, the expansion of the Romanian Cultural Institute network - opening new RCI branches in European capitals and intensifying activities in the USA and Asia and, more recently, in 2024 in Tokyo, funding programmes for Romanian artists, etc (Ministry of Culture). These initiatives have had a positive impact on Romania's image, emphasising the country's cultural diversity and creativity.

Economic diplomacy has also become an essential component of Romania's foreign strategy, aimed at attracting foreign investment and promoting Romanian products on international markets. Recent strategies in economic diplomacy include bilateral economic partnerships - Romania has concluded economic cooperation agreements with Germany,

Italy and Japan in areas such as technology, green energy and the automotive industry, international economic forums - participation in Expo 2020 Dubai and the organisation of economic events in Asia and North America to promote the Romanian business environment, and the "Invest in Romania" programme launched by the Ministry of Foreign Affairs and the Ministry of Economy, which supports the attraction of investors through tax incentives and strategic partnerships (Ministry of Economy). These initiatives have contributed to increased foreign direct investment in Romania, particularly in the technology and renewable energy sectors. Romania has also managed to expand its export markets, strengthening its presence in Asia and the Middle East.

Digital diplomacy has become a priority for Romania in the context of globalisation and the growing importance of technology in foreign policy. Recent initiatives in digital diplomacy include the digitisation of consular services through the introduction of the "e-Consulat" online appointment system and the implementation of electronic passports for the Romanian diaspora (MAE), international collaborations in the field of cyber security - the European Cyber Security Centre, the use of Big Data and AI in diplomacy by integrating artificial intelligence solutions to monitor the perception of Romania in the international media and to combat disinformation. The digitisation of Romanian diplomacy has led to greater efficiency in the management of foreign relations and improved communication with the diaspora.

Conclusions and outlook

Public diplomacy has become an essential tool in the foreign policy of modern states, facilitating the promotion of the national image, the strengthening of international relations and the management of external perceptions. Romania, as a member state of the European Union and NATO, has implemented a number of strategies to improve its international image and strengthen its geopolitical position. Through digital diplomacy, Romania can strengthen its global influence, attract investment and support cultural and economic initiatives of impact. To promote national interests, Romania utilises various digital tools, including: social networks used to disseminate official information, promote national culture and respond quickly to international events, official websites: platforms such as romania.travel, mae.ro and embassy websites provide information on foreign policies, investment opportunities and tourism promotion, podcasts and vlogs, but also virtual tours: the use of AR/VR technology allows the promotion of cultural heritage through interactive experiences, such as virtual tours of museums and historical monuments (Zaharna, 2020:16).

Romania has carried out numerous campaigns and projects to promote its image internationally, such as #WeAreNATO: a global campaign to emphasise the contribution of NATO member states, including Romania, to collective security. This was promoted through social media, conferences and official videos. Embassies and consulates organise cultural events, conferences and virtual exhibitions to keep in touch with Romanian communities abroad, and digital diplomacy facilitates close collaboration with the Romanian diaspora which plays a crucial role in promoting the country's image abroad. Collaboration with international media is also essential to ensure an accurate and positive representation of Romania in the global press. At the same time, global influencers are involved in promotional campaigns, creating authentic content that draws attention to Romania as an important tourist and economic destination.

Digital diplomacy provides Romania with unique opportunities to promote its image and strategic interests globally. The effective use of digital platforms, well-structured campaigns and collaborations with the diaspora, the international press and influencers contribute to reinforcing the positive perception of Romania internationally. A country's

international image plays a key role in attracting investment, promoting tourism and strengthening geopolitical influence.

REFERENCES

- Adejumo, D. A., Wynn, M., & Vale, V. T. (2024). The Role of Digitalisation in Shaping a Country's Image. Proceedings of the ... European Conference on Information Warfare and Security, 23(1), pp.1-9
- Ariyani, N. (2023). *Komunikasi Public Relations Politik Luar Negeri Rumania*. International Journal of Demos,5 (1) , pp.3-5
- Aussadyk, A. B. (2023). *New Technological Tools in Diplomatic Practice*, p2
- Bjola, C., & Manor, I. (2024). The Oxford Handbook of Digital Diplomacy. Oxford: Oxford University Press, pp 3-28
- Bjola, C., & Manor, I. (2024). Digital diplomacy in the age of technological acceleration: three impact scenarios of generative artificial intelligence, Place Branding and Public Diplomacy, Palgrave Macmillan UK, pp.1-6
- Bjola, C., & Papadakis, K. (2020). Digital propaganda, counterpublics, and the disruption of the public sphere: The Finnish approach to building digital resilience, he World Information War, Routledge, pp 186-213
- Byrne, S. (2024). Public Diplomacy , Foreign Policy: Theories, Actors, Cases, Oxford University Press, pp.218-235
- Chirileasa, Andrei. (2021). 'Euro-scepticism on the rise in Romania amid wide discrepancies pp.1-5
- Eggeling, K. A. (2023). *Digital Diplomacy*. Oxford Research Encyclopedia of International Studies, p.1
- Fiță, N. D., & Ilieva-Obretenova, M. (2024). Development of the Romanian extended national security strategy for the period 2025-2030. Promoting interests in a dynamic world, unpredictable in full expansion and change. STRATEGIES XXI - National Defence College 2(1), pp 57-66
- Hlihor, C., & Hlihor, E. (2021). Russia's Strategy for Influence Operations Through Public Diplomacy: The Romanian Case .Springer, Cham, pp. 335-352
- Kostanyan, H. (2016) Why Moldova's European integration is failing, p.2
- Lupușor, A., et al. (2022) Why EU should not hesitate in granting Candidate Status to Moldova? , <https://www.expert-grup.org/> , p1
- Manor, I. (2023). Digital public diplomacy .Edward Elgar Publishing eBooks, pp. 267-280
- MFA (2022a). Annual Reports. Bucharest: Ministry of Foreign Affairs.
- MFA (2022b). Cultural diplomacy and educational programmes. București: Ministry of Foreign Affairs.
- Ministry of Culture. <https://www.cultura.ro/culturaro>
- Ministry of Economy. <https://economie.gov.ro/>
- Neary, J. (2024). *Public Diplomacy in Ireland and Japan*. Politics, Security and Society in Asia Pacific, Amsterdam University Press, pp21-28
- Petraru, C., & Anghel, M. (2017) *How Can Romania Use Public Diplomacy in Order to Improve the Image of the European Union in the Republic of Moldova?*pp. 52-54
- Stefan, M., Ionescu, L., & Andreiana, V.-A. (2024). Romanian Tourism Branding Model. Valahian Journal of Economic Studies, 15(1), pp. 73-86.
- Vevera, V. (2022). Promoting digital diplomacy through education. Bulletin of "Carol I" National Defence University, 10(4), pp. 22-27
- Zaharna, R. (2020). Communication Logics of Global Public Diplomacy, Routledge Handbook of Public Diplomacy, p16
- Zavoeanu, R.-G. (2013). the role and importance of public diplomacy, Romania case study in the context of integration into NATO. European Scientific Journal, ESJ, 9(19).

Strained Finances, Strained Marriages? Perceived Financial Hardship and Divorce Likelihood in Azerbaijani Families

Lect. Maryam ADILKHANOVA

PhD Student, Azerbaijan State Economic University (UNEC), Azerbaijan

Abstract

Financial hardships are one of the major stressors in marital relationships. Detrimental effects of financial stress on marital quality have been subject to many studies in the current literature. However, the literature is fairly limited for the case of developing Islamic countries such as Azerbaijan. This research explores the role of financial strain, characterized by perceived inadequacy of resources to meet financial demands, in marital dissatisfaction or more precisely, frequency of thinking about getting divorced. Using first hand survey data on married individuals (n=534) results from conditional probability analysis shows that financial satisfaction matters for married individuals. Probability of “thinking often” about getting divorced decreases for both males and females as financial satisfaction increases, while the conditional probability of “thinking never” decreases. This result is consistent with various measures of financial satisfaction. While more comprehensive analysis is required to have more explicit conclusion, current findings well explain the Family Stress Model framework in case of Azerbaijani families.

Keywords: Financial Strain, Marital Conflict, Marriage, Divorce, Azerbaijan

Business Management in the New Digital Era

Apostolos GOULAS

Phd Student, University of Thessaly, Greece

Dr. Zacharias PAPANIKOLAOU

Democritus University of Thrace, Greece

Abstract

The new digital era has transformed management of business, in a unique and solicit way. Companies, are trying to follow up with the technological jumps and remain competitive, by introducing on their operations the achievements of modern society, like artificial intelligence (AI), big data analytics, cloud computing, blockchain, metaverse. Digital technologies, applied on daily business, end up, transform them, and reshape their organizational structures, affect its decision making process, even with market interaction. Companies and employees should train in the new digital era with digital skills, in order to remain competitive. Furthermore, e-commerce and e-marketing are gaining ground as new market trends for companies, creating a new unstaible business environment, with global real and digital competition. The inceased competition and the continuous need for companies' innovation, make effective leadership a necessity. The present research paper tries to investigate the effect on business management on the new digital era. Companies from different sectors will be examined, in order to study good practices and highlight the challenges and opportunities that these companies are facing.

Keywords: Business Management, New Digital Era, Competitiveness, Decision Making Process, Digital Skills

Management of Organic Farms under the Farm to Fork Strategy: The case of Greece

Apostolos GOULAS

Phd Student, University of Thessaly, Greece

Dr. Zacharias PAPANIKOLAOU

Democritus University of Thrace, Greece

Abstract

The Farm to Fork strategy, as part of the European Union's Green Deal strategy, is aiming to create a sustainable food system by promoting environmentally friendly farming practices, reducing chemical inputs, and ensuring fair economic attributes for farmers. This ambiguous strategy, aims to accelerate the transition of modern societies to a sustainable food system that should have a neutral or positive environmental impact, help to mitigate climate change and adapt to its impacts, reverse the loss of biodiversity, ensure food security, nutrition and public health, making sure that everyone has access to sufficient, safe, nutritious, sustainable food, and preserve affordability of food while generating fairer economic returns, fostering competitiveness of the EU supply sector and promoting fair trade. In Greece, a country with vast agricultural sector, organic farming is at the front line for economical and social reasons. The present study tries to investigate the opinion of Greek farmers, regarding the new Farm to Fork strategy and its implications. Moreover, will try to study, the way EU sustainability targets affect management and competitiveness of organic farms in Greece.

Keywords: Management, Organic Farms, Farm to Fork Strategy, Sustainability, Competitiveness

Examining the Reflections of Spatial Perception on Human Psychology and Emotional State through the Concepts of "Play-Fiction"

Mekan Algısının İnsan Psikolojisi Duygu-Durum Açısından Yansımalarının İncelenmesinin "Oyun-Kurmaca" Kavramları Üzerinden Okunması

Tuğçe ÖZYÜZGEN

Student, Nişantaşı University, Türkiye

Abstract

Humans feel the need to express their experiences through channels such as drama, theater, painting, music, and dance. Confronting oneself is a painful process, and individuals often fear facing their own flaws. Jung attributes this fear to the darkness of the human psyche. For transformation to occur, an inner journey is essential. In social life, individuals tend to conceal their true identities and live behind a mask. Jung refers to this mask as "Persona." Perception is a fundamental area of study in psychology and is shaped by emotional tendencies. Life experiences influence perception. In contemporary society, rapid change has led to issues such as loneliness, alienation, and insecurity. This study examines how individuals working long hours in the same space engage in drama-play fiction training to adopt different identities and its effects on emotional regulation, self-control, and empathy. The research will be conducted through a literature review, focusing on Erving Goffman's Dramaturgical Self Theory, particularly the concepts of Front Stage, Back Stage, Impression Management, and Role-Playing. It is proposed that individuals can transcend their existing statuses and transform their emotions through play-fiction. Drama education is believed to foster self-awareness and have a positive impact on identity transformation.

Keywords: Persona, Dramaturgical Self Theory, Perception and Emotion Management, Drama and Play-Fiction, Individual and Social Transformation

Özet

İnsan, deneyimlediklerini drama, tiyatro, resim, müzik ve dans gibi kanallarla aktarma ihtiyacı hisseder. Kendisiyle yüzleşmesi sancılı bir süreçtir ve yanlışlarıyla yüzleşmekten korkar. Jung, bu korkuyu insanın iç dünyasının karanlığına bağlar. Değişim için bireyin iç yolculuğu önemlidir. İnsan, toplumsal yaşamda gerçek kişiliğini saklama ve bir maske ile yaşama gereği duyar. Jung, bu maske için "Persona" terimini kullanır. Algı, psikolojinin temel çalışma alanlarından biridir ve duygusal eğilimlerle şekillenir. Yaşam deneyimi algıyı etkiler. Günümüzde hızlı değişim, yalnızlık, yabancılaşma, güvensizlik gibi sorunlara yol açmaktadır. Bu çalışmada, aynı mekânda uzun saatler çalışan bireylerin drama-oyun kurmaca eğitimleriyle farklı kimliklere bürünerek duygu yönetimi, özdenetim ve empati becerileri üzerindeki etkileri incelenecektir. Araştırmada literatür taraması

yapılacak, Erving Goffman'ın Dramaturjik Benlik Kuramı'ndaki Ön Sahne, Arka Sahne, İzlenim Yönetimi ve Rol Yapma aşamaları ele alınacaktır. Bireylerin mevcut statülerini aşarak oyun-kurmaca yoluyla duygularını dönüştürebileceği öne sürülmektedir. Drama eğitiminin benlik dönüşümünde farkındalık sağladığı ve olumlu etkiler yarattığı düşünülmektedir.

Anahtar Kelimeler: Persona, Dramaturjik Benlik Kuramı, Algı ve Duygu Yönetimi, Drama ve Oyun Kurmaca, Bireysel ve Sosyal Dönüşüm

The Insurance Industry in Turkey and the Importance of Home Insurance

*Türkiye’de Sigortacılık Sektörü ve Konut Sigortacılığının Önemi**

Merve Esra GÜLCEMAL

Doktora Öğrencisi, Dokuz Eylül Üniversitesi, İktisadi ve İdari Bilimler Fakültesi, Ekonometri Bölümü, Türkiye

<https://orcid.org/0000-0002-6243-2023>

Prof. Dr. Ali Kemal ŞEHİRLİOĞLU

Dokuz Eylül Üniversitesi, İktisadi ve İdari Bilimler Fakültesi, Ekonometri Bölümü, Türkiye

<https://orcid.org/0000-0001-5190-6740>

Abstract

The insurance industry maintains its popularity day by day. The intense interest and demand in this field contribute to the sector's development. Recently, home insurance has gained importance and has become a branch of insurance sought by individuals aiming to protect their assets. It is extremely important to correctly identify the factors affecting premiums in home insurance, both for policyholders and insurers. Insurers must apply the right pricing policy to determine their reserve funds and compensate for damages in case of risks. If they offer too low a price, they will not be able to cover the damages when a risk occurs, and if they offer a price that is too high, the policyholder will face a loss. Those wishing to insure will want to adjust their budgets with an accurate price estimate. Therefore, a model is needed to predict the premium amounts. In this study derived from the thesis work, a generalized linear model was established using key variables believed to influence the price, and the extent of the impact of these variables on the price was investigated. According to the analysis results, the most influential variable on the price was found to be the size of the house, while the least influential variable was the age of the house.

Keywords: Generalized Linear Models, Exponential Distribution Family, Insurance

Özet

Sigortacılık sektörü popülaritesini her geçen gün korumaktadır. Bu alana olan yoğun ilgi ve talep sektörün gelişmesine katkı sağlamaktadır. Son günlerde konut sigortaları önem kazanmaya başlamış, varlıklarını korumak isteyen bireylerin yöneldiği bir sigorta dalı olmuştur. Gerek sigorta ettirenler için gerekse sigortacılar için konut sigortalarında primi etkileyen faktörlerin doğru bir şekilde belirlenebilmesi son derece önem arz etmektedir. Sigortacıların, hazar rezervlerini belirleyebilmek ve risk oluşması durumunda hasarı tazmin edebilmek için doğru bir fiyat politikası uygulamaları gerekmektedir. Olması gerekenden az bir tutarda fiyat verirse, risk oluştuğunda hasarı tazmin edemeyecek, fazla bir fiyat vermesi durumunda ise sigortalı kaybı yaşayacaktır. Sigorta ettirmek isteyenler ise doğru bir fiyat

tahmini ile bütçelerini ayarlamak isteyeceklerdir. Dolayısıyla prim tutarlarının tahmin edilmesi konusunda bir modele ihtiyaç vardır. Tez çalışmasından türetilen bu çalışmada, fiyatı etkileyebileceği düşünülen önemli değişkenler kullanılarak genelleştirilmiş doğrusal model kurulmuş, değişkenlerin fiyat üzerinde ne oranda etkili olduğu araştırılmıştır. Analiz sonuçlarına göre fiyat üzerinde en etkili değişkenin konutun büyüklü olduğu, en az etkiye sahip değişkenin ise konutun yaşı olduğu saptanmıştır.

Anahtar Kelimeler: Genelleştirilmiş Doğrusal Modeller, Üstel Dağılım Ailesi, Sigortacılık

Giriş

Türkiye gerek genç oluşumlu olması gerekse orta kuşakta yer alması sebebiyle çeşitli doğal afetlere maruz kalmaktadır. 2021 yılında Batı Karadeniz’de yaşanan sel felaketi bunun en önemli örneklerinden biridir. Bir saatte metrekareye 133,8 kg yağış düşerek büyük bir sel felaketine neden olan bu olayda, metrekareye düşen yağış miktarı, bir yıllık toplam yağışın 3’ te 2’ si olarak kayıtlara geçmiştir. Yaşanan bu sel felaketi pek çok can ve mal kaybına sebep olmuştur. Benzer şekilde 2023 yılında yaşanan ve asrın felaketi olarak isimlendirilen Kahramanmaraş depremi de pek çok binanın yıkılmasına, pek çok insanın can ve mal kaybına sebep olmuştur. Doğal afetler nedeniyle yaşanan bu olaylar bireylerde gerek canlarını gerekse mallarını koruma konusunda farkındalık oluşturmuştur. Bireyler bu felaketlerden korunmak için yaşayacakları konutların dayanıklılığını ön plana koymuşlardır.

Doğal afetler dışında kalan insan kaynaklı çoğu faktör de bireylerin can ve mal kayıplarına neden olabilecek sonuçlar doğurmaktadır. Bu yılın başında Kartalkaya’da yaşanan büyük yangın bunun en acı örneklerinden biridir. Bu yangın da pek çok insanın can kaybına neden olmuştur. Öte yandan, ülkemizde son zamanlarda suç istatistiklerinde bir artış söz konusudur. Özellikle hırsızlık suçu, ülkemizde görülen yaygın suç türlerinden biri konumuna gelmiştir. Zemin katlarda oturan bireyler ve dükkân sahipleri, can ve mal güvenlikleri için binalarında hırsızlığa karşı koruyucu önlemler almaya başlamışlardır.

Yukarıda verilen örnekler olası bütün risk ve tehditlere karşı sigortacılık sektörünün önemini göstermektedir. Bireylerin zorunlu sigortalar dışında diğer sigorta konularında da bilinçli olması, risklere karşı alabilecekleri önlemler açısından önem arz etmektedir. Bu bağlamda doktora tezinden türetilen bu çalışmanın birinci bölümünde sigorta branşları üzerinde durulacak ve sigorta türleri tanıtılacaktır. İkinci bölümde, çalışmada kullanılan istatistiksel yöntemler paylaşılacaktır. Üçüncü bölümde ise özel bir sigorta türü olan konut sigortalarına dair yapılan istatistiksel analizlerin sonuçları paylaşılacak ve yorumlanacaktır.

1. Sigorta Türleri

Sigortayla ilgili literatürde çeşitli sınıflandırmalar yapılabilmektedir. Bu sınıflandırmaların temel ayrımlarından biri özel sigorta ve sosyal sigorta ayrımıdır. Sosyal sigorta, toplumla ilgili oluşabilecek risklere karşı güvence verebilmek için devlet desteğiyle uygulanmakta olan sigorta türüdür. Özel sigorta ise gerçek kişi veya tüzel kişilerin sahip olduğu riskleri güvence altına alabilmek için başvurduğu ihtiyari ya da zorunlu sigorta türleridir (Baştürk, Çakmak ve Demirtaş, 2017: 147).

Sigortayı branş olarak da ayırmak mümkündür. Türkiye’de uygulanan sigortacılık faaliyetleri Dünya sigortacılığına benzer olarak hayat dışı sigortalar ve hayat sigortaları olarak iki ana başlıkta ifade edilmektedir (Şahin, 2018: 166). Hayat sigortası insanın hayatı boyunca karşılaşacağı riskleri güvence altına alan sigorta sözleşmeleridir. İnsan hayatı

dışında kalan diğer bir ifade ile mal ve sorumluluklarla ilgili rizikoları ise elementer sigortalar teminat altına almaktadır (Çipil, 2019: 109).

1.1.Hayat Sigortaları

Hayat sigortaları yaşamı konu edinen sigorta branşlarıdır. Yaşamın uzun olması sebebiyle bu sigorta ürünleri genellikle uzun vadelidir. Sigorta ürünü satın alan müşterinin intihar ya da intihara teşebbüs sonucu ölmesi durumunda sigorta ücreti ara vermeden üç sene ödenmiş ise sigortacının tazminatı ödeme yükümlülüğü bulunmaktadır (Çipil, 2019: 109). Hayat sigortalarının birikimli hayat sigortaları ve risk ağırlıklı hayat sigortaları olarak iki türü vardır.

Bireyin kazanmış olduğu ücretin karşısında tasarruf yaparak kendi ve sevdiklerinin hayati risklerini güvence altına alan sigorta sözleşmelerine birikimli hayat sigortası denilmektedir. Poliçe vadesi sona erdiğinde elde edilen birikimler sigortalı tarafa ödenmektedir. Birikimli hayat sigorta poliçelerine emeklilik poliçesi de denilmektedir (Özbolet, 2004: 27). Risk ağırlıklı sigorta poliçelerinde sigorta süresi genellikle bir senedir. Sigortalının vefat etmesi durumunda belirlenmiş olan tazminat tutarı kanuni varislere ya da poliçede belirtilmesi koşuluyla lehtar olan kişiye ödeme yapılmaktadır (Kaya, 2020: 552).

1.2.Hayat Dışı Sigortalar

Hayat dışı (elementer) sigortalar birey, kurum ve kuruluşların para ile ölçülebilir ve maddi olarak tehdit edilebilecek olan rizikolara karşı güvence altına alabilmektedir. Risklerin hesaplanmasının ardından belirlenen prim ile güvence altına alınabilmektedir. Hasarın meydana gelmesi halinde ise gerçekleşen zarar ve ziyanlar sigortacı tarafından sigortalıya ödenmektedir (Akay, 2001: 16).

1.2.1.Kaza Sigortaları

Kaza sigortalarında sözleşmenin konusu, beklenmedik bir olay karşısında ortaya çıkan riskleri ifade etmektedir. Kişinin mal varlığına ve bedenine karşı olan olumsuzlukları teminat altına alan sigorta türüdür. Kaza sigortaları, ferdi kaza sigortaları ve karayolu Yolcu Taşımacılığı Zorunlu Koltuk Ferdi Kaza Sigortası olarak ikiye türü vardır (Akay, 2001: 17).

1.2.2.Hastalık/Sağlık Sigortaları

Hastalık ve sağlık sigorta sözleşmesi, sigortalının sigorta sözleşmesinde belirtilen süre içerisinde kaza sonucu yaralanması veya hastalanması durumunda tedavi ücretleri sigorta kapsamına alınmaktadır. Bu sigorta sözleşmelerinin ayakta tedavi ve yatarak tedavi teminatı olmak üzere iki teminatı bulunmaktadır (Şahin, 2018: 172).

1.2.3. Konut sigortası

Konut sigortası genel şartları kapsamında, yalnızca deprem gibi doğal afetler değil, aynı zamanda hırsızlık, terör olayları ve su baskını gibi çeşitli riskler de teminat altına alınmaktadır. Bu sigorta, hem konutun fiziksel yapısını hem de içerisinde bulunan eşyaları kapsayacak şekilde düzenlenmektedir. Zorunlu bir sigorta türü olmaması sebebiyle, poliçenin kapsamı ve buna bağlı olarak sigorta primleri, sigortalı ve sigorta sağlayıcı tarafından karşılıklı olarak belirlenebilmektedir (Allianz, 2025). Konut sigortası; yangın, deprem, hırsızlık, sel, su baskını, yapının dahili su tesisatından kaynaklanan zararlar, cam kırılması gibi çeşitli riskleri güvence altına almakta olup, sunulan teminatlar poliçenin kapsamına bağlı olarak değişkenlik gösterebilmektedir (Sigortam.net, 2024).

1.2.4.Zorunlu Deprem Sigortası (ZDS)

Zorunlu deprem sigortası, doğa olayı olan depremin gerçekleşmesi sonucu ortaya çıkan zararları karşılama amacıyla yapılan sigorta türüdür (Barlas, 2011: 115).

Zorunlu deprem sigortası sigorta sözleşmesine söz konusu olan malı sigorta bedeline kadar teminat altına almaktadır. ZDS; deprem, deprem etkisiyle oluşan yangın, infilak, deprem sonrasında yeryüzü kayması ve deprem etkisiyle ortaya çıkan tsunamiyi teminat altına almaktadır (Orhaner, 2013: 206).

1.2.5.Yangın Sigortası

Yangın sigortası, yangın etkisiyle evde, evin içerisinde bulunan eşyalarda ortaya çıkan zararı güvence altına alan sigorta türü olarak karşımıza çıkmaktadır. Kuramsal olarak yangının tanımı, kaynağı belirsiz olan ve kendiliğinden meydana gelen zararlı bir ateş olarak bilinmektedir. Yangın sigortasında yangının yanı sıra yıldırım ve infilak gibi risklerde güvence altına alınabilmektedir (Orhaner, 2013: 325).

1.2.6.Seyahat Sağlık Sigortası

Seyahat sağlık sigortası kişinin yurt içi veya uluslararası yolculuğu esnasında başına gelebilecek sağlık sorunlarına karşı güvence verilen özel sigorta ürünüdür (Özcan, 2020: 92).

Yukarıda sayılan bu önemli sigorta branşları dışında başka sigorta branşları da vardır. Bu branşlar aşağıdaki gibi maddelenebilir:

- Karayolları Motorlu Araçlar Zorunlu Mali Sorumluluk Sigortası
- Yeşil Kart Sigortaları
- Genel Zarar Sigortaları
- Nakliyat Sigortaları
- Genel Sorumluluk Sigortaları
- Kredi Sigortaları
- Hukuksal Koruma Sigortası
- Finansal Kayıplar Sigortası

2. Yöntem

Kütahya ilinde 500 konut poliçesine ulaşılarak hazırlanan tez çalışmasında, yöntem olarak geliştirilmiş doğrusal model kullanılmıştır. Geliştirilmiş modelin kurulmasındaki ilk ve en önemli kıstas, bağımlı değişkenin dağılımının üstel aileden gelmesidir. Bu yüzden, bu başlık altında üstel dağılım ailesi hakkında da kısa bir bilgi verilecektir.

2.1. Geliştirilmiş Doğrusal Modeller

Bilim ve teknoloji alanlarında, dünyadaki olguların açıklanmasını kolaylaştırmak amacıyla kullanılan modeller genel olarak deterministik ve stokastik olmak üzere iki temel kategoriye ayrılmaktadır. Deterministik modellerde sonuçlar kesin ve öngörülebilir bir yapıya sahipken, stokastik modeller belirsizlik unsurlarını içermekte ve rastgele değişkenlerin etkisiyle ortaya çıkabilecek dalgalanmaları da dikkate almaktadır.

Stokastik modeller içerisinde önemli bir sınıf, klasik doğrusal modellerin (KDM) geliştirilmiş bir biçimi olarak tanımlanan Geliştirilmiş Doğrusal Modellerdir. Bu modeller, KDM'deki doğrusallık varsayımının ötesine geçerek, üstel dağılım ailesinden herhangi bir dağılımın kullanılmasına olanak tanımakta ve doğrusal önkestirim ile seçilen

dağılımın ortalaması arasında bir fonksiyonel ilişki kuran bağ fonksiyonu aracılığıyla iki yönlü bir genelleştirme yapmaktadır (Lindsey, 1997: 258).

Genelleştirilmiş doğrusal modeller, rasgele bileşen, sistematik bileşen ve bağ fonksiyonu olmak üzere üç temel bileşenden oluşur. Rasgele bileşen, sabit varyanslı, üstel dağılım ailesinde gelen bir dağılıma sahip olan yanıt değişkenidir. Sistematik bileşenler, doğrusal ön kestiricilerdir. Bağ fonksiyonu ise diğer iki bileşen arasında bağ kuran, monoton, diferansiyellenebilir bir fonksiyondur (Tunç, 2010: 16).

2.2. Üstel Dağılım Ailesi

Bağımlı değişken Y 'nin üstel dağılıma sahip olduğu varsayımı altında, üstel aileye ait olasılık yoğunluk fonksiyonu, belirli özel fonksiyonlar olan $a(\cdot)$, $b(\cdot)$ ve $c(\cdot)$ kullanılarak aşağıdaki biçimde ifade edilmektedir:

$$f_y(y; \theta, \phi) = \exp \{ (y(\theta) - b(\theta)) / a(\phi) + c(y, \phi) \}$$

biçiminde ifade edilmektedir.

Burada θ konumu temsil eden kanonik (doğal) parametreyi, ϕ ise ölçeği belirleyen yayılım parametresini ifade etmektedir.

Üstel dağılıma sahip olan Y 'nin beklenen değeri (ortalaması) ve varyansı sırasıyla

$$E(Y) = \mu = b'(\theta) \text{ ve}$$

$$Var(Y) = b''(\theta)a(\phi) = V(\mu)a(\phi) \text{ biçimindedir.}$$

Bu bağlamda, $b'(\theta)$ ve $b''(\theta)$, parametresine göre birinci ve ikinci dereceden türevleri ifade etmektedir. Öte yandan $V(\mu)$ bağımlı değişken Y 'nin beklenen değeri ile varyansı arasındaki matematiksel ilişkiyi tanımlayan bir fonksiyon olup, literatürde varyans fonksiyonu olarak adlandırılmaktadır (Jong ve Heller, 2008: 196).

3. Bulgular

Konut poliçelerinde fiyatlandırma üzerine yapılan tez çalışmasında 500 adet poliçe kullanılmıştır. Çalışmanın bağımlı değişkeni prim tutarı iken bağımsız değişkenler konutun büyüklüğü (metrekaresi), konutun tipi, konutun konumu (diğer bir ifade ile bulunduğu kat) ve konutun yaşıdır. Bu değişkenler kullanılarak yapılan analiz sonuçları Tablo 1'de paylaşılmıştır:

Tablo 1: Genelleştirilmiş Model Çıktıları

	Katsayı (exp (b))	Standart Hata	95% Güvenilirlik		Wald Test İstatistiği	Prob.
			Alt Sınır	Üst Sınır		
Sabit	1879,376	273,5849	1343,159	2415,592	47,189	0,000
K. Büyüklüğü	50,323	2,2132	46,986	55,661	537,776	0,000
K. Tipi	5,969	1,7475	8,427	15,416	8,196	0,004
K. Konumu	-45,146	23,6219	-93,444	-0,848	3,983	0,046
K. Yaşı	3,175	1,4117	3,928	60,421	4,984	0,026

Kurulan genelleştirilmiş doğrusal modele sonuçlarına göre çalışmada kullanılan bütün değişkenler istatistiksel olarak anlamlı bulunmuştur (prob.<0,05). Tabloya göre genelleştirilmiş doğrusal model aşağıdaki gibi yazılabilir:

$$Y = 1879,376 + 50,323 KB + 5,969 KT - 45,146 KK + 3,175 KY$$

Yukarıda yer alan eşitliğe göre toplam primi en çok etkileyen faktörün, katsayısı en büyük olması nedeniyle konutun büyüklüğü olduğu görülmektedir. Konutun yaşı ise katsayısı en küçük değişken olup konut poliçe prim tutarını en az etkileyen değişken olmuştur.

Sonuç

Günümüzde sigortacılık sektörünün gelişmesine paralel olarak bu sektörde yer alan alt branşlara da olan talep artmıştır. Özellikle yaşanan doğal afetler ve kazalar sonucunda hayat poliçeleri, yangın poliçeleri, konut poliçeleri gibi sigortacılık alanları yoğun ilgi görmeye başlamıştır.

Hayat dışı sigortanın bir türü olan konut sigortalarının incelendiği tez çalışmasından türetilen bu çalışma sonucuna göre, konut sigorta primini etkilediği düşünülen değişkenlerin, en çok önemliden en az önemliye doğru önem sırası şu şekildedir: Konutun büyüklüğü, konutun konumu, konutun tipi ve konutun yaşı. Gelecekte yapılacak çalışmalara konut özelliği dışında farklı faktörlerin de modele eklenmesi önerilmektedir.

KAYNAKÇA

- Akay, H. (2001). *Hayat Sigorta Şirketlerinde Hesap İşleri Düzeni*. İstanbul: Türkmen Kitabevi.
- Allianz. (2025). *DASK ile Konut Sigortası Arasındaki Farklar Nelerdir?* 02 03, 2025 tarihinde https://www.allianz.com.tr/tr_TR/seninle-guzel/dask-ile-konut-sigortasi-farklari.html adresinden alındı
- Barlas, N. (2011). Afet Sigortaları Kanunu'na Göre Zorunlu Deprem Sigortası Sözleşmesinin Tarafları. *Erzincan Binali Yıldırım Üniversitesi Hukuk Fakültesi Dergisi*, 15(3-4), 113-156.
- Baştürk, F., Çakmak, D., & Demirtaş, B. (2017). *Sigortacılığa Giriş*. Ankara: Bankacılık Akademisi Yayınları.
- Çipil, M. (2019). *Sigortacılık ve Risk Yönetimi*. İstanbul: Seçkin Yayıncılık.
- Jong, P., & Heller, G. Z. (2008). *Generalized Linear Models for Insurance Data*. London: Cambridge University Press.
- Kaya, F. (2020). Sigortacılık. F. Kaya içinde, *Türkiye'de Uygulanan Sigorta Türleri (Branşları)* (s. 327-559). İstanbul: Beta Basım Yayım Dağıtım A.Ş.
- Lindsey, J. K. (1997). *Applying Generalized Linear Models*. New York: Springer Verlag Inc.
- Orhaner, E. (2013). *Sigortacılık*. Ankara: Siyasal Kitabevi.
- Özbolat, M. (2004). *Türkiye'de Hayat Sigortaları & Bireysel Emeklilik Sistemi*. İstanbul: Detay Yayıncılık.
- Özcan, H. (2020). Yolcuların Seyahat Sigortası Satın Alma Şekilleri Üzerine Bir Çalışma. *Kocaeli Üniversitesi Sosyal Bilimler Dergisi*(39), 91-104.
- Sigortam.net. (2024). *Konut Sigortası Hangi Riskleri Kapsar*. 02 03, 2025 tarihinde <https://www.sigortam.net/konut-sigortasi-hangi-riskleri-kapsar> adresinden alındı
- Şahin, C. (2018). Sigortacılığa Giriş. F. Akın içinde, *Sigorta Branşları* (s. 165-190). Bursa: Ekin Yayınevi.
- Tunç, T. (2010). Hayatdışı Sigortalarda Hasar Rezervinin Genelleştirilmiş Doğrusal Modellerle Tahmini. Yüksek Lisans Tezi, Hacettepe Üniversitesi.

Persian Rule in Egypt from the Beginning until the Inaros Revolt (525-460 BC)

Başlangıcından İnaros İsyanına Kadar Mısır'da Pers Hakimiyeti (M.Ö. 525-460)

Yusuf Başbuğ ARMAĞAN

Master Student, Ondokuz Mayıs University, Türkiye

Abstract

Egypt is a civilisation located in the northeast of Africa, which has stood out with its geographical location throughout history. The Nile River formed the basis of Egypt's agriculture, economy and social structure, and contributed to the development of civilisation by providing fertile lands with its annual floods. As Herodotus stated, 'Egypt is the gift of the Nile.' From the Neolithic Age until the Iron Age, Egypt struggled against the attacks of the Nubians in the south and the Libyans in the west, expanding its borders in the process and becoming an important power in the region. Egypt's relations with the outside world began in the third and second millennia BC with trade with the states in the Levant and the Mediterranean. This trade was actually in the form of supplying Egypt's deficiencies. The timber and stone required for the temples and palaces built in parallel with the greatness of the pharaoh, who was seen as a divine figure, were tried to be supplied from nearby geographies. In addition, Egypt was dependent on foreign sources for precious metals, precious stones, exotic odours and resin used in mummy making. The desire to control resources directly led Egypt to war with the Near Eastern states. Wars such as the Battle of Kadesh with the Hittites increased Egypt's regional influence. However, external threats such as the Hyksos invasion and Assyrian attacks left Egypt in a difficult situation. The arrival of the Persians in the region radically changed the history of Egypt.

Keywords: Egypt, Persian Empire, Cambyses II, Darius I - Mısır, Pers İmparatorluğu, II. Kambyes, I. Dareios

Özet

Mısır, Afrika'nın kuzeydoğusunda yer alan ve tarih boyunca coğrafi konumuyla öne çıkan bir medeniyettir. Nil Nehri, Mısır'ın tarım, ekonomi ve toplumsal yapısının temelini oluşturmuş, yıllık taşkınlarıyla verimli topraklar sunarak medeniyetin gelişmesine katkıda bulunmuştur. Herodotos'un da belirttiği gibi, "Mısır Nil'in armağanıdır." Mısır, Neolitik Çağ'dan Demir Çağı'na kadar güneyde Nübye ve batıda Libyalıların saldırılarıyla mücadele etmiş, bu süreçte sınırlarını genişletip bölgenin önemli bir gücü haline gelmiştir. Mısır'ın dış dünya ile ilişkileri MÖ III. ve II. binde Levant ve Akdeniz'de bulunan devletler ile ticaret yaparak başlamıştır. Bu ticaret aslında Mısır'ın eksikliklerini temin etme şeklinde olmuştur. Tanrısal bir figür olarak görülen firavunun büyüklüğüne paralel olarak inşa edilen tapınaklar ve saraylar için gerekli olan kereste ve taş yakın coğrafyalardan temin edilmeye çalışılmıştır. Bunun yanında değerli metaller, değerli taşlar, egzotik kokular ve mumya

yapımında kullanılan reçine için Mısır dışı bağımlı olmuştur. Kaynakları doğrudan kontrol etme isteği Mısır'ı Yakındoğu devletleri ile savaşa sürüklemiştir. Hititlerle yapılan Kadeş Savaşı gibi savaşlar, Mısır'ın bölgesel etkisini artırmıştır. Ancak, Hiksos işgali ve Asurluların saldırıları gibi dış tehditler, Mısır'ı zor durumda bırakmıştır. Perslerin bölgeye gelişi ise Mısır tarihini kökten değiştirmiştir.

Anahtar Kelimeler: Mısır, Pers İmparatorluğu, II. Kambyes, I. Dareios

Mısır'ın Doğu Akdeniz'deki ticaret rotalarındaki stratejik konumu ve zenginlikleri, pek çok yabancı bu bölgeyi ele geçirmek istemesine sebep olmuştur. Tarih boyunca Mısır'a hâkim olan güçler Suriye'ye, Suriye'ye hakim olan güçlerse Mısır'a hakim olmaya çalışmışlardır. Coğrafyanın buna mecbur etmesi veya yanı başında güçlü bir devlet istemeyen uygarlıklar bu yolu izlemişlerdir. Bir diğer bu yolu izleyenlerse Asurlulardan sonra Persler olmuştur. Herodotos'un aktardığına göre savaş sebebi, Mısır'ın firavununun Pers yönetiminde bulunan II. Kambyes'e kızı yerine başka asil ailelerden birinin kızını yollamasıdır. Ancak, bu mücadele daha derin sebeplerle de ilişkilidir. II. Kyros döneminde Babil devleti ve Lidya devletini hakimiyetine alan Persler, kuzeyde konar göçer Massaget ve İskit boylarının mukavemetleriyle karşılaşmışlardır. Doğuda ise İndus nehri ve dağlar Perslerin o dönem için yayılım sahalarını kısıtlamıştır. Bu durum Persleri Mısır, Cyreneialılar ve Kartacalılar üzerine seferler yapma fikrine sebep olmuştur. Ayrıca Mısır'da bulunan Nil nehrinin geniş alüvyonlu arazileri oldukça verimli olması sebebi ile çevresindeki en büyük hububat ve tahıl üretim sahalarından sayılır. (BREWER-TEETER, 2024; 30) Nil'in oluşturduğu kesim noktalarında büyük kıyı vahaları vardır. Bunlardan en büyüğü Kerkeosiris(Fayyum) vahasıdır. Fayyum vahasında, balıkçılık, antilop avcılığı yapılacak alanlar ile büyük tarım sahaları vardır. (BREWER-TEETER, 2024; 24) Ekonomik olarak büyük bir gelecek vadeden bu topraklara karşı Persler kayıtsız kalmamıştır.

MÖ 525'te Arap kabilelerinin yardımını alan Persler, Mısır'a sefer düzenlediler ve Pelusium olarak adlandırılan Mısır'ın kilidi olarak nitelendirilen mevkiye, Mısır ordusunu mağlup etmiştir. İlerleyen Pers ordusu pek çok kent ve kaleyi ele geçirmiştir. Mısır'ın ilhaki, tek bir güç olarak karşı koyamayıp, yerel güçler olarak kalan Mısırlıların direnişi yüzünden, Asurlular dönemindeki gibi bir akın olarak kalmamış; ülke, Pers İmparatorluğu'nun bir parçası haline gelmiştir. II. Kambyes Mısır kralı olmuş ve görünüşe bakılırsa MÖ 522'ye kadar hükümdarlığının büyük bölümü boyunca Mısır'da kalmıştır. (Van De MIEROOP, 2006;328.) II. Kambyes, Manetho'ya göre XXVII. Mısır Hanedanı'nın sekiz kralından ilki olarak sayılır. (Manetho, *Aigyptiaka*, 71.) Böylece Mısır'da yeni bir dönem başlamıştır. Herodotos'a göre II. Kambyes, Mısır'ın ileri gelenlerinin kızları ve Mısır kralının kızına köle elbiseleri ile su taşıtarak Güney Mısır'daki direnişi manevi olarak kırmaya çalışmıştır. Daha sonra ise Sais'e gelen II. Kambyes, Amasis'in sarayına girdi, Amasis'in ölüsünü mezarından çıkartıp getirmelerini emretti ve türlü biçimlerde cesede zarar vermiştir. Sonunda cellatlar yorulmuşlar ve Pers kralı II. Kambyes'ten bağış dilemişlerdir. (Herodotos, III, 16.) Diodorus Sicillus da bize bu konuda Herodotos ile paralel bilgiler aktarmıştır. (Diodorus Siculus X, 14, 2,) Ayrıca Diodorus, II. Kambyes'in Mısır Kralı Amasis'in cesedini yaktırdığını aktarır. (Diodorus Siculus X, 14, 2.) Ölü yakmak veya yaktırmak, Mısır kültürüne göre ölüyü gücendirmek için yapıldığını ekler. Çünkü Mısırlılar, ölümden sonra yaşam için bedenlerini korumak adına mumyalatırlar. Bu durumda Mısır kültürünün bir nebze gücendirildiğini,

Pers dini ve kültürü için önemli olan ateşin, burada bir mesaj olarak Mısır'ın hakiminin artık Perslerin olduğu düşüncesini yansıttığını düşünebiliriz.

Bölge halkının sert muhalefetine uğrayan II. Kambyes, hakimiyetini güçlendirmek ve bölgede kalıcı olmak için Cyrenecia, Barkalılar, Amonlular ve Etiyopya halklarına karşı Mısır'dayken harekete geçti. II. Kambyes, Etiyopya üzerine sefere çıkmak üzereyken ordusunun bir bölümünü Amonluların üzerine yolladı ve önemli bir kehanet merkezi olan Amon Kehanet Merkezini yakmalarını ve tapınak çevresindekilerini esir etmelerini emretti. (Diodorus Siculus X, 14, 3.) Daha sonra Etiyopya üzerine gitmek isteyen II. Kambyes, güneye doğru yöneldi. Ancak, Sudan topraklarına giden yoldaki ikmal sorunları yüzünden geri dönmeye karar verip seferi yarıda kesmiştir. Dönüş yolunda Herodotos'un aktarmasına göre, "...II. Kambyes Memphis'e döndüğü sırada Apis -ki, Yunanlılar "Epaphos" derler- Mısırlılara göründü; bu olay üzerine Mısırlılar en güzel giyeceklerini giyindiler ve bayram yaptılar. Mısırlıların sevinçlerini gören II. Kambyes, kendi başarısızlığına sevindiklerini sandı ve yöneticileri işkenceye yollayıp Mısırlılar için kutsal sayılan Kutsal Apis (Epaphos) öküzünü öldürttü. Bayramı da yasakladı..." (Herodotos, III, 27, 1.) Herodotos bu bilgileri, oradaki rahip ve halktan duyduklarından yararlanarak aktardığı düşünülmektedir. Burada kendisinin aktardığı söylencelerin gerçek olup olmadığını araştırmakla birlikte, Herodotos'a bu olayları aktaranların toplumun değişik zümresinden insanların olduğu ve onların gözünde II. Kambyes yönetimi hakkındaki fikir ve düşüncelerinin ne olduğu gözler önüne serilmektedir. Diodoros ise bize, Perslerin Kralı II. Kambyes önderliğinde Mısırlıları ordularıyla yenip, bastırdıktan sonra Perslerin egemenliklerinin sertliği ve yerel tanrılara saygısızlıklarından dolayı Mısırlıların isyan çıkardıklarından bahsetmektedir. (Diodorus Siculus I, 44, 3.) Öyle ki Strabon, Herodotos'un anlatısını sürdürerek Mısır seyahatinde Thebes kentinde birkaç tapınağa II. Kambyes tarafından saldırılar yaptırıldığından bahseder. (Strabon, XVII, 46, 1.) Mısırlılar, Persleri yabancı olarak nitelendirerek Mısır'ın çeşitli yerlerinde pek çok isyan hareketine girişmişlerdir. Perslerin başkentlerinin Mısır'ın dışında oluşu, kültür farklılığı ve Pers kralının Mısır'da ikamet etmemesi gibi sebeplerden dolayı Perslerin Mısır'daki yönetimini Mısır'ın yerel halkı kabullenememiştir.

Satrap Aryandes Dönemi

II. Kambyes döneminde görevlendirildiği düşünülen Pers soylularından Aryandes Mısır valiliği görevine getirildi. (Herodotos, IV, 166.) Burada sert politikalar ile Mısır halkını bezdirme politikasını uygulayan Aryandes, II. Kambyes'in ölümü sonrası bölgede bir güç olarak ortaya çıkmaya başlamaktadır; öyle ki, Herodotos'un aktarmasına göre, hemen akabinde gümüş para darp ettirmişti ve dönemin Yunan dünyasında en saf gümüş paraya "Aryandes Gümüşü" olduğunu, bizlere aktarmaktadır. (Herodotos, IV, 166.) Aryandes'in bölgedeki halka karşı tavırları, Mısır'ın yeni fethedilen bir yer olması ve Pers Kralı II. Kambyes'in Mısırlıların geleneklerine karşı takındığı tavır sebebiyle isyanlar başlamıştır. Ayrıca Mısır Satrabı Aryandes sert bir politika izleyerek Mısırlılara karşı baskıcı bir tutum geliştirmiştir. (TIGNOR, 2022;112.) Bununla da yetinmeyip, Batı Mısır'da yer alan yerli halklar ve Yunan kolonilerine sefer açtı. Mısır'ın komşu halklarından Libyalılar ve Etiyopyalılar yerli olarak görülürken Yunanlılar dışarıdan gelme görülürler. (Herodotos, IV, 197.) Satrap Aryandes Mısır'a karşı onları tehdit gördüğü Yunanlılar üzerlerine yürüyerek Mısır'ın batısındaki Yunanlıları sindirmeye çalışmıştır. Herodotos ve onunla paralel şekilde aktaran Polyainos'a göre; Pheretime'nin komutasındaki Pers satraplık kuvvetleri, Aryandes'in emriyle Mısır'dan kalkıp yürüyüşe geçtiler. Bugün Mısır'ın batısı ile Libya'nın doğusuna düşen Barka'ya geldiler, kenti kuşattılar ve kentin ileri gelenlerinden Arkesilaos'un ölümünden sorumlu olanların kendilerine verilmesini istediler ama bu talep Barkalılar tarafından kabul görmedi. Barka'yı dokuz aylık kuşatma ile ele geçirdiler. (Herodotos, IV, 200) (Polyainos, *Strategemata*, VII, XXXIV-Aryandes.) Bölgede yapılan

seferde, Cyrenaicalıların (Kuzey Libya'da bulunan Yunan kolonicileri)kurucuları Battos soyundan olanlara dokunulmamış; ancak geriye kalanların içinde Yunanlıların olduğu düşünülen pek çok esiri, Mısır'a getirtmiştir. Batı Mısırdaki Yunanlıların kolonileri her ne kadar ele geçirilemese de bu seferde Persler tarafından bastırılmış ve güçleri kırılmıştır. Mısır ticareti, Afrika kıyılarından Kartaca kontrolündeki bölgeye kadar gözetim altına girdiği düşünülmektedir. Böylece Yunanistan'daki Yunanlıların Kuzey Afrika'daki ticaretleri sekteye uğramıştır. Bu seferde kontrol altına alınan Yunan nüfusunun bir kısmının, Mısır'ın kuzeyi ve muhtelif Thebes, Memphis, Elephentine, Abydos gibi büyük şehirlerde ikamet eden Yunanlılar olduğu düşünülmektedir. II. Kambyses'in Mısır seferi sırasında, MÖ 525 yılında Perslerin Mısır'ı kontrol etmeleri ile Yunanlıların Mısır'daki ticaret üsleri Persler tarafından Naukratis emporion'unu (Ticaret Kolonisi) ağır saldırıya uğradı. Aryandes'in Satraplık döneminde ise, Cyrene bölgesindeki Yunanlı kolonilere ağır darbe vurulmuştur. Böylece Yunanlıların Mısır ticareti sekteye uğratmıştı. Bu durumda Mısır'dan gelen hammaddenin dağlık ve tarıma elverişsiz Yunanistan coğrafyasına tedarikinde sorunlar baş göstermeye başlamasına sebep olmuştur. Naukratis hakkında Herodotos şunları aktarır; *"...İonia'dan Khios, Teos, Phokaia, Klazomenai; Dor'lardan Rhodos, Knidos, Halikarnassos, Phaselis; Aioliyalılardan ise yalnız Mytilene bu tapınağın sahipleridir. Zaten ticaret komiserlerini de bunlar gönderirlerdi; bu tapınak üzerinde bunlardan başka hak iddiasında bulunanlar haksızlık etmiş olurlar. Aiginallılar kendi hesaplarına bir Zeus tapınağı, Samoslular bir Here tapınağı (Tanrıça Hera kastedilmiştir.) ve Miletoslular bir Apollon tapınağı kurmuşlardır..."* (Herodotos, II, 178.) Naukratis'in anlatılara göre Yunan kent yapısına uygun Agorası olan ve içerisinde Yunan kentlerinin çabalarıyla kurulmuş Zeus, Apollon ve Hera'ya adanmış tapınaklar bulunmaktadır. Konum itibarıyla Naukratis, bölgeye yollanan tüccarlar için bir dağıtım noktası durumundadır. Nil, kuzeye doğru akarak derinleşmektedir. Naukratis'te Nil boyunca seyir takip eden gemiler için derin bir liman olduğu tahmin edilmektedir. Bu durumda büyük gemilerin kente yanaşmasına olanak sağladığı düşünülmektedir. Ayrıca Eskiçağ denizciliğinde rüzgâr ile akıntılar seyir için oldukça önemlidir. Naukratis, Nil'in devamındaki şelaleler bölgesine giderken son duraklardan biri olması sebebiyle güvenli doğal bir liman olmasına ve Nil nehrinin giriş çıkışını bir ölçüde denetlemesine sebep olmuştur. Mısır Satrabı Aryandes'in Cyrene seferinden sonraki dönemlerde, Peloponnesos Savaşları esnasında Libya'da Yunanlılar, Kartacalılar tarafından Syrt'e'nin gerisine atılmışlardır. Sicilya'da adanın en büyük batı parçası, Kartacalıların eline geçmiştir. İtalya'da ise Yunanlık, Apeninlerden gelen kavimlerin baskısı altında yavaş yavaş sönmekteydi. (DROYSEN, 2007; 48.) Kartacalılardan dolayı Sicilya adasının hububat ve hammaddelerinden de yeteri kadar faydalanamayan Yunanlıların, Perslerle mücadele etmesi ve Perslere karşı Mısırlı yerel güçleri desteklemesi, en önemli sosyo-ekonomik sebeplerden birinin oluşmasına sebep olmuştur. Persler, Mısır ve çevresinde bulunan Yunan varlığından ve güçlü ticaret ağundan rahatsızlardı. II. Kambyses döneminde Persler bizzat Mısır çevresindeki Yunan kolonilerine ve Emporionlarına saldırmışlar I. Dareios döneine gelindiğinde ise Perslerin yönetimi altındaki Fenikeliler Doğu Akdeniz'de Pers himayesinde düşük gümrük vergisi ile rekabet edilemeyecek şekilde ticarete tekelleştirilerek Yunanlıların Mısır üzerindeki ticari etkisini yok etmişlerdir. Batı Akdeniz'de ise Fenike kolonisi olan Kartaca'nın başını çektiği Utica, Gozzo, Gades, Karalis, Oea, Lilybaeum gibi Fenikeliler kolonilerin federatif yapısı ile oluşan Kartaca devletinde Fenike tüccarlar eli ile Batı Akdeniz'de de bir Fenike tekeli kurulmuştu. Bu dönemde Yunanlılar ticari hammaddelerin tedariki konusunda büyük sorunlar yaşayarak bu tedarik yolunun tekrar açılması için Mısır'da yeşerecek olan Inaros isyanına destek vermişlerdi.

I. Dareios Dönemi Mısır Yönetimi ve Düzenlemeler

MÖ 11 Mart 522 yılında Mag, Gaumata/Smerdis öncülüğünde patlak veren Mag Ayaklanması, II. Kambyzes'in isyanı bastıramadan aynı yıl içerisinde halef bırakmaksızın ölmesi, Pers kralının Küçük Asya'da idari-askeri düzenleme yapmasına fırsat tanımasını yanı sıra tüm İmparatorluk içerisinde otorite boşluğunun doğmasına ve dolayısı ile kriz ortamı oluşmasına yol açtı. (Arslan-Sarikaya, 2017; 81.) Perslerin yedi ailesi olarak adlandırılan aileler, bu güç durumdan kurtulmak ve istikrarı sağlamak için I. Dareios'un hükümdarlığının yolunu açtılar. (Flavius Josephus, XI, 3, 1.) Mısır'da art arda pek çok isyan çıkmış ayrıca Mısır'ın Satrabı Aryandes'in kendi başına buyruk tavırları sebepleriyle I. Dareios yönünü Mısır'a çevirdi. Pers imparatorluğunda devletin çöküş dönemine kadar kendi sikkesini darp ettiren satraplar görememekteyiz. Aryandes, tahminlere göre sikkesini darp ettirmiş, Mısır'ın Batı'sındaki topraklara hükmetmeye başlayarak güçlenmiş, Mısır'da kendi özerk idaresini kurma yolunda adımlar attığı düşünülmektedir. Herodotos'a göre I. Dareios, Aryandes'i isyanla suçlayıp öldürtmüştür. (Herodotos, IV, 166.) I. Dareios, Mısır'ın kontrolünü büyük ölçüde sağladı. Böylece Mısır'ın zengin tahıl ve hububatı Pers İmparatorluğuna aktı. (Wright Vaux, 2022; 37) Pers İmparatorluğunun diğer satraplıklarına bu kaynakları aktararak imparatorluğun içinde mal aktarımı yaptı. Böylece zengin gıda kaynakları sayesinde rakipleri Yunanlılara karşı üstünlük ile ordunun uzun seferleri için gereken gıda teminini sağlamış oldu. Elephantine Papirüslerinden edindiğimiz bilgilere göre, I. Dareios'un Aryandes'ten sonra Pharandates adında birini atadığına dair MÖ 492 yılına tarihlenen iki adet belge vardır. Pharandates, bu vesikalardan birinde "...Mısır'ın emanet edildiği kişi..." olarak kendisinden bahsedilmektedir. (Porten, 1996; 290.) Ayrıca belgelerin içeriğine bakarsak, Pharandates'in bölgedeki en yetkili Pers bürokratu olduğu bilinmektedir. Pharandates'e Tanrı Khnum tapınağına yapılacak olan atamalar için Wab Rahipleri tarafından bilgi verilmiş, kendisi ise belgede rahiplere cevaben bir mektup yollamıştır. Pharandates, Lesonis'in ataması konusunda I. Dareios'tan firavun olarak bahsederek onun belirttiği yönerge konusunda bilgi vererek atamayı onayladığını belirtmiştir. (Porten, 1996; 290-292.)

Mısır'da satrap olarak Pharandates, I. Dareios'un doğrudan temsilcisi olarak Mısırlıların dini kurumlarındaki atamalarını dahi elinde bulundurduğunu gösteriyor. Aryandes'ten sonra Pharandates'in daha merkeze bağlı ve daha derin yetkiye sahip bir kimse olduğunu gösteriyor. Dareios'un imar faaliyetleri, Mısır'daki birçok yerde kolaylıkla görülebilir. Yukarı Mısır'ın imparatorluk mabedi olan ve firavun Horus'un beyaz tacını aldığı El Kab'daki tapınağı I. Dareios tarafından yeniden inşa edilmiştir. Karnak'ta bulunan El Kab'daki tapınağa karşılık olarak görülen tapınak "Kral Haroeris'in sevgilisi" unvanını taşır. (Briant, 2002; 475.) Mısır firavunları iki renk tacının birleşimi olan hükümdarlık alameti bir taç takarlardı. Kırmızı ve beyaz renkte olan bu taçlar, Yukarı Mısır ile Aşağı Mısır'ın hakimiyetlerini sembolize ediyordu. Bununla birlikte I. Dareios, Mısır'da düzenlemeler yapmış ve II. Kambyzes döneminde getirilen yasakları kaldırmıştır. Apis öküzüne tapma uygulamasını serbest bırakarak Mısır halkının dini figürüne saygılı olmuştur. I. Dareios bu uygulamaları ve eylemleri ile iyi bir imaj çizmiş ve Mısır'ın geniş çöl coğrafyası ve Perslerin bu bölgeye yönetimsel, konumsal ve kültürel olarak uzak oluşları günümüz Mısır'ının tümünde yönetim kurmalarını güçleştirmiştir. Mısır'da aynı dönemde iç bölgelerde pek çok yerel otorite ve yerli hanedanların var olmalarına ya da mevcudiyetlerini korumalarına sebebiyet vermiştir. I. Dareios, Mısır'ın ve diğer yönetimi altındaki bölgelerin aynı sorunla uğraşması yüzünden bir dizi reform hareketlerine girişti. II. Kyros'tan beri Persler, taşralarında miraslarını devraldığı Med ve Asur tarzı taşra teşkilatlanmasına gitmişlerdi. Zamanla bu sistemde bazı dezavantajlar ortaya çıkmaya başlamıştır. I. Dareios, daha önce uygulanan ama yetersiz olan satraplık uygulamasını düzenledi. İmparatorluğun her köşesindeki isyanları azaltmak için devletin tüm satraplıklarını yirmi ile yirmi dokuz arası

satraplığa bölerek daha merkezi bir yapıya kavuşturdu. (Wright Vaux, 2022; 37.) Bu satraplıklara ise güvendiği satrapları atadı. Satraplar; siyasi, ekonomik ve askerî açıdan üstün idari yetkilerle donatılmıştı kimselerdir. Ancak, böyle geniş yetkilere sahip olan satrapların olası isyanlara neden olmamaları içinde önlemleri bizzat Büyük Kral tarafından müfettişler yetkilendirilerek yapılmış, müfettişler satraplıkları gezerek, denetlemelerini Büyük Kral'a rapor ediyor ve böylelikle isyanların önüne geçerek satrapları her zaman Büyük Kral'a bağlı kılmaya çalışıyorlardı.(Sezer, 2019; 784.) Satraplar, diğer yerel yöneticilere göre daha geniş yetkiye sahip oldukları için, Mısır'da daha otoriter bir Pers hakimiyeti dönemi yaşandı. Satraplar, isyan veya olası olumsuz durumlarda tez elden karar alıyor ve kendi yönetim altındaki askerleri ile olaya büyümeden müdahale ediyorlardı.

I. Dareios, yaptığı düzenlemelerde, Pers devleti içinde daha kurumsal bir yapı oluşturarak başkenti Persepolis'e taşıdı. I. Dareios, Mısır'ın yönetim başta Apis kültü olmak üzere inanış ve geleneklerine saygılı olarak kendisinden Mısır satrabı Pharandates konu başlıklı Elehantine papirüslerinde firavun şeklinde hitap edilirken, bir ritüel eşyası parçasının üzerinde I. Dareios adına bir yazıt taşımaktadır. Daha yakın bir zamanda, aynı kutsal alanda, üzerinde I. Dareios'un adının yazılı olduğu bir sütunun yarım tamburu bulunması ve: "*Ayinleri gerçekleştiren, Yukarı ve Aşağı Mısır'ın kralı Dareios*" şeklinde ifade ile karşılaşılması Mısır halkının I. Dareios'a daha saygı duyduklarını göstermektedir. (Briant, 2002; 475.) I. Dareios, Mısır geleneklerine uygun olarak Yukarı ve Aşağı Mısır'ın efendisi olarak hitap görmekteydi. Bu, Mısır'ın zor iklimli ve kalabalık coğrafyasına hükmetmenin ve dolayısıyla, Mısırlı yerlilerin nüfusça baskın olduğunu tahmin ettiğimiz Perslerin kontrol mesafesinden uzak bir coğrafyayı kontrolünü kolaylaştırmaya yönelik adımlar olarak değerlendirebiliriz. Ancak, Mısırlıların gözünde Perslerin dönemleri, Mısır'da yabancı bir hanedanın işgali olarak değerlendirilmiştir.

Pers Kralı Dareios, MÖ 513'te İskitler üzerine yürüdü. Her ne kadar İskitlere karşı başarısı tartışma konusu olsa da Propontis (Marmara Denizi) üzerinde kontrol sağlayarak Byzantion ve Kalkedon gibi yerleri ele geçirdi. Yunanistan anakarası dışında, İonia'da bile ekonomik açıdan kriz baş göstermişti. Zira Pers gümrük vergilerinin yüksekliği, Fenikeli tüccarların İonialı tüccarlara karşı himaye görmesi ve MÖ 525'te Mısır'daki , Yunanlıların en büyük ticaret kentinin tahribi, bu krizin en büyük sebeplerindendi.(Memiş, 2018; 45.) Yunanistan'daki Yunan devletlerinin doğudaki hububat ve hammadde tedarik noktaları olan Anadolu ve Mısır, Perslerin himayesindeyken ayrıca "Propontis Bosporus'u" (İstanbul Boğazı'nı) kontrol eden Perslerden dolayı Karadeniz'deki kolonileri ve ticaret noktalarından gelecek hammaddeden yoksun kalmışlardı. Yunanlı kent devletlerinden Atinalıların en önem verdiği noktalarından olan donanma konusu da bu hammadde krizinden etkilendi. Atinalılar gemilerinin yapımında keten, kereste, demir, bakır ve balmumu kullanırlardı. (Pseudo-Ksenophon, *Athanaion Politeia*, II, 12,) Gemi yapımında kullanılan malzemelerin tedarikinde ciddi sorunlar baş göstermiştir. En iyi gemi kerestesi olan sedir ağacı Fenike topraklarından, Demir ise Mısır'ın bugünkü Sina bölgesinden, bakır ise genel olarak Kıbrıs adasından Yunan anakarasına getirildiği bilinirdi. Mısırlılara, Yunanlılar tarafından Fenikeliler aracılığı ile ciddi bir ihracat söz konusuydu. Bu ürünler genelde imal edilmiş, işlenmiş ürünlerdi. (Inan, 1987; 214.) Yunanlılar, doğuda ve güneydoğudan Persler tarafından, Batı ve Güney-Batıda Sicilya ve Syrte üzerinden Kartacalıların baskısı altındaydılar. Dolayısıyla batıdan gelecek Sicilya ve İtalya hububatı, İberia gümüşü ve kalayından mahrum kalmışlardı.

Yunanistan anakarası dağlık ve tarıma elverişsizken, ayrıca dağlarla birbirinden ayrılan ovalara sahipti. Bu yüzden ekonomileri hammaddeye dayalı ve ayrıca paralı askerlik ile geçinilen bir rejim üzerine kuruluydu. Persler ile Yunanlılar arasında savaş için gereken şartlar oluşmaya başlamıştı. I. Dareios, İonia'daki isyanların sonrasında yönünü isyanlara destek veren Atinalılara çevirdi. Bir rivayete göre I. Dareios, sakisine (içecek sunan hizmetli)

Yunanlıları sürekli hatırlatmasını bile emretmiştir. Tahkim edilmiş Pers ordusu, deniz yolundan önce Mardonius komutasında Athos Dağı'na öncü sefer düzenledi. Mardonius'tan sonra, donanmanın çıkarma için en uygun olduğu yer olan Attika bölgesine çıkartma gerçekleştirdi. MÖ 490'da gerçekleşen çıkarmada, Olimpiyat savaş arabası şampiyonluğu ile bilinen Miltiades komutasındaki Yunan ordusu, Persleri bozguna uğrattı. Bu sebeple Yunanlılarda Perslere karşı bir ittifak oluştu. Bu savaştan sonra Mısır'da yerel hanedanlar bağımsızlık için isyanlar çıkardılar. Atina, gelişen duruma göre şekil aldı. Kendisinin ölümünden sonra oğlu Kserkses, babasının yarım bıraktığı işi tamamlamak için Yunanistan'a sefer açtı. MÖ 480'de Thermopylae Muharebesi'nde Persler üstün gelmiş olsa da devamındaki Artemision Deniz Muharebesi ve MÖ 480 Salamis Deniz Muharebesi'nde Pers donanması büyük kayıplar verdi. Akabinde MÖ 479'da Plataea ve Mykale Muharebeleri'nde zafer galip gelen Yunanlılar, Persleri bölgeden kovdu. Atina, bu zaferlerden sonra kendi başını çektiği Attika-Delos Birliği'ni kurdu ve artık Atina devleti, denizlerde hüküm süren ve etkisi olan güçlü bir devlet haline geldi. Atinalı yurttaşların olduğu gibi Atinalı zengin kişilerin, "Leitourgia" adı verilen hükümlülükleri vardı. Buna bağlı olarak triremeleri (Üç sıra kürekli) silahlandırma masraflarının bir kısmını onlar karşıladılar. (Ksenophon, *Oikonomikos*, II, 6,) ve seferlere hazır ederdi. Yapılan savaşlarda ganimetten zenginleşen bu sınıf, zamanla ticareti de kontrol etmeye başladı ve "Talassokratik" bir güç halini aldı. Öyle ki bu Talassokratlar, gemi yapımında stratejik öneme sahip bronz, demir, kereste ve keten başlıca olmak üzere önemli taciri maddelerin ticaretinde söz sahibi hale geldiler. (Pseudo-Ksenophon, *Athenaion Politeia*, II, 11.) Durum bu haldeyken Atinalılar, artık kendi anakaraları ile yetinemez hale geldiler ve yönlerini hammadde açısından kıymetli Perslerin topraklarına döndüler. Başta Anadolu'daki İonları özgürleştirmek için bu politikayı seçseler de zamanla Atina devleti parlak bir deniz devleti, Talassokratik büyük bir devlet halini almıştır. Bu sebeple bu denizlerde söz sahibi olmak isteyen bir devlet haline gelmiştir. Atina devletinin içindeki zengin Tallasokratlar olan bu sınıf, Mısır'da Atinalıların var olmasını desteklemişlerdir. Bu grup Mısır'ın hammaddelerine dikkat çekerek Atina'nın Mısır'daki isyanlara destek olarak bu kaynakları Atina'ya aktarmaları için önemli bir tabanı oluşturmuşlardır. Böylece Perslerin Mısır'da otorite sağlayamayıp isyanları bastıramamasından dolayı Atinalılar için Mısır bir hedef haline almıştır.

Sonuç

Mısır, zengin kaynakları ve konumu ile Doğu Akdeniz'de kilit bir konuma sahiptir. II. Kambyes'in yönünü buraya dönmesine sebebiyet vermiştir. Persler Mısır'ı ele geçirmiş ve büyük kazanımlar elde etmişlerdir. Mısır'ın zengin kaynaklarının Persler için önemli bir gelir sağladığı düşünülmektedir. Persler Mısır'ı ele geçirdikten sonra büyük ve maliyetleri seferlerin ödemelerini kolayca yapabilecek güce erişmiş olmalıdır. Mısır'ın ele geçiren II. Kambyes güçlü Mısır hanedanlarının etkisini kırmak için sert önlemler almış ancak bu Mısır'ın yerel halk tarafından tepkiye sebep olmuştur. Mısır'ın savaştan yeni çıkmış olması ve Mısırlı hanedanların dağılması Mısırlıların topyekûn Perslere karşı koymasını engellemiştir. II. Kambyes yönetiminde Mısır halkı baskılara maruz kalmış, dini bayramlar yasaklanmıştır. Bu durum Mısır'da istikrarsızlığa sebep olarak Perslerin bölgedeki yönetimin tabana yayılmasını engellemiştir. Ancak II. Kambyes'ten bir süre sonra I. Dareios farklı bir politika izleyerek Mısır halkının daha çok Pers imparatorluğuna katılımını sağlamıştır. I. Dareios'un bu uygulamaları sayesinde II. Kambyes'in yasaklarının kaldırılması Mısır halkının topyekûn Persler'e karşı ayaklanması engellemiştir. Böylece I. Dareios, Mısır içerisinde Firavun sayılmış ve Mısırlılar bir ölçüde Pers imparatorluğuna entegre olmuşlardır. Ayrıca I. Dareios kendi satrabı Pharandates'i Mısır'a atayarak bölgedeki tapınakların tamiri ve rahip atamalarını bile onun elinden kontrol ederek Mısır halkının tabanının inandığı değerleri kontrol altına almayı başarmıştır. Ayrıca ülkeyi 20-29 satraplığa

bölerek atadığı satrapları da sürekli denetimde tutmuştur. Mısır'ın hububatı ve diğer önemli ticaret ürünlerinin Yunanlılar olmak üzere ülke dışına çıkmasını engelleyerek Yunan tüccarlara ağır gümrük vergileri uygulamıştır. Böylece Pers destekli Fenikeli tüccarların önünü açarak Mısır'ın zengin ticari ürünlerinin İmparatorluk içerisinde alım satımını arttırmış zenginliği imparatorluğun içerisinde tutmuştur. Doğu Akdeniz'de zamanla Yunanlılar ile Persler arasındaki mücadele meydana gelmiştir. Yunanlılar, Doğu Akdeniz'de özellikle Mısır noktasında Perslerle bir deniz hakimiyet sahası mücadelesine girdiler. MÖ. 525'te Mısır'daki en büyük Emporion Naukratis'in tahribi ve I. Dareios'un Yunan tüccarlarına karşı aldığı önlemler Yunan-Pers mücadelesinin Mısır'a taşınmasına büyük bir engel teşkil etti. Mısır'da bulunan yerel isyanlar bu dönemde Yunanlılardan destek alamadılar. Daha sonra I. Dareios'un ölümü ve I. Serhas'ın tahta geçmesi durumlar değişmiştir. I. Dareios'un Mısır için aldığı İdari, ekonomik ve askeri uygulamalar takip edilmemiş ya da edilememiş dolayısı ile Mısır'da isyanlar büyüyerek Perslerin yönetiminin Mısır'da kısmi var olmasına sebep olmuştur. Persler için ise I. Dareios'tan sonra Mısır'da isyanlar artmış ve pers yönetimin için son büyük darbe ise MÖ 460'ta yerel Mısırlıları organize eden İnaros tarafından gelmiştir. I. Dareios'un Yunanlılar'ı Mısır isyanlarına yardım etmekten uzak tutarak onları Mısır'ın zenginlerini kaptırmamak için izlediği politika halefleri tarafından devam ettirilememiştir. Perslerin Mısır'daki varlığı böylece zayıflamıştır. İnaros isyanı, Yunanlıların desteklediği büyük bir isyan halini almıştır ve Persler için Mısır'da büyük ve yıkıcı isyanların zincirleme olarak ilk halkasını oluşturmuştur.

KAYNAKÇA

- ARSLAN, Murat-SIRAKAYA, Sevgi (2017), *Persler Anadolu'da Görkem ve Kudret*, İstanbul, Yapı Kredi Yayınları.
- BRIANT, Pierre (2002) *From Cyrus to Alexander A History of the Persian Empire*, Indiana, Eisenbrauns.
- BREWER, Douglas -TEETER Emily, *Mısır ve Mısırlılar* (2024), Ankara, Akılçelen Kitaplar Yayınları.
- DROYSEN, Johann Gustav (2007), *Büyük İskender Tarihi*, İstanbul, Dharma Yayınları.
- Diodorus Siculus, *Bibliotheca Historica*, Çeviren OLDFATHER, Charles Henry (1946), *Bibliotheca Historica , Library of History, Volume IV: Books 9-12.40*. Loeb Classical Library 375, Cambridge, MA: Harvard University Press.
- Flavius Josephus, *Antiquities of the Jews, The Works of Flavius Josephus* (1737). Çeviren WİNSTON, William, A.M.
- Ksenophon, *Oikonomikos*, Çeviren ÇOKONA, Ari, *İktisat üzerine* (2022), İstanbul, Türkiye İş Bankası Kültür Yayınları.
- Herodotos, *Historiae*, Çeviren ÖKTEM, Müntekim (2019), *Herodotos Tarih*, İstanbul, Türkiye İş Bankası Yayınları
- İNAN, Afet, *Eski Mısır tarihi ve Medeniyeti* (1987), Ankara, TTK.
- MEMİŞ, Ekrem, *Eski İran Tarihi* (2018), Bursa, Ekin Yayınevi.
- Manetho, *Aigyptiaka*, Çeviren DEMİR, Okan (Mart 2023), *Mısır Tarihi*, İstanbul, Pinhan Yayınları.
- Polyainos, *Strategemata*, VII, XXXIV-Aryandes, Çeviren SHEPHERD, Richard (1793), Polyainos, *Strategemata*, Londra,Pall-Mall, NICOL, George tarafından basıldı.
- PORTEN, Bezalel (1996), *The Elephantine Papyri in English, Three millennia of cross-cultural continuity and change*, Leiden: Brill,
- Pseudo-Ksenophon, *Athenaion Politeia* (2021), Çeviren DEMİR, Okan, İstanbul, Pinhan Yayınları.
- TIGNOR, Robert, *Kısa Mısır Tarihi* (2022), İstanbul, Say Yayınları.
- SEZER, Deniz Serhad (2019), *Pers satraplık sistemi*, 5. Uluslararası Bilimsel Araştırmalar, S. 784.
- Strabon, *Geographika*, XVII, Çeviren KİLECİ, Şenkal, *Strabon, Geographika: XVII* (2017), Libri II, Volume III. S.391.
- WRIGHT VAUX, William Sandys Wright, *Persler* (2022), Çeviren UZUN, Berna Asuman, Say Yayınları.
- VAN DE MIEROOP, Marc, *Antik Yakındoğu'nun tarihi* (2006), Ankara, Dost Kitabevi.

Effective Online English Teaching with Interactive Methods

Elona ZIREK

Researcher, University College "LOGOS", Tirana, Albania

Zamira BOBOLI

Researcher, "Eqrem Çabej" University of Gjirokastra, Albania

Abstract

With the rapid expansion of digital education, online interactive English language teaching (ELT) has emerged as a central focus of educational research. This study explores effective strategies for interactive teaching in the online ELT, focusing on communicative approaches, technology integration, student engagement, and assessment methods. The communicative language teaching (CLT) approach emphasizes real-world communication and interactive learning, which can be facilitated through video conferencing tools, discussion forums, and collaborative projects. These methods promote increased student participation while helping to alleviate learner anxiety. Furthermore, the integration of advanced technologies, such as Virtual Learning Environments (VLEs), gamification platforms, Artificial Intelligence (AI), and Virtual Reality (VR), has proven to significantly enhance student engagement, knowledge retention, and motivation. Active learning techniques, including peer collaboration, break out rooms, and AI-driven personalized feedback, further support meaningful learning experiences. Additionally, the use of digital assessment tools, such as automated feedback systems and peer evaluations, contributes to a more efficient and dynamic approach to language acquisition. Together these strategies work in synergy to optimize the online ELT experience, fostering a more interactive, engaging, and effective environment for students.

Keywords: Online Interactive English Language Teaching (ELT), Communicative Approaches, Technology Integration, Student Engagement, Communicative Language Teaching (CLT), Virtual Learning Environments (VLEs), Artificial Intelligence (AI), Digital Assessment Tools.

Introduction

The rapid advancement of digital education has transformed the landscape of English language teaching (ELT), making online interactive instruction an essential area of research and practice. The rise of digital education has expanded access to learning opportunities across the globe, breaking down geographical barriers and enabling students to engage in language learning from virtually anywhere. With the increasing reliance on virtual platforms, the need for effective teaching strategies that foster meaningful interaction has become more critical than ever. Digital education has not only made learning more accessible but has also introduced innovative tools that support personalized learning experiences and enhance student engagement.

As technological innovations continue to shape educational methodologies, educators and researchers are increasingly exploring strategies to enhance the effectiveness of online ELT.

Among these approaches, Communicative Language Teaching (CLT) has gained prominence due to its emphasis on real-world communication and interactive learning, fostering student engagement and improving language acquisition. However, adapting CLT to an online environment presents both opportunities and challenges, requiring the integration of digital tools and innovative pedagogical strategies (ULM, Retrieved Feb. 2025).

Interactive English Language Teaching (ELT) plays a crucial role in online learning environments by actively engaging students in communication-based tasks that mirror real-world scenarios. Research suggests that learners acquire language more effectively when they participate in dynamic discussions, collaborate on projects, and receive immediate feedback. The use of interactive techniques such as role-playing, live discussions, and AI-driven personalized learning pathways enables students to practice language skills in a meaningful and practical way. By fostering engagement and interaction, online ELT helps bridge the gap between theoretical knowledge and practical application, ensuring that students develop both linguistic competence and communicative confidence (Moreas, Retrieved Feb. 2025).

The adoption of technology in online ELT has facilitated interactive and engaging learning experiences through platforms such as video conferencing tools, discussion forums, and collaborative digital projects. These methods have been shown to increase student participation and reduce learner anxiety by providing a more immersive and supportive environment. Moreover, the incorporation of advanced technologies, including Virtual Learning Environments (VLEs), gamification, Artificial Intelligence (AI), and Virtual Reality (VR), has further enriched the learning process by promoting motivation, personalization, and deeper engagement with the content (Moreas, Retrieved Feb. 2025).

Additionally, assessment plays a critical role in online ELT, with digital tools enabling more dynamic and efficient evaluation methods. Automated feedback systems, peer assessments, and AI-driven analytics provide timely and constructive feedback, helping students track their progress and refine their language skills. By leveraging these technological advancements, educators can create a more interactive and student-centered learning environment that aligns with modern educational paradigms.

This study aims to explore, using a qualitative analysis, effective strategies for interactive teaching in online ELT, focusing on the integration of CLT principles, technology-enhanced learning, student engagement, and digital assessment methods. By analyzing existing research and evaluating practical implementations, this study further seeks to contribute to the ongoing development of best practices in online language education,

ultimately fostering a more immersive, engaging, and effective learning experience for students.

Literature Review

Online ELT and CLT have been covered in various studies exploring the integration of technology in language learning, the effectiveness of online pedagogical strategies, and student engagement in digital environments. Researchers have examined the role of peer feedback in enhancing online discussions (Ertmer et al., 2007), the dynamics of critical inquiry in text-based learning environments (Garrison, Anderson, & Archer, 1999), and the evolution of digital tools for language acquisition (Godwin-Jones, 2021). Studies have also reviewed the effectiveness of different technological interventions in foreign language education (Golonka et al., 2014) and emphasized the importance of research-based pedagogies for online language teaching (Hampel & Stickler, 2015). Furthermore, learning management systems and their impact on student motivation (Lai & Kritsonis, 2006), assessment feedback in online learning (Li & De Luca, 2014), and distinctions between e-learning, online learning, and distance education (Moore, DicksonDeane, & Galyen, 2011) have been explored. The use of game-based learning tools like Kahoot! to foster engagement (Plump & LaRosa, 2017) and the principles of Communicative Language Teaching (Richards, 2006) further contribute to the discourse on online ELT and CLT. Additionally, research on learner participation and self-regulation in online discussions (Sun & Yang, 2015), automated writing evaluation systems (Wang, 2016), and synchronous online learning during the COVID-19 pandemic (Zhang & Wu, 2022) provide valuable insights into contemporary digital language learning environments.

Research Design & Methodology

This study employed a qualitative research design to explore effective strategies for interactive English Language Teaching (ELT) in an online setting. A questionnaire was administered to collect subjective experiences, perceptions, and challenges faced by learners in online English instruction. The data were analyzed thematically to identify common patterns and insights into effective teaching practices. The study participants included English language learners with varying levels of proficiency, ranging from beginner to advanced. They had diverse experiences with online English learning, utilizing different platforms and technologies. The participants were selected through a voluntary response sampling method, ensuring a broad range of insights into the effectiveness of online ELT. Data were collected using a structured questionnaire designed to capture learners' experiences with online ELT. The questionnaire included open-ended and Likert scale questions focusing on the following themes:

1. Preferred online learning platforms and tools
2. Perceived advantages and challenges of online ELT
3. Engagement with interactive elements such as breakout rooms, discussion forums, and group activities
4. The role of AI-based feedback in language learning
5. Perceptions of online assessments and their impact on learning independence
6. Strategies used to maintain motivation and engagement in online ELT
7. Suggestions for improving online ELT experiences

A thematic analysis approach was employed to analyze the qualitative responses. Responses were categorized into key themes based on recurring patterns in participants' experiences. Thematic coding was conducted manually to ensure a detailed and nuanced interpretation of learners' perspectives. The main themes that emerged included engagement strategies, technological effectiveness, learner autonomy, and challenges in online ELT. The study adhered to ethical guidelines for educational research, ensuring the integrity and privacy of the participants' responses. All participants provided informed consent before completing the questionnaire. Confidentiality and anonymity were maintained throughout the study, and data were used solely for research purposes. This qualitative approach allows for an in-depth exploration of learners' experiences and offers insights into best practices for enhancing interactive online ELT.

Results

Based on the qualitative analysis of 20 student responses, the following themes emerged:

1. Student Demographics and Experience

Proficiency Levels: 11/20 students self-identified as Advanced, while 9/20 were Intermediate.

- Online Learning Duration: Experiences varied widely.
- Long-term learners: 8 students (e.g., "8+ years," "since 2005").
- Short-term learners: 5 students (e.g., "1 month," "3 months").
- Mixed/ambiguous: 7 students (e.g., "not much online setting," reliance on YouTube tutorials).

2. Platform and Tool Usage Most Used Tools:

- Live Interaction: Zoom/Google Meet (15/20).
- Self-Paced Learning: YouTube (14/20), Duolingo/Babbel (7/20).
- Writing Support: Grammarly (9/20).
- AI Tools: Chatbots/speech recognition apps (8/20).

Unique Cases: Student 20 highlighted "video games" as a tool, while Student 12 emphasized immersion in English-speaking countries.

3. Preferences and Challenges

Online vs. Traditional Learning:

- 12/20 preferred online or hybrid models for flexibility and digital resources (e.g., "access to recorded lessons").
- 5/20 favored traditional classrooms for face-to-face interaction and focus.
- 3/20 remained neutral.

Key Challenges:

- Technical Issues: Cited by 11/20 (e.g., "poor internet connection").

- Isolation/Lack of Interaction: 9/20.
- Motivation/Time Management: 7/20.
- Student 20 noted, "I don't do online classes "

4. Effectiveness of Interactive Tools

Breakout Rooms/Group Activities:

- 14/20 reported improved engagement (e.g., "opportunity to share thoughts without judgment").
- Student 11: "Better to communicate online than in class" (introverts).
- Critiques: Student 19 found forums "sensitive," while Student 15 noted dependency on "topic."

AI Feedback:

- 14/20 found it "very helpful" for instant corrections (e.g., "improves quickly").
- 4/20 needed teacher guidance, and Student 20 rejected AI entirely ("I HATE ai <3").

5. Motivation and Independence

- Strategies: Goal-setting (12/20), multimedia consumption (10/20), peer collaboration (7/20).
- Independence: 11/20 felt online learning boosted self-discipline, while 7/20 still relied on teacher guidance.

6. Suggested Improvements

Top Requests:

- More interactive activities (e.g., games, role-play) (12/20).
- Live Speaking Practice (9/20).
- Balanced Feedback: AI + teacher input (6/20).
- Student 20: "Remove the AI and we're good."

7. Hybrid Learning Preference

- 12/20 supported hybrid models, especially for practical activities (e.g., speaking, group work).
- 4/20 preferred purely online, while 4/20 were neutral.

Conclusions & Future Recommendations

The study highlights critical insights for optimizing online interactive English language teaching (ELT). Technology turns out to be a Double-Edged Sword. Tools like Zoom, YouTube, and AI feedback enhance flexibility and engagement but require addressing technical barriers and balancing automation with human interaction. Breakout rooms and collaborative projects align with communicative language teaching (CLT), reducing anxiety and fostering peer interaction. Another important takeaway of this study is that diverse learner needs can be addressed using the flexibility of digital tools. Advanced

learners benefit from self-paced tools (e.g., Grammarly), while intermediates need structured interaction. Outliers of this study (e.g., Student 20's videogame-based learning) underscore the value of personalized pathways. Overall results indicate that a hybrid approach combining online flexibility with in-person interaction addresses the isolation and motivation challenges. Further recommendations derived from the results of this study include:

- Integration of gamification and real-world simulations.
- Development of AI-human feedback loops to retain personalization without over-reliance.
- Prioritization of technical support and community-building to mitigate isolation.

These findings advocate for a learner-centered, technology-enhanced framework that adapts to diverse proficiencies and preferences, ensuring equitable and engaging online ELT experiences.

REFERENCES

- Ertmer, P. A., Richardson, J. C., Belland, B. R., Camin, D., Connolly, P., Coulthard, G., & Mong, C. (2007). Using peer feedback to enhance the quality of student online postings: An exploratory study. *Journal of Computer-Mediated Communication*, 12(2), 412-433.
- Garrison, D. R., Anderson, T., & Archer, W. (1999). Critical inquiry in a text-based environment: Computer conferencing in higher education. *The Internet and Higher Education*, 2(2-3), 87-105.
- Godwin-Jones, R. (2021). Evolving technologies for language learning. *Language Learning & Technology*, 25(3), 6-26.
- Golonka, E.M., Bowles, A. R., Frank V. M., Richardson D. L. & Suzanne Freynik (2014) Technologies for foreign language learning: a review of technology types and their effectiveness, *Computer Assisted Language Learning*, 27:1, 70-105.
- Hampel, R., & Stickler, U. (2015). *Developing online language teaching: Research-based pedagogies and reflective practices*. Palgrave Macmillan.
- Lai, E., & Kritsonis, W. A. (2006). The use of learning management systems and student motivation in online learning. *National Journal for Publishing and Mentoring Doctoral Student Research*, 3(1), 1-8.
- Li, J., & De Luca, R. (2014). Review of assessment feedback. *Studies in Higher Education*, 39(2), 378-393.
- Moore, J. L., Dickson-Deane, C., & Galyen, K. (2011). e-Learning, online learning, and distance learning environments: Are they the same? *The Internet and Higher Education*, 14 (2), 129-135.
- Plump, C. M., & LaRosa, J. (2017). Using Kahoot! in the classroom to create engagement and active learning: A Game-Based Technology solution for eLearning Novices. *Management Teaching Review*, 2(2), 151-158.
- Richards, J. C. (2006). *Communicative language teaching today*. Cambridge University Press.
- Sun, Y., & Yang, F. (2015). Learner participation and engagement in online discussion forums: Examining the roles of learner motivation, self-regulation, and cognitive engagement. *Computers & Education*, 90, 161-174.
- Wang, S. (2016). Automated writing evaluation and feedback: A study on its impact on EFL students' writing improvement. *Educational Technology & Society*, 19(3), 265-277.
- Zhang, K., & Wu, H. (2022). Synchronous Online Learning During COVID-19: Chinese University EFL Students' Perspectives. *SAGE Open*, 12(2).

ULM. (2025, February). Communicative language approach. Retrieved from <https://online.ulm.edu/degrees/education/med/curriculum-and-instruction/communicativelanguage-approach/>

Moreas, A. (2025, February). Enhancing engagement: 6 strategies for interactive and effective online learning. Retrieved from <https://www.cambridge.org/elt/blog/2023/11/30/enhancingengagement-6-strategies-for-interactive-and-effective-online-learning/>

Comparative Analysis of Performances in Western European And Eastern European Economies-Free Market Economies vs Command Economies

Assoc. Prof. Dr. Tahir MAHMUTEFENDIC

The Sarajevo School of Science and Technology (SSST), Bosnia and Herzegovina

Abstract

The article conducts a comparative analysis of the performances of the Western European economies and the Eastern European economies on three different levels 1. Comparison between the performance of the former communist countries and free market economies in a period 1950-1990, 2. Comparison between the performance of the former communist countries in a period 1950-1990, when they were command economies, with the performance in a period after 1990, when they became free market economies, and 3. Comparison between the former communist countries and the Western countries in a period after 1990.

The Western European countries were more developed than the Eastern European countries. The least developed Western European country Italy was at the same level of development as the most developed Eastern European country Czechoslovakia. The Western European countries grew faster than the Eastern European countries in a period 1950-1990 with the exception of Yugoslavia. This means that they increased their advantage over the Eastern European countries. Therefore, divergence occurred.

In a period 1990-2024, after the transition, the Eastern European countries grew faster than the Western European countries and managed to catch up. Therefore, convergence between the two groups of the countries occurred. The Eastern European countries grew faster in a period 1990-2024 than in a period 1950-1990. This would lead to a conclusion that free market economies have been superior to command economies. However, if qualitative, non-monetary indicators are used, the command economies fared much better in comparison with free market economies than when GDP per capita is used. All of them have had a high Human Development Index. This was the result of excellent health and education system. This is corroborated by the fact that after the transition health and education systems rapidly deteriorated in the former communist countries. Also, differences in distribution of income and wealth dramatically increased, particularly in Russia and Romania. A survey conducted in 2006 asked a simple question: "Life is better now than before". The results of the survey show that a conclusion as regards the satisfaction with life after the transition are inconclusive.

Keywords: Free Market Economy, Command Economy, Convergence, Divergence, GDP per capita (PPP), Human Development Index (HDI)

INTRODUCTION

The article compares a level of development and dynamics of growth in the Western and Eastern European countries in a period 1950-2024, measured by the level of GDP per capita (PPP), and the annual rates of growth of GDP. Although limited in scope and with a lot of drawbacks GDP is still a most widely used measure of economic performance. Logarithm equations are used to calculate growth rates.

The article consists of three chapters. A first chapter compares economic performance of free market economies and command economies in a period 1950-1990. A second chapter deals with economic performance of the two groups of countries in a period 1990-2024. A third chapter compares economic performance in the Eastern European countries before and after the transition. The analysis in this chapter is extended to non-monetary indicators, namely the quality of health and education system and distribution of income, the areas in which the command economies fared much better in comparison with the Western countries than when GDP per capita is used. The article ends with a survey. The survey compares a satisfaction with life in the Eastern European countries after the transition with a satisfaction of life in the *ancient regime*.

CHAPTER 1 - Comparison between free market economies and command economies in a period 1950-1990

A full comparison between the two economic system is a complex and paramount task, which would require a team work. It would include a comparative analysis of macroeconomic objectives such as growth rates, inflation, unemployment, external and fiscal balances, distribution of income, and externalities. A more limited analysis would compare the level of GDP and the rates of growth of GDP.

Although GDP is most often used as a measure of development it has many drawbacks:

- GDP does not comprise non-marketed activities. For example, if parents take their child to a private kindergarten they will pay for the service, which will be recorded in GDP. If they have relatives (mother, aunts) who can look after the child they will save the money. Although the same service was performed it will not be included in GDP since there was not a monetary transaction. The same applies to cleaning a flat. If we hire a professional cleaner we will need to pay for the service and this will be included in GDP. If we do it ourselves the same service will be performed but it will not be calculated as part of GDP since it is non-monetary and non-market activity. According to some estimates up to 1/3 of GDP consists of non-marketed activities.
- GDP does not comprise value created in informal economy. Informal economy consists of two parts; black and grey. Black economy consists of illegal activities such as drug and weapons trafficking. A larger part of informal economy comprises legal activities which are not recorded for tax purposes. For example, if a plumber comes to our house to fix a boiler we will pay them, but they will not report it for tax purposes. The value of GDP created in informal economy varies from 10-12 per cent in high-income countries to 50 per cent in low-income countries. In Bosnia and Herzegovina, which is a middle-income country, GDP created in informal economy is estimated at 25 per cent.
- GDP calculated at market exchange rate does not take into account huge differences in the level of prices in various countries. Prices are much higher in developed than in developing countries. The difference between prices of goods is smaller than the differences in prices of services. Services are much more expensive in high-income countries. This is why GDP calculated at market exchange rates gives

unrealistically big differences between developed and developing countries. To rectify this international organizations have started using a concept of GDP at PPP (purchasing power parity). All prices are converted into American prices (international dollars). This measure gives a more realistic picture about differences in GDP across countries. For example, Bosnia and Herzegovina had GDP at market exchange rate of \$5,000 and \$12,000 at PPP in 2017.

- GDP calculated at market exchange rate does not take into account fluctuations in exchange rates. For example, the euro increased its value against the dollar from \$0.84 in 2001 to \$1.58 in 2008. Since the KM is pegged (fixed) to the euro a nominal GDP in Bosnia and Herzegovina doubled, although it did not affect a real GDP.
- GDP does not take into account distribution of income. For example, the United States and Sweden had a similar level of GDP in the 1970s. However, a distribution of income is much more egalitarian in Sweden compared to the USA. This means that the standard of living of a majority of people is higher in Sweden than in the USA.

Recently, an alternative measure of development and the standard of living has been used. **Human Development Index (HDI)** consist of three components; 1. Income per head, 2. Level of education, which is further decomposed into a literacy level and higher education level and 3. Life expectancy. ¹ In spite of the above-mentioned drawbacks, GDP per capita is still used as a main indicator of the level of development. For GDP per capita is reflected in the standard of living and is therefore considered the most relevant indicator of the level of development.

The following table, provided by Angus Maddison, gives the levels of GDP per capita (PPP) for the Western European countries for 1950 and 1990:

Table 1 - GDP per capita (PPP) in Western Europe in 1950 and 1990 in 1990 international dollars

COUNTRY	1950	1990
AUSTRIA	3,706	16,881
BELGIUM	5,462	17,194
DENMARK	6,946	18,463
FINLAND	4,253	16,868
FRANCE	5,270	18,093
ITALY	3,502	16,328
NETHERLANDS	5,996	17,267
NORWAY	5,463	18,470
SWEDEN	6,738	17,680
SWITZERLAND	9,064	21,616
UNITED KINGDOM	6,907	16,411
WESTERN EUROPE	5,013	16,872

SOURCE: ANGUS MADDISON: "THE WORLD ECONOMY", Millennial Perspective and Historical Statistics, OECD PUBLISHING 2008, p184

¹ Mahmutefendic-Economics and Politics-Textbook for Year 4 Grammar School, Social Department, Markos Banjaluka, Bosnia and Herzegovina, 2019, p 22 & 23

Algebra, using the data in the table, can help in calculating average annual growth rates in a period 1950-1990- The following formulae and equations could be used for that purpose:

1. **$\Delta Y/Y$ - the percentage change in GDP.** There is an alternative, more complicated way to calculate the percentage change in GDP, which is supposed to give the same result:

$$\Delta Y = Y (1 + g)^n - Y$$

$$\Delta Y = Y ((1 + g)^n - 1)$$

2. **g - the growth rate.** From the formula (6) we can derive the formula for calculating the growth rate:

$$\Delta Y = Y ((1 + g)^n - 1)$$

$$\Delta Y/Y = (1 + g)^n - 1$$

$$\Delta Y/Y + 1 = (1 + g)^n$$

$$(\Delta Y + Y)/Y = (1 + g)^n$$

$$((\Delta Y + Y)/Y)^{1/n} = 1 + g$$

$$g = ((\Delta Y + Y)/Y)^{1/n} - 1$$

3. **g - the growth rate.** We can also calculate the growth rate in the following way:

$$\Delta Y = Y ((1 + g)^n - 1)/Y; \quad \Delta Y/Y = ((1 + g)^n - 1); \quad \Delta Y/Y + 1 = (1 + g)^n; \quad \Delta Y + Y/Y = (1 + g)^n.$$

We can logarithm both sides of the equation and arrive at: $\log (\Delta Y + Y) - \log Y = n \log (1 + g)/n$; $(\log (\Delta Y + Y) - \log Y)/n = \log (1 + g)$; $1 + g = 10^{((\log \Delta Y + Y) - \log Y)/n}$; $g = 10^{((\log \Delta Y + Y) - \log Y)/n} - 1$ (Owen J, Haese R, Haese S, Bruce M)

AUSTRIA

$$\begin{aligned} (\Delta Y + Y)/Y &= (1 + g)^n \\ 16\,881/3706 &= (1 + g)^{40} \\ 4.55 &= (1 + g)^{40}/\log \\ \log 4.55 &= 40 \log (1 + g) \\ 0.66 &= 40 \log (1 + g) \\ \log (1 + g) &= 0.0165 \\ (1 + g) &= 10^{0.0165} \\ 1 + g &= 1.0387 \\ g &= 3.87\% \end{aligned}$$

BELGIUM

$$\begin{aligned}(\Delta Y + Y)/Y &= (1 + g)^n \\ 17\,194/5462 &= (1 + g)^{40} \\ 3.15 &= (1 + g)^{40}/\log \\ \log 3.15 &= 40 \log (1 + g) \\ 0.5 &= 40 \log (1 + g) \\ \log (1 + g) &= 0.0125 \\ (1 + g) &= 10^{0.0125} \\ 1 + g &= 1.029 \\ \mathbf{g} &= \mathbf{2.9\%}\end{aligned}$$

DENMARK

$$\begin{aligned}(\Delta Y + Y)/Y &= (1 + g)^n \\ 18\,463/6946 &= (1 + g)^{40} \\ 2.66 &= (1 + g)^{40}/\log \\ \log 2.66 &= 40 \log (1 + g) \\ 0.42 &= 40 \log (1 + g) \\ \log (1 + g) &= 0.0105 \\ (1 + g) &= 10^{0.0105} \\ 1 + g &= 1.024 \\ \mathbf{g} &= \mathbf{2.4\%}\end{aligned}$$

FINLAND

$$\begin{aligned}(\Delta Y + Y)/Y &= (1 + g)^n \\ 16\,868/4253 &= (1 + g)^{40} \\ 3.96 &= (1 + g)^{40}/\log \\ \log 3.96 &= 40 \log (1 + g) \\ 0.60 &= 40 \log (1 + g) \\ \log (1 + g) &= 0.015 \\ (1 + g) &= 10^{0.015} \\ 1 + g &= 1.0351 \\ \mathbf{g} &= \mathbf{3.5\%}\end{aligned}$$

FRANCE

$$\begin{aligned}(\Delta Y + Y)/Y &= (1 + g)^n \\ 18093/5270 &= (1 + g)^{40} \\ 3.43 &= (1 + g)^{40}/\log \\ \log 3.43 &= 40 \log (1 + g) \\ 0.54 &= 40 \log (1 + g) \\ \log (1 + g) &= 0.0135 \\ (1 + g) &= 10^{0.0135} \\ 1 + g &= 1.032 \\ \mathbf{g} &= \mathbf{3.2\%}\end{aligned}$$

ITALY

$$\begin{aligned}\Delta Y + Y)/Y &= (1 + g)^n \\ 16328/3502 &= (1 + g)^{40} \\ 4.66 &= (1 + g)^{40}/\log \\ \log 3.43 &= 40 \log (1 + g) \\ 0.67 &= 40 \log (1 + g) \\ \log (1 + g) &= 0.0135\end{aligned}$$

$$(1 + g) = 10^{0.01675}$$
$$1 + g = 1.039$$
$$g = 3.9\%$$

NETHERLANDS

$$\Delta Y + Y)/Y = (1 + g)^n$$
$$17267/5996 = (1 + g)^{40}$$
$$2.88 = (1 + g)^{40}/\log$$
$$\log 2.88 = 40 \log (1 + g)$$
$$0.46 = 40 \log (1 + g)$$
$$\log (1 + g) = 0.0135$$
$$(1 + g) = 10^{0.0115}$$
$$1 + g = 1.0268$$
$$g = 2.68\%$$

NORWAY

$$\Delta Y + Y)/Y = (1 + g)^n$$
$$18470/5463 = (1 + g)^{40}$$
$$3.37 = (1 + g)^{40}/\log$$
$$\log 3.37 = 40 \log (1 + g)$$
$$0.53 = 40 \log (1 + g)$$
$$\log (1 + g) = 0.01325$$
$$(1 + g) = 10^{0.01325}$$
$$1 + g = 1.031$$
$$g = 3.1\%$$

SWEDEN

$$\Delta Y + Y)/Y = (1 + g)^n$$
$$17680/6738 = (1 + g)^{40}$$
$$2.48 = (1 + g)^{40}/\log$$
$$\log 2.48 = 40 \log (1 + g)$$
$$0.40 = 40 \log (1 + g)$$
$$\log (1 + g) = 0.01325$$
$$(1 + g) = 10^{0.01}$$
$$1 + g = 1023$$
$$g = 2.3\%$$

SWITZERLAND

$$\Delta Y + Y)/Y = (1 + g)^n$$
$$21616/9064 = (1 + g)^{40}$$
$$2.38 = (1 + g)^{40}/\log$$
$$\log 2.38 = 40 \log (1 + g)$$
$$0.38 = 40 \log (1 + g)$$
$$\log (1 + g) = 0.0095$$
$$(1 + g) = 10^{0.0095}$$
$$1 + g = 1022$$
$$g = 2.2\%$$

UNITED KINGDOM

$$\Delta Y + Y)/Y = (1 + g)^n$$

$$16411/6907 = (1 + g)^{40}$$

$$2.31 = (1 + g)^{40}/\log$$

$$\log 2.31 = 40 \log (1 + g)$$

$$0.36 = 40 \log (1 + g)$$

$$\log (1 + g) = 0.009$$

$$(1 + g) = 10^{0.009}$$

$$1 + g = 1021$$

$$g = 2.1\%$$

WESTERN EUROPE

$$\Delta Y + Y)/Y = (1 + g)^n$$

$$16872/5013 = (1 + g)^{40}$$

$$3.36 = (1 + g)^{40}/\log$$

$$\log 3.36 = 40 \log (1 + g)$$

$$0.53 = 40 \log (1 + g)$$

$$\log (1 + g) = 0.01325$$

$$(1 + g) = 10^{0.01325}$$

$$1 + g = 10309$$

$$g = 3.1\%$$

The same table is provided for the Eastern European countries:

Table 2 - GDP PER CAPITA (PPP) IN EASTERN EUROPEAN COUNTRIES IN 1950 AND 1990 IN 1990 INTERNATIONAL DOLLARS

COUNTRY	1950	1990
ALBANIA	1001	2480
BULGARIA	1651	5552
CZECHOSLOVAKIA	3501	8570
HUNGARY	2480	6471
POLAND	2447	5115
ROMANIA	1182	3525
FORMER YUGOSLAVIA	1585	5695
EASTERN EUROPE	2120	5437

SOURCE: ANGUS MADDISON: "THE WORLD ECONOMY", Millennial Perspective and Historical Statistics, OECD PUBLISHING 2008, p185

Using data in the table 2, applying the same method as for the Western European countries, it is possible to calculate average annual growth rates for the Eastern European countries for a period 1950-1990.

ALBANIA

$$\Delta Y + Y)/Y = (1 + g)^n$$

$$2480/1001 = (1 + g)^{40}$$

$$2.48 = (1 + g)^{40}/\log$$

$$\log 2.48 = 40 \log (1 + g)$$

$$0.40 = 40 \log (1 + g)$$

$$\log (1 + g) = 0.01$$

$$(1 + g) = 10^{0.01}$$

$$1 + g = 1023$$

$$g = 2.3\%$$

BULGARIA

$$\Delta Y + Y)/Y = (1 + g)^n$$

$$5552/1651 = (1 + g)^{40}$$

$$3.36 = (1 + g)^{40}/\log$$

$$\log 3.36 = 40 \log (1 + g)$$

$$0.53 = 40 \log (1 + g)$$

$$\log (1 + g) = 0.0125$$

$$(1 + g) = 10^{0.0125}$$

$$1 + g = 1029$$

$$g = 2.9\%$$

CZECHOSLOVAKIA

$$\Delta Y + Y)/Y = (1 + g)^n$$

$$8570/3501 = (1 + g)^{40}$$

$$2.45 = (1 + g)^{40}/\log$$

$$\log 2.45 = 40 \log (1 + g)$$

$$0.39 = 40 \log (1 + g)$$

$$\log (1 + g) = 0.00975$$

$$(1 + g) = 10^{0.00975}$$

$$1 + g = 1022$$

$$g = 2.2\%$$

HUNGARY

$$\Delta Y + Y)/Y = (1 + g)^n$$

$$6471/2480 = (1 + g)^{40}$$

$$2.45 = (1 + g)^{40}/\log$$

$$\log 2.45 = 40 \log (1 + g)$$

$$0.39 = 40 \log (1 + g)$$

$$\log (1 + g) = 0.00975$$

$$(1 + g) = 10^{0.00975}$$

$$1 + g = 1022$$

$$g = 2.2\%$$

POLAND

$$\Delta Y + Y)/Y = (1 + g)^n$$

$$5115/2447 = (1 + g)^{40}$$

$$2.09 = (1 + g)^{40}/\log$$

$$\log 2.45 = 40 \log (1 + g)$$

$$0.32 = 40 \log (1 + g)$$

$$\log (1 + g) = 0.008$$

$$(1 + g) = 10^{0.008}$$

$$1 + g = 101859$$

$$g = 1.9\%$$

ROMANIA

$$\Delta Y + Y)/Y = (1 + g)^n$$

$$3525/1182 = (1 + g)^{40}$$

$$2.98 = (1 + g)^{40}/\log$$

$$\log 2.98 = 40 \log (1 + g)$$

$$0.48 = 40 \log (1 + g)$$

$$\log (1 + g) = 0.012$$

$$(1 + g) = 10^{0.012}$$

$$1 + g = 1028$$

$$g = 2.8\%$$

FORMER YUGOSLAVIA

$$\Delta Y + Y)/Y = (1 + g)^n$$

$$5695/1585 = (1 + g)^{40}$$

$$3.57 = (1 + g)^{40}/\log$$

$$\log 3.57 = 40 \log (1 + g)$$

$$0.55 = 40 \log (1 + g)$$

$$\log (1 + g) = 0.01375$$

$$(1 + g) = 10^{0.01375}$$

$$1 + g = 1032$$

$$g = 3.2\%$$

EASTERN EUROPE

$$\Delta Y + Y)/Y = (1 + g)^n$$

$$5437/2120 = (1 + g)^{40}$$

$$2.57 = (1 + g)^{40}/\log$$

$$\log 2.57 = 40 \log (1 + g)$$

$$0.41 = 40 \log (1 + g)$$

$$\log (1 + g) = 0.01025$$

$$(1 + g) = 10^{0.01025}$$

$$1 + g = 1024$$

$$g = 2.4\%$$

Data on average growth rates in the Western European countries and Eastern European countries will be put in one table, to facilitate the comparison.

Table 3 – Growth rates of GDP per capita (PPP) in Western and Eastern Europe in a period 1950-1990

WESTERN EUROPEAN COUNTRIES	Average annual growth rate	EASTERN EUROPEAN COUNTRIES	Average annual growth rate
AUSTRIA	3.87%	ALBANIA	2.3%
BELGIUM	2.9%	BULGARIA	2.9%
DENMARK	2.44%	CZECHOSLOVAKIA	2.2%
FINLAND	3.5%	HUNGARY	2.2%
FRANCE	3.2%	POLAND	1.9%
ITALY	3.9%	ROMANIA	2.8%
NETHERLANDS	3.5%	FORMER YUGOSLAVIA	3.2%
NORWAY	3.1%		
SWEDEN	2.3%		
SWITZERLAND	2.2%		
UNITED KINGDOM	2.1%		
WESTERN EUROPE	3.1%	EASTERN EUROPE	2.4%

SOURCE: The author's calculations based on Maddison.

The tables 1, 2, and 3 reveal several important points.

1. Within Western Europe, less developed countries grew faster and managed to converge with most developed countries.
2. With the exception of Albania, the same applies to Eastern Europe. Less developed countries grew faster and managed to converge with more developed countries.
3. Western Europe was more developed than Eastern Europe in 1950. The least developed Western country, Italy, was at the same level of development as the most developed country in Eastern Europe, Czechoslovakia.
4. With the exception of the former Yugoslavia, the Eastern European countries recorded a slower growth compared to the Western European countries. They diverged, which means that in a period 1950-1990 the Western European countries increased its advantage over the Eastern European countries. This would lead to a conclusion that free market economies were superior to command economies. However, if other indicators are included the picture is not that clear. Command economies achieved artificial and in the long-run unsustainable price stability and full employment, while the Western European countries experienced stagflation in the 1970s. Also, the Eastern European countries had a more egalitarian distribution of income. On the other hand, they were notorious for ecocide, i.e. disrespected the impact of industrialization on the environment. Also, soft budget constraints caused by subsidies given to big loss-making companies increased fiscal deficits more than in the Western European countries. But one needs to bear in mind that when non-monetary indicators such as life expectancy, literacy rate, the quality of health and education, and security are taken into account the command economies fare better than when GDP per capita is used for comparison with the free market economies. ²

² J. Barkley Rosser Jr. & Marina V. Rosser: "Comparative Economics in a Transforming World Economy - third edition", Massachusetts Institute of Technology, USA 2018, p 269 & 270

CHAPTER 2 - Comparison between performances of the Western European and the Eastern European countries in a period 1990-2024

The following table provides the IMF forecast for GDP per capita (PPP) for the Western European and the Eastern European countries in a period 1990-2024

Table 4 - GDP per capita (PPP) in the Western European and the Eastern European countries in the 2024 international dollars

WESTERN EUROPE	GDP PER CAPITA (PPP)	EASTERN EUROPE	GDP PER CAPITA (PPP)
AUSTRIA	73,051	ALBANIA	21,300
BELGIUM	73,222	BULGARIA	39,815
DENMARK	83,459	THE CZECH REPUBLIC	56,686
FINLAND	64,657	HUNGARY	46,807
FRANCE	65,940	POLAND	51,627
ITALY	60,993	ROMANIA	47,204
NETHERLANDS	81,495		
NORWAY	103,446		
SWEDEN	71,731		
SWITZERLAND	95,837		
UNITED KINGDOM	62,574		

SOURCE: THE IMF PROJECTIONS FOR 2024

These figures can be divided by 2.41 (a cumulative inflation in the USA in a period 1990-2024) to arrive at the figures for GDP in the 1990 international dollars.

Table 5 - GDP per capita (PPP) in the Western European and the Eastern European countries in 2024 in the 1990 international dollars

WESTERN EUROPE	GDP PER CAPITA (PPP)	EASTERN EUROPE	GDP PER CAPITA (PPP)
AUSTRIA	30,311	ALBANIA	8,838
BELGIUM	30,382	BULGARIA	16,259
DENMARK	34,628	THE CZECH REPUBLIC	23,521
FINLAND	26,828	HUNGARY	19,422
FRANCE	27,360	POLAND	21,421
ITALY	25,308	ROMANIA	19,586
NETHERLANDS	33,815		

NORWAY	42,923		
SWEDEN	29,763		
SWITZERLAND	39,766		
UNITED KINGDOM	25,964		

SOURCE: THE IMF PROJECTIONS FOR 2024 IN THE 1990 INTERNATIONAL DOLLARS

It is possible, using the same method for 1990, to calculate average growth rates for a period 1990-2024.

AUSTRIA

$$(\Delta Y + Y)/Y = (1 + g)^n$$

$$30,311/16,881 = (1 + g)^{34}$$

$$1.80 = (1 + g)^{34}/\log$$

$$\log 1.80 = 34 \log (1 + g)$$

$$0.26 = 34 \log (1 + g)$$

$$\log (1 + g) = 0.0076$$

$$(1 + g) = 10^{0.0076}$$

$$1 + g = 10176$$

$$g = 1.76\%$$

BELGIUM

$$(\Delta Y + Y)/Y = (1 + g)^n$$

$$30,382/17,194 = (1 + g)^{34}$$

$$1.80 = (1 + g)^{34}/\log$$

$$\log 1.77 = 34 \log (1 + g)$$

$$0.25 = 34 \log (1 + g)$$

$$\log (1 + g) = 0.007$$

$$(1 + g) = 10^{0.007}$$

$$1 + g = 1016$$

$$g = 1.6\%$$

DENMARK

$$(\Delta Y + Y)/Y = (1 + g)^n$$

$$34,628/18,463 = (1 + g)^{34}$$

$$1.88 = (1 + g)^{34}/\log$$

$$\log 1.88 = 34 \log (1 + g)$$

$$0.27 = 34 \log (1 + g)$$

$$\log (1 + g) = 0.0079$$

$$(1 + g) = 10^{0.0079}$$

$$1 + g = 10183$$

$$g = 1.83\%$$

FINLAND

$$(\Delta Y + Y)/Y = (1 + g)^n$$

$$26,828/16,868 = (1 + g)^{34}$$

$$1.59 = (1 + g)^{34}/\log$$

$$\log 1.59 = 34 \log (1 + g)$$

$$0.20 = 34 \log (1 + g)$$

$$\log(1 + g) = 0.0059$$

$$(1 + g) = 10^{0.0059}$$

$$1 + g = 1.0136$$

$$g = 1.36\%$$

FRANCE

$$(\Delta Y + Y)/Y = (1 + g)^n$$

$$27,360/18,093 = (1 + g)^{34}$$

$$1.53 = (1 + g)^{34}/\log$$

$$\log 1.53 = 34 \log(1 + g)$$

$$0.18 = 34 \log(1 + g)$$

$$\log(1 + g) = 0.00529$$

$$(1 + g) = 10^{0.00529}$$

$$1 + g = 1.0129$$

$$g = 1.29\%$$

ITALY

$$(\Delta Y + Y)/Y = (1 + g)^n$$

$$25,308/16,328 = (1 + g)^{34}$$

$$1.55 = (1 + g)^{34}/\log$$

$$\log 1.55 = 34 \log(1 + g)$$

$$0.19 = 34 \log(1 + g)$$

$$\log(1 + g) = 0.0056$$

$$(1 + g) = 10^{0.0056}$$

$$1 + g = 1.013$$

$$g = 1.3\%$$

NETHERLANDS

$$(\Delta Y + Y)/Y = (1 + g)^n$$

$$33,815/17,267 = (1 + g)^{34}$$

$$1.96 = (1 + g)^{34}/\log$$

$$\log 1.96 = 34 \log(1 + g)$$

$$0.29 = 34 \log(1 + g)$$

$$\log(1 + g) = 0.0085$$

$$(1 + g) = 10^{0.0085}$$

$$1 + g = 1.0197$$

$$g = 1.97\%$$

NORWAY

$$(\Delta Y + Y)/Y = (1 + g)^n$$

$$42,923/18,470 = (1 + g)^{34}$$

$$2.32 = (1 + g)^{34}/\log$$

$$\log 2.32 = 34 \log(1 + g)$$

$$0.29 = 34 \log(1 + g)$$

$$\log(1 + g) = 0.0107$$

$$(1 + g) = 10^{0.0107}$$

$$1 + g = 1.024$$

$$g = 2.4\%$$

SWEDEN

$$(\Delta Y + Y)/Y = (1 + g)^n$$

$$29,673/17,680 = (1 + g)^{34}$$

$$1.678 = (1 + g)^{34}/\log$$

$$\log 1.678 = 34 \log (1 + g)$$

$$0.22 = 34 \log (1 + g)$$

$$\log (1 + g) = 0.0064$$

$$(1 + g) = 10^{0.0064}$$

$$1 + g = 1.0148$$

$$\mathbf{g = 1.48\%}$$

SWITZERLAND

$$(\Delta Y + Y)/Y = (1 + g)^n$$

$$39,766/21,616 = (1 + g)^{34}$$

$$1.84 = (1 + g)^{34}/\log$$

$$\log 1.84 = 34 \log (1 + g)$$

$$0.26 = 34 \log (1 + g)$$

$$\log (1 + g) = 0.0064$$

$$(1 + g) = 10^{0.0076}$$

$$1 + g = 1.0176$$

$$\mathbf{g = 1.76\%}$$

UNITED KINGDOM

$$(\Delta Y + Y)/Y = (1 + g)^n$$

$$25,964/16,411 = (1 + g)^{34}$$

$$1.582 = (1 + g)^{34}/\log$$

$$\log 1.582 = 34 \log (1 + g)$$

$$0.2 = 34 \log (1 + g)$$

$$\log (1 + g) = 0.0059$$

$$(1 + g) = 10^{0.00588}$$

$$1 + g = 1.0136$$

$$\mathbf{g = 1.36\%}$$

ALBANIA

$$(\Delta Y + Y)/Y = (1 + g)^n$$

$$8,838/2,480 = (1 + g)^{34}$$

$$3.56 = (1 + g)^{34}/\log$$

$$\log 3.56 = 34 \log (1 + g)$$

$$0.55 = 34 \log (1 + g)$$

$$\log (1 + g) = 0.016$$

$$(1 + g) = 10^{0.016}$$

$$1 + g = 1.0375$$

$$\mathbf{g = 3,75\%}$$

BULGARIA

$$(\Delta Y + Y)/Y = (1 + g)^n$$

$$16,259/5,552 = (1 + g)^{34}$$

$$2.93 = (1 + g)^{34}/\log$$

$$\log 2.93 = 34 \log (1 + g)$$

$$0.47 = 34 \log (1 + g)$$

$$\log (1 + g) = 0.0138$$

$$(1 + g) = 10^{0.0138}$$

$$1 + g = 1.032$$

$$\mathbf{g = 3.2\%}$$

THE CZECH REPUBLIC

$$\begin{aligned}(\Delta Y + Y)/Y &= (1 + g)^n \\ 23,521/8,895 &= (1 + g)^{34} \\ 2.64 &= (1 + g)^{34}/\log \\ \log 2.64 &= 34 \log (1 + g) \\ 0.42 &= 34 \log (1 + g) \\ \log (1 + g) &= 0.012 \\ (1 + g) &= 10^{0.012} \\ 1 + g &= 1.028 \\ \mathbf{g} &= \mathbf{2.8\%}\end{aligned}$$

HUNGARY

$$\begin{aligned}(\Delta Y + Y)/Y &= (1 + g)^n \\ 19,422/6,477 &= (1 + g)^{34} \\ 3 &= (1 + g)^{34}/\log \\ \log 3 &= 34 \log (1 + g) \\ 0.48 &= 34 \log (1 + g) \\ \log (1 + g) &= 0.012 \\ (1 + g) &= 10^{0.014} \\ 1 + g &= 1.033 \\ \mathbf{g} &= \mathbf{3.3\%}\end{aligned}$$

POLAND

$$\begin{aligned}(\Delta Y + Y)/Y &= (1 + g)^n \\ 21,421/5,115 &= (1 + g)^{34} \\ 4.19 &= (1 + g)^{34}/\log \\ \log 4.19 &= 34 \log (1 + g) \\ 0.62 &= 34 \log (1 + g) \\ \log (1 + g) &= 0.018 \\ (1 + g) &= 10^{0.018} \\ 1 + g &= 1.0423 \\ \mathbf{g} &= \mathbf{4.23\%}\end{aligned}$$

ROMANIA

$$\begin{aligned}(\Delta Y + Y)/Y &= (1 + g)^n \\ 19,586/3,525 &= (1 + g)^{34} \\ 5.56 &= (1 + g)^{34}/\log \\ \log 5.56 &= 34 \log (1 + g) \\ 0.62 &= 34 \log (1 + g) \\ \log (1 + g) &= 0.022 \\ (1 + g) &= 10^{0.022} \\ 1 + g &= 1.052 \\ \mathbf{g} &= \mathbf{5.2\%}\end{aligned}$$

Average annual rates of growth of GDP for the Western and the Eastern European countries will be put in a single table to get a better overview of relative economic performance:

Table 6 – Average annual rates of growth of GDP in the Western European and the Eastern European countries in a period 1990-1924

WESTERN EUROPE	Rate of growth of GDP (%)	EASTERN EUROPE	Rate of growth of GDP (%)
AUSTRIA	1.76	ALBANIA	3.75
BELGIUM	1.6	BULGARIA	3.2
DENMARK	1.83	THE CZECH REPUBLIC	2.8
FINLAND	1.36	HUNGARY	3.3
FRANCE	1.3	POLAND	4.23
ITALY	1.3	ROMANIA	5.2
NETHERLANDS	1.97		
NORWAY	2.4		
SWEDEN	1.48		
SWITZERLAND	1.76		
UNITED KINGDOM	1.36		

SOURCE: The author’s calculations based on Maddison and the IMF projections

The Eastern European countries recorded much higher growth rates compared to the Western European countries in a period 1990-2024. This means that they managed to close the gap with the more developed Western economies and converge a good deal.

CHAPTER 3 - Comparison between average annual growth rates in the Eastern European economies before and after the transition

Table 7 – Average annual growth rates in the Eastern European countries in periods 1950-1990 and 1990-2024

COUNTRY	GROWTH RATE (%) 1950-1990	GROWTH RATE (%) 1990-2024
ALBANIA	2.3	3.75
BULGARIA	2.9	3.2
CZECHOSLOVAKIA/THE CZECH REPUBLIC	2.2	2.8
HUNGARY	2.2	3.3
POLAND	1.9	4.23
ROMANIA	2.8	5.2

SOURCE: Author’s calculations based on Maddison and the IMF projections.

The data from the tables 5,6, and 7 indicate that the Eastern European countries performed better as free market economies than as command economies.

However, this group of countries experienced deterioration in three areas after the transition, namely health, education, and distribution of income.

1. Health care

By the end of the 1980s all countries of Eastern Europe and the former Soviet Union enjoyed a relatively high level of human development index and social welfare. This was reflected in a high life expectancy, which by far exceeded the life expectancy in the other countries at the similar level of development. This was the result of a high level of medical protection. The health system, although inefficient according to the Western criteria, was of a very high quality and free at the point of delivery for all citizens.

At the beginning of transition, a sharp fall in GDP negatively affected real consumption and health care. This characterized the health system even when growth was resumed. The percentage of deliveries attended by non-professionals increased. Impoverished medical workers ask for a bribe for performing medical services. This puts poor citizens in unfavorable position. Universal access to health care, taken for granted in the communist system, has been put in danger. This was the result of a friction between the health budget and real costs of medical treatment. As a result, the quality of health care has been deteriorating. In addition, households feel an increase costs of direct and indirect payment for medical services. The evidence shows that the costs of health care are increasingly regressive. This negatively affects poor layers of population, who are struggling to foot medical bills, which means that the universal access to health care is compromised. In other words, although the health care system is still mainly in the public sector and officially free at the point of delivery, increasing numbers of poor cannot afford a medical treatment.³

2. Education

Education, the brightest spot of the communist system, became another victim of transition. In the communist system, a high percentage of GDP was allocated to education. Educational standards were extremely high even when compared to most developed Western countries. Primary education was compulsory, and illiteracy among adults was almost eradicated. There was a wide network of kindergartens for children of the age 3 to 6, as well as a network of vocational and technical schools for those who wanted to continue education after completing primary school. However, excellent performances have been deteriorated and it is unlikely that high levels of literacy would be maintained in the future.

Deterioration has engulfed both, the demand and the supply side of education. Low salaries and a loss of status teachers had in the previous system prompted many to leave education. With the reduction in investment in education this had negative repercussions on the quality of the educational process.

On the demand side negative impact was threefold. Firstly, the attendance of pupils coming from poor families has fallen due to their inability to afford school uniforms, textbooks, and other necessary school equipment. Secondly, some children do not attend school regularly since they have to work in order to supplement family income or to look after their younger siblings. Thirdly, even if they attend school regularly, they do not have much benefit of it. This can be the result of a lack of heating, poor ventilation, or the absence of elementary resources, or because of the absence of poorly paid teachers who during school hours do other jobs to increase their income.

³ Tahir Mahmutefendić: "Balkanske tranzicijske i globalizacijske teme – eseji i prikazi" (The Balkan Transition and Globalization Themes- Essays and Reviews"), Lijepa riječ Tuzla, Bosnia and Herzegovina, 2018, p72 & 73

A conspicuous characteristic of the education system after transition is expansion of private universities. Private universities are richer and better equipped than public universities and offer previously less represented courses such as computer sciences, business studies, marketing, management, accounting, law etc. The quality of private universities varies a lot, since this sector of high education is still unregulated. Establishment of private universities was encouraged by the USA, where the quality of private universities education is higher than the quality of education provided by state universities. However, the former communist countries are still far from the situation in which the same would apply to them. ⁴

3. Distribution of income

Eastern European countries had a pretty egalitarian distribution of income in the communist system. Absolute poverty, at least officially, did not exist, and the percentage of rich did not exceed 5 per cent. The rich were recruited from the ruling establishment (party top brass, ministers, generals, etc.), comprising 2-3 per cent of population, and the same percentage of those who operated in an informal economy. In the absence of significant ownership of capital and land differences in the level of income for the rest of population stemmed from differences in the level of education and responsibility in the work place. These differences, however, were negligible in comparison with those in the Western countries.

Economic transition was accompanied by an increase in inequality in all transition countries. A double process of transition from command to free market economy and privatization of state-owned enterprises played a vital role in a sharp rise in inequality.

A market system increases inequality in distribution of income since it assumes the link between earnings on one hand, with taking a risk, proficiency, individual talents and effort on the other hand. Also, differences in earnings are much higher in the private sector than in the public sector. A trend of increase in inequality has started in Western countries in 1979, when a neoliberal revolution overthrew Keynesianism. However, there were three differences between Eastern European and Western European countries. Firstly, the percentage of privatized means of production in the West was much lower than in the East. Secondly, the Western European countries retained the system of progressive taxation with the aim of correcting a market failure in distribution of income and wealth., while most of the Eastern European countries have had low and flat tax rates. Thirdly, wrong methods of privatization in the Eastern European countries led to concentration of wealth in a small number of hands, and were accompanied by a high increase in unemployment. Unemployed, without a safety net which exists in the Western countries, found themselves in a vulnerable position. An additional factor which contributed to inequality in distribution of income was a large informal sector, unearned income, and violation of contracts with a widespread practice of deference in payment to workers with low wages.

As a result of this, Gini coefficient, which varied between 0.22 and 0.28 in the most of Eastern European countries in 1989, exceeded Gini coefficient in the Western European countries. The highest rise of Gini coefficient occurred in Russia and Romania, where it rose from 0.27 in 1989 to 0.52 in 2001, and from 0.16 to 0.39 respectively. ⁵

As a result of these trends there has been a surge of nostalgia to the old system among certain layers of population, particularly in the former Yugoslavia. ⁶

⁴ Ibid, p73-75

⁵ Ibid, p76 & 77

⁶ Christopher Cviic & Peter Sanfey: "In Search of the Balkan Recovery – The Political and Economic Re-emergence of South-Eastern Europe", EBRD7World Bank, London 2006, p149

The following table shows subjective assessments of transition:

Table 8 – Economic situation is better today than in 1989. (percentage of interviewees)

	I agree	I disagree	Undecided
Central European and Baltic states	40	40	20
Commonwealth of independent states	40	46	14
Countries in South-Eastern Europe	20	64	16

SOURCE: Christopher Cviic & Peter Sanfey: "In Search of the Balkan Recovery-The Political and Economic Re-emergence of South-Eastern Europe" EBRD/World Bank, London, 2006, p154

CONCLUSION

In 1950 the European West was more developed than the European East. The least developed Western country Italy was at the same level of development as the most developed Eastern country Czechoslovakia. In a period 1950-1990 the European West grew faster compared to the European East and increased its advantage. Therefore, a divergence between the two groups of countries occurred.

After the transition, in a period 1990-2024, the European East grew faster than the European West and managed to catch up. Therefore, in this period a convergence occurred between the two groups of countries.

The European East grew faster in a period 1990-2024 than in a period 1950-1990. All this would lead to a conclusion that free market economies have been superior to command economies. However, if non-monetary indicators are used the command economies fared much better in comparison with free market economies than when GDP per capita (PPP) is used. The command economies had a high Human Development Index. This was the result of excellent health and education system. In addition, after the transition the European East experienced a rapid deterioration in the quality of health and education system. Also, Gini coefficient significantly increased, particularly in Russia and Romania. A survey conducted in 2006 shows that only a majority of citizens in the Central European and the Baltic states thought that the quality of life improved after the transition. A majority of citizens in the other two groups, namely the South-East European countries and the former republics of the former Soviet Union thought that the satisfaction with life was better in the *ancient regime*. Therefore, the result is inconclusive.

LITERATURE

Acamoglu Daron, Laibson David, List John A: "Macroeconomics", Pearson Education Limited USA, 2016

Anderton Alen: "A-Level Economics-Eight Edition", Causeway Press, United Kingdom, 1994

Cviic Christopher & Stanfey Peter: "In Search of the Balkan Recovery-The Political and Economic Re-emergence of South-Eastern Europe", EBRD, London, 2006

Lines David, Marcouse Ian & Martin Barry: "The Complete A-Z BUSINESS STUDIES Handbook", Hodder & Stoughton, UK 1999

Maddison Angus: "The World Economy- Volume 1: The Millennial Perspective, Volume2: Historical Statistics", OECD PUBLISHING 2001

Madzar Ljubomir: "Suton socijalističkih privreda", (A Twilight of the Socialist Economies), Institut Ekonomskih Nauka Beograd 1990

- Mahmutefendic Tahir: "Economics and Politics-Textbook for Year 3 Grammar School, Social Department", MARKOS BANJALUKA, 2018
- Mahmutefendic Tahir: "The Balkans over Years - History and Politics", Xlibris, London 2018
- Mahmutefendic Tahir: "Economics and Politics-Textbook for Year 4 Grammar School, Social Department", MARKOS BANJALUKA, 2019
- Mahmutefendic Tahir: "Eseji iz apsurdne ekonomije i politike", (Essays in Absurd Economy and Politics), Bosanska riječ Tuzla, 2014
- Mahmutefendić Tahir: "Kratak leksikon ekonomskih pojmova/A Short Lexicon of Economic Concepts", Markos Banjaluka, 2019
- Mahmutefendic Tahir: "The Great Recession, the Balkans, and the Euro, Xlibris London 2015
- Mahmutefendić Tahir: "Ekonomski razvoj Bosne i Hercegovine u austrougarskom razdoblju-komparativna analiza makroekonomskih pokazatelja", (Economic Development of Bosnia and Herzegovina during Austro-Hungarian Period- Comparative Analysis of Macroeconomic Indicators), Infografika Sarajevo, 2024
- Mahmutefendic Tahir: "The European Core and European Periphery-Convergence and Divergence", Jahorina Business Forum, 2024
- Owen J, Haese R, Haese S, Bruce M: "Mathematics for International Student/Mathematics SL ", Haese & Harris Publications, Australia 2007
- Petrakos George and Totev Stoyan (editors): "The Development of the Balkan Region", Ashgate Publishing Company Limited, 2001
- Picketty Thomas: "Kapital u XXI vijeku", (The Capital in XXI Century, Buybook, Sarajevo 2015
- Rosser J. Barkley & Rosser Marina V. : "Comparative Economics in a Transforming World Economy", Massachusetts Institute of Technology", 2018
- Russell Bertrand: "History of Western Philosophy", Routledge 2015
- Schlomlich & Meisen: "Logaritamske tablice", Zagreb 1972
- Schumpeter Josef Alois: "The Theory of Economic Development", Transaction Publisher, USA 1983
- Schwab Klaus: "The Fourth Industrial Revolution", Penguin Random House, United Kingdom, 2017
- Sirc Ljubo: "Da li je kritika samoupravljanja još uvijek aktuelna?" (Is the Critic of Self-management still up-to-date?), Institut Ekonomskih Nauka Beograd I Centar za Post-komunističke studije London, 1997
- Todaro Michael P. & Smith Stephen S. : "Ekonomski razvoj, deveto izdanje", (Economic Development- Ninth edition)Šahinpašić, Sarajevo 2006
- Wall Nancy: "The Complete A-Z ECONOMICS Handbook", Hodder & Stoughton, UK 2001
- The IMF GDP Projections for 2024

The Queen and the Mountain of Bandaman Maurice : A Dramatization of the Insignificance of the Contemporary Political World

Yaoua Bio ADJOURMANI

Université Alassane Ouattara de Bouaké, Côte d'Ivoire

Dr. N'golo Aboudou SORO

Université Alassane Ouattara de Bouaké, Côte d'Ivoire

Abstract

Contemporary society is shaken by various ills, among which political problems occupy a prominent place. These problems are pointed out by the ivoirian playwright Bandaman Maurice in his play *The Queen and the mountain*. As an observer of the society in which he lives, and concerned with depicting these ills that generate not only the fracture of society but also the degradation of the political climate, this playwright decides to stage the ignoble acts of politicians. He does so with a trivial discourse to convey their insignificance.

Keywords : politic, dramatization, society, insignificance, contemporary

Inspection of Cost Accounting and Pricing Adequacy of an Object

Assoc. Prof. Dr. Malkhaz SULASHVILI

Georgian Technical University, Georgia

Prof. Dr. Olga KHUTSISHVILI

Georgian Technical University, Georgia

Prof. Dr. Aleksander SICHINAVA

Georgian Technical University, Georgia

Giorgi ZAALISHVILI

Master's Student, Georgian Technical University, Georgia

Mariami GOGOCHURI

PhD student, Georgian Technical University, Georgia

Abstract

Running a successful business isn't just about sales—it's about making sure those sales generate profit. Cost accounting, often operating behind the scenes like a gray cardinal, helps businesses track every unit spent, from materials and labor to overhead costs, so they can spot inefficiencies and make smarter financial decisions. But knowing costs alone isn't enough. Pricing adequacy takes that data and ensures prices not only cover expenses but also keep businesses competitive and appealing to customers. This paper examines the adequacy of costing, assessing how correctly and fairly all necessary costs related to business success are considered. It also determines the importance of cost accounting and pricing adequacy in business decision-making, highlighting their role in sustainable profitability. Businesses use strategies like cost-plus, market-based, and value-based pricing to stay ahead, while external factors such as inflation, regulations, and customer demand also shape pricing decisions. When cost accounting and pricing adequacy work together, businesses can avoid major mistakes, maximize profits, and stay strong in a constantly changing market. They turn numbers into strategy, and strategy into profit.

Keywords: Cost Accounting, Pricing Adequacy, Profitability, Financial Management, Pricing Strategy

INTRODUCTION

In today's merciless business world, every decision matters. Success isn't just about making sales, it's about making sure those sales actually generate profit. That's why businesses need to pay attention on how much they are spending and make sure they are setting the right prices for their products. This is where cost accounting and pricing adequacy come in.

Cost accounting is like the gray cardinal of business—operating behind the scenes, rarely in the spotlight, yet controlling the flow of financial decisions. It tracks every unit spent, whether on materials, labor, or overhead, acting as a financial path that shows where money is going and where things might be going wrong. Spotting inefficiencies early means fixing them before they turn into costlier problems. But knowing costs alone isn't enough, because even the best-managed expenses can't save a business with poor pricing.

That's where pricing adequacy steps in. It takes everything cost accounting uncovers and helps businesses set prices that cover expenses, keep them competitive, and match what customers are willing to pay. Pricing is a delicate task, set it too high, and customers might look elsewhere. set it too low, and the business risks losing money.

When cost accounting and pricing adequacy work together, businesses gain a powerful advantage. They can make smarter financial decisions, basing them on data and strategy rather than guessing.

UNDERSTANDING COST ACCOUNTING

In the world of business operations, where fortunes are built and lost in the seconds, few disciples hold as much influence and power such as cost accounting. It's not just about keeping track of numbers – It's the system that helps organizations understand how is every unit spent, making sure the money isn't wasted and resources are being used wisely. Cost Accounting helps businesses find problems before they become issues.

Unlike financial accounting, which focuses on reporting financial results to people outside organization such as investors or regulators – Cost accounting is designed for internal use for someone who manages and decides. By having a clear picture, these people can make better choices which will lead to improving operations and increasing profits.¹

OBJECTIVES OF COST ACCOUNTING

Primary goals of cost accounting are straightforward, yet essential to the foundation of any successful organization. These objectives are not just about playing around numbers, but about ensuring that business is running as effectively as it could be.

1. **COST CONTROL:** The first goal of cost accounting is to identify and eliminate unnecessary expenses. We can think about this as finding leaks in a ship and patching them before they sink the whole operation. By controlling and tracking costs we can find inefficiencies – whether small hidden ones or larger, more visibles. With cost control we can ensure that every unit contributes to organizational success. ²
2. **BUDGETING:** Cost accounting provides bussinesses with necessary insights to plan for the future. By understanding current costs and predicting future ones, keeping in mind things such as material costs, labor costs, production costs, market and economic conditions, we can ensure that we don't overspend in one area and leave us vulnerable in another.³

¹ (Fleischman & Tyson, 1993: 503-517)

² (Garrison, Noreen, & Brewer, 2018: 467)

³ (Horngren, Datar, & Rajan, 2015: 199-203)

3. **PROFITABILITY ANALYSIS:** One of the most significant advantages of cost accounting is its ability to reveal which products and services are most profitable. With this information, businesses can focus their efforts and direct their power to things that already works, while reconsidering offerings that aren't delivering the returns that are expected.⁴
4. **PRICING DECISIONS:** Setting the right price is important aspect of pricing and profitabilty strategy, but it starts with understaning the costs. Price of the product or service has to cover all associated expenses while still yielding a reasonable profit. Without clear understandings, businesses risk underpricing their goods and going in the loss or overpricing them and losing market competetiveness. We can avoid this by factoring direct and indirect costs.
5. **FINANCIAL TRANSPARENCY:** Finally, cost accounting provides clear and detailed breakdown of cash flow. This transparency is important for leaders to make informed and strategic decisions whether this is reducing costs, reallocating resources, or changing business priorities.

TYPES OF COSTS IN COST ACCOUNTING

Costs are divided into different categories based on Traceability, Behavior and Function.

1. Based on Traceability

Direct Costs: Expenses that can be directly traced to a specific product or service. Examples include raw materials, wages of workers and manufacturing supplies.⁵

Indirect Costs: Costs that support production but are not directly tied to a single product. These include utilities, rent, etc.⁶

2. Based on Behavior:

Fixed Costs: Expenses that remain unchanged regardless of production levels such as rent, insurance and salaries of staff.⁷

Variable Costs: Costs that change in direct proportion of production levels, such as raw materials and sales. ⁸

3. Based on Function

Operating Costs: Costs associated with everyday operations. These costs can be both fixed or variable.⁹

Capital Costs: Investments in long-term assets like machines and buildings.

Overhead Costs: Business costs that are not directly tied to production but are necessary to run business smoothly. Examples consist of office supplies, maintenance and marketing expenses.

⁴ (Horngren, Datar, & Rajan, 2015: 559-560)

⁵ (Institute of Company Secretaries of India [ICSI], 2017: 9).

⁶ (Institute of Company Secretaries of India [ICSI], 2017: 9).

⁷ (Institute of Company Secretaries of India [ICSI], 2017: 324).

⁸ (Institute of Company Secretaries of India [ICSI], 2017: 324).

⁹ (Fleischman & Tyson, 1993: 503-517)

Pricing Adequacy and Its Importance

In the complex chessboard of business, pricing is more than just a number. It's an art. Set it too high, and customers will hesitate to buy. Too low, and profitability will fall down before our eyes. Pricing adequacy is a balance to ensure that's products price reflects its costs, its realities on the market and how consumers and clients perceive the value.

Common Pricing Strategies

Determining the right price is no simple job. It requires unifying calculation, psychology and market ideas. There are some different methodologies business relies on:

1. **Cost-Plus Pricing** - Probably the most straightforward of all pricings. We take the total cost of a product, add a little bit of unit, and call it a day. Simple, effective, but not the most strategic.¹⁰
2. **Competitive Pricing**- Perception matters just as much as product. In this methodology we look at others pricings in the same industry and price the product accordingly.¹¹
3. **Value-Based Pricing** - Instead of focusing on costs, this pricing asks a simple question: "how much is this worth to the customer?" and depends on the answer the pricing is born. This can sometimes justify a price far beyond production costs.
4. **Dynamic Pricing** - The most fluid and responsive strategy. Prices shift based on demand and competition. This strategy adjusts prices in real time to maximize income. Even 1% increase in price optimization may lead to 10 or more percent of increase in total profits. The best example would be airlines and their ever-changing prices.¹²

Factors Affecting Pricing Adequacy

1. **Covering Costs and Staying Profitable** - A business must ensure that not only its prices cover expenses but also leave room for growth. Extra topping on price will be used to reinvest and expand.
2. **Market Demand and Competition** - Supply and demand is very remorseless. A price that is good in one market, might fail in another. To avoid failure we must keep an eye on competitors.
3. **Rules and Regulations** - Governments have a say in pricing. They Regulate everything according to laws and ignoring those regulations can lead to fines, lawsuits and last straws - even worse
4. **What Customers Are Willing to Pay** - At the end of the day, it doesn't matter what have we considered if we overlook the biggest power of them all - Consumers. their perception and willingness to pay is what determines whether a price fails or succeeds.
5. **The Bigger Economic Picture** - Inflation, currency shifts and economic downturns can turn today's smart pricing upside down and become a disaster. What works today may not work tomorrow.

Conclusion

In business, success isn't about making sales but rather making sales at the right place and at the right time. Cost accounting and Pricing adequacy should work together to make

¹⁰ (Peppler, 2022).

¹¹ (Pennsylvania State University, 2023).

¹² (Mailmodo, 2025)

sure that every unit spent contributes to long-term progress. One without the other is a recipe for disaster.

Cost Accounting: The Foundation of Smart Pricing

The idea of cost accounting is to provide raw data to make informed pricing decisions. It should track every expense, labor and overhead prices to give a clear view of how much it actually costs to produce a product or a deliver service. Without this information pricing is just a gamble, a coin into the air.

Pricing Adequacy: Turning Data into Strategy

Once costs are understood, pricing adequacy ensures that business remains competitive and profitable. It should consider internal costs along with external factors. A price needs a little bit more than just covering costs. It needs to reflect the value customers perceive and be adaptable to changes in the market.

The Power of Working Together

When Cost accounting and Pricing Adequacy work together, they become a force to be reckoned with, and businesses can operate with confidence. They can optimize expenses, adjust pricing based on data and avoid financial downfalls. A stable cost accounting is a core structure for what's on the top of it, the Pricing Adequacy.

Bibliography

Books:

Garrison, R. H., Noreen, E. W., & Brewer, P. C. (2018). *Managerial accounting* (16th ed.). New York: McGraw-Hill Education.

Hornigren, C. T., Datar, S. M., & Rajan, M. V. (2015). *Cost accounting: A managerial emphasis* (15th ed.). Pearson.

Institute of Company Secretaries of India (ICSI). (2017). *Study material executive programme: Cost and management accounting, module 1, paper 2*. ICSI.

Journal Article:

Fleischman, R. K., & Tyson, T. N. (1993). Cost accounting during the industrial revolution: The present state of historical knowledge. *Economic History Review*, 46(3), 503-517.

Web Sources:

Mailmodo. (2025, January 8). 6 dynamic pricing examples from different industries. Mailmodo. Retrieved from <https://www.mailmodo.com/guides/dynamic-pricing-examples/>

Pennsylvania State University. (2023). Understanding pricing objectives and strategies for the value-added ag producer. College of Agricultural Sciences, Agricultural Research and Cooperative Extension. Retrieved from <https://extension.psu.edu/understanding-pricing-objectives-and-strategies-for-the-value-added-ag-producer>

Peppler, S. (2022, November 30). Cost-based pricing strategy advantages & disadvantages. Flintfox. Retrieved from <https://www.flintfox.com/resources/articles/cost-based-pricing-guide/>

The Impact of Cooperative Learning in Developing English Language Skills Among Primary School Students in a Romanian Private School

Corina Georgiana BALABAN

PhD Student, "Alexandru Ioan Cuza" University of Iași, Romania

Abstract

In an increasingly digitalized world, where children spend more time in front of screens than engaging in direct interaction with their peers, the need to teach young learners how to develop collaboration skills and both social and individual responsibility has become more evident. Throughout my seven years of teaching English at both kindergarten and primary school levels in a private school, I have observed firsthand the benefits of cooperative learning. Through methods such as direct observation, reflective journaling, and summative assessments, I have found that students not only improve their English language proficiency but also develop crucial social and cognitive abilities.

The purpose of this study was to highlight the significant impact that such a method can have on the development of collaborative skills among primary school students and to examine more closely its influence on their English communication abilities. The focus was placed on self-confidence, fluency in expression, initiative in starting conversations in English, and the equitable distribution of responsibilities during classroom activities. Furthermore, this study will demonstrate that primary school students gain an essential tool that teaches them how to learn, not only in English but across other academic subjects as well. The structured and well-organized nature of the cooperative learning method fosters a deeper understanding and long-term retention of knowledge, equipping students with valuable lifelong learning strategies.

Keywords: Cooperative Learning, Collaboration Skills, Learning to Learn, Teaching English

Greek Language Influence on the Albanian Language and Literature: A Historical and Cultural Overview

Aleksander BOBOLI

“Eqrem Cabej” University of Gjirokastra, Albania

Elona ZIREK

“Eqrem Cabej” University of Gjirokastra, Albania

Zamira BOBOLI

“Eqrem Cabej” University of Gjirokastra, Albania

Abstract

The Albanian language has incorporated a considerable number of Greek words, a phenomenon resulting from extensive interactions between the two civilizations over time. This process of lexical borrowing began with the dissemination of Greek culture, particularly during the Byzantine Empire. Moreover, the ancient Greek language impacted Albanian through trade, contact with Greek-speaking communities, and its prominence as a language of science, philosophy, and literature.

Greek-derived vocabulary in Albanian spans in various domains including religion, governance, science, literature, and daily life. The most prominent categories of borrowed Greek terms encompass:

Religious Lexicon: Terms such as *kisha* (church), *patriark* (patriarch), *episkop* (bishop), and *teologji* (theology) reflect this influence.

Cultural and Intellectual Contributions: Words such as *filozofi* (philosophy), *logjikë* (logic), are derived from Greek.

Administrative Terminology: Examples include *diplomaci* (diplomacy), *shtet* (state), and *konsull* (consul).

Everyday Vocabulary: The Albanian language has absorbed numerous Greek terms for objects, professions, and activities in daily life. Examples include *orë* (clock), *mjek* (doctor), etc.

Scientific and Technical Terminology: Terms such as *analizë* (analysis), *fizikë* (physics) etc., demonstrate this influence.

The presence of Greek borrowings in the Albanian language highlights the profound cultural and intellectual exchange between the two civilizations. This ongoing influence has significantly enriched Albanian vocabulary.

Keywords: Loan words, Albanian language, linguistic influence, cultural exchange, historical borrowing.

Balancing Digital and In-Person Communication in Social Service Provision

Edvarts PAVULENS

PhD Student, Rīga Stradiņš University, Latvia

Abstract

Objectives: Digital technologies (IT) are transforming social work by changing communication methods, improving service efficiency, and increasing accessibility for various target groups. This study explores how IT implementation impacts communication between social workers and residents, and how these technologies affect access to social services in rural areas.

Materials and Methods: The study uses empirical data from a survey on social workers' organization and digital tool usage. An eco-social perspective is applied, emphasizing the relationships between individuals and their environment regarding resource and service access.

Results: Survey data show that 78% of social workers primarily provide in-person services, either through client visits or support at social service centers. Meanwhile, 14% rely on remote communication via phone calls, video conferencing, and emails.

Conclusions: The integration of digital technologies in social work requires balancing innovative solutions with the need for face-to-face communication. While digital tools can improve service efficiency, they must be tailored to the specific needs of target groups. Increased remote communication can hinder social workers' ability to fully assess clients' situations, potentially reducing the effectiveness of personalized support and services.

Keywords: Social Work, Digitalization, Communication

Mathematical Modelling and Structural Stability in Aerospace

Andreea V. COJOCARU

Independent researcher, Timisoara, Romania, candreeavalentina@gmail.com

Prof. Dr. Stefan BALINT

Department of Computer Science, West University of Timisoara, Blvd. V. Parvan 4, 300223 Timisoara, Romania, stefan.balint@e-uvv.ro

Correspondence: candreeavalentina@gmail.com; stefan.balint@e-uvv.ro

Abstract

In the present paper, the meaning of the structural stability is presented and examples of airplanes, UAVs and space vehicles models are given whose theoretical model is not structurally stable.

Keywords: Mathematical Modelling, Structural Stability, Aerospace.

1.Introduction. According to [1] there is no set rules, and an understanding of the “right” way to model real word phenomena. One learns it by practice. To model can be reached by familiarity with a wealth of examples. A model is a mental representation of a process. Usually, a mathematical model is a mental construction and takes the form of a set of equations describing a number of variables. We distinguish between continuous models, in which the variables vary continuously in space and time and discrete models whose variables varies discontinuously. Applied mathematicians have a procedure, almost a philosophy that they apply when building models, for a process of interest that on wants to describe or more importantly, explain. Observations of the process lead, sometimes after a great deal of effort, to a hypothetical mechanism, that can explain the phenomenon. The purpose of a model is then to formulate a description of the mechanism in quantitative terms. The analysis of the resulting model leads to results that can be tested against the observations. Ideally, the model also leads to predictions, which if verified, lend authenticity to the model. It is important to realize that all models are idealizations and limited in their applicability. In fact, one usually aims to simplify. The idea is that if a model is right, then it can be subsequently be made more complicated, but the analysis of it is facilitated by having treated a simpler version first. Simplifications appear in the case of the differential systems that describe the movement of existing airplanes, UAVs and space vehicles, and even during the development period of new prototypes [2], [3], [4], [5], and [6]. Because, the undesirable consequences due to the simplifications, as well as the cost of new prototypes, it is useful to have theoretical tool that establishes necessary condition which has to be satisfied by the simplified system of differential equation. The necessary condition it could be the structural

stability in S. Smale sense [7], [8] of the simplified system of differential equations. In the present paper, the meaning of the structural stability is presented and examples of airplanes, UAVs and space vehicles models are given whose theoretical model is not structurally stable.

2. Structural stability.

According to [9],[10] the continuous-time dynamical system

$$\dot{x} = f(x, \alpha) \quad x \in U \subset R^n \quad \alpha \in V \subset R^m \quad (2.1)$$

is topologically equivalent in $U \subset R^n$ to the dynamical system

$$\dot{y} = f(y, \beta) \quad y \in U \subset R^n \quad \beta \in V' \subset R^m \quad (2.2)$$

if there is

-a homeomorphism of the parameter space $p: V \rightarrow V'$;

-a parameter-dependent homeomorphism of the phase-space $h_\alpha: U \rightarrow U$

such that for all $\alpha \in V$, h_α maps orbits of the first system onto orbits of the second system preserving the direction of time, i.e.

$$h_\alpha[x(t; \alpha, x^0)] = y[t; p(\alpha), h_\alpha(x^0)] \quad \text{for any } x^0 \in U \quad \text{and any } t \quad (2.3)$$

where $x(t; \alpha, x^0)$ is the solution of system (2.1) corresponding to the parameter α and to the initial condition x^0 and $y[t; p(\alpha), h_\alpha(x^0)]$ is the solution of system (2.2) corresponding to the parameter $p(\alpha)$ and initial condition $h_\alpha(x^0)$.

Let be a system $\dot{x} = f(x)$ defined in a region $U \subset R^n$ by the C^1 vector field $f: U \rightarrow R^n$. Consider a region $U_0 \subset U$ and assume that the scalar product $\langle f(x), x \rangle$ is strictly negative for each $x \in \partial U_0 \subset U$. According to [8] the system $\dot{x} = f(x)$ is structurally stable in $U_0 \subset U$ if there exist a neighborhood W of vector field f such that for any C^1 vector field $g: U \rightarrow R^n$ $g \in W$ the system $\dot{y} = g(y)$ is topologically equivalent in U_0 to the system $\dot{x} = f(x)$. In [8] pg.312-318 theorems and examples concerning structural stability and structural instability are given. Remark that if the system $\dot{x} = f(x)$ is structurally stable in $U_0 \subset U$ and $g \in W$ then there exists a bijection between the steady states (equilibriums) of the system $\dot{x} = f(x)$ and equilibriums of the system $\dot{y} = g(y)$ located in U_0 .

3. The system describing the decoupled longitudinal flight in case of ALFLEX space shuttle is not structurally stable.

Automatic-Landing Flight-Experiment (ALFLEX) is a model plane, developed by NASDAQ, Japan. This vehicle is a reduced-scale model of the H-II Orbiting Plane, an unmanned reusable orbiting spacecraft. It has been built to study the flight of the spacecraft during its final approach and landing phases. This flight is made possible due to complicated automatic-flight control systems, designed to perform quick responses to commands. As the mass of this vehicle is concentrated in its fuselage, the phenomenon of inertial coupling may occur, i.e., a gyroscopic effect, causing small perturbations or small changes of the control surface angles that may lead to dramatic changes in roll rate

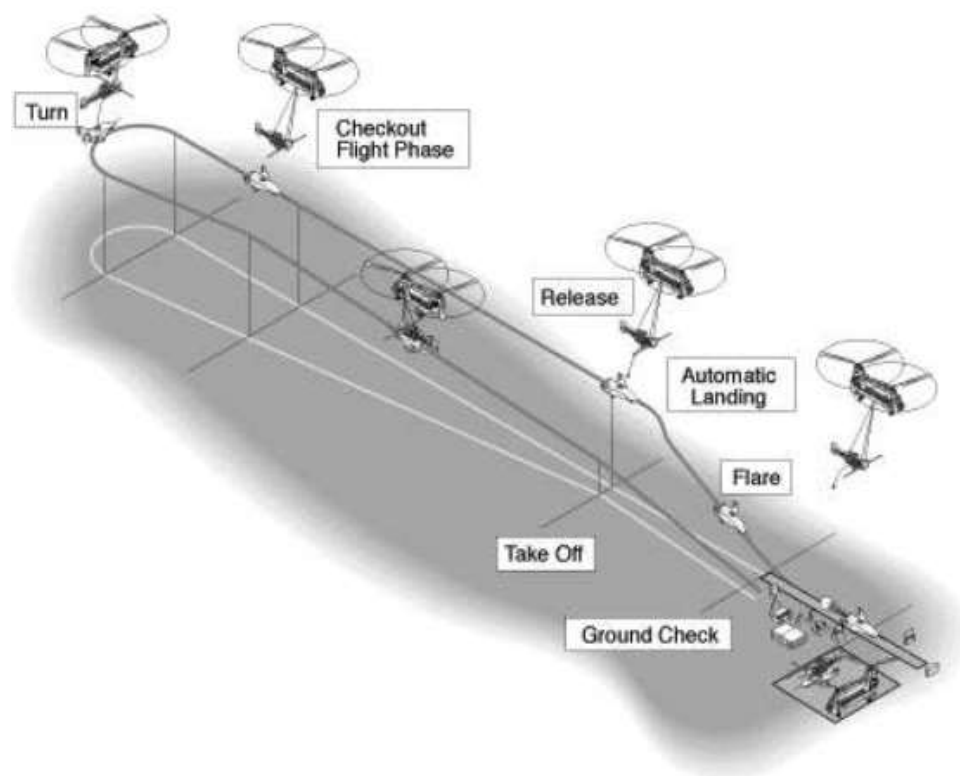
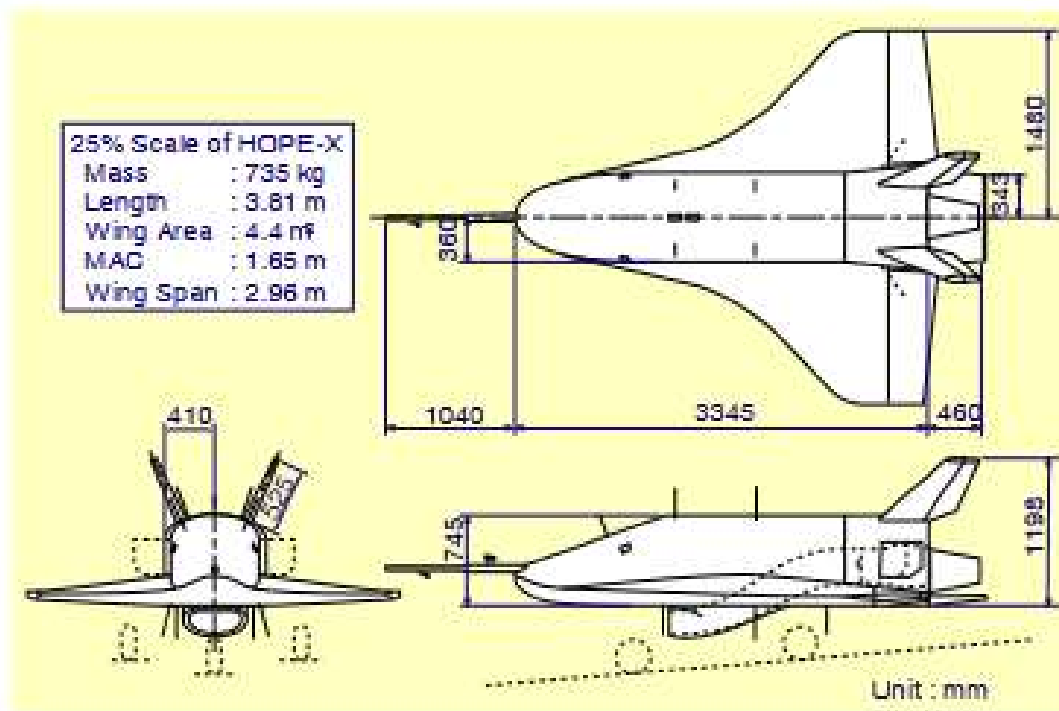


Figure 5.1: Landing experiment [1]

Fig.3.1. ALFLEX

The general system of differential equations which describes the motion around the center of gravity of a rigid aircraft, with respect to an xyz body-axis system, where xz is the plane of symmetry, according to [2], [3] is:

$$\begin{aligned} \frac{\dot{V}}{V} \times \cos\alpha \times \cos\beta - \dot{\beta} \times \cos\alpha \times \sin\beta - \dot{\alpha} \times \sin\alpha \times \cos\beta &= r \times \sin\beta - q \times \sin\alpha \times \cos\beta + \frac{X}{m \times V} \\ \frac{\dot{V}}{V} \times \sin\beta + \dot{\beta} \times \cos\beta &= p \times \sin\alpha \times \cos\beta - r \times \cos\alpha \times \cos\beta + \frac{Y}{m \times V} \\ \frac{\dot{V}}{V} \times \sin\alpha \times \cos\beta - \dot{\beta} \times \sin\alpha \times \sin\beta + \dot{\alpha} \times \cos\alpha \times \cos\beta \\ &= -p \times \sin\beta + q \times \cos\alpha \times \cos\beta + \frac{Z}{m \times V} \\ I_x \times \dot{p} - I_{xz} \times \dot{r} &= (I_y - I_z) \times q \times r + I_{xz} \times p \times q + L \\ (3.1) \\ I_y \times \dot{q} &= (I_z - I_x) \times p \times r - I_{xz} \times (p^2 - r^2) + M \\ I_z \times \dot{r} - I_{xz} \times \dot{p} &= (I_x - I_y) \times p \times q - I_{xz} \times q \times r + N \\ \dot{\Phi} &= p + q \times \sin\phi \times \tan\theta + r \times \cos\phi \times \tan\theta \\ \dot{\theta} &= q \times \cos\phi - r \times \sin\phi \end{aligned}$$

State parameters of this system are: forward velocity V , angle of attack α , sideslip angle β , roll rate p , pitch rate q , yaw rate r , Euler roll angle ϕ , and Euler pitch angle θ . The constants I_x, I_y, I_z are moments of inertia about the x-, y-, and z-axis, respectively; I_{xz} product of inertia, g gravitational acceleration; and m mass of the vehicle.

The external forces and moments X, Y, Z, L, M, N are, in general, functions of the state parameters and the control parameters: δ_a aileron angle; δ_e elevator angle; and δ_r rudder angle (the body flap and the speed break are available as additional controls but, for simplicity, they are set to 0 in the analysis to follow)

In particular, the following expressions for the external forces and moments are considered for ALFLEX.

$$\begin{aligned} X &= -m \times g \times (\sin\theta - \sin\theta_0) + k \times V^2 \times [C_{x\alpha}(\alpha - \alpha_0) + C_{x\delta_e} \times (\delta_e - \delta_{e0})] \\ Y &= m \times g \times \sin\phi \times \cos\theta + k \times V^2 (C_{y\beta} \times \beta + C_{yr} \times r + C_{y\delta_r} \times \delta_r) \\ Z &= m \times g (\cos\phi \times \cos\theta - \cos\theta_0) + k \times V^2 \times [C_{z\alpha}(\alpha - \alpha_0) + C_{z\delta_e} \times (\delta_e - \delta_{e0})] \\ (3.2) \\ L &= b \times k \times V^2 \times (C_{l\beta} \times \beta + C_{lp} \times p + C_{lr} \times r + C_{l\delta_a} \times \delta_a + C_{l\delta_r} \times \delta_r) \\ M &= c \times k \times V^2 \times [C_{m\alpha} \times (\alpha - \alpha_0) + C_{mq} \times q + C_{m\delta_e} \times (\delta_e - \delta_{e0})] \\ N &= b \times k \times V^2 \times (C_{n\beta} \times \beta + C_{np} \times p + C_{nr} \times r + C_{n\delta_a} \times \delta_a + C_{n\delta_r} \times \delta_r) \end{aligned}$$

A simplified version of the motion in case of the ALFLEX reentry vehicle has been presented in Goto and Matsumoto [11] and Goto and Kawakita [12]. This version was obtained from the general system presented in [2], [3], assuming that the forward velocity V is constant $V = V_0$ and α the angles of attack and sideslip β , respectively, are small. Due to these assumptions, the first three equations of general system were simplified, so that the following system was obtained:

$$\begin{aligned} \dot{V} &= 0 \\ \dot{\beta} &= p \times \sin\alpha - r \times \cos\alpha + \frac{Y}{m \times V} \\ \dot{\alpha} &= -p \times \beta + q + \frac{Z}{m \times V} \\ I_x \times \dot{p} - I_{xz} \times \dot{r} &= (I_y - I_z) \times q \times r + I_{xz} \times p \times q + L \end{aligned}$$

$$I_y \times \dot{q} = (I_z - I_x) \times p \times r - I_{xz} \times (p^2 - r^2) + M \quad (3.3)$$

$$I_z \times \dot{r} - I_{xz} \times \dot{p} = (I_x - I_y) \times p \times q - I_{xz} \times q \times r + N$$

$$\dot{\Phi} = p + q \times \sin\phi \times \tan\theta + r \times \cos\phi \times \tan\theta$$

$$\dot{\theta} = q \times \cos\phi - r \times \sin\phi$$

This system of differential equations has been used to determine the set of steady states corresponding to ALFLEX, to undertake a stability analysis along the existing paths of steady states Goto and Matsumoto 2000; Goto and Kawakita 2004.

If the general system (3.1) and system (3.3) are to accurately reflect reality, they must bear resemblance on some level. For example, one might hope that the behavior of the dynamical systems (3.1) and that defined by (3.3) is qualitatively the same, i.e., they are topological equivalent.

According to Goto [4], the Simplified System (3.3) can be useful for getting an idea about the behavior of the system, although quantitatively, the General System (3.1) should be taken into consideration. In the same paper, the author remarks that if the steady states of the Simplified System (3.3) are used as an initial guess in the continuation method applied to determine the steady states of the General System (3.1), the results are not always satisfying, and the continuation method does not always converge.

In [7] is proven that the dynamical systems defined by (3.1) and (3.3) are not topologically equivalent. Furthermore, System (3.3) is not structurally stable. Consequently, these systems offer quite different images about the real motion around the center of gravity of a rigid aircraft. For example, for a certain combination of control angles, the Simplified System (3.3) has a steady state, while the General System (3.1) has no steady states. Hence, it is not surprising that using the steady state of Eq. (3.3) as an initial guess in the continuation method applied in order to find the steady state of Eq. (3.1), the method does not converge (the limit does not exist). Even if the method converges, the limit cannot be a steady state of Eq. (3.1).

The longitudinally flight system decoupled from (3.1) is:

$$\dot{V} = g \times [\sin(\alpha - \theta) - \sin(\alpha - \theta_0)] + V^2 \times [(A_1 \times \sin\Delta\alpha + A_2 \times \cos\Delta\alpha) \times \Delta\alpha + (B_1 \times \sin\Delta\alpha + B_2 \times \cos\Delta\alpha) \times \Delta\delta_e$$

$$\dot{\alpha} = q + \frac{g}{V} \times [\cos(\alpha - \theta) - \cos(\alpha - \theta_0)] + V \times [(A_1 \times \cos\Delta\alpha - A_2 \times \sin\Delta\alpha) \times \Delta\alpha + (B_1 \times \cos\Delta\alpha - B_2 \times \sin\Delta\alpha) \times \Delta\delta_e$$

$$\dot{q} = \frac{c \times k}{I_y} \times V^2 \times (C_{m\alpha} \times \Delta\alpha + C_{mq} \times q + C_{m\delta_e} \times \delta_e)$$

$$(3.4)$$

$$\dot{\theta} = q$$

The longitudinally flight system decoupled from (3.3) is:

$$\dot{V} = 0$$

$$\dot{\alpha} = q + \frac{g}{V} (\cos\theta - \cos\theta_0)$$

$$\dot{q} = \frac{c \times k}{I_y} \times V^2 \times (C_{m\alpha} \times \Delta\alpha + C_{mq} \times q + C_{m\delta_e} \times \delta_e)$$

(3.5)

$$\dot{\theta} = q$$

In [7] is proven that the dynamical systems defined by (3.4) and (3.5) are not topologically equivalent. Furthermore, System (3.5) is not structurally stable in the bounded region $X_0 = (V_{min}, V_{max}) \times (-\pi, \pi) \times (q_{min}, q_{max}) \times (-\frac{\pi}{2}, \frac{\pi}{2})$ with $0 < V_{min} \leq 1 < V_{max}$, $q_{min} < 0 < q_{max}$. Consequently, systems (3.4) and (3.5) offer quite different images about the real longitudinal flight of a rigid aircraft.

4. Crashes of high-performance fighter airplane such as YF-22A and B-2, due to oscillations.

Interest in oscillation susceptibility of aircrafts has been generated by the crashes of high-performance fighter airplanes such as YF-22A and B-2, due to oscillations that were not predicted during the aircraft development process [12]. Flight quality criteria for oscillation prediction are based on linear analysis and quasi-linear extensions [13]. However, these criteria cannot, in general, predict the presence or the absence of oscillations, because of the large variety of non-linear phenomena that have been identified as factors contributing to oscillations and which are neglected in the linear approach. Sources of these factors include pilot behavioral transitions, actuator rate limiting [14–15] and changes in aircraft dynamics caused by transitions in operating conditions [17], gain scheduling and mode switching [18]. The analysis of nonlinear oscillations involves the computation of non-linear phenomena including Hopf bifurcation that lead sometimes to large changes in the stability of the pilot-vehicle-system [19]. More recently, theoretical bifurcation studies have been undertaken for longitudinal flight dynamics, using the elevator deflection and mass of the vehicle as bifurcation parameters [20–22]. The occurrence of saddle-node and Hopf bifurcations has been pointed out in the case of the F-8 aircraft, and it has been emphasized that these bifurcations may result in jump behavior and pitch oscillations of flight dynamics. Moreover, system controllability with respect to the variation of the elevator deflection angle has been discussed in [10,11].

However, these bifurcation studies can only explain locally the appearance of oscillatory behavior (associated with supercritical Hopf bifurcations), and they do not represent a tool for understanding the global nature of longitudinal flight dynamics. More precisely, a supercritical Hopf bifurcation that occurs at the critical value δ_e^* of the elevator deflection, can only explain the appearance of asymptotically stable limit cycles for values of δ_e close to the critical value δ_e^* , i.e. for δ_e in a neighborhood of the form $(\delta_e^* - \varepsilon, \delta_e^*)$ or $(\delta_e^*, \delta_e^* + \varepsilon)$.

Nevertheless, Hopf bifurcations are not the only type of bifurcation phenomena leading to oscillatory behavior. In [19, 24], it has been shown that in a longitudinal flight with constant forward velocity, equilibria exist for the ADMIRE aircraft and the ALFLEX reentry vehicle only if the elevator deflection δ_e belongs to a closed and bounded interval J. When the elevator deflection is at the boundary of the interval J, a countable infinity of saddle-node bifurcation points is present. When the elevator deflection exceeds these critical values and is outside the interval J, numerical simulations show that the angle of attack and pitch rate oscillate with the same period, while the pitch angle increases or decreases infinitely. Hence, the orbit of the system is spiraling.

In [25] the existence of oscillatory solutions of the simplified dynamical system which governs the motion around the center of gravity in a longitudinal flight with constant forward velocity of a rigid aircraft, when the automatic flight control system is decoupled and the elevator deflection exceeds the bifurcation values.

Sufficient conditions are obtained for the existence of oscillatory solutions for any value of the elevator deflection δ_e outside the interval which corresponds to the existence of equilibria.

Oscillatory longitudinal flight of the ALFLEX reentry vehicle.[25]

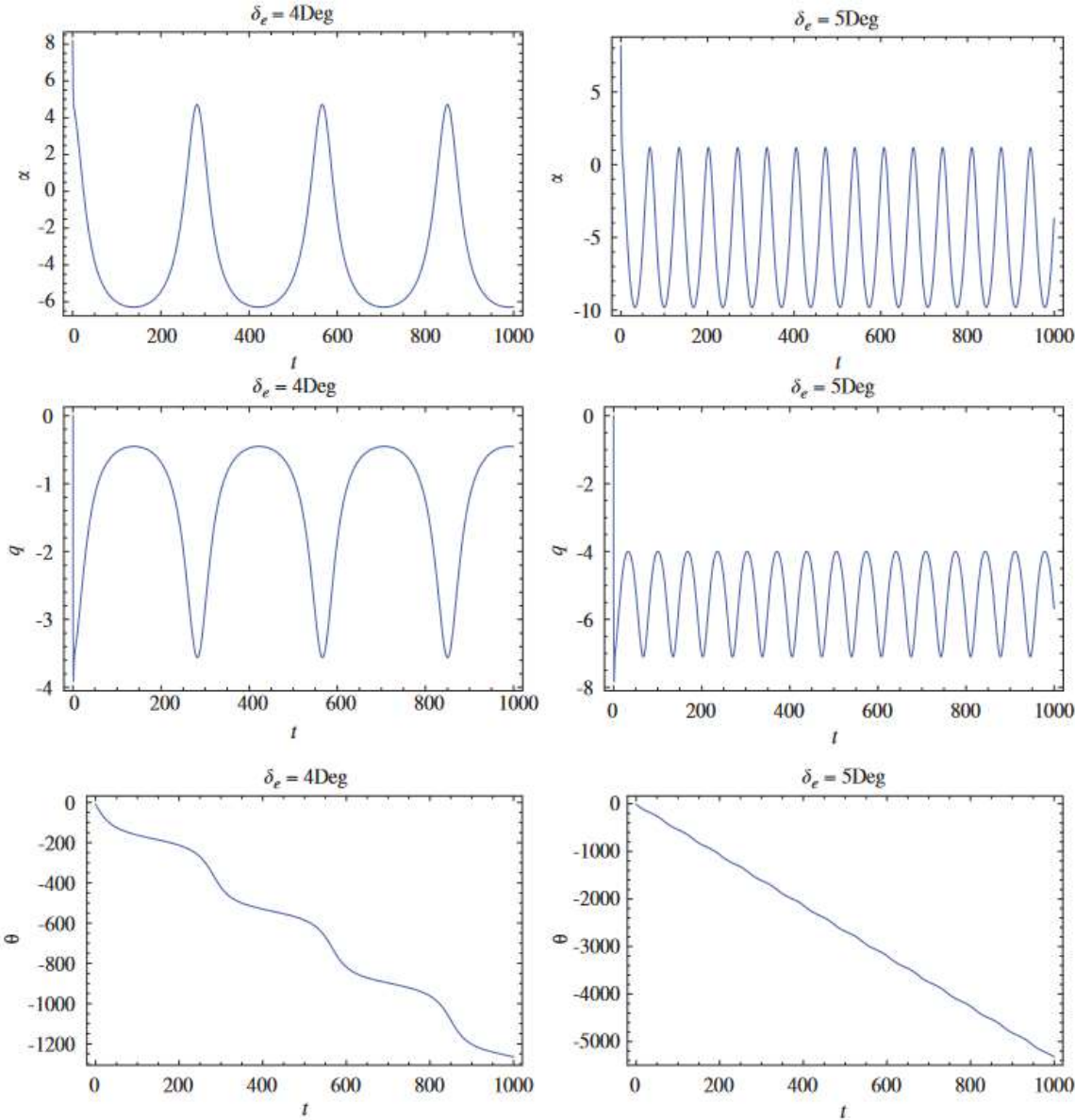
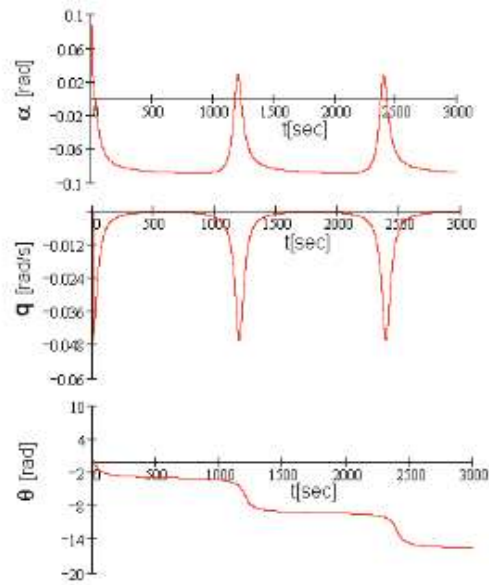


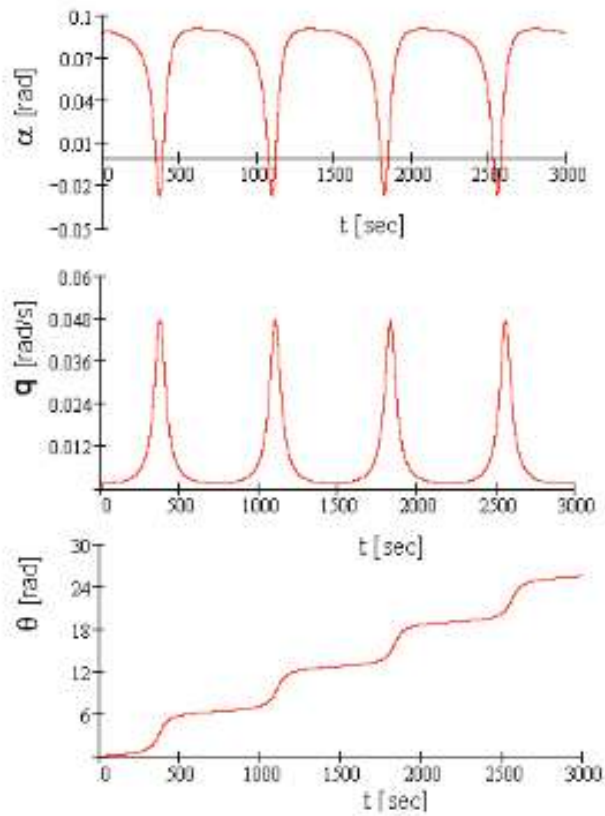
Fig.4.1.Oscillatory longitudinal flight of ALFLEX.

Evolution of the state parameters (α, q, θ) considering the initial condition $(8.18, 0, -9.16)$

Oscillatory longitudinal flight of the ADMIER unmanned aircraft [26]



$$\delta_e = 0.048 \text{ rad}$$



$$\delta_e = -0.05 \text{ rad}$$

Fig.4.2.Oscillatory longitudinal flight of ADMIRE.

Evolution of the state parameters (α, q, θ) considering the initial condition $(0.08869, 0, 0.159329) \text{ rad}$

REFERENCES

- [1]. A.C.Fowler; *Mathematical Models in the Applied Sciences*; Cambridge University Press 1997.
- [2]. M. Cook; *Flight dynamics principles*; Wiley, New York; 1997.
- [3]. B. Etkin and B.Reid; *Dynamics of flight, Stability and control*; Wiley, New York; 1996.
- [4]. N.Goto; *Problems of analysis methods for studying nonlinear flight dynamics*; Proc., 5th Int. Conf. on Nonlinear Problems in Aviation and Aerospace, European Conference Publishers, IFNA, IFIP,IEEE, AIAA, and FIT, Cambridge, U.K., 229-242; 2004.
- [5]. N.Goto and T.Kawakita; *Bifurcation analysis for the inertial coupling problem of a reentry vehicle*; *Advances in dynamics and control*, S. Sivasundaram, ed., Chapman & Hall, London, 45-57; 2004.
- [6]. E.Kaslik and St. Balint; *Existence of oscillatory solutions in longitudinal flight dynamics*; *International Journal of Non-Linear Mechanics*; 45 (2010) 159-168.
- [7]. E.Kaslik and St. Balint ;*Structural Stability of Simplified Dynamical System Governing Motion of ALFLEX Reentry Vehicle*; *Journal of Aerospace Engineering*, Vol. 20, No. 4, October1, 215-219; 2007.
- [8].M.W.Hirsch and S. Smale; *Differential Equations, Dynamical Systems, and Linear Algebra*; Academic press ;1974.
- [9]. Kuznetsov, Y. A. (1998). *Elements of applied bifurcation theory*, Springer, New York.
- [10]. Wiggins, S. (2003). *Introduction to applied nonlinear dynamical systems and chaos*, Springer, New York.
- [11]. Goto, N., and Matsumoto, K. (2000). "Bifurcation analysis for the control of a reentry vehicle." Proc., 3rd Int. Conf. on Nonlinear Problems in Aviation and Aerospace, European Conference Publishers, IFNA, IFIP, IEEE, AIAA, and FIT, Cambridge, U.K., 167-175.
- [12]. R. Mehra, R. Prasanth, *Bifurcation and limit cycle analysis of nonlinear pilot induced oscillations*, in: *AIAA Atmospheric Flight Mechanics Conference and Exhibit*, Boston, MA, August 10-12, 1998, Collection of Technical Papers.
- [13]. *Unified pilot induced oscillation theory*, vol. I-IV, WL-TR-96: 3028-3031, Wright Patterson AFB, Ohio, 1996.
- [14] B.A. Kish, W.B. Mosle III, A.S. Remaly, J.S. Seo, J.F. Kromberg, R. Cabiati, *A limit flight test investigation of pilot induced oscillation due to rate limiting*, in: *Proceedings of the AIAA Guidance, Navigation, and Control Conference*, New Orleans, LA, 11-13 August 1997, no. AIAA-97-3703, pp. 1332-1341.
- [15] D. Klyde, D. McRuer, T. Myers, *Pilot induced oscillation analysis and prediction with actuator rate limiting*, *Journal of Guidance, Control, and Dynamics* 20 (1) (1997) 81-89.
- [16] R. Mehra, W. Kessel, J. Carroll, *Global stability and control analysis of aircraft at high angles of attack* ONR-CR215-248-1, vol. 1-4, 1977
- [17] A. Ionita, A. Halanay, *Delay induced oscillations*, in: *AIAA Atmospheric Flight Mechanics Conference*, New Orleans, LA, August 11-13, 1997, Collection of Technical Papers, no. AIAA-1997-3502.
- [18] J. Shama, M. Athans, *Guaranteed properties of gain schedule control for linear parameter varying plants*, *Automatica* 27 (3) (1991) 559-564
- [19] S. Balint, E. Kaslik, A. Balint, A. Ionita, *Oscillation susceptibility analysis along the path of longitudinal flight equilibria*, *Nonlinear Analysis: Theory, Methods and Applications* DOI: 10.1016/j.na.2008.10.054.
- [20] D. Liaw, C. Song, *Analysis of longitudinal flight dynamics: a bifurcation-theoretic approach*, *Journal of Guidance, Control, and Dynamics* 24 (1) (2001) 109-116.
- [21] D. Liaw, C. Song, Y. Liang, W. Chung, *Two-parameter bifurcation analysis of longitudinal flight dynamics*, *IEEE Transactions on Aerospace and Electronic Systems* 39 (3) (2003) 1103-1112.
- [22] D. Pereira, J. Balthazar, F. Chavarette, M. Rafikov, *On nonlinear dynamics and an optimal control design to a longitudinal flight*, *Journal of Computational and Nonlinear Dynamics* 3 (1) (2008) 011012 (6 pages).
- [23] D. Liaw, W. Chung, C. Hsieh, *Control design for longitudinal flight dynamics*, in: *Proceedings of the First International Conference on Innovative Computing, Information and Control*, vol. 2, IEEE Computer Society Press, 2006, pp. 150-153.
- [24] E. Kaslik, S. Balint, *Numerical analysis of the oscillation susceptibility along the path of longitudinal flight equilibria of a reentry vehicle*, *Nonlinear Analysis: Real World Applications*, DOI: 10.1016/j.nonrwa.2009.04.017.
- [25] E. Kaslik, S. Balint, *Existence of oscillatory solutions in longitudinal flight dynamics*, *International Journal of Non-Linear Mechanics*, 45 (2010) 159-168.
- [26] A.Balint,S.Balint, *Oscillation Susceptibility of an Unmanned Aircraft whose Automatic Flight Control System Fails*, *Advances in Flight Control Systems*,chapt.14 pg. 275-296.INTECH pub.

The Importance of Operational Excellence within StartUps and Early Stage Companies

Momir POLENAKOVIKJ

PhD Student, Ss. Cyril and Methodius University in Skopje, North Macedonia

Abstract

Operational excellence is critical for startups and early-stage companies to establish a foundation for sustainable growth and competitive advantage. In the volatile and resource-constrained environment of a startup, efficient and effective operations can make the difference between survival and failure. This abstract explores the role of operational excellence in streamlining processes, optimizing resource allocation, and fostering agility – key factors for addressing market demands and scaling effectively. Startups often face challenges such as limited funding, small teams, and rapidly evolving goals. By adopting a mindset of continuous improvement, leveraging data-driven decision-making, and embedding lean practices, these companies can reduce waste, minimize inefficiencies, and achieve higher productivity. Furthermore, operational excellence supports the creation of a robust organizational culture, enabling alignment around shared objectives and maintaining focus amidst uncertainty. Practical examples, such as implementing agile project management or automating repetitive tasks, underscore the value of operational excellence in improving customer satisfaction and accelerating time-to-market. Ultimately, the pursuit of operational excellence equips startups to build scalable systems, adapt to market shifts, and position themselves for long-term success in a highly competitive business landscape. This study highlights the imperative of operational excellence as a strategic priority for startups seeking to navigate the complexities of their formative stages.

Keywords: Operations, Operational Excellence, Continuous Improvement, SMEs, Startups, Optimization

Preliminary Study on Development of Waffle Cones Formulated with Powder from Rosehip Waste

Alexandra Raluca BORȘA (BOGDAN)

University of Agricultural Sciences and Veterinary Medicine of Cluj-Napoca

Prof. Dr. Adriana PĂUCEAN

University of Agricultural Sciences and Veterinary Medicine of Cluj-Napoca

Lect. Andrei BORȘA

University of Agricultural Sciences and Veterinary Medicine of Cluj-Napoca

Lect. Melinda FOGARASI

University of Agricultural Sciences and Veterinary Medicine of Cluj-Napoca

MSc Student Raluca Alexandra MATEI

University of Agricultural Sciences and Veterinary Medicine of Cluj-Napoca

Lect. Maria Simona CHIȘ

University of Agricultural Sciences and Veterinary Medicine of Cluj-Napoca

Prof. Dr. Cristina Anamaria SEMENIUC

University of Agricultural Sciences and Veterinary Medicine of Cluj-Napoca

Abstract

Introduction: The waste that remains after processing the rosehips to obtain rosehip purée (raw material for rosehip jam) can be a valuable source of fibres, carotenoid pigments, phenolic compounds, and micro- and macro-elements (Borșa (Bogdan) *et al.*, 2023; Borsa (Bogdan) *et al.*, 2024). Therefore, it could be recovered as a powder (Rp) for later use as an ingredient in the food industry.

Aims: The aim of this study was to use such a powder in the formulation of ice cream waffle cones by partially replacing (10, 15, and 20%, respectively) the wheat flour in a consecrated manufacturing recipe that uses a minimum amount of sugar necessary to obtain this type of product.

Materials and Methods: Four waffle cone formulations were prepared: control (WCc), with 3.7 (WC3.7%rp), 5.6 (WC5.6%rp), and 7.5% rosehip powder (WC7.5%rp) to fulfil the purpose. They were analysed for proximate composition, pH, colour, techno-functional and texture properties and sensory to identify the formula preferred by consumers.

Results: The use of Rp in the proportion of 7.5% caused a significant increase in the moisture content of waffle cones, the ash and fibre content, and a decrease in the fat and protein content, as well as the pH; instead, it did not significantly influence the carbohydrate content because wheat flour and Rp had close levels. The total colour difference (ΔE^*) of WC7.5%rp was obvious from that of WCc; however, consumers rated them to the same extent, with the difference between overall scores not being significant (8.1-8.4).

Conclusion: In conclusion, Rp is suitable for preparing ice cream waffle cones by replacing wheat flour in a proportion of up to 20%. Our further studies will evaluate these formulations' textural attributes, hydration properties, polyphenol and carotenoid content.

Keywords: Colour, Proximate Composition, Rosehip Powder, Sensory Analysis, Waffle Cones

Reassessment of conservation status and analysis of the distribution patterns of the genus *Verbascum* L. (Scrophulariaceae) in Morocco

Asst. Prof. Dr. Hamid KHAMAR

Scientific Institute, University Mohammed V in Rabat, Morocco

Prof. Dr. Amina Ouazzani TOUHAMI

Faculty of Sciences, Ibn Tofail University, Kenitra, Morocco

Prof. Dr. Laure CIVEYREL

Paul Sabatier University III, France

Abstract

The current investigation provides an in-depth analysis of the diversity, endemism, and distribution patterns of 32 *Verbascum* taxa (28 species and 4 subspecies) in Morocco, along with a comprehensive reassessment of their conservation status according to the IUCN Red List Categories and Criteria.

Based on the current knowledge, the genus *Verbascum* is widely distributed in Morocco and displays a large ecological amplitude. It occurs from plains, near the coastline up to high mountains (2000–3500 m); on limestone or siliceous soils, and occupies a variety of habitats: forests, scrublands, lowland and high mountain pastures, rocky places, dry stony ravines and wadis. The species abundance by phytogeographical region ranging from 13 to 2-3 species. The high species-richness zones are restricted to mountain regions: the High Atlas (HA), Middle Atlas (MA), and Rif (R). Furthermore, various distribution patterns of the genus in Morocco can be distinguished; the majority of the species (ca. 46 %) are bi- or tri-phytogeographical elements. This category is followed by 26 % of the species that are mono-regional elements. A quarter of the species (24 %) have a broader distribution covering four to six phytogeographical regions in Morocco. Finally, the last group (4%) is only represented by one species, *V. sinuatum*, which is very well distributed all over the country and all over the Mediterranean region also. Based on this distribution of the genus *Verbascum* in Morocco we can distinguish several categories: (1) non-endemic, which are either widespread across the Mediterranean or are restricted to its western part, (2) North African endemic taxa shared by Morocco and adjacent North African, (3) Morocco-Iberian endemics taxa and (4) the strict endemic Moroccan taxa. The analysis of the extinction risk revealed that *Verbascum* taxa in Morocco can be classified into five threat categories, as follows: 17 taxa Critically Endangered (CR), 10 taxa Endangered (EN), 3 taxa Vulnerable (VU), one taxon Least Concern (LC) and one taxon Non-Applicable (NA).

In sum, this study aligns with the focus of the comprehensive project on the ongoing revision of the Vascular Flora of Morocco (Fennane et al. 1999, 2007, 2014). The biogeographical data analysis here provides new data on a poorly known genus from the

southern shores of the Mediterranean basin. The presence of numerous localized and endemic taxa, along with the application of the IUCN Red List's recommendations, provides significant knowledge that can steer conservation planning initiatives at both national and regional levels. Furthermore, the present research suggests that the genus *Verbascum* can be a useful botanical model for examining diversity and speciation patterns in the western Mediterranean basin, as well as the effects of climate change on biennial plants.

Keywords: Conservation, endemism, IUCN Red List, Scrophulariaceae, *Verbascum*, Morocco

Determination of the Angular Accuracy When Setting Out the Centers of Bridge Piers

Chief Asst. Prof. PhD Eng. Ani STEFANOVA
University of Architecture, Civil Engineering and Geodesy, Bulgaria

Abstract

The article determines the angular accuracy when setting out the centers of bridge piers, based on a designed geodetic network where the location of the points on the shores is established to ensure the required setting out accuracy of all piers. Theoretical conclusions are carried out under the assumption that setting out of the piers is performed directly by linear-angular measurements from 2 reference points. Strict preliminary assessment is conducted on the accuracy of setting out the centers of bridge piers by measurements from 3 reference points.

Keywords: angular accuracy of setting out, bridge piers, horizontal network, reference points, straight intersection, linear-angular measurements.

Introduction

A key aspect for implementing reliable geodetic assurance in bridge construction is designing a network with a sufficient number of points with an appropriate location, allowing the use of a wide range of modern geodetic methods for horizontal setting out.

The author has developed a method for designing the locations of the reference points from geodetic networks (Stefanova, A., 2019) which provides a suitable geometric shape allowing direct setting out of centers of bridge piers with the required accuracy using linear-angular measurements. The presented theoretical conclusions and statements are based on the formulas for assessing the accuracy of a straight intersection (1) (Bakalov, P. 2022; Dimitrov, A., 1989; (Klyushin, E. B., 1993; Levchuk, G. P., 1983; Viduev, N., P. Baran, 1973)0.

$$M_p = \frac{m_\beta}{\rho} \cdot \frac{\sqrt{S_{AP}^2 + S_{BP}^2}}{\sin \gamma} = \frac{m_\beta}{\rho} \cdot \Phi, \quad (1)$$

where: m_β – mean square error of a measured/set out angle; β_1 and β_2 are the measured/set angles at the given points; $\gamma=200-(\beta_1+\beta_2)$ – the angle at the new point; b – the distance between the given points; S_{AP} и S_{BP} (Fig. 1) – the lengths between the given and the new point; Φ – geometric factor.

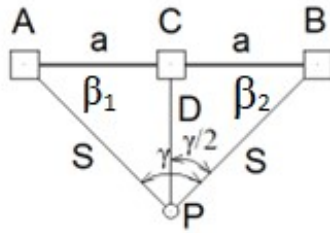


Figure 1. Part of a scheme of a horizontal network

The reference points of the intersection are located perpendicular to the bridge axis (Stefanova, A., 2019).

The developed method is the basis of a methodology for designing geodetic networks (Stefanova, A., 2019) (when bridging wide water obstacles) in which the location of points along the shores is established to ensure the required accuracy of setting out all piers, including the most distant one with the possibility to use practically all setting out methods.

2. Determination of the angular accuracy of setting out

2.1. Determination of the angular accuracy m_{β}^{allow} for setting out bridge piers closer to shores (P_2 and P_1 , fig. 2) from the already selected reference points (A, B and D, E) (Stefanova, A., 2019).

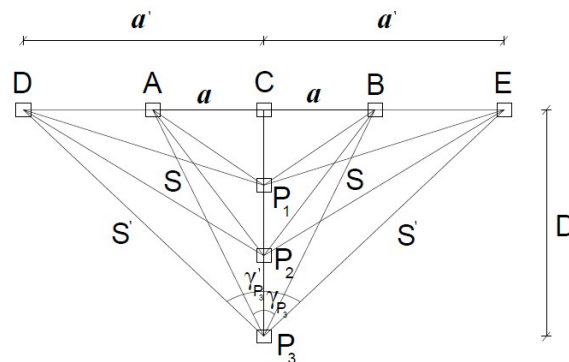


Figure 2. Part of a horizontal network

Calculations are done in the following way:

- For each bridge pier, the detection angle γ is determined as a function of the distance D_i from the reference points and the distance „ a “ (Fig. 2) according to formula:

$$\gamma_{P_i} = 2 \arctg \frac{a}{D_i} \quad (2)$$

- Calculation of a parameter „ c “ ($c = \sin \gamma \cos \frac{\gamma}{2}$) (Stefanova, A., 2019).
- Calculation of m_{β}^{allow} according to formula (3):

$$m_{\beta}^{allow} = \frac{M_P^{allow} \cdot \rho \cdot c}{D_i \cdot \sqrt{2}} \quad (3)$$

where: m_{β}^{allow} - allowable error of a set out angle when measuring/setting out in one set of rounds. M_P^{allow} - allowable error of setting out; D - distance from the direction of the reference points to the set out point; c - coefficient.

These calculations are also done for the other set of reference points D and E. Thus, a double possibility for setting out the bridge piers is provided under the same value of the geometric factor but with a different angular accuracy of setting out m_{β}^{allow} .

Based on the above-described work procedure, a sample diagram of a horizontal network for setting out bridge piers has been developed where the designed location and geometry of "Danube Bridge 2" have been used as output data (Fig. 3).

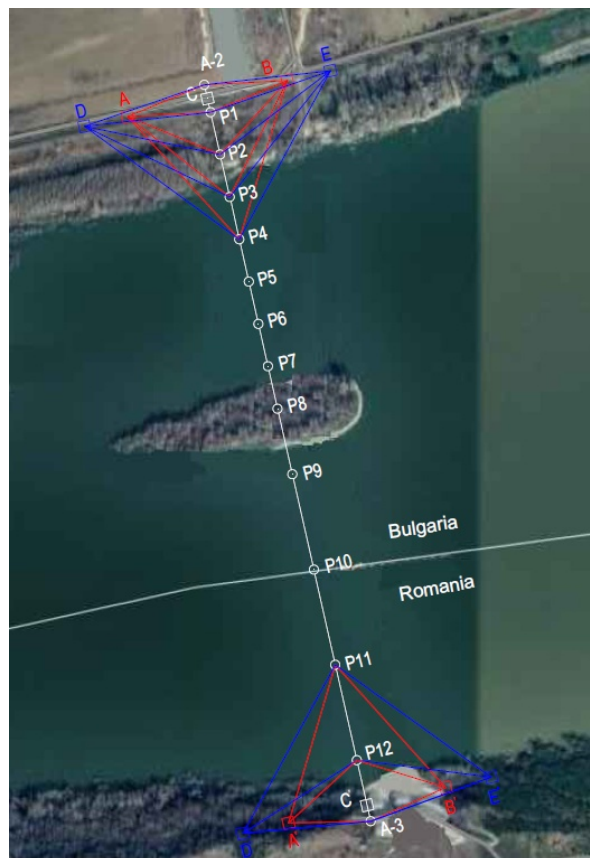


Figure 3. Sample scheme of "Danube Bridge 2" network

Applying the above-mentioned work method and observing the sequence of actions described therein, for the most distant pier from the Bulgarian coast which can be set out directly with the required accuracy by linear-angular measurements (straight intersection, linear intersection, bipolar method), pier P_4 has been established. The parameters necessary for determining the locations of the two sets of reference points have been calculated (Fig. 3). Using formula (4), the angular accuracy of setting out m_{β}^{allow} has been calculated for the closer bridge piers (Fig. 3). The values are described in table 1.

Table 1

Pier N ₀	D _{CPi} [m]	From reference p. A and B				From reference p. D and E			
		S _{APi} =S _{BPi} [m]	γ ^g	C	m _{β^{cc}}	S _{DPi} =S _{EPi} [m]	γ ^g	c	m _{β^{cc}}
P ₄	266	306	65.6585	0.7464	12	353	91.3805	0.7464	12
P ₃	186	239	86.7327	0.7600	18	298	114.0143	0.6101	14
P ₂	106	184	121.9837	0.5412	22	255	145.4784	0.3137	13
P ₁	26	153	178.2596	0.0569	9	234	185.8043	0.0246	4
A-2	26	153	178.2596	0.0569	9	234	185.8043	0.0246	4

Similar actions were carried out in the design of the part of the sample network on the Romanian coast (Fig. 3) as the most distant support that can be set out directly with the necessary accuracy via linear-angular measurements, is pier P₁₁. The locations are determined for the reference points and the angular accuracy of the setting out for the closer piers P₁₂ and A-3 (Table 2).

Table 2

Pier N ₀	D _{CPi} [m]	From reference p. A` and B`				From reference p. D` and E`			
		S _{A`Pi} =S _{B`Pi} [m]	γ ^g	c	m _{β^{cc}}	S _{D`Pi} =S _{E`Pi} [m]	γ ^g	c	m _{β^{cc}}
P ₁₁	265	303	64.9232	0.7436	12	354	92.1587	0.7436	12
P ₁₂	85	171	133.6966	0.4294	21	250	155.6568	0.2186	11
A-3	30	152	174.3410	0.0785	11	236	183.6247	0.0326	5

The analysis of tables 1 and 2 shows that concerning the closest to the reference points – pier P₁ and abutments A-2 and A-3, are obtained very large detection angles and high requirements for accuracy $m_{\beta}^{allow} = 4 - 5$ cc which cannot be achieved in practice by measurements in one set of rounds. In this case, it is recommended that the centers of the mentioned piers to be set out using the polar method.

All theoretical conclusions and research so far have been carried out under the assumption that the setting out of the bridge piers is performed directly via linear-angular measurements from 2 reference points. In order to implement control and possibly to increase the accuracy of setting out, the literature (Levchuk, G. P., 1983) recommends that the setting out is done from three adjacent reference points.

The question here can be stated as: to what extent would the required accuracy of the setting out can be reduced while maintaining the required setting out accuracy M_p^{allow} using the same end reference points, if one additional midpoint located between them is also used.

For this purpose, a strict preliminary assessment of the accuracy of setting out the centers of the piers in fig. 3 was carried out through linear-angular measurements from 3 reference points using a software product for preliminary assessment of linear-angular networks POCLAM¹. The assessment was performed iteratively by setting appropriate values of the setting out accuracy m_{β} to ensure a setting out accuracy of the centers of piers close to the required $M_p^{allow} = 9.5mm$ (Stefanova, A., Kostadinov, T., 2019).

The obtained results are presented in tables 3 and 4. Table 3 presents the piers that will be set out from the reference points A, B, C (D, C, E) on the Bulgarian coast and table 4 – those that will be set out from the reference points located on the Romanian coast.

¹ POCLAM – author: Prof. P. Penev, UACEG

Table 3

Pier N ₀	From reference p. A, B and C			From reference p. D, C and E		
	M _P [mm]	m _R [cc]	m _β [cc]	M _P [mm]	m _R [cc]	m _β [cc]
P ₄	9.5	9	13	9.4	10	14
P ₃	9.3	14	20	9.5	14	20
P ₂	9.1	23	33	9.2	19	27
P ₁	8.9	37	52	9.3	25	35
A-2	9.0	37	52	9.3	25	35

Table 4

Pier N ₀	From reference p. A`, B` and C`			From reference p. D`, C` and E`		
	M _P [mm]	m _R [cc]	m _β [cc]	M _P [mm]	m _R [cc]	m _β [cc]
P ₁₁	9.4	9	13	9.4	10	14
P ₁₂	9.4	27	38	9.4	21	30
A-3	9.5	38	54	9.5	25	35

Tables 5 and 6 compare the obtained values of the angular accuracy of setting out m_{β} when setting out the centers of bridge piers from 2 to 3 reference points.

Table 5

Pier N ₀	From reference p. A and B	From reference p. A, B and C	From reference p. D and E	From reference p. D, C and E
	m _β ^{cc}	m _β ^{cc}	m _β ^{cc}	m _β ^{cc}
P ₄	12	13	12	14
P ₃	18	20	14	20
P ₂	22	33	13	27
P ₁	9	52	4	35
A-2	9	52	4	35

Table 6

Pier N ₀	From reference p. A` and B`	From reference p. A`, B` and C`	From reference p. D` and E`	From reference p. D`, C` and E`
	m _β ^{cc}	m _β ^{cc}	m _β ^{cc}	m _β ^{cc}
P ₁₁	12	13	12	14
P ₁₂	21	38	11	30
A-3	11	54	5	35

From the above tables, the following conclusions can be drawn regarding angular accuracy m_{β} when setting out the bridge piers from 2 and 3 reference points:

- When setting out the more distant piers P_3 , P_4 and P_{11} (sight length about 300 m and a distance of the reference points – about 260 m, Fig. 1) from 3 reference points, a decrease in angular accuracy m_β is observed from 6 to 41%.
- When setting out the closer piers – P_2 and P_{12} (sight length - 180-250 m and distance of the reference points about 106 m) the angular setting out accuracy decreases significantly, 48 and 82%, respectively, when setting out from the internal reference points A, B and C (A' , B' and C') and by 107 and 170% from the external reference points D, C and E (D' , C' and E').
- For the nearest pier P_1 and the abutments A-2 and A-3 (sight length -150-240 m and distance of the reference points about 30m) due to the poor configuration, the required angular setting out accuracy from 2 reference points is very high (4^{cc} , 4^{cc} , 5^{cc}) and practically cannot be performed with measurements in one set of rounds. However, the situation is different when setting out from 3 reference points – the required setting out angular accuracy significantly decreases (4 to 8 times).

For the remaining bridge piers (Fig. 4) for which the required accuracy cannot be achieved with direct setting out methods performed by linear-angular measurements (straight intersection, linear intersection, bipolar intersection), the use of reduction setting out methods is recommended. For this purpose, it is proposed (Stefanova, A., 2019) to design a set of additional reference points on each shore (M, N, M' and N' - Fig. 4) located symmetrically at the midpoint (according to the algorithm in Stefanova, A., 2019) using a detection angle established for the middle pier of the bridge.



Figure 4. Sample horizontal network

Note: The network in Fig. 4 does not show all connections to avoid drawing clutter.

For setting out the centers of the piers, auxiliary points P_i^0 are used located in proximity (5-10 m) to the assumed location of the piers. The coordinates of the auxiliary points are determined with an accuracy higher than the required for setting out by about 10-15%. One-sided or two-sided linear-angular measurements are used towards points of the bridge network with a total station using the "free station" option or GNSS (Stefanova, A., 2019). The setting out of the centers of the bridge piers is done from the auxiliary points via polar method.

In the following calculations, the value used for the required accuracy in the position of the auxiliary point is $M_{P_0}^{allow} = 8.9mm$ (Stefanova, A., 2019).

A strict preliminary accuracy assessment using the sample horizontal network of "Danube bridge 2" (Fig. 4) was performed to derive the required accuracy of angular and linear measurements to determine the position of auxiliary points P_i^0 . The assessment was performed iteratively by setting appropriate values for m_β and m_s to ensure accuracy in the location of the auxiliary points close to the necessary $M_{P_i^0}^{allow} = 8.9mm$. The given accuracy of length measurements is $m_s^{allow} = 8mm/km$, ($a=5 mm$, $b=3 ppm$) since it is assumed that the sights go over a mixed bedding surface (land and water) and the expected temperature variations along the route are more significant, hence their impact on measurement accuracy.

The obtained results are presented in tables 7, 8 and 9. S_{aver} denotes the average sight length from the reference points to the auxiliary points and D_{CP0i} - the distance of the auxiliary points from the reference points. Table 7 presents the auxiliary points whose position will be determined one-sided, only from the reference points on the Bulgarian coast and table 8 - those whose position will be determined only from the reference points located on the Romanian coast. Table 9 presents the results for the accuracy in the position of auxiliary points P_7^0 , P_8^0 и P_9^0 for which it is proposed to be determined from reference points on both shores since these piers are located in the middle of the bridge.

Table 7. One-sided determination from reference points on the Bulgarian coast

Pier №	D_{CP0i} [m]	Average sight length - S_{aver} [m]	From reference p. A, B, C, D, E (S, R)		
			m_P [mm]	m_R [cc]	m_β [cc]
P_5^0	346	387	7.1	40	57
P_6^0	426	460	8.1	8	11
P_7^0	506	535	8.7	3.5	5
P_8^0	586	690	8.3	1.5	2.1

Table 8. One-sided determination from reference points on the Romanian coast

Pier №	D_{CP0i} [m]	Average sight length - S_{aver} [m]	From reference p. A', B', C', D', E' (S, R)		
			m_P [mm]	m_R [cc]	m_β [cc]
P_8^0	748	769	8.8	0.7	1.0
P_9^0	625	649	8.9	1.4	2.0
P_{10}^0	445	478	8.1	6	7

Table 9. Two-sided determination from reference points on both shores

Pier No	Average sight length - S_{aver} [m]	From reference p. A, B, C, A', B', C' (S, R)			From reference p. D, C, E, D', C', E' (S, R)		
		m_P [mm]	m_R [cc]	m_β [cc]	m_P [mm]	m_R [cc]	m_β [cc]
P ₀₇	687	8.8	24	34	8	26	37
P ₀₈	690	8.7	22	31	8.2	24	34
P ₀₉	689	8.8	22	31	8.1	23	33

Tables 7 and 8 show that to achieve the required accuracy in the position of auxiliary points P₀₇, P₀₈ and P₀₉ ($M_{P_0}^{allow} = 8.9mm$) in one-sided determinations (using reference points on only one or the other shore), the accuracy of angular measurements m_β^{allow} is very high (5^{cc}, 2.1^{cc}/1.0^{cc} and 2.0^{cc}) and therefore very difficult to reach. This can be explained by the worse geometry due to the one-sided determinations and the bigger average sight length (from 535 to 769 m). This conclusion is confirmed by table 9 which presents the results of the preliminary assessment for the same points already determined two-sided - from the reference points on both shores. It can be seen that the required angular accuracy (with the above-given longitudinal accuracy - 8 mm/km) significantly decreases to 31-37^{cc} and can be easily achieved.

Conclusion

Based on the calculations above, conclusions and recommendations have been drawn concerning the angular accuracy m_β when setting out the centers of bridge piers from 2 and 3 reference points. The conclusions should not be considered as an absolute since the derived accuracies of linear and angular measurements refer to a specific case.

REFERENCES

- Bakalov, P., R. Yaneva, D. Tonkov, E. Krastanov, (2002). Manual for exercises in Geodesy. Sofia. UACEG.
- Dimitrov, A., (1989). Engineering Geodesy. Sofia. Technique.
- Klyushin, E. B., (1993). Practical training in applied geodesy. Geodetic assurance for construction and operation of engineering structures. Moscow. Nedra.
- Levchuk, G. P., (1983). Applied geodesy. Geodetic works in surveys and construction of engineering structures. Moscow. Nedra.
- Stefanova, A., (2019). Design of 2D geodetic control network for overcoming wide water obstacles, Journal of Geodesy, Cartography, Land Management, issues 5-6` 2019, ISSN: 0324-1610
- Stefanova, A., Kostadinov, T., (2019). Accuracy of the geodetic activities in bridge construction, Journal of Geodesy, Cartography, Land Management, issues 1-2` 2019, ISSN: 0324-1610
- Viduev, N., P. Baran, (1973). Geodetic survey work. Moscow. Nedra.

Fabrication and Performance Improvement of ZnO NRs Based Photodetectors via Localized Surface Plasmons Resonance Effects

Somaye HOSEINGHOLI OGHLI
Master's Student, Urmia University, Iran

Asst. Prof. Dr. Pantea AURANG
Urmia University, Iran

Abstract

In recent years, many efforts have been made to optimize the ultraviolet photodetectors due to their numerous field of applications. In this study the ZnO nanorods based p-n junction photodetectors were fabricated via hydrothermal growth method on p-type silicon wafers. Silver nanoparticles synthesized through chemical methods in solution were applied on top of photodetectors to enhance the performance of the detectors benefitting from plasmonic effect of metallic nanoparticles. The formation of the nanostructures were investigated by scanning electron microscope (SEM). Enhancement of the light absorption was observed in the photodetectors with metallic nanoparticles in UV-Vis measurements. The I-V (current-voltage) analysis were realized in dark and under UV illumination showed the increase in photocurrent.

Keywords: Plasmonic Effect, p-n Photodetectors, ZnO NRs, Ag Nanoparticles

Introduction

Photodetectors or photosensors are integral parts of IC circuits that generate an electrical signal proportional to the intensity of light upon receiving optical signals. UV detection technology is a new technology that is required for a wide range of military and civilian applications such as space communications, surveillance, missile warning, etc. [1]. Semiconductor materials such as GaN, TiO₂, SiC, and ZnO are also known as photoconductors because the density of free charges in them changes with photon irradiation. The use of these semiconductors in UV photodetectors has been of great interest. [2]. Since the ZnO semiconductor has a wide energy gap, it still has good stability at high temperatures, and as a result, detectors made of it can be used at temperatures above 300°C. Therefore, this material is very important in military applications. Other characteristics such as excellent chemical stability, special electrical and optical properties along with large excitation binding energy have distinguished it from other semiconductor materials. [3] In particular, one-dimensional NR nanorods can significantly reduce light reflection and increase its absorption due to the high surface-to-volume ratio of their one-dimensional nanostructure and optical trapping properties [4]. The ability to transport electrons more

easily by providing a direct conduction path for them and thus reducing the number of grain boundaries in the electron path is another unique feature of this type of one-dimensional nanostructures [5].

Therefore, ZnONRs are considered as an ideal material for the construction of optical detectors with high sensitivity and fast response [6]. Generally, ZnO NRs synthesized by hydrothermal method, which is widely used due to its simplicity and low cost, have a large number of surface and bulk crystal defects [7]. These crystal defects act as traps during electron transport in these nanostructures in optoelectronic devices, causing electron-hole recombination and increasing surface resistance and poor device performance [8]. In recent years, the use of the LSPR effect of suitable metal nanoparticles has become an attractive idea to increase the photon absorption rate and improve the performance of photoelectric detectors [9]. On the other hand, decorating the surfaces of nanorods with metal nanoparticles such as silver, gold and aluminum is an effective way to reduce the effects of ZnO surface crystal defects and improve device performance in optoelectronic fields [10]. This point of view can be used to help enhance the light detection performance through the interaction between light and electron plasmon waves in detectors.

The p-n junctions made by ZnO NRs, which are inherently n-type, on p-type silicon substrates are the proposed structure for the fabrication of UV detectors[3]. The superiority and usefulness of ZnO nanostructures in optical detectors are higher on/off current ratio, higher optical conductivity, and faster recovery and response speed than other optical detectors . Despite the simplicity of the structure and the cost-effectiveness of their fabrication, ZnO/p-Si detectors usually have low responsiveness due to the presence of an energy barrier at the junction. Efforts have been made by researchers to improve the performance of these types of detectors.

Doping ZnO with another metal means introducing impurity atoms to improve its conductivity. Extrinsic impurities added to ZnO nanostructures significantly enhance the performance of UV light detectors by reducing the series resistance to electron movement. Shabannia et al. reported a study of the optical response of a UV detector based on doped ZnO NRs [12]. Lakshmi et al. studied the optical response of the detector by doping a thin ZnO layer by introducing Mn, Ni, and Co atoms into it and studied the n-type nanostructures [13]. Also, the growth of ZnO nanorods with gallium (Ga) doping on a flexible substrate (polyethylene 6,2 naphthalate) has led to improved electronic properties of the fabricated detectors compared to devices with intrinsic nanorods. The results show an improvement in dark current and photocurrent with the addition of this impurity [14]. Researchers have also used the addition of a thin insulating layer at the p-n junction to improve the properties of the desired detector. For example, the optical and electrical properties of the n-ZnO/p-Si heterogeneous junction have been investigated under the influence of the thickness of the Al₂O₃ thin film introduced into it. The detector made of the n-ZnO/Al₂O₃/p-Si heterogeneous junction provides better structural and electrical properties[15]. The effect of the geometric properties of the nanorods, such as their length, on the performance of the ZnONR/CdS ultraviolet detectors has also been investigated, and the optical response has increased with increasing the length of the ZnO NRs [16].

In the pioneering research, an attempt will be made to improve the detectors based on ZnO NRs by applying the effect of localized surface plasmon resonances (LSPR) by metal nanoparticles in the aforementioned detectors and increasing photon absorption and the production of more charge carriers. This new idea for improving the performance of optical detectors will be used to help increase the light detection performance through the interaction between light and electron plasma waves on the surface of metal particles.

Experimental

All the chemical materials were bought from sigma- Aldrich and used without any further purification. In this work for the fabrication of the photodetectors, *p*-type single side polished (ssp), 300 μm thick and (100) oriented Si wafers with a resistivity of 1–10 $\Omega\cdot\text{cm}$ were cut to 1.5 \times 1.5 cm^2 and after RCA cleaning process, the Al layer was deposited on the rear side of the silicon wafer through sputtering technique to serve as back side contact. The contact annealed at the 800 $^\circ\text{C}$ under N_2 ambient to form a P^+ region on the back. For the growth the ZnO nanorods, 2 steps hydrothermal method was used. First the seed solution which is the A 10 mM solution of zinc acetate dihydrate [$\text{Zn}(\text{O}_2\text{CCH}_3)_2(\text{H}_2\text{O})_2$, 99%] in 1-propanol was spin coated on the front side of detectors. The native silicon oxide was removed before the spin coating process by dilute HF solution. The Al front contact was deposited on ZnO seed layer through shadow masks by means of sputtering. For the growth of ZnO nanorods, the detectors were dipped into an aqueous growth solution of equimolar, 20 mM, zinc acetate dihydrate [$\text{Zn}(\text{O}_2\text{CCH}_3)_2(\text{H}_2\text{O})_2$, 99%] and hexamethylenetetramine (HMTA, $(\text{CH}_2)_6\text{N}_4$, 99%). Heating process was carried out using a autoclave at 80 $^\circ\text{C}$ for 1.5 h. The Ag NPs were synthesized via polyol process. In summary, 7 mg of sodium chloride (NaCl, 99.5%) was added into 10 ml of 0.45 M ethylene glycol (EG) solution of polyvinylpyrrolidone (PVP, monomer-based calculation, MW = 55,000) and heated to different temperatures from 120 $^\circ\text{C}$ -160 $^\circ\text{C}$. Subsequently, 0.12 M silver nitrate (AgNO_3 , 99.5%) solution in 5 ml of EG was prepared and added dropwise into the PVP solution. Also, the effect of molar ratio of AgNO_3 and the rate of injection were examined in order to obtained right size of Ag nanoparticles for plasmonic resonance effect. During the whole process, the solution was stirred by a magnetic stirrer and was annealed for 30 min following the injection process. In order to separate Ag NPs from PVP, EG and other by products, the solution was diluted with acetone and centrifuged several times. Another centrifuge process was conducted with the same parameters for ethanolic dilution. The final product was dispersed in ethanol and stored for further processing. NPs deposition process was performed by spin coating of the ethanolic solution of the Ag NPs. The substrates were placed onto a hot plate, heated to 150 $^\circ\text{C}$ for instant removal of ethanol.

Results and discussion

The SEM images and the UV-Vis absorption spectra of the synthesized Ag NPs dispersed inside Ethanol was shown in Fig.1. The effect of growth solution temperature, precursor molar ratio and AgNO_3 injection rate were on the size of the Ag nanoparticles were examined. In Fig. 1(a), the sample synthesized at 140 $^\circ\text{C}$, with the molar ratio of PVP/ Ag^+ no absorption peak related to silver nanoparticles is observed in the 400 nm range, indicating no synthesis or very low concentration of silver nanoparticles in the solution. The peak observed at 300 nm can also be related to the reducing agent converting Ag^+ to Ag^0 , which disappeared at higher temperatures with the formation of silver particles. In the spectrum of the samples synthesized at 150 $^\circ\text{C}$, a small shoulder appears in the wavelength of 440 nm range, which is the result of the plasmonic frequency of the synthesized silver particles and confirms the beginning of the formation of silver nanoparticles at this temperature. At the spectrum temperature of 160 $^\circ\text{C}$, the peak observed at 440nm is highly intense and the peak related to the reducing agent is completely disappeared, indicating the end of the silver nanoparticle growth process. The broadness of the peak at this temperature can indicate the size distribution of the nanoparticles. The absorption peak at 440 nm is due to surface plasmon resonance (LSPR), the collective oscillation of electrons in metal nanoparticles. The size of the synthesized particles was determined using SEM images and ImageJ software by averaging over at least seventy particles. Figure 2 shows the SEM image of the particles synthesized at 160 $^\circ\text{C}$. The average size of the synthesized particles is 50 ± 4

nm. Fig. 1(b) shows the UV-Vis absorption spectrum of silver nanoparticles synthesized by the polyol method with different concentrations of silver nitrate at a constant concentration of stabilizer (PVP). The process temperature was 160 °C and the injection rate was 1 ml/s. With increasing AgNO₃ concentration relative to PVP, the plasmonic frequency of silver nanoparticles shifts to longer wavelengths, indicating an increase in the size of the synthesized particles. With increasing PVP/AgNO₃ ratio from 0.11 to 10.8, the plasmonic frequency decreases from 445nm to 405nm. The particle size of each sample was examined by SEM images taken with ImageJ software. For a relative concentration of 0.11, the average particle size was 50±6 nm, for a relative concentration of 2.7, the average particle size was 30±4 nm, and for the lowest AgNO₃ concentration, the particle size was 12±2 nm. The data show that the concentration of silver nitrate in the polyol synthesis significantly affects the size of the resulting silver nanoparticles. Higher concentrations result in larger nanoparticles with a red-shifted LSPR peak, while lower concentrations result in smaller nanoparticles with a blue-shifted peak.

Fig. 1(c), shows the absorption spectra of silver nanoparticles synthesized with different injection rates of AgNO₃ solution. At an injection rate of 7 ml/s, the smallest plasmonic frequency of the nanoparticles is observed (440 nm). By decreasing the injection rate of AgNO₃ solution to 0.1 ml/s, the LSPR absorption peak shifts to the red region (490 nm). The injection rate of the silver precursor solution into the polyol solution directly affects the nucleation and growth kinetics of silver nanoparticles. Higher injection rates lead to a rapid increase in the concentration of silver ions in the reaction mixture and promote faster nucleation, which leads to the formation of more nuclei but less time for their growth, resulting in smaller particle sizes. Lower injection rates allow the silver ions to be released in a more controlled manner, resulting in slower nucleation. This provides more time for the nuclei to grow, resulting in larger particle sizes. The size of the synthesized particles was measured using SEM technique, which is in agreement with the UV-Vis spectral results. By decreasing the injection rate from 7ml/s to 2.5 ml/s and then 0.1ml/s, the particle size increased from 55±5nm to 66±5 nm and then to 87±3 nm, respectively. The injection rate is a critical parameter in controlling the particle size of silver nanoparticles synthesized by the polyol method. Higher injection rates result in larger nanoparticles, while lower rates result in smaller particles. This understanding is essential for optimizing the synthesis process to obtain nanoparticles with desired size and properties.

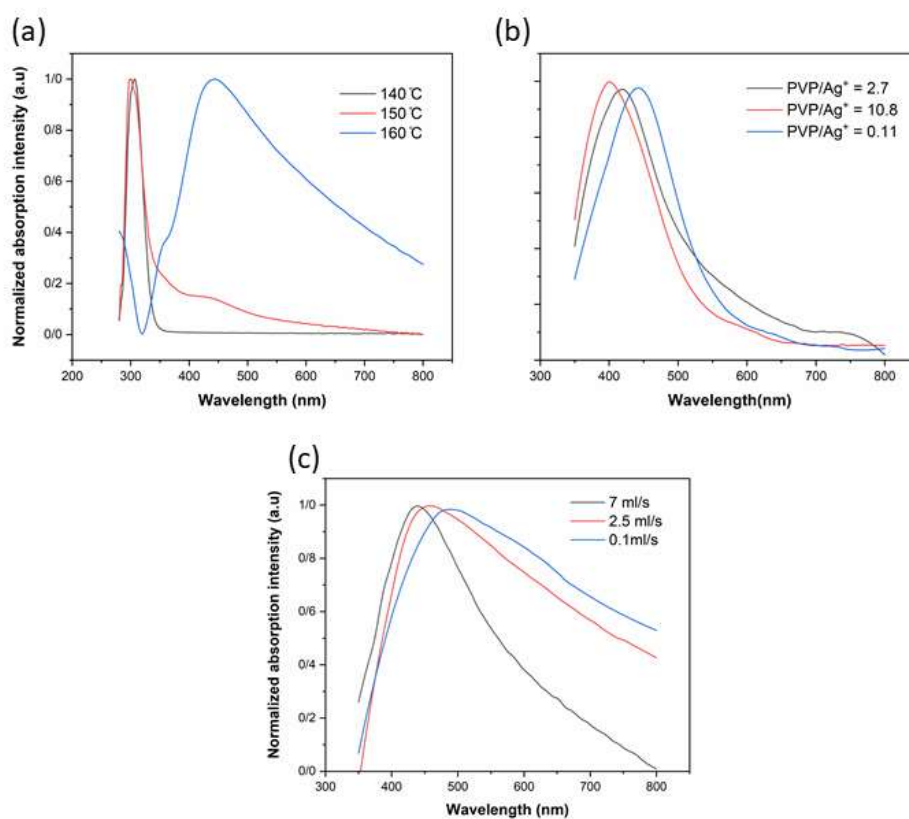


Figure 1. UV-Vis spectra of the Ag NPs. The effect of (a) temperature, (b) PVP/Ag⁺ molar ratio (c) injection rates on the frequency of the LSP.

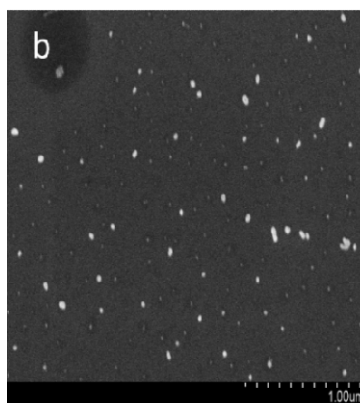


Fig.2. The SEM image of Ag NPs Synthesized in 160°C, molar ratio of PVP/Ag⁺ = 0.11 and injection rate of 1ml/s with the average size of 30±4 nm.

Top view and cross-sectional images of ZnO nanorods synthesized by hydrothermal method on silicon wafer substrate are shown in Fig.3. SEM images confirm the vertical and aligned growth of nanorods on the substrate. As can be seen, the nanorods crystallized as hexagonal wurtzite crystals. The cross-sectional size of the rods is about 50 nm and their length is about 0.5 μm.

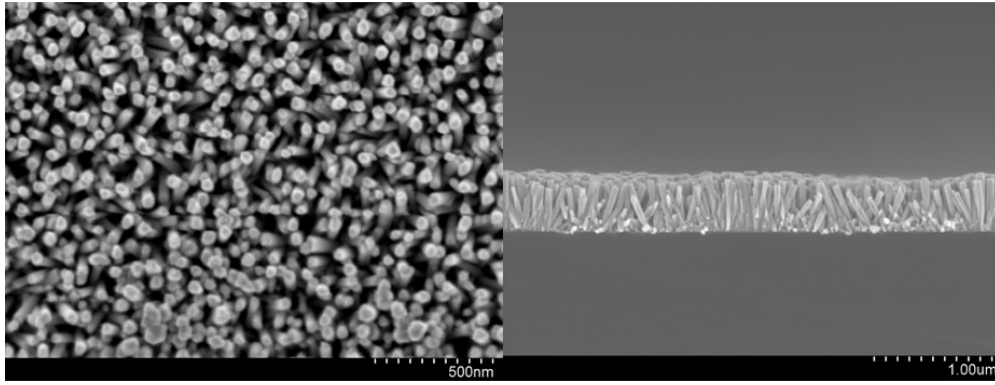


Fig.3. The top view and cross-sectional images of synthesized ZnO nanorods.

The x-ray diffraction spectrum of ZnO nanorods spin-coated with silver nanoparticles on a silicon substrate is shown in Fig.4. The Miller indices of the crystal planes corresponding to each peak on it are indicated on the spectrum. The high-intensity peak located at $2\theta=69.11^\circ$ belongs to Si(400) which is caused by the silicon substrate. The presence of high-intensity peaks of the (002) crystal plane at $2\theta=33.4^\circ$ and subsequently the (101) plane at $2\theta=36.6^\circ$ indicates the purity and high degree of crystallization of ZnO. The diffraction peaks obtained between the angles of $2\theta=10^\circ$ to $2\theta=80^\circ$ indicate the hexagonal wurtzite phase of zinc oxide according to card number JSPDS#36-1451 and the less intense peaks located at angles of 64.42° and 69.11° correspond to the (220) and (311) planes of silver nanoparticles, respectively. The absence of other peaks is proof of the absence of impurity structures.

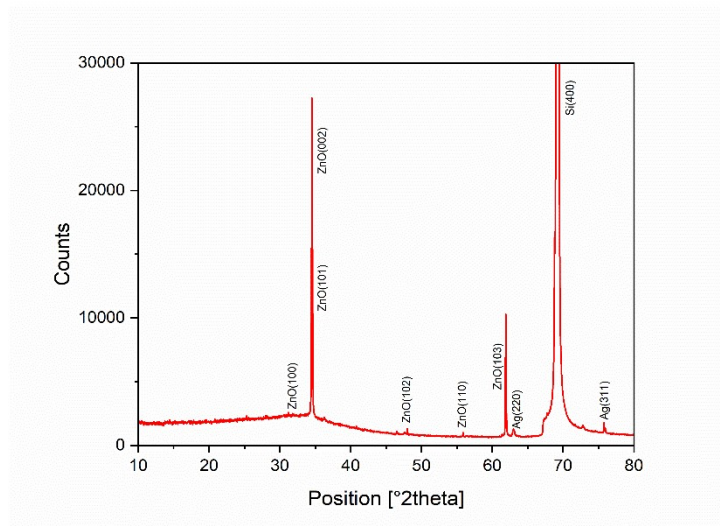


Fig.4. XRD spectra of the ZnO nanorods decorated with Ag NPs.

To measure the absorption spectrum of ZnO NRs decorated with silver nanoparticles, ZnO nanorods were first grown on a soda lime glass substrate and then silver nanoparticles dispersed in ethanol were spin-coated onto the nanorods. In order to investigate the plasmonic effect of silver nanoparticles, a comparative sample consisting of ZnO NRs alone was also prepared. The UV-Vis absorption spectrum of the fabricated samples is shown in Figure 5. The absorption spectrum of the blank glass was used as a reference and subtracted from the absorption spectrum of the samples. The absorption peak of ZnO nanorods at a wavelength of about 360 nm is clearly visible in both curves. In the curve for ZnO NRs

decorated with silver nanoparticles, the increase in the intensity of absorbed light in the range of 425 nm is due to the phenomenon of localized surface plasmon resonance (LSPR) in silver nanoparticles, which refers to the collective oscillations of surface electrons that are excited by light irradiation and cause an increase in absorption at certain wavelengths.

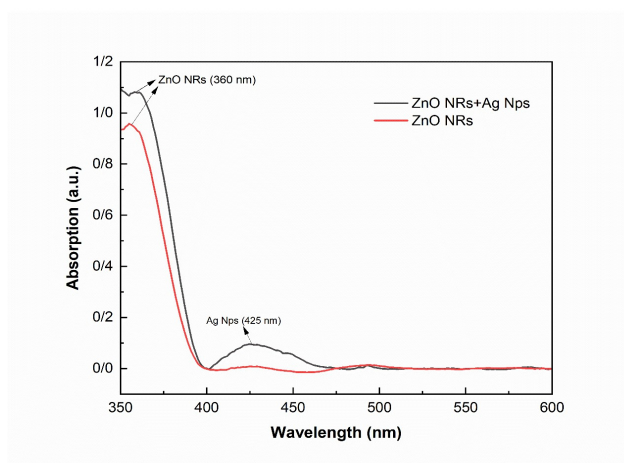


Fig. 5. UV-Vis spectra of ZnO Nanorods decorated with and without Ag NPs.

Conclusion

In this work the plasmonic effect of Ag NPs was applied in the enhancement of the p-si/ZnO NRs photodetectors. The ZnO NRs and Ag NPs were synthesized successfully and confirmed with scanning electron microscopy. The enhancement in the absorption spectra of the ZnO NRs decorated with Ag NPs was observed which was due the plasmonic resonances of the metallic particles.

REFERENCES

1. Nguyen, T.T.; Patel, M.; Kim, (2021) J. Self-powered transparent photodetectors for broadband applications. *Surf. Interfaces*, 23, 100934.
2. Hu, L.; Yan, J.; Liao, M.; Xiang, H.; Gong, X.; Zhang, L.; Fang, X. (2012), An Optimized Ultraviolet-A Light Photodetector with Wide-Range Photoresponse Based on ZnS/ZnO Biaxial Nanobelt. *Adv. Mater.* 24, 2305-2309.
3. Aurang, P. ; Demircioglu, O. ; Es, F.; Turan, R.; Unalan, H. E.; (2013), ZnO Nanorods as Antireflective Coatings for Industrial Scale Single Crystalline Silicon Solar Cells. *J. Am. Ceram. Soc.*, 96 [4] 1253-1257.
4. Qu, Y.; Huang, X.; Li, Y.; Lin, G.; Guo, B.; Song, D.; Cheng, Q. (2017), Chemical bath deposition produced ZnO nanorod arrays as an antireflective layer in the polycrystalline Si solar cells. *J. Alloy. Compd.* 698, 719-724.
5. Chang, C.M.; Hon, M.H.; Leu, I.C. (2010), Preparation of ZnO nanorod arrays with tailored defect-related characteristics and their effect on the ethanol gas sensing performance. *Sens. Actuators B Chem.* 151, 15-20.
6. Zarezadeh, E.; Ghorbani, A. Bipolar, (2010), photoresponse ultraviolet photodetectors based on ZnO nanowires. *Mater. Res. Express* 7, 056203.
7. Yu, X.; Yu, X.; Yan, M.; Weng, T.; Chen, L.; Zhou, Y.; Wei, J. (2020), Lowering oxygen vacancies of ZnO nanorods via Mg-doping and their effect on polymeric diode behavior. *Sens. Actuator. A Phys.* 312, 112163.

8. Chen, S.; Small, C.E.; Amb, C.M.; Subbiah, J.; Lai, T.H.; Tsang, S.W.; Manders, J.R.; Reynolds, J.R.; So, F. (2012), Inverted Polymer Solar Cells with Reduced Interface Recombination. *Adv. Energy Mater.* 2, 1333–1337.
9. Iwantono, I.; Saad, S.M.; Anggelina, F.; Awitdrus, A.; Ramli, M.A.; Umar, A.A. (2019), Enhanced charge transfer activity in Au nanoparticles decorated ZnO nanorods photoanode. *Phys. E Low Dimens. Syst. Nanostruct.* 111, 44–50.
10. Mohammad, S.M.; Rajamanickam, S.; Hassan, Z.; Abdullah, M.; Shafiq, A.R.; Abuelsamen, A. (2021), Self-powered UV photodetector performance optimization based on Ag nanoparticles-encapsulated-ZnO nanorods by photo-deposition method. *Sens. Actuator. A Phys.* 331, 113032.
11. W. Kim and K. S. J. P. s. s. Chu, (2009), ZnO nanowire field-effect transistor as a UV photodetector; optimization for maximum sensitivity. *206(1):179-182.*
12. R. J. M. L. Shabannia. (2018), High-sensitivity UV photodetector based on oblique and vertical Co-doped ZnO nanorods. *214:254-256.*
13. R. Rajalakshmi, S. J. M. S. Angappane and E. B. (2013), Synthesis, characterization and photoresponse study of undoped and transition metal (Co, Ni, Mn) doped ZnO thin films. *178(16):1068-1075.*
14. Young, S. J., Liu, Y. H., Shiblee, M. N. I., Ahmed, K., Lai, L. T., Nagahara, L., ... & Khosla, A., (2020). Flexible ultraviolet photodetectors based on one-dimensional gallium-doped zinc oxide nanostructures. *ACS Applied Electronic Materials*, 2(11), 3522-3529.
15. Hong-Liang Lu, Yu-Zhu Gu, Yuan Zhang, Xin-Yan Liu, Peng-Fei Wang, Qing-Qing Sun, Shi-Jin Ding, and David Wei Zhang, (2019) Improved photoelectrical properties of n-ZnO/p-Si heterojunction by inserting an optimized thin Al₂O₃ buffer layer. *OPTICS EXPRESS*, vol. 22(18) 22184.
16. Lam, K. T., Hsiao, Y. J., Ji, L. W., Fang, T. H., Hsiao, K. H., & Chu, T. T. (2017). High-sensitive ultraviolet photodetectors based on ZnO nanorods/CdS heterostructures. *Nanoscale research letters*, 12(1), 1-7.

Future Challenges and Perspectives on the Integration of Artificial Intelligence in Albanian Education

Assoc. Prof. Dr. Lekë PEPKOLAJ

Department of Computer Engineering; Faculty of Computer Science and IT, Metropolitan University of Tirana, Albania

Arbër MALAJ

Department of Basic Informatics, Faculty of Information Technology, Polytechnic University of Tirana, Albania

Abstract

The problems of education in Albania are diverse, including limited resources, curriculum improvement, quality of education, training of academic staff, inequality of opportunities, outdated technologies, ethical and social challenges. This article examines the complex landscape of artificial intelligence in the context of educational problems, focusing on practical applications, successful experiences, challenges, and prospects. Through a detailed analysis of best practices, the article identifies ways in which artificial intelligence can be effectively integrated to improve teaching/learning processes. At the same time, the challenges associated with its integration into education are examined, providing a critical perspective on emerging issues. Finally, the article focuses on future trends of artificial intelligence in education, suggesting possible developments in its application in this field. This topic is of interest to educators, teachers, students, policymakers, and all those interested in a conscious and effective approach to integrating artificial intelligence into educational contexts.

Keywords: Education in Albania, Artificial Intelligence, Future Challenges and Prospects

1. Introduction

This article is of relevance in the Albanian context, including today's technological and educational environment. Applications of artificial intelligence offer important opportunities to enrich the teaching and learning process, preparing students for the challenges of an ever-evolving digital world. The successful experiences presented highlight how the integration of artificial intelligence in education can achieve significant results, improving learning, and personalizing the educational experience.

However, the challenges and concerns associated with the use of artificial intelligence in education should not be overlooked. Ethical issues, privacy, and equitable access to technological resources are important aspects that require attention and responsible

management. Understanding and addressing these challenges is essential to ensure the ethical and inclusive implementation of artificial intelligence in education, where looking to the future and exploring trends is essential to adapt to the continuous technological evolution. Recognizing these trends will enable the development of advanced educational strategies and provide educators, students, and administrators with the tools necessary to successfully navigate an increasingly connected and technologically advanced world.

The main goal of this research is to integrate artificial intelligence into education to improve, the effectiveness of education and instruction, making it more personalized, accessible, and effective for all students. While the specific objectives are pedagogical-didactic innovation, support for educators/teachers, reduction of inequalities, challenges, and ethical issues.

In conclusion, the integration of artificial intelligence in Albanian education aims to transform and improve education, making it more adaptive, inclusive, efficient, and promoting the success and development of all students. The importance of this topic extends to all those involved in education, helping to shape a future in which artificial intelligence is a valuable ally for learning, individual and social development.

2. Definition of Intelligence

Artificial Intelligence in Education is a research/scientific field that focuses on the application of artificial intelligence technology to improve the educational process and facilitate student learning. Its concept has been defined in different ways by many authors over the years. Below are some definitions:

Artificial intelligence is the science of having technology do things that, if done by humans, would require intelligence (Minsky, 1968).

Artificial intelligence is the study of how to make computers do what humans are currently better at (Rich & Knight, 1991).

Artificial intelligence is that activity dedicated to making machines intelligent, and intelligence is that quality that allows a value to function properly and carefully in its environment (Nilsson, 2010).

Artificial intelligence in education is a powerful tool to open up what has been called the 'black box of learning', providing us with a deeper and more detailed understanding of how learning actually happens (Luckin et al., 2016).

Our intelligence is what makes us smarter, and artificial intelligence is an extension of this quality (LeCun, 2018).

Artificial intelligence in education can be defined as 'branch-based automation' (USDE, 2023).

2.1 Quotes on Artificial Intelligence in Education (Holmes et al., 2019)

"Artificial Intelligence will be disruptive, but few realize that education will be at the forefront... A rather bold intellectual achievement..." - Dirk Vandamme, Deputy Director, Education and Skills Directorate, OECD.

"Artificial Intelligence is a must-read for educators and all stakeholders interested in the future of education, who will be influenced by, and very likely transformed by, it... Remaining rooted in the science of learning, the experts offer critical insight into the potential benefits and risks of artificial intelligence, without overstating the technology" - Jim Flanagan, Chief Operating and Strategic Officer, ISTE.

“Artificial intelligence is an undeniable resource that helps us cut through the noise surrounding AI in education and think deeply about shaping the future of teaching and learning.” - Keith Krueger, CEO, COSN.

“Artificial intelligence is transforming the knowledge and skills students need to succeed... it is enabling powerful methods of teaching and learning.” Chris Dede, Timothy E. Wirth Professors at Harvard University.

“Artificial intelligence is an invaluable resource for those concerned with the future of education” - Tony Wagner, GAGCI.

3. Methodology

Artificial intelligence is still an emerging research field and there is no specific and standardized methodology to study its application in the field of education. However, general ideas for scientific research and its application can be provided. To address the topic of artificial intelligence in the context of the purpose of the article, the following structure can be used:

- A brief introduction to artificial intelligence, emphasizing its growing importance in the field of education.
- Definition of artificial intelligence, a clear explanation of what is meant by artificial intelligence in the educational context.
- Practical applications in education, describing how artificial intelligence can be practiced in education.
- Success stories, presenting success stories (specific projects and applications) that demonstrate the effectiveness of artificial intelligence in education.
- Challenges and concerns, which deals with exploring the ethical, technical and social challenges associated with the use of artificial intelligence in education.
- Future perspectives, looking towards the future and discussing possible developments of artificial intelligence in the educational context.

This structure allows to present the topic of the article in the educational context in a clear and organized way. The customization of this plan is based on the specific needs and the content that is desired to be emphasized.

4. Practical applications

The advantages of utilizing artificial intelligence in education to enhance learning outcomes, support academic staff, and foster personalized learning is exciting, but also a bit daunting. To have a realistic approach, one must first move beyond science fiction scenarios of computers and robots ‘replacing’ teachers and reducing the human element from what is a fundamentally human activity (Luckin et al., 2022; Cardona et al., 2023; Cazzaniga et al., 2024). The implementation advantages will be seen in terms of the teaching process and at the administration level.

4.1 Benefits in the teaching/learning process

Below we will address issues such as:

- The help that artificial intelligence provides in adapting didactic materials to the individual needs of students.
- Teaching assistance, the use of chatbots or virtual mentors to respond to students' needs. Monitoring student performance through data analysis.

- Successful examples of recommender systems in education, courses, resources, or activities based on student preferences and performance.

Some potential advantages of integrating artificial intelligence into education are:

Personalized learning: It can be extremely difficult for an educator to figure out how to meet the needs of all students in a classroom. Artificial intelligence systems easily adapt to the individual needs of students and can target learning based on their strengths and weaknesses (Maghsudi, et al., 2021; Cardona, et al., 2023; Rukadikar & Khandelwal, 2023). There are various platforms and educational ecosystems that implement personalized learning with the help of artificial intelligence. Here are some examples:

Duolingo: a foreign language learning tools that uses artificial intelligence to personalize the learning paths of each user. It adapts exercises based on previous performance and areas where students may need additional practice.

Khan Academy: uses automated learning algorithms to adapt didactic content based on students' abilities and needs. Provides immediate feedback and personalized suggestions to help students progress in their learning.

Coursera: offers online courses with personalized content based on student data analysis and to adapt recommendations in real time. Uses recommender systems to suggest additional courses based on students' interests and goals.

ALEKS: an online learning system that adapts materials based on student responses. Helps students focus on areas where they need improvement.

CogBooks: uses artificial intelligence to create personalized didactic materials and adapts the learning flow to maximize its effectiveness.

The recommendation systems that have been introduced are numerous and their number is increasing. <https://fjala.info/zbatime-te-inteligjences-artificiale-ne-arsim-eksplorimi-i-perparesive-dhe-kufizimeve/>

Mentoring: AI systems can assess learning style, prior knowledge to provide personalized support and education (Van der Vorst & Nick, 2019; González-Calatayud et al., 2021; Chaipidech et al., 2022). Here are some examples: *Thinkster Math:* an online math tutoring platform that uses AI to personalize each student's learning path. It combines human-centered teaching with automated adaptation of assignments, projects. *IXL Learning:* offers customized practice exercises in math, English, science, and other disciplines. It uses machine learning to adjust the level of difficulty and provide detailed feedback. *Jill Watson, Cognii:* virtual teaching assistant.

Assessment: AI can help with exams using an answer key, but it can also compile data on student performance in various forms (González-Calatayud et al., 2021). Some such tools are: *Cognii:* focuses on using educational chatbots to assess student writing. It provides personalized feedback to improve the quality of writing through conversational interactions. *TestGorilla, Sapient.ai* are some other platforms that help in this case.

Teaching assistance:

Various chatbots: *Homework help, projects: Socratic by Google,* where it helps students in math, science, literature and more. *Mathway,* specializing in solving mathematical problems, from basic arithmetic. Exam preparation and study guides: *QuizBot,* offers customizable quizzes in various subjects to help students prepare for exams. Test preparation bots, for example, GRE, SAT, ACT, offer practice questions, tips, and strategies for standardized tests. *ChatGPT:* our AI-powered ideation partner. *Paperity:* the superhero of bibliographic research. *Scite:* the vigilant keeper and checker of the study of facts in our studies. *QuillBot:* the miracle of paraphrasing. *Research Rabbit:* the organizational master of your research paper.

Consensus: a catalyst for collaboration. *Scholarcy*: your personal translator, breaks down complex texts into manageable parts, clarifies unclear concepts and answers your research questions. *Trinka*: the AI aggregator. *Tableau*: the creative data analysis tool. *ChatPDF*: summarizes and analyzes text with ease, removing jargon and highlighting essential information (Gkinko & Elbanna, 2022; Vijaya Lakshmi & Ishfaq 2022) https://patugwu.com/blog/ai-apps-for-researchers/#google_vignette

Content technologies: *Palitt*: personalized lesson plans, syllabi, or textbooks. *Cram101*: turns any textbook into an intelligent study guide, complete with chapter summaries, unlimited multiple-choice and true/false practice tests, flashcards, etc. *JustTheFacts101*: highlights and generates specific summaries for each book and chapter. <https://onlinedegrees.sandiego.edu/artificial-intelligence-education/>

Assistive technology: can help students with special needs access a more equitable education. (DeFreitas et al., 2022; Lim et al., 2022; Emma et al., 2023; EDF, 2023). Here are some tools: *Grammarly*, *Speech to Text*, *Immersive Reading*, *CoPilot*, *Natural Reader*, *Nuance Dragon*, *Image Recognition Apps*, ... etc. <https://www.digitallearninginstitute.com/blog/webinar-highlights-the-benefits-of-ai-to-assistive-technology-in-digital-learning>

Other developments in today's time: Lesson planning, audio-visual classroom creation, test preparation, plagiarism detection, exam integrity, voice-to-text transcribing, online discussion threads; tracking and evaluating student success, creating hybrid learning environments, virtual learning. <https://onlinedegrees.sandiego.edu/artificial-intelligence-education/>

4.2 Other benefits

The benefits at the administration level are numerous, here are some of them:

Scheduling: Helps leaders plan training and individuals manage their daily, weekly, monthly, or annual schedules. Plan lesson schedules and manage substitutions.

Institutional Services Management: Monitors the status of electricity, Wi-Fi, water services and alerts facilities management staff when problems arise. Manages entire universities, powering student enrollment systems, transportation, IT and maintenance, planning, budgeting, ... etc. Assists in security, protection, and cybersecurity. <https://onlinedegrees.sandiego.edu/artificial-intelligence-education/> **Pounce**: A chatbot designed to assist students during the enrollment process.

These examples show how AI-based recommendation systems are contributing to improving the student learning experience, adapting subject content, didactic materials to their needs, and promoting more effective learning.

5. Success Stories

There are many educational institutions and projects that have been successful in applying artificial intelligence to improve the teaching/learning process. Here are some concrete examples:

The University of Michigan, through its Digital Innovation Greenhouse, uses machine learning algorithms to personalize learning paths, improving student interaction with courses. <https://www.aau.edu/university-michigan-digital-innovation-greenhouse>

Georgia State University, using adaptive learning software, changed the results in core subjects that were once obstacles to student success. The project used has the potential to have a significant and lasting impact on graduation rates, especially for students at risk of dropping out of university. <https://success.gsu.edu/adaptive-learning-tools/>

The University of Technology Sydney has an artificial intelligence-based system that automates the correction of written exams. <https://help.online.uts.edu.au/information-for-all-users/review-instructors-user-guide/#-task-results>

Squirrel AI is an online tutoring system based on artificial intelligence that adapts to the learning needs of students. The system is widely used in China and has been shown to improve students' performance in mathematics <https://www.technologyreview.com/2019/08/02/131198/china-squirrel-has-started-a-grand-experiment-in-ai-education-it-could-reshape-how-the/>

Robolink is a successful project in South Korea that uses artificial intelligence to teach and promote hands-on learning through robotic experiences. <https://www.robolink.com/blogs/roblog-link/tagged/artificial-intelligence>

Arizona State University has implemented adaptive learning technologies to provide personalized education to students. Through data analysis, the system has adapted didactic materials and provided suggestions to students, significantly helping to improve results. <https://teachonline.asu.edu/2022/08/inscribe-digital-community-powered-pedagogy/>

EdSurge Concierge is an editorially independent project in the USA based on artificial intelligence that has helped teachers and school leaders find educational resources and tools suitable for their specific needs. <https://www.edsurge.com/news/2017-05-24-the-next-stage-for-edsurge-concierge>

Quillionz uses artificial intelligence to automatically generate questions and quizzes based on specific text or content. It is also used by teachers to quickly create personalized didactic materials. <https://www.quillionz.com/>

Content Technologies, Inc. develops an automated AI-based grading system called e-rater®, used to grade students on standardized exams like the TOEFL. <https://www.crunchbase.com/organization/content-technologies-inc-cti>

These featured systems demonstrate how educational institutions and projects are successfully using AI to improve teaching, personalize learning, and provide more effective support for students.

6. Challenges, concerns, and perspectives

Artificial intelligence in education beyond its numerous and valuable applications also has limitations, some of which come from the common format of the technology and the rest from the artificial intelligence itself (Owoc et al., 2021; Walker & Baten, 2022; Cardona et al., 2023; Smith et al., 2023; Bertrand et al., 2024). There are issues that on the one hand bring advantages and on the other hand limitations. Some of its limitations are:

Loss of human connection (contact): lack of empathetic contact. Lack of emotional intelligence and interpersonal skills of students. Data privacy and security: students' personal data, access to information, authorship is unprotected. Bias and equality: if the input data contains bias, gender or racial discrimination, then we have an unintentional perpetuation of them. Over-reliance on artificial intelligence: can inhibit critical, creative, and independent thinking.

Job substitution for academic staff: the unique knowledge, creativity, and adaptability that human educators bring to the classroom are difficult to replace. Limited personalization: it may still be a struggle to provide truly personalized education for each student, with individual learning styles and needs. Inclusion and equity: advanced technology may not be accessible to all students, especially those from disadvantaged backgrounds.

Technical issues and system malfunctions. Impersonal assessment and feedback: lack the specific feedback that human educators provide. Distraction and multitasking: losing the

original purpose. Ethical concerns: how should data be used ethically? Training educators/teachers on its use. Expensive implementation costs: can lead to unequal opportunities for students. The loss of human-driven classroom dynamics.

6.1 Future Perspectives

Ethical considerations are profound when it comes to the use of artificial intelligence in any environment. It lacks a 'moral compass,' meaning its ethical behavior is essentially a reflection of its developer's intentions and programming. The literature (Jobin et al., 2019; Holmes et al., 2022; Luckin et al., 2022; Al-Tkhayneh et al., 2023), outlines important recommendations for the future, where we need to:

- Have ethics embedded in the idea of why a specific piece of technology, equipped with artificial intelligence, is being developed.
- Observe/control/protect the results of that technology to fully understand its behaviors and ensure that it does not violate our moral compass.

Artificial intelligence is rapidly transforming education management and improving the efficiency of its various processes. Its future in education management is bright and promising. Prospects of intelligence in education are oriented towards greater integration and personalization of learning. Some of the most important prospects may include:

Virtual Mentoring: an AI-based mentoring platform provides personalized support to students, helping them overcome difficulties and consolidate skills more effectively. *Predictive Analytics:* AI is used to analyze large amounts of student data, allowing educators to identify learning problems in advance and intervene in time. *Chatbot-based Education:* Educational chatbots will be able to instantly answer students' questions and guide them interactively through learning materials. *Ethical and Social Challenges:* The widespread use of AI in education brings forth ethical concerns regarding student privacy and equitable access to technology. Addressing these challenges is crucial to promote the fair and ethical implementation of AI in educational settings.

Finally, the prospects of AI promise a radical change in education, offering previously unprecedented opportunities to improve the effectiveness and equity of education. However, it is important to take a critical and responsible approach to maximize the benefits of intelligence as we face emerging challenges.

7. Conclusions

Education in Albania is facing a series of complex challenges ranging from limited resources, quality of education to unequal opportunities. However, artificial intelligence offers an important opportunity to address these challenges and improve teaching and learning processes.

This article examines the role of artificial intelligence in education, highlighting its strengths through recommender systems, successful examples, challenges related to their implementation, and ethical and social issues. By identifying best practices, this paper highlighted how artificial intelligence can improve educational approaches from both pedagogical and administrative perspectives. In our country, it is essential to approach new challenges regarding its integration into education with a critical vision, to develop a constructive approach.

Overall, implementing artificial intelligence in education management has the potential to drive transformative changes. Tools based on it can help academic staff personalize the learning experience, improve student engagement, and provide real-time, tailored feedback. Furthermore, it can help educational institutions simplify administrative

tasks, automate assessments, and optimize resource allocation. While the application of artificial intelligence to education holds great potential for improving the quality and effectiveness of education, it is important to approach this technology with caution, recognizing its potential limitations.

This topic is relevant to a wide range of stakeholders, including educators, students, and policymakers, as they seek to promote more inclusive, effective, and future-oriented education through the integration of artificial intelligence.

REFERENCES

- Al-Tkhayneh, K.M., Alghazo, E.M., & That, D. (2023). "The Advantages and Disadvantages of Using Artificial Intelligence in Education". *Journal of Educational and Social Research*, 13(4), 105. <https://doi.org/10.36941/jesr-2023-0094>
- Bertrand, M. G., Sezer, H. B., & Namukasa, I. K. (2024). Exploring AR and VR tools in mathematics education through culturally responsive pedagogies. *Digital Experiences in Mathematics Education*, 10, 462–486. <https://doi.org/10.1007/s40751-024-00152-x>
- Cardona, M. A. Rodríguez, R.J., & Ishmael, K. (2023). "Artificial Intelligence and Future of Teaching and Learning: Insights and Recommendations". *Washington, DC*, 2023.
- Cazzaniga, M., Jaumotte, F., Li, L., Melina, G., Panton, A.J., Pizzinelli, C., Rockall, E., & Tavares, M.M. (2024). "Gen-AI: Artificial Intelligence and the Future of Work". *IMF Staff Discussion Note*, SDN2024/001, International Monetary Fund, Washington, DC.
- Chaipidech P., Srisawasdi N., Kajornmanee T., & Chaipah K. (2022). "A personalized learning system-supported professional training model for teachers' TPACK development". *Computers and Education: Artificial Intelligence*, 3, art. no. 100064. <https://doi.org/10.1016/j.caeai.2022.100064>
- DeFreitas, M.P., Piai, V.A. & Farias, R.H., Fernandes, A.M.R.; DeMoraes Rossetto, A.G., Leithardt, V.R.Q. (2022). Artificial Intelligence of Things Applied to Assistive Technology: A Systematic Literature Review. *Sensors*, 22,8531. <https://doi.org/10.3390/s22218531>
- Emma M. Smith, David Graham, Cathal Morgan & Malcolm MacLachlan (2023) Artificial intelligence and assistive technology: risks, rewards, challenges, and opportunities, *Assistive Technology*, 35:5, 375-377, <https://doi.org/10.1080/10400435.2023.2259247>
- European Disability Forum. (EDF). (2023). "Resolution on the EU artificial intelligence act for the inclusion of persons with disabilities". *European disability forum*.
- Gkinko, L., & Elbanna, A. (2022). "AI Chatbots sociotechnical research: An overview and Future Directions". 8th International Workshop on Socio-Technical Perspective in IS Development, August 19-22. (STPIS'22).
- González-Calatayud, V., Prendes-Espinosa, P., & Roig-Vila, R. (2021). "Artificial Intelligence for Student Assessment: A Systematic Review". *Appl. Sci.*, 11, 5467. <https://doi.org/10.3390/app11125467>
- Holmes, W., Bialik, M., & Fadel, C. (2019). "Artificial Intelligence In Education Promises and Implications for Teaching and Learning". *The Center for Curriculum Redesign*, Boston, MA.
- Holmes, W., Porayska-Pomsta, K., Holstein, K., Sutherland, E., & Baker, T., et al. (2022). "Ethics of AI in Education: Towards a Community-Wide Framework". *Int J Artif Intell Educ* 32, 504–526 <https://doi.org/10.1007/s40593-021-00239-1>
- Jobin, A., Ienca, M., & Vayena, E. (2019). "Artificial intelligence: The global landscape of ethics guidelines". *Nature Machine Intelligence*, 1(9), 389–399. <https://doi.org/10.1038/s42256-019-0088-2>.
- LeCun, Y. (2018). "The Power and Limits of Deep Learning". *Research-Technology Management* 61,22–27.
- Lim, M. J., Song, W. K., Kweon, H., & Ro, E. R. (2022). "Care robot research and development plan for disability and aged care in Korea: A mixed-methods user participation study". *Assistive Technology*, 35(4), 292–301. <https://doi.org/10.1080/10400435.2022.2038307>
- Luckin, R., Holmes, W., Griffiths, M., & Forcier, L. B. (2016). "Intelligence Unleashed. An argument for AI in Education". Pearson.

- Luckin, R., George, K., & Cukurova, M. (2022). "AI for School Teachers (1st ed.)". CRC Press. <https://doi.org/10.1201/9781003193173>
- Maghsudi, S. Lan, A. & Van Der Schaar, M (2021). "Personalized Education in the Artificial Intelligence Era: What to Expect Next" in *IEEE Signal Processing Magazine*, vol. 38, no. 3, pp. 37-50, May 2021, <https://doi.org/10.1109/MSP.2021.3055032>
- Minsky, M. (1968). "Semantic information processing". Cambridge, Mass., MIT Press.
- Nilsson, S. (2010). "Enhancing Individual Employability: The Perspective of Engineering Graduates". *Education + Training*, 52, 540-551. <http://dx.doi.org/10.1108/00400911011068487>
- Owoc, M. L., Sawicka, A., & Weichbroth, P. (2021). "Artificial Intelligence Technologies in Education: Benefits, Challenges and Strategies of Implementation". In: Owoc, M.L., Pondel, M. (eds) *Artificial Intelligence for Knowledge Management. AI4KM 2019. IFIP Advances in Information and Communication Technology*, vol 599. Springer, Cham. https://doi.org/10.1007/978-3-030-85001-2_4
- Rich, E., & Knight, K. (1991). "Artificial Intelligence". McGraw-Hill, New York.
- Rukadikar, A. V., & Khandelwal, K. (2023). "Adoption of Artificial Intelligence in Personalising E-Learning: A Helping Hand for K-12 Teachers". *7th International Conference on New Media Studies (CONMEDIA)*, pp.94-98.
- Smith, E.M., Graham, D., Cathal Morgan, C., & MacLachlan, M. (2023). "Artificial intelligence and assistive technology: risks, rewards, challenges, and opportunities". *Assistive Technology*, 35:5, 375-377, <https://doi.org/10.1080/10400435.2023.2259247>
- USDE, (2023). U.S. Department of Education, Office of Educational Technology, *Artificial Intelligence and Future of Teaching and Learning: Insights and Recommendations*, Washington, DC.
- Van der Vorst, T., & Nick, J. (2019). "Artificial Intelligence in Education: Can AI bring the full potential of personalized learning to education?" *30th European Conference of the International Telecommunications Society (ITS): "Towards a Connected and Automated Society"*, Helsinki, Finland, 16th-19th June, International Telecommunications Society (ITS), Calgary.
- Vijaya Lakshmi, Y., & Ishfaq, M. (2022). "Chatbots in Education System". *University news*, 60(08).
- Walker, J., & Baten, D. (2022). "Promises of AI in Education - Discussing the impact of AI systems in educational practices". *SURF*.

Empowering Human-like Non-Player Character Interactions in Virtual Reality through Large Language Models

Haarinesh SELVARAJU

Researcher, Universiti Teknologi Petronas, Malaysia

Asst. Prof. Dr. Noreen Izza Binti ARSHAD

Universiti Teknologi Petronas, Malaysia

Abstract

This research paper explores the integration of Large Language Models (LLMs) into Virtual Reality (VR) environments to enhance human-like interactions with non-Player Characters (NPCs) in professional training simulations. Current VR systems suffer from repetitive, scripted dialogues that lack naturalness and adaptability, which significantly reduce user engagement, immersion, and learning outcomes. To address these limitations, the study developed a proof-of-concept VR system utilizing state-of-the-art LLMs, including GPT-4, Claude 3.5, and LLaMA, evaluated through the Massive Multitask Language Understanding (MMLU) benchmark. The Agile methodology was employed to iteratively refine the system based on extensive user feedback, focusing on optimizing NPC interactions for contextual relevance, realism, and adaptability. Results demonstrated significant improvements in naturalness, user engagement, and context maintenance, with LLaMA-powered NPCs outperforming other models in user acceptance testing. These findings underscore the transformative potential of LLMs to revolutionize VR-based training by delivering dynamic, lifelike, and context-aware dialogues, paving the way for more advanced AI-driven immersive environments.

Keywords: Artificial Intelligence, Metaverse, GPT, Business Networking, Multitask Language Understanding (MMLU), Unity, LLaMA, Claude

Atmosphere, Weather, Climate Can They be Predicted? Why is This Important?

Dokleida HODAJ

MEP&M joint master of Science in "Maritime Environmental Protection and Management"
University Ismail Qemali, Vlore, Albania; University Aleksander Moisiu, Durres Albania; University
of Montenegro, Faculty of Maritime studies, Kotor

Abstract

Atmosphere is one the key elements of the nature and of earth, it is because of it that the all living and nonliving life is protected from UV radiation. Weather is the conditions of atmosphere over a short period influenced by the elements that are in atmosphere like air pressure, temperature, and wind speed, which create rain fall or snowfall. These elements can be measured by equipment like barometers, computers modeling. By doing so the weather forecast can predict climate. Because of relation especially to the ocean climate and the relation atmosphere-ocean and human behavior, all these are elements that help us to predict the weather.

When applying an urban project One of the focal points of the General Regulation Plan of the Territory for the Municipality of Vlora City is the study and prediction of climate and weather, in this case is done a Specific calculation of the level of rain in a long distance for the last 28 years by finding an exact coefficient of correlation between the reality and prediction from human factor.

This study put in point the correlation between weather prediction, environmental challenges and human importance of attention to the climate change.

Keywords: Atmospheric prediction, urban planning, climate adoption, metrological analysis.

Introduction

The atmosphere is a fundamental component of the Earth's natural system, playing a crucial role in sustaining life and protecting it from harmful ultraviolet (UV) radiation. Weather, as a short-term atmospheric condition, is influenced by various factors such as air pressure, temperature, and wind speed, all of which determine phenomena like rainfall or snowfall. These factors can be measured using tools such as barometers and computer models, enabling us to make weather forecasts (The National Institute of Open Schooling).

However, predicting climate trends is far more complex, as it requires analyzing long-term interactions between the atmosphere, ocean currents, and human activity. Understanding these relationships is vital, as it allows municipalities to take preventive

measures against extreme weather events. But forecasting is not only about knowing when heavy rains will occur—it extends to urban planning, environmental policies, and disaster prevention strategies.

The Importance of Weather Prediction in Urban Planning

One of the primary goals of the General Regulation Plan of the Territory for the Municipality of Vlora is to integrate climate and weather predictions into urban development (Municipality of Vlora, 2009). This involves analyzing historical rainfall data over the past 28 years to establish a correlation between actual climatic events and human-led forecasting efforts.

Despite these studies, a growing concern is the increasing unpredictability of weather patterns. In the past, meteorologists could reasonably estimate the amount of rainfall expected over a certain period, allowing authorities to plan accordingly. However, this predictability has significantly declined. The flooding event in Vlora in October 2024 serves as a stark example of this challenge. Many construction permits have been granted without proper consideration of the terrain’s characteristics, resulting in severe floods that endangered both properties and lives.

The Human Impact on Climate and Weather Patterns

In addition to flawed urban planning, human activities have accelerated climate change and contributed to unpredictable weather patterns. CO₂ emissions, deforestation, and the destruction of green areas have disturbed the natural equilibrium, increasing the frequency and severity of extreme weather events (Mitiga Solutions, 2023).

One way to address this challenge is through urban planning that incorporates a balanced approach to construction, green spaces, and CO₂ emissions. By calculating the CO₂ emissions of new construction projects, municipalities can determine the exact green area required to offset those emissions. This approach can help ensure that new developments contribute to the environment rather than detract from it.

Proposed Formula for Green Space Requirement

To calculate the required green space for a new construction based on its CO₂ emissions, the following formula can be used:

$$A_g = E_c / R_g$$

Where:

- **A_g** = Required green area (m²)
- **E_c** = Total estimated CO₂ emissions from construction (kg CO₂)
- **R_g** = CO₂ absorption rate of green spaces (kg CO₂/m² per year)

For example, if a construction project generates 50,000 kg of CO₂ emissions and the green space absorbs 5 kg CO₂ per square meter annually, the required green area would be:

$$A_g = 50,000 / 5 = 10,000 \text{ m}^2$$

This formula could help urban planners calculate the amount of green space—such as trees, parks, and green rooftops—needed to offset the emissions of new developments, ultimately ensuring more sustainable cities and mitigating the impact of urbanization on climate.

Lessons from Other Countries: The Delta Works Example

Many nations have successfully tackled the challenge of unpredictable weather and urban development by implementing integrated forecasting systems and climate-resilient infrastructure. A prime example is the Netherlands, which has one of the world's most advanced flood prevention systems – *the Delta Works*.

This system uses real-time weather prediction, artificial intelligence (AI), and automated storm surge barriers to protect against floods. Satellite technology and AI-driven controls allow the system to respond dynamically to changing weather conditions, ensuring long-term resilience. Recognized by the American Society of Civil Engineers as one of the Seven Wonders of the Modern World, the Delta Works demonstrates how cities can adapt to climate unpredictability through innovative infrastructure and forward-thinking urban policies (Mitiga Solutions, 2023).

Conclusion

The increasing unpredictability of weather patterns requires a new, integrated approach to urban development. Municipalities must prioritize real-time weather forecasting as part of their planning strategies, ensuring that construction projects account for environmental factors. A sustainable urban plan should balance green spaces, CO₂ emissions, and water management to mitigate the risks associated with extreme weather.

Countries like the Netherlands have successfully demonstrated that integrating advanced climate modeling and AI-driven systems can help prevent disasters while ensuring sustainable development. If similar measures are adopted in Albania, cities like Vlora can better withstand future climate challenges and create a safer, more resilient urban environment.

REFERENCES

Mitiga Solutions (2023). *Earth Scan*.

The National Institute of Open Schooling, *Weather and Climate Studies*

Municipality of Vlora (2009). *Regulatory Plan of the Municipality of Vlora City*.

Artificial Intelligence (AI) and Reading fMRI Exams – Study of the Scientific Method

Prof. Dr. Mariana Nucci Penteadó
(InRad-FM-USP/CNPq), Brasil

Hernán Joel Cervantes Rodríguez
(IF-USP/CNPq), Brasil

Renata Barbosa Vicente
(UFRPE/IEA-USP-PD/CNPq), Brasil

Cristina Lopomo Defendi
(IFSP/IEA-USP/CNPq), Brasil

Kauã Machado dos Santos
(FFLCH-USP/IC-FAPESP), Brasil

Isabella Silva Cantos
(FFLCH-USP/IC-FAPESP), Brasil

Prof. Dr. Maria Célia Lima-Hernandes
(USP-IEA/CNPq), Brasil

Abstract

This presentation is related to the Universal Project, funded by the National Council for Scientific and Technological Development of Brazil, which has been studying the inferential processing of metaphorical language performed by congenitally blind individuals (vision loss by age 3) and by typically sighted individuals for the past two years. We used four levels of complexity of metaphorical sentences created from audio-described narratives specially prepared for blind individuals. The sentences were randomized with a similar number of non-metaphorical sentences, and the participant had to press a button indicating their decision on whether or not the sentence they heard was metaphorical. Before the experiments, there were two training sessions on the use and possible sensations inside the machine, as well as on what the linguistic stimuli used as input would be like. After collecting exams by fMRI in a 7Tesla machine, we identified two cases of blind individuals who, although they claimed not to have any comorbidity, presented brain anomalies. Both had pathologies that could hypothetically interfere with the results of metaphorical language processing and prevent us from adequately comparing the results of all participants involved, since the others did not present any type of visible comorbidity in brain formation.

The communication proposal that we will present arises from these two cases. The problem that arises is how a researcher can obtain a reliable report of fMRI exams without

the intervention of a neuroradiologist, who, as a rule, at the Faculty of Medicine of the University of São Paulo, does not work on preparing medical reports for exams dedicated exclusively to research. So, the team had the idea of using two types of AI to read the two exams with anomalies. At the same time, the team provided a non-medical study of the morphological results presented using only technical knowledge of brain morphology, fMRI processing and linguistic complexity.

In this communication, we will discuss the results of this experiment and give details about all the previous data collection methodology, as well as the interpretations and conclusions we reached with this procedure that can help future research in the field of functional magnetic resonance imaging.

Keywords: fMRI, Medical Reports, AI, Interdisciplinary Studies.

Apresentação

Este texto, originalmente preparado por uma equipe interdisciplinar que lida com imagens cerebrais de cegos congênitos, visa a divulgar os trabalhos que temos feito junto ao grupo de Pesquisa Linguagem e Cognição da Universidade de São Paulo.

Como passávamos por um problema de termos um volume de exames sem laudos radiológicos, para avançarmos em meios científicos de leitura, resolvemos testar três IAs para verificar como elas resolveriam duas imagens com anormalias, identificadas durante os procedimentos científicos do Projeto Universal “Recursos inferenciais na metáfora situada e audiodescrição – estudo contrastivo”¹, financiado pelo CNPq, e sediado entre fev/2024 e jan/2025 pelo Instituto de Estudos Avançados da USP. Teríamos IAs eficientes ao ponto de podermos envolvê-las como parte do protocolo científico? Quais os desafios de seu uso?

As imagens estruturais referem-se a outputs de uma máquina 7 Teslas, instalada no Instituto de Radiologia, da Universidade de São Paulo. As participantes são duas pessoas cegas congêntas (cegas desde o nascimento) que apresentaram anomalias cerebrais, uma de 25 anos e a outra de 42 anos de idade, ambas brasileiras com anormalidades anatômicas cerebrais detectadas em seus exames estruturais. Perguntamo-nos, então, se as IAs seriam capazes de detectá-las. Caso positivo, teríamos uma ferramenta útil para fazer a triagem de exames e dar mais velocidade às nossas atividades científicas.

Antes de tratar dos resultados dessas testagens de triagem de alterações anatômicas, fizemos um levantamento de trabalhos publicados em revistas de radiologia, nos quais houvesse o emprego de IA. Os resultados, se lidos no conjunto, podem ser metaforicamente compreendidos como uma escalada do progresso no campo da saúde correlacionado ao uso de IAs. Ocorre que não temos a convicção sobre serem todas as IAs efetivas nas tarefas que precisamos desenvolver. Na seção seguinte, apresentamos os trabalhos que lidam com IA no campo da saúde, num recorte histórico recente, para, então, produzir nosso próprio estudo com ressonância magnética.

Revisão do tema

Com o *boom* das IAs, pesquisadores de vários campos começam a entender a importância de uma equipe interdisciplinar, sob risco de se tornar tão somente usuário dessas ferramentas. Uma das portas que se abre, conectando-nos agora ao projeto que temos conduzido, é compreender como poderemos oferecer contribuições à automatização de

¹ Processo 423337/2021-1 - Projeto Universal.

triagens de alterações anatômicas não fisiológicas voltados para os estudos científicos no campo da linguagem associado aos exames de RM.

Obviamente ainda é cedo para isso, mas a velocidade das descobertas tem acelerado essa possibilidade não mais remota e, como temos aprendido ao longo dos anos, algumas descobertas nascem de novos fatos inusitados que vamos percebendo ao longo de um velho caminho de investigação. Neste caso, tínhamos como critério de exclusão de participantes comorbidades que pudessem inviabilizar a leitura dos resultados de linguagem. Seria o caso de descartar os exames que, porventura, trouxessem indícios patológicos. Seria, realmente, adequado descartar os exames de duas participantes cegas congênitas que desconheciam que tivessem anomalias sem, antes, sabermos em que medida essas imagens interfeririam na identificação das metáforas? Fomos colocados frente a frente com uma questão ética, mas também com a possibilidade de responder àquela provocação da Cátedra Oscar Sala. Estariam as IAs preparadas para nos ajudar a fazer uma triagem eficiente dos resultados de exames que apresentam anomalias? Se fosse, teria também condições de assumir um grau de confiança nos processamentos a que visávamos.

Para que o caminho fique bem delineado e para que a compreensão de nosso roteiro aqui se explicita, visitamos a plataforma Scielo Brasil, e utilizamos como descritores de busca os termos “IA/AI e diagnóstico” em revistas de Radiologia. Procedemos a uma recolha não exaustiva dos trabalhos a partir de 2019, quando estávamos a ponto de vivenciar o isolamento social devido à Pandemia da Covid19 e quando o uso de IA e de comunicação via internet disseminara-se grandiosamente por todo o mundo. Visitaremos alguns estudos que contribuíram, de algum modo, para esta reflexão sobre o diagnóstico científico e sua leitura via IA. Identificamos 13 estudos que nos auxiliariam a pensar as nossas próprias barreiras para a leitura de exames científicos por RM e os possíveis avanços que decorreriam de nossa interação com esses trabalhos (Leite, 2019; Brandes *et al.*, 2020; Macruz, 2021; Silva, 2023; Bhayana, Krishna e Bleakney, 2023; Wanderley *et al.*, 2023; Serpa *et al.*, 2023; Nather Junior, 2023; Godoy *et al.*, 2023; Espíndola *et al.*, 2024; Macedo e Rocha, 2024; Santin e Lee, 2024; Leitão *et al.*, 2024).

Leite (2019), nos momentos antecedentes à Pandemia, já tratava em seu artigo de aprendizado de máquina para fins de leitura de exames de radiologia. A autora, a partir da leitura de Koenigkam-Santos *et al.* (2019)², discute a relevância da IA para diagnósticos radiológicos, e indica esse texto por considerar que os autores utilizam uma forma didática de exposição dos termos técnicos e de conceitos dando acesso ao que será necessário às dinâmicas futuras nesse campo. Em seu artigo, Leite resume o que tem visto de aplicação no campo da saúde e refere algumas áreas, tais como radiologia, patologia, oftalmologia e dermatologia diagnóstica (Amato *et al.* 2017; Kooi *et al.* 2017; Lakhani 2018; Bychkov e Turkki 2018; Usman *et al.* 2014 e Esteve *et al.* 2017; Liu *et al.* 2019; Sarwar *et al.* 2019)³. Àquela época, a pesquisadora reconhecia haver algumas aplicações potenciais para IA no campo da imagem

² Koenigkam-Santos M, Ferreira-Júnior JR, Wada DT, *et al.* Artificial intelligence, machine learning, computer-aided diagnosis, and radiomics: advances in imaging towards to precision medicine. **Radiologia Brasileira**. 2019 (52): 387-96.

³ Eis os estudos referidos por Leite: Amato F, López A, Peña-Méndez EM, *et al.* Artificial neural networks in medical diagnosis. *J Appl Biomed*. 2013;11:47-58. Kooi T, van Ginneken B, Karssemeijer N, *et al.* Discriminating solitary cysts from soft tissue lesions in mammography using a pretrained deep convolutional neural network. *Med Phys*. 2017;44:1017-27. Lakhani P, Sundaram B. Deep learning at chest radiography: automated classification of pulmonary tuberculosis by using convolutional neural networks. *Radiology*. 2017;284:574-82. Bychkov D, Linder N, Turkki R, *et al.* Deep learning based tissue analysis predicts outcome in colorectal cancer. *Sci Rep*. 2018;8:3395. Usman Akram M, Khalid S, Tariq A, *et al.* Detection and classification of retinal lesions for grading of diabetic retinopathy. *Comput Biol Med*. 2014;45:161-71. Esteve A, Kuprel B, Novoa RA, *et al.* Dermatologist-level classification of skin cancer with deep neural networks. *Nature*. 2017;542:115-8. Liu Y, Gadepalli K, Norouzi M, *et al.* Detecting cancer metastases on gigapixel pathology images. [cited 2019 Aug 15]. Sarwar S, Dent A, Faust K, *et al.* Physician perspectives on integration of artificial intelligence into diagnostic pathology. *Digital Medicine*. 2019 (2), article 28.

e alertava para a mudança que se afigurava nesse cenário e para as providências que deveriam ser pensadas para lidar com essas novas tecnologias.

Silva (2023), por sua vez, verticalizou o estudo da IA na área da radiologia médica detendo-se no problema das imagens por raios X, que são baseadas na absorção corporal do paciente dos raios X. À medida que os raios passam pelo corpo distribuem-se em quantidade e de modo diferente a depender da região física, fazendo com que a dose de radiação e os efeitos sejam variáveis. Na tomografia computadorizada, diferentemente, a imagem humana é seccionada com cortes transversais que são selecionados para variados diagnósticos. Na análise de Silva, não há dúvida sobre a aplicabilidade das IAs nesse campo, tal como observara no trabalho de Höeschen (2020), que mobilizou software de pós-processamento. Feita essa detida leitura e análise dos resultados, a autora identificou algumas barreiras que impedem o avanço das IA no campo científico: (a) confiabilidade, (b) controle de qualidade da IA; e, como já esperávamos, (c) questões legais e acadêmicas, que nos conduzem novamente ao calabouço da responsabilidade ética de provedores de tecnologia.

Silva resolve, então, mobilizar dados dos valores biológicos da literatura, reservando os testes de aquisição de imagens apenas em materiais miméticos ao sistema biológico. Utilizando um simulador com técnicas de impressão 3D, o qual forja a dureza e a densidade do osso humano em materiais como resina e polímeros, procede a um estudo que toma por base a análise do gráfico de superfície, a escala de Hounsfield, a resolução espacial, a precisão geométrica e o uso de algoritmos de segmentação óssea com as técnicas Thresholding, Measurement Space e Automatic bone. O que ela percebeu - e gritava aos olhos - era que os modelos de IA disponíveis no mercado careciam do conceito EXAI, que é uma inteligência artificial explicável. O que remanesce deste precioso trabalho são, primeiramente, as contribuições metodológicas relevantes para o aperfeiçoamento das IAs, sem o que não será possível tratar das questões éticas implicadas. Sem o desenvolvimento de um processo de validação não se alcançará, portanto, o controle de qualidade nos resultados extraídos com o emprego das IAs.

Na verdade, poucos anos antes, Macruz (2021) noticiava que as IAs já eram amplamente utilizadas nos exames médicos de imagem, especialmente na associação entre sintomas e biomarcadores com o diagnóstico e prognóstico de doenças. Não obstante esse desenvolvimento, as pesquisas científicas interdisciplinares continuaram defasadas pelo inaccessível aos laudos tão importantes para compreender alguns processamentos no campo da linguagem em interferência com anomalias tais como aquelas com que nos deparamos. É nesse momento que a área médica radiológica deixa uma lacuna imensa no desenvolvimento científico de áreas interdisciplinares já que, ao sair de campo e não oferecer valiosas interpretações radiológicas estagna possíveis descobertas dependentes de outras áreas científicas, tais como as de linguagem. Um tumor ou uma malformação cerebral específica poderia afetar a identificação de metáforas? Caso positivo, em que graus de complexidade linguística a linguagem seria afetada? Não temos respostas. Na época em que Macruz refletia sobre o tema, ela também se incomodava sobremaneira com alguns descompassos: ela percebia uma defasagem notável entre o potencial de desempenho das ferramentas, os aplicativos médicos que utilizavam IA e sua relevância clínica.

Hoje, temos, ao contrário desse cenário, variadas IAs e diversas bases de dados que, colhidas para a pesquisa científica básica, poderiam ser usadas como *input* para treinamento, no entanto ainda nos falta a estrutura universitária que permita não somente a criação de ferramentas efetivas, mas ainda a reserva de descobertas antes de sua transferência inevitável para a indústria médica tecnológica.

As provocações ao longo do caminho de construção de conhecimento sempre provocam avanços nas reflexões. Bhayana, Krishna e Bleakney (2023) foram instigados a

avaliar o desempenho do ChatGPT no contexto de resolução de questões do exame do Conselho de Radiologia sem imagens. Foi muito interessante perceber os pontos fortes e limitações da IA. Utilizaram 150 questões de múltipla escolha organizadas por tipo de habilidade envolvida (pensamento de ordem inferior, tal como recordar e compreender; e de ordem superior, envolvendo ações de aplicar, analisar e sintetizar), além de questões mais tópicas (física, clínica). As questões de pensamento de ordem superior foram ainda subclassificadas por tipo (descrição de achados de imagem, manejo clínico, aplicação de conceitos, cálculo e classificação, associações de doenças). O desempenho do ChatGPT foi avaliado de três modos: geral, por tipo de questão e por tópico. A confiança da linguagem nas respostas também foi avaliada em análise univariável. Apesar de não ter nenhum pré-treinamento específico em radiologia, o ChatGPT por pouco não passou em um exame do Conselho de Radiologia sem imagens. Seu desempenho foi bom em questões de pensamento de ordem inferior e em questões de gerenciamento clínico, mas não teve tão bom desempenho nas questões de pensamento de ordem superior envolvendo descrição de achados de imagem, cálculo, classificação, e aplicação de conceitos.

Talvez pudesse se sair melhor na distinção clínica entre malignidade ou benignidade de um nódulo mamário. Wanderley *et al.* (2023) fizeram exatamente essa testagem, utilizando um *software* baseado em algoritmo de IA, por meio do que esperavam observar a confiabilidade para a predição do risco de malignidade em nódulos mamários. Utilizaram uma amostra retrospectiva e unicêntrica com 555 nódulos mamários submetidos a biópsia percutânea. Os achados ultrassonográficos foram classificados de acordo com o léxico do BI-RADS e as imagens foram analisadas pelo *software* Koios DS Breast respeitando uma divisão entre 6 faixas gradientes polarizadas pelo grau benigno e provavelmente maligno. O resultado histopatológico foi considerado como padrão ouro. Os resultados revelaram-se promissores, já que dois resultados falso-negativos na avaliação realizada pelo radiologista foram classificados como suspeitos pelo *software*, e quatro resultados falso-negativos indicados pela avaliação do *software* foram classificados como suspeitos pelo radiologista. Esses resultados são ótimos preditivos para que a IA seja empregada numa fase de elaboração primária de laudos, ficando um menor número de casos (falsos negativos e falsos positivos) dependentes de uma análise mais acurada pelo radiologista.

Serpa *et al.* (2023) tiveram a ideia de utilizar IA, num modelo de aprendizado profundo (deep learning – DL⁴), para estimar idades ósseas de paulistas, comparando esses resultados, posteriormente, com os derivados do método Greulich e Pyle. Procederam, então, ao estudo transversal com 714 radiografias de mão e punho. Essa análise manual foi feita por um radiologista com grande experiência. Depois, implementaram o uso de uma rede neural convolucional premiada na Sociedade Radiológica da América do Norte em 2017 para a mesma análise. O algoritmo do DL estimou eficientemente a idade óssea dos indivíduos, a despeito das variáveis gênero e etnia. Nos resultados de exames de pacientes mais jovens, houve alguma imprecisão, o que demandaria alguns aprimoramentos no algoritmo.

Também com aprendizado profundo, Nather Júnior (2023) questionou a precisão contida no desenvolvimento tecnológico da área de diagnósticos radiológicos. Para sua testagem, fez uso de redes neurais convolucionais (CNNs) para a análise radiográfica da osteoartrite de joelhos. O autor demonstrou que o sucesso do treinamento situava-se na aplicação de um modelo computacional treinado com um extenso conjunto de dados locais, sem o que fragilizaria a eficiência e a precisão da resposta diagnóstica. Também alertou para

⁴ Cabe uma distinção entre *Inteligência Artificial* (simulação da inteligência humana em máquinas programadas por humanos na percepção visual, reconhecimento de fala, tomada de decisão e processamento de linguagem natural), *Machine Learning* (subcampo da IA focado no desenvolvimento de algoritmos e modelos estatísticos que fazem com o treinamento e aprendizagem de computadores) e *Deep Learning* (divisão do *Machine Learning* que treina redes neurais profundas para aprender tarefas com base em grandes datasets). Não se aplica aqui, portanto, o conceito anterior de programação.

as limitações subjacentes a esse uso, citando a necessidade de grandes volumes de dados anotados para treinar esses sistemas e a questão ética da privacidade dos dados. Os benefícios que ele nota com o êxito dessas aplicações se voltam à redução da carga de trabalho sempre muito grande dos radiologistas e um lugar de destaque para sua expertise: radiologistas entrariam em campo num segundo momento em que sua expertise seria fundamental, o de gerar confiabilidade aos resultados interpretados. Vemos, assim, que há um campo imenso de aplicação para as CNNs, com resultados na qualidade do tempo e na valorização da expertise dos profissionais radiologistas.

Ainda no modelo *deep learning*, o estudo de Godoy *et al.* (2023) traz uma contribuição relevante. Esses autores checaram a acurácia da tomografia computadorizada de pacientes hospitalizados por síndrome respiratória aguda grave causada por COVID-19. Partiram da amostra de 823 pacientes infectados, confirmados por RT-PCR, da qual selecionaram os 93 que estavam em ventilação mecânica hospitalar. Criaram, para a checagem, um modelo de aprendizado de máquina com elevada especificidade. O resultado foi positivo, já que conseguiram, por esse meio, prever de forma confiável quais pacientes não precisariam de ventilação mecânica.

O último e mais complexo reduto diagnóstico que a ciência desbrava é o da mente humana. Seriam as IAs eficientes nesse campo num momento em que temos protocolos diagnósticos bem delineados? Espíndola *et al.* (2024) buscaram entender como a IA ajudaria no diagnóstico de doenças neurológicas. Com *inputs* de neuroimagem e eletroencefalogramas (EEGs), partiram do pressuposto de que, em sendo eficientes, dariam maior agilidade ao acesso de resultados, minimizariam o tempo necessário e mão de obra especializada para a elaboração de laudos, consequentemente agilizando as respostas clínicas. Fizeram seus testes e experimentos e chegaram a algo que era preciso ser dito: esses benefícios todos ainda não são alcançados devido aos desafios próprios de implementação do uso de IA, ou seja, sem uma volumosa base de dados com representatividade diversificada de laudos diagnósticos o algoritmo não teria treinamento eficiente. Ademais, será preciso trabalhar a aceitação por parte dos profissionais de saúde que ainda demonstram ceticismo em relação às IAs.

Temos consciência de que toda novidade pode acarretar inseguranças e dúvidas, mas também traz a necessidade de se criarem normas, regras de uso e procedimentos profissionais, que se desdobram, é certo, numa série de questões éticas, incluindo as limitações de uso. O estudo de Espíndola *et al.* (2024) deixa ver que, sem uma equipe interdisciplinar – no caso dele, da saúde e da engenharia –, alinhamentos técnicos não podem ser realizados. Vivenciamos esse processo numa outra instância. A junção de áreas diferentes num mesmo grupo de pesquisa requer um exercício de aproximação muitas vezes lento e complexo, mas que implica ganhos imensuráveis para a ciência. O texto de Espíndola *et al.* (2024) nos inspira a pensar caminhos de aproximação com essa nova tecnologia, mas especialmente para uma aplicação primária no campo da pesquisa, já que, somente com um corpo mais volumoso de trabalhos em frentes diversas interdisciplinares, daremos algum passo no potencial uso das IAs, inclusive percorrendo roteiros inéditos para as áreas, tal como aquele percorrido por Santin e Lee ao decidirem construir um modelo ajustado aos seus interesses médicos.

Santin e Lee (2024) tinham como foco de atenção a identificação automática de doenças cirúrgicas benignas da vesícula biliar a partir de laudos radiológicos. Prepararam o *input* com 1.200 laudos contendo a descrição da vesícula biliar e pediram a quatro radiologistas que classificassem os laudos como doença benigna cirúrgica ou maligna. Treinaram a CNN e a memória longa de curto prazo bidirecional (*bidirectional long short-term memory* - BiLSTM). Os modelos foram treinados, avaliados por meio da divisão do conjunto de dados entre treinamento e, depois, validados, sendo considerados pelos autores como

modelos de alto desempenho. Dois outros estudos demonstram terem tido ideias semelhantes para checar o potencial do ChatGPT: Macedo e Rocha (2024) e Leitão et al. (2024). Lembremo-nos que, um ano antes, vimos as testagens realizadas por Bhayana, Krishna e Bleakney (2023) com fragilidades de resultados nas questões de pensamento de ordem superior envolvendo descrição de achados de imagem, cálculo, classificação, e aplicação de conceitos.

Macedo e Rocha (2024) utilizaram o ChatGPT para avaliar sua resposta frente a um exame especializado promovido pelo Colégio Brasileiro de Radiologia e Diagnóstico por Imagem e o resultado foi surpreendente justamente porque produziu um resultado próximo do limite necessário para aprovação e foi capaz de responder satisfatoriamente a questões de ordem cognitiva inferior. Frente aos resultados alcançados pela IA, os autores apontaram dois problemas: qual seria agora o papel do radiologista diante das iminentes mudanças tecnológicas? Que impacto teria a formação necessária para o futuro profissional? Concluem seu texto alegando a alta relevância de nos prepararmos para o lado bom desse avanço na automatização dos recursos auxiliares para diagnósticos médicos: (a) precisão do diagnósticos; (b) otimização da produção de relatórios; e (c) eficiência do trabalho médico. Oferecem, por último, indicativos de providências inadiáveis na educação médica, de modo a equipar programas de treinamento com novas aplicações de IA. De acordo com a percepção dos autores, compete às novas gerações de radiologistas tornarem-se líderes da implementação de soluções inovadoras para a eficiência da assistência médica nesse campo, o que pressupõe uma formação alinhada a esses mesmos avanços. E não fecham o texto antes de recordarem ao leitor de qual é a peça-chave para esse êxito: reuniões multidisciplinares.

Um segundo estudo que checa o desempenho do ChatGPT foi realizado por Leitão *et al.* (2024), que simularam que a IA fosse um residente do Colégio Brasileiro de Radiologia (CBR) em situação de avaliação. Selecionaram, então, as 165 questões da avaliação anual dos residentes do CBR (2018, 2019 e 2022) e as utilizaram como *input*. As questões avaliavam habilidades cognitivas de ordem superior e inferior, considerando a subespecialidade, o tipo da questão (descrição de um achado clínico ou sinal, manejo clínico de um doente, aplicação de um conceito, cálculo ou classificação dos achados descritos, associação entre doenças ou anatomia) e a complexidade da questão por meio do controle do ano da residência (R1, R2 ou R3) a que se destinava a questão. O resultado já era imaginado: o ChatGPT acertou bastante mas, talvez por não ter tido uma base suficiente de treino para suas respostas, alcançou índices relativos: somente 53,3% das questões (88/165). Nas questões de ordem cognitiva inferior, o acerto foi um pouco mais alto (cognição superior: 64,4%; 38/59; cognição inferior 47,2%; 50/106); em física, houve maior índice de acertos (90,0%; 18/20) e nas questões clínicas faltaram elementos para um acerto maior (48,3%; 70/145). Não houve diferença significativa de desempenho entre subespecialidades ou ano de residência. Dadas as condições do treinamento da IA, consideramos que com ajustes na base de dados e com um treinamento da IA com expansão dos *inputs*, logo teremos índices de acertos que podem superar os resultados humanos.

Esses estudos nos levaram a refletir sobre a possibilidade de uma nova testagem comparativa das IAs tomando como ponto de partida o problema que explicitamos inicialmente. Está no centro da questão a lacuna de laudos para a área científica e os estudos de imagens cerebrais de voluntários cegos congênitos. A seção seguinte permitirá compreender as decisões que tomamos nessa empreitada.

Checando o desempenho de IAs com ressonância magnética estrutural

Para proceder à checagem de triagem das duas imagens de ressonância magnética (Figuras 1 e 2), foram utilizadas as seguintes IAs: Chat GPT 4, Copilot e Diagnostic Expert.

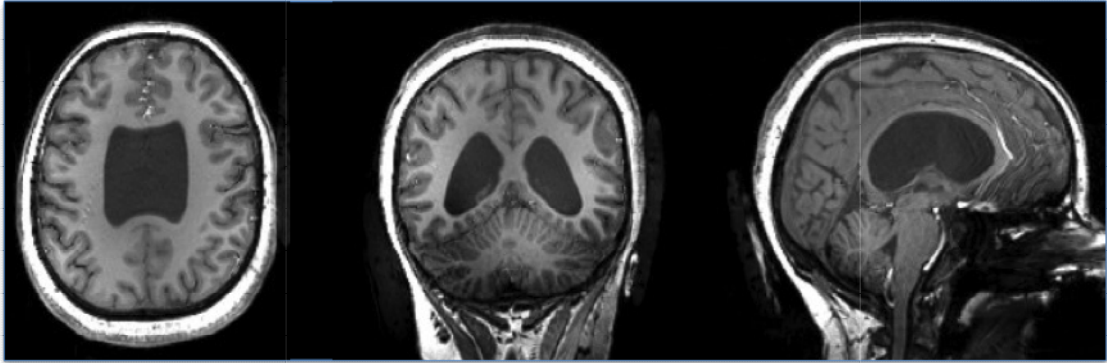


Figura 1 - Imagem de ressonância magnética ponderada em T1, nos planos axial, coronal e sagital, respectivamente, do participante com dilatação dos ventrículos. [Fonte: Projeto Universal 423337/2021-1]

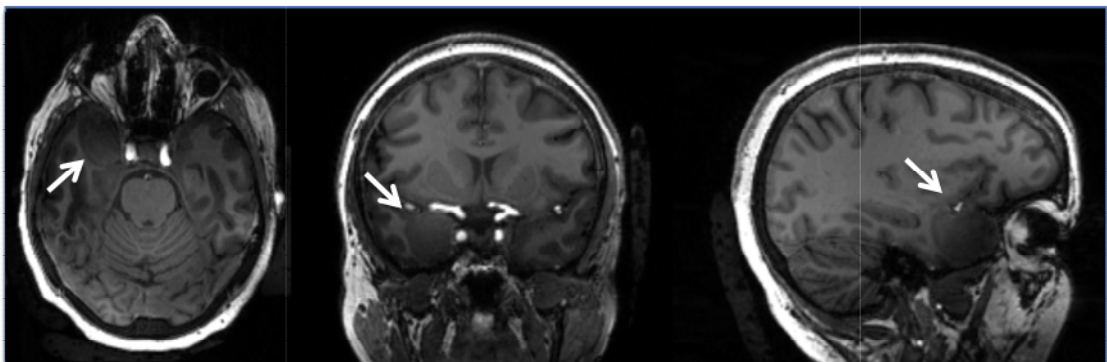


Figura 2 - Imagem de ressonância magnética ponderada em T1, nos planos axial, coronal e sagital, respectivamente, do segundo participante com tumor. [Fonte: Projeto Universal 423337/2021-1]

Ao selecionar uma das imagens de ressonância magnética (Figura 1) para principiar as análises, submetemos à IA ChatGPT 4.0 e solicitamos que procedesse à análise. A resposta foi imediata: não é adequada para fornecer análises precisas da imagem de RM, e ressalta as condições éticas que a impedem de fornecer um resultado. Sugere que se consulte um médico especialista (radiologista) para que um laudo definitivo da imagem seja fornecido.

Logo abaixo, no entanto, a IA apresenta algumas interpretações da imagem enviada, identificando os três planos da imagem e a ponderação da imagem adquirida, ponderação em T1, o que se justifica pela característica típica da imagem, qual seja, nesta ponderação, o líquido assume uma representação na cor preta devido a sua característica hipointensa. Na sequência, a IA revela-se capaz de elencar, de forma geral, as principais características percebidas em cada plano, fazendo ressalvas às alterações anatômicas presentes, tais como o aumento dos ventrículos cerebrais, que explana em detalhes pelo aumento de tamanho e pela forma difusa assumida nos cornos frontais e occipitais. Essas alterações seriam

evidências de uma maior sensibilidade da IA na identificação e consequente localização das áreas anatômicas.

Outro fato a destacar na leitura da IA foi a leitura da dilatação entre os achados em duas hipóteses explicativas: um discreto apagamento dos sulcos (1) devido à dilatação e possivelmente um aumento da pressão intracraniana; ou (2) consequência da posição do corte da imagem apresentada. Ao final, elabora três possíveis interpretações alternativas e hipóteses para a imagem fornecida: (i) hidrocefalia, (ii) ventriculomegalia ex-vácuo; ou (iii) anomalias de desenvolvimento.

Na sequência desta testagem, a mesma IA foi exposta a uma nova imagem de RM (Figura 2), desta vez de um indivíduo com modificações neuronatômicas mais discretas do que as da Figura 1. Foi solicitado que a IA explicitasse as diferenças percebidas entre o primeiro participante (Figura 1) e o segundo (Figura 2). A resposta emitida nos levou a perceber que a IA detinha habilidade na comparação entre as imagens de RM, já que apontou todos os pontos em que percebia diferenças entre as imagens nos três planos, principalmente quanto à diferença de tamanho dos ventrículos. Um equívoco foi denunciado neste exercício da IA: talvez devido à sequência de amostras e ao pedido de comparação, ela foi induzida a ler como se fossem imagens do processo de tratamento médico de uma mesma pessoa. Concluiu, por isso mesmo, que a paciente apresentava melhora no quadro clínico. Essa fragilidade interpretativa denuncia um ponto necessário de treinamento ainda lacunar da IA e demonstra a dificuldade de compreensão do modelo de linguagem ao distinguir duas imagens distintas. Para além disso, a IA não demonstrou sensibilidade para detecção da massa da Figura 2.

As mesmas imagens de RM (Figuras 1 e 2) foram utilizadas como aplicadas na mesma ordem de escolha como *input* no Copilot. Requisitamos, inicialmente, que explicasse a imagem de RM do primeiro participante, e a resposta da IA procedeu à leitura da imagem 1 pelos planos axial, coronal e sagital. Quanto às alterações significativas, a IA não desempenhou esforço autônomo para explicar as propriedades do exame em si; somente abordou a ressonância de forma geral quanto à anatomia da imagem visualizada e em detalhes gerais. Após ser requisitada para que fosse mais precisa e fornecesse as possíveis condições clínicas, gerou seis resultados sem, contudo, utilizar justificativas baseadas na imagem fornecida. Alertou, ao final, que apenas um profissional de saúde especializado poderia fornecer um diagnóstico preciso com base em uma imagem de RM completa e no histórico clínico do paciente.

Como foi possível notar, a IA Copilot utilizou para a formulação de sua resposta conhecimentos prévios de condições neurológicas possíveis para quaisquer contextos no uso de imagens de RM, ou seja, não demonstra habilidades de precisão contextual, o que a levou a listar condições discrepantes e até excludentes entre si: tumores, malformações, doenças degenerativas, lesões cerebrais, infecções e doenças inflamatórias. Devido às respostas genéricas da IA, foi solicitado que ela escolhesse uma principal condição clínica que fosse possível com base na imagem fornecida e desenvolvesse os motivos de sua escolha. A IA escolheu doenças degenerativas como sua resposta final, por ser uma das condições mais comuns e frequentemente diagnosticáveis através de uma ressonância magnética cerebral. Entretanto, alertou novamente que sua leitura correspondia a uma análise hipotética e genérica e que, para um diagnóstico preciso, seria necessário um avaliação completa por um profissional da saúde.

Concluída a leitura anterior, a IA foi solicitada a realizar nova leitura, agora a da ressonância magnética da Figura 2. Da mesma forma que se comportou com a leitura do exame anterior (Figura 1), a IA abordou os três planos da imagem apresentada e forneceu três possíveis respostas para as condições clínicas. A primeira foi idêntica à elaborada para a Figura 1, a possibilidade de ser a doença de Alzheimer, marcada pela atrofia do hipocampo e

pela dilatação dos ventrículos laterais. A segunda possibilidade foi explanada como um tumor cerebral, que normalmente decorreria da presença de uma massa anormal, não localizada pela IA durante a aplicação do teste. E, por fim, indicou um quadro de esclerose múltipla, o que normalmente é marcado por lesões desmielinizantes e inflamações.

Após ser solicitada para que comparasse as duas figuras, a IA respondeu de forma genérica com base nas descrições anteriores das três condições clínicas, que não se relacionam com uma interpretação das imagens apresentadas, muito menos com um laudo final. Nesse sentido, um erro inicial conduzirá nas demais leituras comparativas uma progressão escalar de “mais do mesmo”, sem embutir qualquer complexidade. Portanto, a IA Copilot demonstra-se, no atual estágio de desenvolvimento, a capacidade de identificar os planos das imagens em Figuras que lhe são apresentadas, no entanto, não revela sensibilidade para identificar qualquer alteração anatômica de forma contextualizada em exames por imagem, assim como demonstra facilidade para entrar num espiral de respostas conflitantes entre si, demandando um treinamento mais focado nas imagens cerebrais tomando como contraponto conhecimentos mais especializados, além de, nas fases iniciais, ter suas respostas validadas por radiologistas experientes.

Numa terceira testagem, submetemos as imagens à leitura da IA Diagnostic Expert. Foi possível observar semelhantes resultados com os supracitados. Aproximou-se da leitura do GPT 4.0 ao proceder à leitura da imagem nos três planos apresentados pelas estruturas anatômicas e identificar em cada um deles a dilatação anormal da cavidade ventricular, mais especificamente nos ventrículos laterais da Figura 1, sugerindo a condição de hidrocefalia. Na sequência, apresentou uma breve explicação do que se tratava essa condição: pode ocorrer devido ao acúmulo excessivo de líquido cefalorraquidiano (LCR) nos ventrículos cerebrais. Esse alargamento pode ser relacionado a um aumento da pressão intracraniana ou a dificuldades na absorção ou circulação do LCR. Além disso relatou uma diminuição no volume do tecido cerebral ao redor dos ventrículos, o que pode ser uma indicação de atrofia cerebral, frequentemente associada a condições como demência ou outros processos neurodegenerativos, já que a redução do volume do tecido cerebral pode ser um sinal de perda neuronal. Entretanto, fez ressalvas que estas observações, possíveis diagnósticos e condições associadas requerem uma avaliação mais completa a depender da consulta com um médico especialista, que poderá correlacionar esses achados com os sintomas clínicos do paciente, histórico médico e outros exames.

Na análise da Figura 2, a mesma IA fez a avaliação dos três planos anatômicos não identificando nenhuma alteração, nem indícios óbvios de lesões focais ou massas tumorais visíveis. Não notou igualmente sinais de compressão nas estruturas cerebrais nem alterações significativas no tamanho dos ventrículos, o que nos pareceu muito diferente do que as anteriores formularam. Obviamente, como já o dissemos, as alterações da figura 2 são mais discretas e poderiam não ser notadas na comparação entre as duas imagens, especialmente se a IA não tivesse um treinamento especializado.

Considerando as testagens realizadas entre três IAs na tarefa de leitura das imagens selecionadas para este estudo, pudemos notar uma diferença de precisão entre elas, já que as leituras produziram um espectro de hipóteses sobre a estrutura anormal dos cérebros avaliados. A IA Copilot foi, pelo menos na solicitação que fizemos, a que não percebeu nenhuma alteração significativa nas imagens, embora houvesse as possibilidades de dilatação ventricular, de lesões focais ou perda de volume do tecido cerebral.

Considerações finais

O acesso a um diagnóstico preciso e confiável é um privilégio que ainda está restrito aos acompanhamentos clínicos. Intuímos que as IAs possam ajudar no exercício de triagem

primária, mas ainda assim, duas ações são necessárias: reunião de um *corpus* substantivo contendo informações básicas sobre anatomia cerebral com formações típicas e atípicas e utilização de um dataset com exames e laudos precisos e especializados no campo da radiologia. A grande proporção de laudos geraria meta-análises confiáveis. Esses materiais podem ser empregados no desenvolvimento de CNN e também na formação médica.

Vimos, ao longo deste texto, que as IAs respondem às imagens, mas suas leituras ainda podem ganhar em qualidade, pois, embora partam da identificação dos três planos de cada imagem e a respectiva descrição anatômica de forma global, permitindo detecção de alterações representativas, mostram-se bem limitadas na identificação de alterações sutis e na formulação de justificativas para possíveis fatores causais, como o caso da dilatação ventricular. Demonstramos como as duas das três IAs selecionadas – ChatGPT 4.0 e Diagnostic Expert – descreveram com pormenores explicações relativamente plausíveis para a dilatação. Em todos os momentos de consulta ressaltaram que, para qualquer diagnóstico final, seria necessário consultar um médico especialista ou profissional da saúde.

A aplicação de IA para automatização de triagens para laudo no campo da imagem parece ser inevitável e já não é promessa para um futuro distante, como alegara Nather Júnior (2023) há poucos anos. Se, naquele momento, ele considerava que estivéssemos “no limiar de uma nova era na radiologia diagnóstica, impulsionada pelo desenvolvimento e integração de técnicas avançadas de inteligência artificial”, não temos dúvidas de que esse momento já está sendo superado pelas IAs, mesmo que, para que seja extensivamente aplicada a outros exames, será preciso que receber um treinamento com materiais diversificados e um volume grande de dados. A única barreira que se sinaliza, até onde podemos ver, é um grande impasse causado pela questão ética do acesso e compartilhamento de dados de pesquisa e de pacientes.

Há, ainda, um último problema a ser apresentado e que esbarra no próprio avanço da ciência: como uma IA alcançará um poder explicativo diante de um novo fato verificado? Uma patologia não descrita e observada em máquinas de fMRI cada vez mais potentes e específicas enublariam o poder interpretativo que a IA alcançaria. Sem um radiologista capaz de verificar pontualmente esses casos, não resta dúvida, como já argumentou Silva (2003), que a IA sozinha não poderia exibir uma capacidade que depende não somente de uma base diversificada de dados, nem tampouco de um volume considerável de dados, pois se trata de casos especiais, específicos e pouco frequentes.

Há, no entanto, uma força ainda maior capaz de paralisar esses avanços por algum tempo: o medo do impacto tecnológico no setor vivenciado atualmente por radiologistas e por estudantes de medicina, os quais consideram que a IA é uma ameaça para a prática radiológica (cf. Brandes *et al.* 2020).

A despeito dos benefícios para o campo da saúde e os problemas apresentados para a formação e incorporação dessas ferramentas no cotidiano acadêmico, há ainda um reduto que depende desses avanços e neles também esbarra: é o campo científico em que as equipes interdisciplinares atuam. As Neurociências contam com o conhecimento interdisciplinar, mas não prescindem do conhecimento de base disciplinar para a integração das perspectivas sobre um mesmo objeto. De nossa experiência, emanam preocupações práticas: como vivenciar a formulação de problemas derivados da combinação de laudos precisos e validados com os objetos específicos que nos movem ao estudo? Conhecer as funcionalidades das IAs pode ser, por si só, um avanço nas reflexões da equipe. Lidar com linguagem abstrata como objeto de estudo e ter a representação abstrata no campo da radiologia permitirá que linguagem e processamento cerebral possam cooperar no avanço dos conhecimentos.

REFERÊNCIAS

- Bhayana R, Krishna S, Bleakney RR. Performance of ChatGPT on a radiology board-style examination: insights into current strengths and limitations. *Radiology*, 307, n. 5. 2023. <https://doi.org/10.1148/radiol.230582>
- Brandes, Gabriela Irene Garcia; D'Ippolito, Giuseppe; Azzolini, Anderson Gusatti; Meirelles, Gustavo. Impact of artificial intelligence on the choice of radiology as a specialty by medical students from the city of São Paulo. *Radiologia Brasileira* 53 (3), 2020. <https://doi.org/10.1590/0100-3984.2019.0101>
- Espindola, Renata S.; Ribas, Isabela Wandarti; Marin, Lucas Goulart; Alves, Letícia M.; Gastaldi, Glória Nantes V.; Caravina, Henrique G.; Lacerda, Manuela Estrela do O.; Arbo, Maria Júlia; Sevá, Ana Clara; Brito, Carlos Eduardo P.de; Zulato, Adriana Gonçalves; Tavares, Letícia de F.; Lebedenco, Gabriella; Rocha, Vitória Ferrarese; Soares, Beatriz C.; Silva, Gisele S. da. Uso de inteligência artificial no diagnóstico neurológico: investigação sobre como a IA pode ser utilizada para aprimorar o diagnóstico de doenças neurológicas por meio de análise de dados de neuroimagem e eletroencefalogramas. *Contribuciones a las ciencias sociales*, 2024-09, Vol.17 (9), p.e10144.
- Godoy, Mariana Frizzo de; Chatkin, José Miguel; Rodrigues, Rosana Souza; Forte, Gabriele Carra; Marchiori, Edson; Gavenski, Nathan; Barros, Rodrigo Coelho; Hochegger, Bruno. Artificial intelligence to predict the need for mechanical ventilation in cases of severe COVID-19. *Radiologia Brasileira* 56 (2), 2023. <https://doi.org/10.1590/0100-3984.2022.0049>
- Leitão, Cleverson Alex; Salvador, Gabriel Lucca de Oliveira; Rabelo, Leda Maria; Escuissato, Dante Luiz. Performance of ChatGPT on questions from the Brazilian College of Radiology annual resident evaluation test. *Radiologia Brasileira* 57, 2024. <https://doi.org/10.1590/0100-3984.2023.0083-en>
- Leite, Claudia da Costa. Artificial intelligence, radiology, precision medicine, and personalized medicine. *Radiologia Brasileira* 52 (6), 2019. <https://doi.org/10.1590/0100-3984.2019.52.6e2>
- Macedo, Tulio Augusto Alves; Rocha, Manoel de Souza. Radiology in the age of artificial intelligence: challenges and opportunities. *Radiologia Brasileira* 57, 2024. <https://doi.org/10.1590/0100-3984.2024.57.e1-en>
- Macruz, Fabiola. Conceitos enviesados na indústria de tecnologia da saúde que retardam a tradução da inteligência artificial em ferramentas clínicas relevantes. *Radiologia Brasileira* 54 (4), 2021. <https://doi.org/10.1590/0100-3984.2020.0151>
- Mello, Juliana Mariano R. B. Artificial intelligence in breast imaging. *Radiologia Brasileira* 56 (5) , 2023. <https://doi.org/10.1590/0100-3984.2023.56.5e1-en>
- Nather Junior, Julio Cesar. Advances and challenges in the use of artificial intelligence for the diagnosis of osteoarthritis. *Radiologia Brasileira* 56 (5), 2023. <https://doi.org/10.1590/0100-3984.2023.56.5e4-en>
- Santin, Lislíe Gabriela; Lee, Henrique Min Ho. Natural language processing in the classification of radiology reports in benign gallbladder diseases. *Radiologia Brasileira* 57, 2024. <https://doi.org/10.1590/0100-3984.2023.0096-en>
- Serpa, Augusto Sarquis; Elias Neto, Abrahão; Kitamura, Felipe Campos; Monteiro, Soraya Silveira; Ragazzini, Rodrigo; Duarte, Gustavo Antunes Rodrigues; Caricati, Lucas André; Abdala, Nitamar. Validation of a deep learning algorithm for bone age estimation among patients in the city of São Paulo, Brazil. *Radiologia Brasileira* 56 (5), 2023. <https://doi.org/10.1590/0100-3984.2023.0056-en>
- Silva, Ana Carolina Costa da. Criação de um protótipo objeto simulador para o controle de qualidade de algoritmos de segmentação óssea para o uso em softwares de pós processamento tomográfico. Tese de doutorado. São Paulo: IPEN - Instituto de Pesquisas Energéticas e Nucleares, 2023. Disponível em: <https://doi.org/10.11606/T.85.2023.tde-04102023-162007>
- Vereza, Solange. "Metáfora é que nem...": cognição e discurso na metáfora situada. *Signo*, Santa Cruz do Sul, v. 38, n. 65, p. 2-21, jul. dez. 2013.
- Wanderley, Mariah Carneiro; Soares, Cândida Maria Alves; Morais, Marina Marcondes Moreira; Cruz, Rachel Malheiros; Lima, Isadora Ribeiro Monteiro; Chojniak, Rubens; Bitencourt, Almir Galvão Vieira. Aplicação de inteligência artificial na predição de risco de malignidade em nódulos mamários na ultrassonografia. *Radiologia Brasileira*, 56 (5), 2023. <https://doi.org/10.1590/0100-3984.2023.0034>

Leveraging AI for a Smarter and Sustainable Urban Planning

Asst. Prof. Dr. Alexandra ALEXANDROPOULOU
University of Piraeus, Greece

Asst. Prof. Dr. Andreas FOUSTERIS
University of Piraeus, Greece

Maria KARVOUNIDI
University of Piraeus, Greece

Abstract

The rapid growth of digital technologies has resulted in the metaverse, a network of interconnected virtual environments that mirror real-world events. This developing digital world opens up unparalleled possibilities for urban planning, allowing architects, policymakers, and communities to explore, design, and revise cities in immersive, data-driven environments. The utilisation of digital twins – high-fidelity virtual representations of urban areas – in conjunction with simulation tools that enable real-time testing of infrastructure, environmental impact, and public engagement strategies.

By leveraging the metaverse, urban planners can create virtual prototypes of cities, where factors such as transportation systems, energy consumption, zoning regulations, and green infrastructure can be modeled and optimized before physical implementation resulting to more efficient urban designs and enhanced sustainability.

Nevertheless, there are drawbacks to using metaverse technologies in urban planning as well, including concerns about data privacy, obstacles to digital accessibility, and moral dilemmas with regard to fair participation. Notwithstanding these obstacles, the incorporation of the metaverse into urban planning is a paradigm change that could result in cities that are smarter, more resilient, and prepared for the future. Urban planners must responsibly traverse these new digital frontiers as this technology develops to make sure that both virtual and physical spaces meet the many demands of people throughout the world.

Keywords: Urban Planning, Metaverse, Digital Twins, City Planning

Designing Of 264 Kw Solar Power System With Spotlight on tThe Weather Aand Location: Case Study of N'djamena City, Chad

Prof. Dr. Ziyodulla YUSUPOV
Karabük University, Türkiye

Abakar Mahamat HASSAN
Karabük University, Türkiye

Ulugbek AVLIYOROV
National Research University TIIAME, Uzbekistan

Abstract

The global shift towards renewable energy sources has positioned solar power as a cornerstone of sustainable energy solutions. Among the various renewable energy technologies, solar photovoltaic (PV) systems have gained significant traction due to their scalability, declining costs, and environmental benefits. Designing an efficient solar power system requires a meticulous approach that considers not only the technical specifications but also the environmental and geographical factors that influence system performance. This study investigates the design of a 264 kW PV solar power plant in N'djamena City, Chad. Considering Chad's ample solar resource throughout the year, a significant amount of renewable energy can be produced. The proposed PV plant comprises PV modules, inverters, AC and DC cables, AC boxes, a transformer, a data server, sensors, a display, and wireless internet connectivity. The design and parameter calculations are conducted using PVsyst and SketchUp software, as well as manual calculations. The annual energy yield of the plant was determined for various tilt angles. The optimal tilt angle of 15 degrees is expected to yield 485.72 MWh annually, resulting in an estimated 210,687 kg/year of avoided CO₂ emissions.

Keywords: Power Plant, Renewable Energy, PVsyst, SketchUP

Two-Level Architecture of Hybrid Control Systems with Behavioral Abstractions and AI Supervisor

Assoc. Prof. Dr. Pavel UGAROV
South Ural State University, Russia

Prof. Dr. Vladimir TELEZHKIN
South Ural State University, Russia

Assoc. Prof. Dr. Maksim DEVYATOV
South Ural State University, Russia

Abstract

The article considers two-level hybrid (discrete-continuous) control systems for complex and distributed objects. At the lower level, objects are described by hybrid automata and continuous differential equations, and at the upper level, control is performed using simplified models (abstractions). The so-called behavioral abstractions are used, the states of which are sequences of invariant sets through which the subsystem passes, and sequences of local regulators. These regulators are designed taking into account disturbances using game theory methods. This ensures that safety constraints are met, as well as the autonomy of lower-level subsystems, which are able to continue operating even without upper-level intervention (in the case of faults). The global control problem is reduced to finding trajectories in the discrete space states of the abstractions. The decision on the choice of certain local regulators is made using an AI supervisor, which takes into account the states through which the abstractions passed, the regulators used and the achieved quality. The proposed control architecture ensures a reduction in computational costs, guaranteed fulfillment of constraints under the influence of disturbances, as well as an increase in quality.

Keywords: Two-level Systems, Behavioral Abstractions, Supervisory Control, Game Theory, Hybrid Systems

How to Create a Successful Technopark: Key Factors and Best Practices

Prof. Dr. Javanshir ZEYNALOV
Nakhchivan State University, Azerbaijan

Lect. Sariya GASIMOVA
Nakhchivan State University, Azerbaijan

Abstract

Technoparks are specialized areas where innovative companies, research institutions, and educational institutions are concentrated, engaged in the development and application of new technologies. Typically, such parks are created to stimulate scientific and practical experience, attract investments, and serve as an ecosystem for the development of high-level technology and entrepreneurship.

The main idea of the technopark is to create favorable conditions for startups and scientific enterprises, where companies can operate with minimal administrative barriers, gain access to the necessary infrastructure, and interact with scientists and creators of new technologies.

Technology parks play an important role in the economy, stimulating innovation activity, creating new jobs, and helping to create new high-tech companies that can actively influence the economy and hold leading positions in the market, while increasing the competitiveness of the region or country as a whole.

Close cooperation with universities and research centers helps to train qualified specialists who can work in the technology industry. Similarly, high-tech companies developing in technoparks create new jobs, which helps to reduce unemployment and improve the standard of living in the region.

Technoparks facilitate knowledge exchange between different participants - researchers, entrepreneurs, investors. This allows us to accelerate the process of commercializing new technologies and implementing innovative solutions.

Creating conditions for close cooperation between scientific institutions and business allows us to accelerate the application of scientific work to industry and mass production.

For startups, technology parks offer unique opportunities for rapid growth and development. They provide access to the necessary infrastructure, which significantly reduces start-up costs for renting premises, purchasing equipment, and other aspects of doing business. Startups can also take advantage of technology park services such as consulting on business, marketing, legal aspects, and finance.

For scientific research, technoparks create a favorable atmosphere where scientists can work on projects, receive funding, and attract the attention of businesses to the results of

their research. In such conditions, the transition from fundamental science to the practical application of innovations is accelerated.

Thus, technoparks play a unifying role between science, business, and government, having a significant impact on innovative development and ensuring the creation of technologically advanced companies that can change both local and global markets.

Keywords: Technopark, Interactivity, Infrastructure, Start-up, Experience, Financing

The aim of the topic is to identify the legal, economic, social and technological conditions necessary for the successful operation of technology parks and to focus on best practices on how to combine these conditions. Within this aim, based on the experiences of successful technology parks in different countries and regions, the factors important for the development of technology parks and the creation of an innovation environment will be discussed. Specifically, it will be studied how key elements such as government support, infrastructure investments, education and research opportunities work synergistically and how these factors can be benefited from. In addition, the best management and organizational models applied in the world, approaches supporting innovation and business development will be examined, which methods and structural approaches are most effective in the success of various technology parks and the best results will be discussed.

1. Key factors for the successful creation of a technopark

Creating a successful technology park requires attention to several key aspects that will ensure its efficiency and development. These factors include infrastructure, start-up support, cooperation with scientific and research institutions, and access to financing, etc.

Let's look at each of these factors in more detail.

Infrastructure:

One of the most important factors for a successful technopark is the availability of high-quality infrastructure that will create favorable conditions for the activities of innovative companies. Thus, the Technopark should provide modern office space that meets the requirements of startups and innovative companies. At the same time, it is also important to provide production space for those involved in the development and production of technology products.

It is important for technology companies to have specialized laboratories, research centers, and other facilities for testing and developing new products. This can include laboratories for testing materials, creating prototypes, as well as manufacturing facilities for small-scale production.

A collaborative infrastructure for meetings and negotiations, exchange of experiences and ideas is an important issue. These elements help create a communication network and promote interaction between the various participants in the ecosystem.

Startup support:

Accelerators help startups grow and develop rapidly, not just with physical space, but also with support programs including mentoring, training, and business consulting. Incubators provide long-term support to startups, from ideation to product commercialization.

Successful tech parks provide mentoring programs for startups to work with experienced entrepreneurs and experts who can help them solve key business problems, advise on growth strategy, and customer acquisition.

A key aspect of startup development is access to financing. Technology parks should provide startups with opportunities to attract venture capital investments, as well as participate in finding sources of financing through funds, investment banks, and government programs.

Cooperation with scientific and research institutions:

It is impossible to build a successful technopark without close cooperation with scientific institutions. Cooperation with universities and research laboratories is an important factor in the creation of new technologies and innovations.

Universities and research institutions are often the source of new ideas and technologies. Technology parks can provide a platform to bring these ideas to the commercial sector, where startups and companies can work together with research institutions to prototype and implement new solutions.

The participation of scientific and research institutions in the technopark creates conditions for access to the latest scientific developments, technologies and talents. This allows companies and startups to incorporate advanced scientific knowledge into their products and services.

Technology parks are becoming centers for knowledge exchange between scientific institutions, startups, and large companies. This facilitates the exchange of mutual experience and new ideas, which helps accelerate innovation processes.

Access to financing:

Access to financing is one of the most important factors determining the success of a technology park. Innovative companies and startups require significant financial investments at various stages of their development, and the technology park should create mechanisms that facilitate the attraction of such funds.

The technopark should be able to attract venture capitalists who are willing to invest in promising startups and projects. This requires creating conditions that make the technopark attractive to investors, including successful examples and a guarantee of support from the technopark.

Public and private grants can play a key role in supporting innovative companies. The technopark should have mechanisms for accessing grants, subsidies, and other forms of financial support that stimulate the research activities of startups and companies and the application of new technologies.

Technology parks can serve as a link between startups and various investment funds, public and private organizations, as well as international partners, and can provide financial and expert support.

2.The role of the state and the private sector in the creation and support of technoparks

The successful development of technoparks is impossible without close cooperation between government agencies and the private sector. Both of these sectors play a key role in creating conditions for the development of innovative companies and technologies. The interaction between them provides effective support to startups, ensures the attraction of investments and the creation of a favorable infrastructure for entrepreneurs.

State initiatives in the creation of technoparks play an important role in supporting technoparks both at the stage of their creation and in the process of their further development. One of the main forms of state support is the provision of financial subsidies and grants for the construction and equipping of technopark infrastructure. These funds can be spent on the creation of specialized laboratories, office space, research centers and production facilities.

In order to stimulate the development of innovative companies, the state can provide tax breaks to companies operating in technoparks. These can be discounts on profit, VAT, property and other types of taxes. Tax breaks can help startups save money and use it to develop their businesses.

Many countries offer programs to support innovative businesses. For example, programs aimed at developing new technologies, creating innovative ecosystems, or transferring technologies from science to production. These programs can include both financial support and organizational measures for the development of technology parks.

The state can also play a coordinating role in the process of creating technoparks, proposing a regulatory framework, and creating legislative initiatives that will encourage innovative development. This could include simplifying administrative procedures and creating a more flexible licensing and certification system for startups and companies.

The private sector plays an equally important role in the success of technology parks. Private investors and companies can offer significant resources, expertise, and business strategies for the effective operation of technology parks.

Private investors (venture capital companies, business angels) are the main sources of financing for startups in technology parks. They provide the necessary capital for the development of new technologies and startups at the earliest stages of their development, which contributes to the expansion of the technology park ecosystem.

The private sector can be involved in the design and construction of technology park infrastructure. For example, real estate companies can develop and provide the necessary office and industrial space, as well as manage technology parks, providing comprehensive services for tenants.

Private companies operating in technology parks can provide expertise in technology, management, and marketing that are critical to the development of startups. Mentoring programs and consultations with experienced entrepreneurs help young companies develop rapidly.

Private companies can be important partners for startups by providing opportunities for joint research, commercialization of technologies, and access to new markets. For example, large corporations can share their knowledge, offer startups collaboration opportunities, and enter the market with new products.

One of the most striking examples of successful cooperation between the public and private sectors is the Skolkovo technopark in Russia. Here, state subsidies and incentives, as well as partnerships with private companies and venture funds, create favorable conditions for the development of startups. The technopark provides innovative companies not only

with office and production space, but also with grants, tax breaks, and access to state funding. In turn, private companies and investors provide their resources and mentoring support.

Silicon Valley (USA) California's Silicon Valley is an example of how government and the private sector can work together to create an innovation ecosystem. While most funding and resources come from private venture capital firms, public universities (such as Stanford) and research institutes play a significant role in the creation of new technologies. California has tax incentives for startups and investors, as well as federal and state research and development grants, which have helped create the world's largest innovation hub.

South Korea has several successful examples of public-private partnerships in the field of technology parks, especially BioTech technology parks. They have been established with the participation of both government agencies and large private corporations such as Samsung and LG. The government has provided incentives for biotechnology companies, and private corporations support startups with investments and offer resources for research and production.

3. Attracting and retaining talent:

Attracting and retaining highly qualified professionals is a critical aspect of the success of technology parks and innovation ecosystems. Key strategies that can help create the conditions for attracting and retaining talent include creating a supportive work environment, offering professional development, incentive programs, and effective communication channels.

Offering competitive salaries and bonus systems is a key factor in attracting talented professionals. It is important to regularly conduct market research and adjust compensation depending on the level of specialists and market conditions.

It is imperative to attract young professionals to the job. The ability to work from home or for employees with special skills can help improve the balance between personal and professional lives.

Creating comfortable and innovative workplaces (creative offices, relaxation areas, coworking spaces) helps increase employee satisfaction. Modern collaboration tools, comfortable workspaces, and informal communication areas help teams integrate and interact.

Offering courses, training, certifications, and professional seminars for employees. Organizing internal and external educational programs helps professionals improve their skills, which contributes to their professional development and satisfaction.

Successful companies in technology parks often offer clear career paths where employees can see opportunities for growth. This includes regular performance reviews and opportunities for advancement within the company.

Experienced professionals can act as mentors for newcomers, which helps develop corporate culture and maintain high professional standards. It also facilitates the rapid onboarding of new employees.

Best practices of technology parks around the world

Technology parks play a special role in driving innovation and technological progress around the world. Every country has examples of successful technology parks that have become centers of startups, research, and the development of new technologies. Let's take a look at a few such examples and the factors that led to their success.

1. Silicon Valley (USA): Silicon Valley is the world's largest and most famous technology park located in California. It is home to major technology companies such as Apple, Google, Facebook, Tesla, and many other startups. Key Success Factors:

Innovation Ecosystem: Silicon Valley is known for its unique mix of universities, research institutes, venture capitalists, and technology startups, creating a strong ecosystem for research, development, and commercialization of innovations.

Access to funding: Silicon Valley is a global hub for venture capital, providing startups with the resources they need to grow. Investors are willing to invest in new ideas, despite the risks.

Risk and Entrepreneurship Culture: Silicon Valley has a culture where failure is seen as a stepping stone to success. Many startups start with small ideas, and only one of them can achieve global success.

Partnerships with universities: Universities like Stanford and UC Berkeley play a vital role in shaping the research and innovation that is the foundation for new companies.

2. "Skolkovo" Technopark (Russia): Skolkovo Technopark was established in 2010 with the aim of transforming Russia into a center of technological innovation. It provides startups with infrastructure, support, and opportunities to collaborate with leading scientific institutions. Key success factors:

Government support: One of the most important factors in Skolkovo's success is government support. This includes tax breaks, subsidies, grants, and incentives for startups.

International cooperation: Skolkovo actively works with international partners, such as leading universities and companies. This helps to attract global experts and develop an international innovation network.

Science and education ties: The Technopark closely cooperates with Russian universities and research centers, which helps integrate scientific work into commercial technologies.

3. Shenzhen and Beijing: Shenzhen is a city known for its innovation in technology, especially in the electronics industry. Beijing, in turn, is an important center for startups and high-tech in China. Key success factors:

Government initiatives: China actively supports the establishment of technology parks through national and local programs. This includes financial subsidies, tax breaks, and research and development support.

Manufacturer support: Shenzhen Science and Technology Park has become a center for the development and production of high-tech products such as smartphones and electronics. This combination of scientific research and manufacturing capabilities stimulates innovation. It is home to several high-level scientific and technological innovation institutes.

Investments and international cooperation: China is actively attracting venture capital and foreign investment to its technology parks, which contributes to the rapid growth of startups.

Cultural Characteristics: China has a culture of rapid adoption of new technologies. Chinese technology parks create an ecosystem where startups can quickly experiment and innovate.

4. "Cambridge Innovation Park" technopark (Great Britain): Cambridge Innovation Park in the UK is one of the most successful research-based technology parks. It has become

home to many startups in the fields of biotechnology, pharmaceuticals and information technology. Key success factors:

Strong Research: Cambridge University plays a key role in the creation of new technologies and startups. Many companies have started to develop in the university's research laboratories.

Science and business collaboration: The Technopark has become an example of successful collaboration between scientific institutions and the private sector. The university provides knowledge and research, and startups and corporations commercialize these developments.

Government support: The UK provides tax breaks and other forms of government support to help startups in Cambridge attract new companies.

Integration with a global network: Cambridge Innovation Park actively interacts with international partners, which helps the company enter new markets and attract investment.

5. "Bangalore IT Park" technology park (India): Known as the "Silicon Valley of India", Bangalore is a hub for software development and IT startups. It is home to large technology companies such as Infosys and Wipro, as well as many small and medium-sized startups. Key success factors:

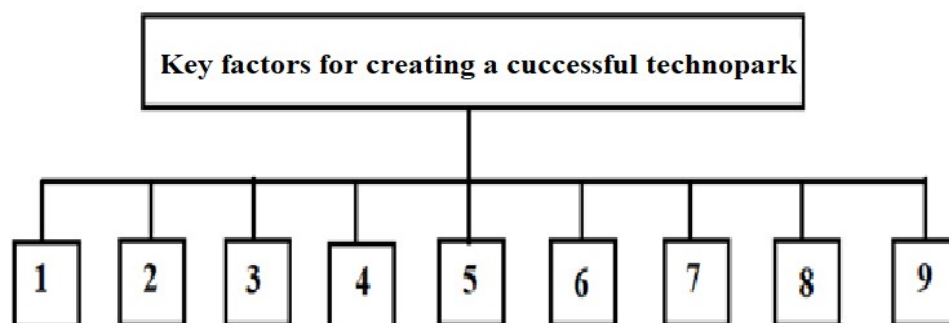
Talent: Bangalore attracts programming and engineering talent from all over the world, creating a strong workforce for startups and large IT companies.

Access to education: Bangalore is known for its high level of education in the field of technology. Local universities and engineering schools provide a large number of highly qualified professionals to the market.

Cost-effectiveness: Bangalore offers low operating costs for startups, making the city attractive to international companies and venture capitalists.

Government Initiatives: The Indian government supports the establishment of technology parks through tax breaks and subsidies that help develop startups and attract investment.

The diagram below clearly shows the relationships between the factors that influence the success of each technopark.



1. Identification of Needs and Goals. Market Demand Analysis: It should be determined in which areas the technopark will operate (for example, artificial intelligence, biotechnology, robotics, software, energy technologies, etc.).

2. Infrastructure Construction (Buildings and Office Spaces, Internet and High-Speed Connectivity, Public Areas, Residential Areas, etc.)

3. Organizational Structure and Management (Management Team, Company Support, Collaboration and Networking).

4. Research and Innovation (Research Institute, Innovation Center, Prototyping and Testing Center)

5. Financial and Incentive Mechanisms (Investment and Financial Support, State and Municipal Support, Incubation and Acceleration Programs).

6. Human Resources and Training

- Training and Development Programs: Professional development trainings relevant to the labor market.

- Internship and Practice Programs: Collaboration with universities and other educational institutions.

- Recruitment and Employee Presentations: Providing relevant workforce for companies operating in the Technopark.

7. Marketing and Business Relations

- Company Promotion: Presentation and advertising of companies operating in the Technopark.

- International Relations: Building relationships with foreign investors, international businesses and technology companies.

- Conferences and Exhibitions: Promoting innovation by organizing events, conferences and exhibitions in the Technopark.

8. Environment and Sustainability

- Green Technologies: Implementation of environmentally sustainable solutions for the Technopark's energy supply, water and waste management.

- Energy Efficiency: Use of technologies that increase the energy efficiency of buildings.

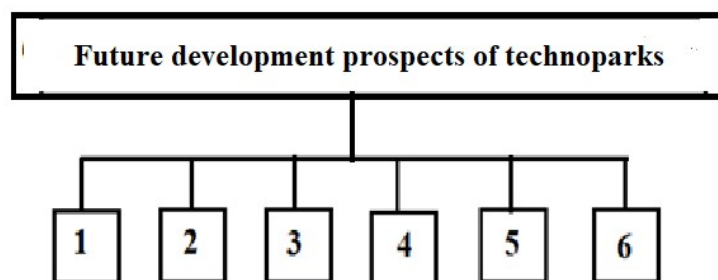
9. Monitoring and Evaluation

- Performance Indicators: Continuous monitoring and evaluation of the technopark's performance (e.g., new jobs created, patents acquired, or revenue growth).

- Feedback: Improving the technopark's performance by collecting feedback from companies and customers

Future development prospects of technoparks

A number of global technological and social trends will shape the development of technology parks in the coming years. These trends will affect both the structure of technology parks and their role in the economy and innovation ecosystem. Let's consider the main factors that may have a significant impact on the development of technology parks in the future.



1. Artificial Intelligence AI

Application of artificial intelligence in business and startups: Artificial intelligence is already actively used in various fields, from healthcare to finance and manufacturing. More startups will appear in technoparks that will develop and implement solutions based on artificial intelligence. These solutions can significantly increase efficiency and productivity in both startups and large companies.

Development of AI labs and research centers: Dedicated labs and research groups will be established in technoparks to develop and test new AI solutions. It can also help create new AI-powered products and services.

Education and training of AI professionals: Creating educational programs focused on training AI professionals will be an important part. Technology parks can collaborate with universities to train the workforce that will create the future of AI.

2. Green technologies (ecological innovations)

Sustainable development and energy efficiency: In the context of climate change and the need to save resources, interest in green technologies such as renewable energy, waste recycling and energy efficiency is growing. Technoparks will actively support startups working in these areas, offering them the necessary resources, research and business incubation.

Clean technologies and green startups: Technology parks will serve as centers for the development and application of technologies aimed at reducing carbon emissions, improving water management, and developing environmentally friendly products and services.

Support for environmental initiatives: Innovative companies that develop new waste disposal methods and technologies to reduce environmental impact can receive assistance from technoparks in the form of funding, laboratories, and scientific research.

3. Digitalization and automation Internet of Things (IoT):

The development of IoT technologies will lead to the creation of smart cities, smart homes, and intelligent systems in various industries. Technoparks will focus on developing solutions to improve everyday life through the integration of smart devices.

Process automation and robotization: The trend of implementing robotic solutions for business, including automation of production, management and other processes, will strengthen in technoparks. Startups developing robots and automated systems will be able to obtain the necessary resources in technoparks for testing and implementing new technologies.

Development of big data and analytics: Big data analytics startups will play a significant role by developing systems to process and analyze large amounts of data in real time.

4. Blockchain and cryptocurrencies

Financial Technology (FinTech) Development: Technology parks will play a key role in supporting innovative startups in blockchain, cryptocurrencies, and decentralized finance (DeFi). These technologies have the potential to revolutionize the financial sector and change the way we interact with money and assets.

Decentralized applications: Technology parks will also appear where new startups will develop decentralized applications (dApps) based on blockchain. These applications can have an impact on various sectors such as healthcare, law, logistics, etc.

Integration with traditional business models: Blockchain will increasingly integrate into traditional business processes, ensuring transparency and security of transactions, as well as reducing operational costs. Technology parks will provide platforms for the development of such solutions.

5. Cybersecurity

Increasing number of cyberattacks: In the context of global digitalization and increasing dependence on technology, cyber threats are becoming increasingly relevant. Technology parks will support startups developing new solutions for internet security and data protection.

Innovations in the field of cyber defense: Companies developing new methods of information protection, such as encryption, biometrics and artificial intelligence, to combat cyber threats will actively develop within technoparks.

6. Social and cultural changes

Flexible workplaces and remote working: The trend towards flexible working conditions and remote working will encourage the creation of workplaces in technology parks that will allow startups and companies to work remotely. Technology parks will develop co-working spaces, providing startups with access to infrastructure and resources without the need to rent an office.

Culture of Inclusivity and Diversity: In the future, technology parks will foster an inclusive and diverse work environment by providing equal opportunities for all professionals and supporting initiatives to improve corporate culture.

Collective development and sustainable leadership: The development of new forms of governance and leadership in technoparks, including support for collective initiatives, openness to cooperation, and social responsibility, will be an important aspect.

Conclusion

To create a successful technopark, it is necessary to ensure balanced development of infrastructure, support for startups, active cooperation with scientific and research institutions, and access to financing. All these elements interact with each other and create conditions for the growth of innovative companies, which in turn contributes to economic development and technological breakthroughs.

The successful establishment and development of technology parks requires a strong partnership between the public and private sectors. State initiatives in the form of subsidies, tax breaks, and innovation support programs play an important role in providing startups with the necessary resources. In turn, private companies and investors provide technology parks with capital, infrastructure, and expert support, which contributes to the creation of innovation ecosystems and the growth of new technologies. The joint work of these sectors contributes to the creation of successful technology parks, which become the basis of economic growth and technological progress.

Attracting and retaining talent is a complex process that requires attention to creating a positive work environment, career advancement, and professional development opportunities. Strategies aimed at developing a corporate culture, ensuring competitive working conditions, and maintaining high educational standards and mentorship help

technology parks attract and retain highly qualified specialists, which in turn contributes to the innovative development and success of technology parks.

Examples of successful technology parks around the world show that critical elements such as support for startups, collaboration with universities, access to venture capital, and international partnerships contribute to the creation of strong and sustainable innovation ecosystems.

In the coming years, the development of technoparks will be closely linked to global technological and social trends. Artificial intelligence, green technologies, blockchain, cybersecurity, as well as social change and digitalization will be the main factors determining the future of technoparks. Successful technoparks will be able to integrate these trends into their ecosystems and create favorable conditions for innovations, startups and technological progress.

REFERENCES

1. Foster, J., & Kaplan, S. (2001). *Building the Innovation Economy: The Role of Technology Parks in Technology-Based Economic Development*. Oxford University Press.
2. Müller, E., & Harhoff, D. (2004). *Innovation and Entrepreneurship in Technological Parks*. Cambridge University Press.
3. Ratti, C., & Biderman, A. (2011). *Urban Innovation and Sustainability in Technological Parks: New Frontiers in Research and Development*. Springer.
4. Markes, L., & Evans, S. (2022). The Future of Technological Parks: Innovation Ecosystems in a Post-Pandemic World. *Journal of Technology Transfer*, 47(5), 1012-1028.
5. Thornhill, S., & Gellatly, I. R. (2017). Technological Parks and Knowledge Transfer: A Comparative Study of Silicon Valley and European Technological Hubs. *Technological Forecasting and Social Change*, 116, 24-35.
6. Lichtenberg, A., & Becker, T. (2020). Green Technologies and Sustainability in Technology Parks: Emerging Trends and Opportunities. *Renewable and Sustainable Energy Reviews*, 122, 235-245.
7. ACM Digital Library (2023). *Technological Hubs and Innovation Clusters: Proceedings of the International Conference on Technology Parks and Innovation*. <https://dl.acm.org/>
8. Cavanshir Zeynalov, Sariya Gasimova (2024). The role of Technoparks in Education. *International Scientific Research Congress, İstanbul*, 350-354

Applications of Generalized Pell Sequences on Matrices

*Genelleştirilmiş Pell Dizilerinin Matrisler Üzerine Uygulamaları**

Barış Can ÇAKIR
PhD Student, Gazi University

Abstract

Number sequences and matrices have been the focus of attention of mathematicians since ancient times. In this paper, Pell number sequences were studied with the help of matrices. This study started with the iteration correlations and Binet formulas of Pell, Pell Lucas and modified Pell number sequences. Then Pell (K), Pell Lucas (L), and modified Pell (M) matrices which are generated with the terms of these number sequences has been defined with 2×2 size. Then the powers of Pell (K) matrices of order n has been produced. Afterward, the iterative correlations and Binet formulas of generalized k -Pell, number sequences has been mentioned. $n \times n$ sized K_n matrice which is generating form of Pell (K) matrix and $n \times n$ sized B_n matrices which are generating matrices of k -Pell number sequences introduced. Some applications with these generating matrices has been made and found relations of these generating matrices with K_n matrix. Also the terms of this number sequences calculated with the aid of the definitions and generating matrices of k -Pell number sequences.

Keywords: Pell, k -Pell, Number Sequence, Matrice.

Özet

Matematikçiler, eski zamanlardan beri sayı dizileri ve matrislerle ilgilenmişlerdir. Bu çalışmada, Pell sayı dizileri matrislerin yardımıyla incelenmiştir. Çalışma, Pell, Pell Lucas ve modifiye Pell sayı dizilerinin iterasyon ilişkileri ve Binet formülleriyle başlamıştır. Ardından, bu sayı dizilerinin terimleriyle oluşturulan 2×2 boyutundaki Pell (K), Pell Lucas (L) ve modifiye Pell (M) matrisleri tanımlanmıştır. Daha sonra, n mertebesindeki Pell (K) matrislerinin kuvvetleri üretilmiştir. Ayrıca, genelleştirilmiş k -Pell sayı dizilerinin iterasyon ilişkileri ve Binet formülleri belirtilmiştir. $n \times n$ boyutunda Pell (K) matrisinden türetilmiş olan K_n matrisi ve k -Pell sayı dizilerini üreten $n \times n$ boyutundaki B_n matrisleri tanıtılmıştır. Bu üreteç matrisleriyle bazı uygulamalar yapılmış ve bu matrislerin K_n matrisi ile ilişkileri bulunmuştur. Ayrıca, bu sayı dizilerinin terimleri, k -Pell sayı dizilerinin tanımları ve üreten matrisler yardımıyla hesaplanmıştır.

Anahtar Kelimeler: Pell, k -Pell, sayı dizisi, matris.

* Bu çalışma yazar tarafından Gaziantep Üniversitesi Fen Bilimleri Enstitüsünde hazırlanan "Genelleştirilmiş pell, pell lucas ve modifiye pell sayı dizilerinin matrisler üzerindeki uygulamaları" başlıklı yüksek lisans tezinden üretilmiştir.

1. INTRODUCTION

Pell $\{P_n\}$, Pell Lucas $\{Q_n\}$, modified Pell $\{q_n\}$ sequences are defined respectively with the initial conditions $P_0 = 0, P_1 = 1, Q_0 = 2, Q_1 = 2, q_0 = 1, q_1 = 1$ and by the following recurrence relations respectively for $n \geq 1$

$$P_{n+1} = 2P_n + P_{n-1}, \quad Q_{n+1} = 2Q_n + Q_{n-1}, \quad q_{n+1} = 2q_n + q_{n-1}$$

(Bicknell, 1975: 345-349).

Binet formulas for Pell $\{P_n\}$, Pell Lucas $\{Q_n\}$, modified Pell $\{q_n\}$ sequences are given respectively in the forms of

$$P_n = \frac{\alpha^n - \beta^n}{\alpha - \beta}, \quad Q_n = \alpha^n + \beta^n, \quad q_n = \frac{\alpha^n + \beta^n}{2}$$

where

$$\alpha = 1 + \sqrt{2}, \quad \beta = 1 - \sqrt{2}.$$

Pell, Pell Lucas and modified Pell number sequences with negative indices are defined with

$$P_{-n} = (-1)^{n+1}P_n, \quad Q_{-n} = (-1)^nQ_n, \quad q_{-n} = (-1)^nq_n$$

(Horadam, 1971: 245-242) (Horadam and Mahon, 1985: 7-20) (Catarino and Vasco, 2013: 6031-3037).

2. k -PELL, k -PELL LUCAS AND MODIFIED k -PELL NUMBERS

2.1 Basic Properties of k -Pell, k -Pell Lucas and Modified k -Pell Numbers

Definition 2.1.1 k -Pell $\{P_{k,n}\}_{n \in \mathbb{N}}$, k -Pell Lucas $\{Q_{k,n}\}_{n \in \mathbb{N}}$ and modified k -Pell $\{q_{k,n}\}_{n \in \mathbb{N}}$ sequences are defined by the following recurrence relations respectively for $n \geq 1$:

$$\begin{aligned} P_{k,n+1} &= 2P_{k,n} + kP_{k,n-1}, & P_{k,0} &= 0, & P_{k,1} &= 1, \\ Q_{k,n+1} &= 2Q_{k,n} + kQ_{k,n-1}, & Q_{k,0} &= 2, & Q_{k,1} &= 2, \\ q_{k,n+1} &= 2q_{k,n} + kq_{k,n-1}, & q_{k,0} &= 1, & q_{k,1} &= 1. \end{aligned}$$

Definition 2.1.2 Binet formulas for k -Pell, k -Pell Lucas and modified k -Pell sequences are given respectively in the following:

$$P_{k,n} = \frac{\alpha^n - \beta^n}{\alpha - \beta}, \quad Q_{k,n} = \alpha^n + \beta^n, \quad q_n = \frac{\alpha^n + \beta^n}{2}$$

where

$$\alpha = 1 + \sqrt{1+k}, \quad \beta = 1 - \sqrt{1+k}.$$

(Catarino and Vasco, 2013: 1877-1884).

2.2 Pell K , Pell Lucas L and Modified Pell M Matrices

Pell K , Pell Lucas L and modified Pell M matrices are demonstrated by the following 2×2 matrices as

$$K = \begin{bmatrix} P_2 & P_1 \\ P_1 & P_0 \end{bmatrix} = \begin{bmatrix} 2 & 1 \\ 1 & 0 \end{bmatrix},$$

$$L = \begin{bmatrix} Q_2 & Q_1 \\ Q_1 & Q_0 \end{bmatrix} = \begin{bmatrix} 6 & 2 \\ 2 & 2 \end{bmatrix},$$

$$M = \begin{bmatrix} q_2 & q_1 \\ q_1 & q_0 \end{bmatrix} = \begin{bmatrix} 3 & 1 \\ 1 & 1 \end{bmatrix}.$$

Now, there are some properties of K , L ve M matrices and their determinants.

Theorem 2.2.1 If $K = \begin{bmatrix} 2 & 1 \\ 1 & 0 \end{bmatrix}$ for every integer n , then the n th power of the matrix is

$$K^n = \begin{bmatrix} P_{n+1} & P_n \\ P_n & P_{n-1} \end{bmatrix}$$

(Bicknell, 1975: 345-349).

Lemma 2.2.1 If $L = \begin{bmatrix} 6 & 2 \\ 2 & 2 \end{bmatrix}$ for every integer n , then the n th power of the matrix L is

$$L^n = \begin{cases} 8^k \begin{bmatrix} Q_{n+1} & Q_n \\ Q_n & Q_{n-1} \end{bmatrix}, |n| = 2k + 1 \text{ and } k \geq 0 \\ 8^k \begin{bmatrix} P_{n+1} & P_n \\ P_n & P_{n-1} \end{bmatrix}, |n| = 2k \text{ and } k \geq 0 \end{cases}$$

(Daşdemir, 2011: 3173-3181).

Proof. The proof is made by induction method.

Assume that firstly $|n| = 2k + 1$ and $k \geq 0$. When $n = 1$ the assertion is satisfied that $k = 0$ and

$$L = 8^k \begin{bmatrix} Q_{n+1} & Q_n \\ Q_n & Q_{n-1} \end{bmatrix} = 8^0 \begin{bmatrix} Q_2 & Q_1 \\ Q_1 & Q_0 \end{bmatrix} = \begin{bmatrix} 6 & 2 \\ 2 & 2 \end{bmatrix}.$$

Assume that it is true for $n = 2k - 1$. So $k = \frac{n+1}{2}$ and we obtain

$$L^n = 8^{\frac{n+1}{2}} \begin{bmatrix} Q_{n+1} & Q_n \\ Q_n & Q_{n-1} \end{bmatrix}.$$

Based on our assumption, we get

$$\begin{aligned} L^{2k-1}L^2 &= 8^{\frac{n+1}{2}} \begin{bmatrix} Q_{n+1} & Q_n \\ Q_n & Q_{n-1} \end{bmatrix} \begin{bmatrix} 6 & 2 \\ 2 & 2 \end{bmatrix}^2 \\ &= 8^{\frac{n+1}{2}} \begin{bmatrix} Q_{n+1} & Q_n \\ Q_n & Q_{n-1} \end{bmatrix} \begin{bmatrix} 40 & 16 \\ 16 & 8 \end{bmatrix} \\ &= 8^{\frac{n+3}{2}} \begin{bmatrix} Q_{n+1} & Q_n \\ Q_n & Q_{n-1} \end{bmatrix} \begin{bmatrix} 5 & 2 \\ 2 & 1 \end{bmatrix} \\ &= 8^{\frac{n+3}{2}} \begin{bmatrix} 5Q_{n+1} + 2Q_n & 2Q_{n+1} + Q_n \\ 5Q_n + 2Q_{n-1} & 2Q_n + Q_{n-1} \end{bmatrix} \\ &= 8^{\frac{n+3}{2}} \begin{bmatrix} 2Q_{n+2} + Q_{n+1} & 2Q_{n+1} + Q_n \\ 2Q_{n+1} + Q_n & 2Q_n + Q_{n-1} \end{bmatrix} \\ &= 8^{\frac{n+3}{2}} \begin{bmatrix} Q_{n+3} & Q_{n+2} \\ Q_{n+2} & Q_{n+1} \end{bmatrix} \\ &= 8^{\frac{2k+1+3}{2}} \begin{bmatrix} Q_{n+3} & Q_{n+2} \\ Q_{n+2} & Q_{n+1} \end{bmatrix} \\ &= 8^{k+2} \begin{bmatrix} Q_{n+3} & Q_{n+2} \\ Q_{n+2} & Q_{n+1} \end{bmatrix}. \end{aligned}$$

Secondly let $|n| = 2k$ and $k \geq 0$. $k = 1$ is for $n = 2$. Then

$$L^2 = 8^1 \begin{bmatrix} P_3 & P_2 \\ P_2 & P_1 \end{bmatrix} = 8 \begin{bmatrix} 5 & 2 \\ 2 & 1 \end{bmatrix} = \begin{bmatrix} 40 & 16 \\ 16 & 8 \end{bmatrix}$$

and

$$L^2 = LL = \begin{bmatrix} 6 & 2 \\ 2 & 2 \end{bmatrix} \begin{bmatrix} 6 & 2 \\ 2 & 2 \end{bmatrix} = \begin{bmatrix} 40 & 16 \\ 16 & 8 \end{bmatrix}$$

are obtained. Let's assume that

$$L^n = 8^k \begin{bmatrix} P_{n+1} & P_n \\ P_n & P_{n-1} \end{bmatrix}$$

is true for $n = 2k$. Then we get

$$\begin{aligned} L^{n+1} &= L^{2k+2} = L^{2k}L^2 = 8^k \begin{bmatrix} P_{n+1} & P_n \\ P_n & P_{n-1} \end{bmatrix} \begin{bmatrix} 40 & 16 \\ 16 & 8 \end{bmatrix} \\ &= 8^k \begin{bmatrix} P_{n+1} & P_n \\ P_n & P_{n-1} \end{bmatrix} 8 \begin{bmatrix} 5 & 2 \\ 2 & 1 \end{bmatrix} \\ &= 8^{k+1} \begin{bmatrix} 5P_{n+1} + 2P_n & 2P_{n+1} + P_n \\ 5P_n + 2P_{n-1} & 2P_n + P_{n-1} \end{bmatrix} \\ &= 8^{k+1} \begin{bmatrix} P_{n+3} & P_{n+2} \\ P_{n+2} & P_{n+1} \end{bmatrix} \end{aligned}$$

The assertion is satisfied for $n = 2k + 2$. So the proof is completed.

Lemma 2.2.2 If $M = \begin{bmatrix} 3 & 1 \\ 1 & 1 \end{bmatrix}$ for every integer n , then the n th power of the matrix M is

$$M^n = \begin{cases} 2^k \begin{bmatrix} q_{n+1} & q_n \\ q_n & q_{n-1} \end{bmatrix}, |n| = 2k + 1 \text{ ve } k \geq 0 \\ 2^k \begin{bmatrix} P_{n+1} & P_n \\ P_n & P_{n-1} \end{bmatrix}, |n| = 2k \text{ ve } k \geq 0 \end{cases}$$

(Daşdemir, 2011: 3173-3181).

Proof. The proof is made by induction method as the previous Lemma 2.2.1.

3. GENERALIZED PELL NUMBER SEQUENCES

3.1 Generalized k -Pell Number Sequences

k -Pell number sequences are defined with the following initial conditions and the recurrence relation based on Pell number sequence:

$$P_{1,k} = P_{2,k} = \dots = P_{k,k} = 1, \quad P_{n,k} = 2P_{n-1,k} + P_{n-k-1,k}$$

(Catarino and Vasco, 2013: 1877-1884).

The iteration formula produces number sequences. When $n \leq 0$ and $k > 0$, negative indexed k -Pell numbers can be written with the same iteration formula as the following.

$$P_{0,k}, P_{-1,k}, P_{-2,k}, \dots, P_{-k,k}, \dots, P_{-2k+1,k}, \dots$$

This initial conditions are used also below in this context.

$$P_{0,k} = 0, \quad P_{-1,k} = P_{-2,k} = \dots = P_{-k-1,k} = 1$$

Corollary 3.1.1 Following equation can be got by considering the initial conditions of k -Pell number sequences and linear recurrence formulas.

$$P_{n,k} = P_{n+1,k+1}$$

3.1.1 Some Properties of Pell K Matrix

It's found by using Pell K matrix and recurrence relation of Pell numbers that

$$\begin{aligned} K^n &= \begin{bmatrix} P_{n+1} & P_n \\ P_n & P_{n-1} \end{bmatrix} = \begin{bmatrix} 2P_n + P_{n-1} & 2P_{n-1} + P_{n-2} \\ 2P_{n-1} + P_{n-2} & 2P_{n-2} + P_{n-3} \end{bmatrix} \\ &= \begin{bmatrix} 2P_{n+1} & 2P_n \\ 2P_n & 2P_{n-1} \end{bmatrix} + \begin{bmatrix} P_{n-1} & P_{n-2} \\ P_{n-2} & P_{n-3} \end{bmatrix} \\ &= 2 \begin{bmatrix} P_{n+1} & P_n \\ P_n & P_{n-1} \end{bmatrix} + \begin{bmatrix} P_{n-1} & P_{n-2} \\ P_{n-2} & P_{n-3} \end{bmatrix} \\ &= 2K^{n-1} + K^{n-2}. \end{aligned}$$

and

$$K^{n-2} = K^n - 2K^{n-1}.$$

is achieved.

K^n and K^{-n} which are the inverses of K^n is obtained by using above formula and equation

$$P_{-n} = (-1)^{n+1}P_n$$

(Horadam and Mahon, 1985: 7-20).

Table 3.1.1 Pell K Matrices

n	0	1	2	3	4	5	...
K^n	$\begin{bmatrix} 1 & 0 \\ 0 & 1 \end{bmatrix}$	$\begin{bmatrix} 2 & 1 \\ 1 & 0 \end{bmatrix}$	$\begin{bmatrix} 5 & 2 \\ 2 & 1 \end{bmatrix}$	$\begin{bmatrix} 12 & 5 \\ 5 & 2 \end{bmatrix}$	$\begin{bmatrix} 29 & 12 \\ 12 & 5 \end{bmatrix}$	$\begin{bmatrix} 70 & 29 \\ 29 & 12 \end{bmatrix}$...
K^{-n}	$\begin{bmatrix} 1 & 0 \\ 0 & 1 \end{bmatrix}$	$\begin{bmatrix} 0 & 1 \\ 1 & -2 \end{bmatrix}$	$\begin{bmatrix} 1 & -2 \\ -2 & 5 \end{bmatrix}$	$\begin{bmatrix} -2 & 5 \\ 5 & -12 \end{bmatrix}$	$\begin{bmatrix} 5 & -12 \\ -12 & 29 \end{bmatrix}$	$\begin{bmatrix} -12 & 29 \\ 29 & -70 \end{bmatrix}$...

As it appears from the table, it is acceptable for K^{-n} that

$$K^{-n} = \begin{cases} \begin{bmatrix} -P_{n-1} & P_n \\ P_n & -P_{n+1} \end{bmatrix}, n \text{ is odd} \\ \begin{bmatrix} P_{n-1} & -P_n \\ -P_n & +P_{n+1} \end{bmatrix}, n \text{ is even.} \end{cases}$$

Corollary 3.1.2 The following equation is true for every integer k .

$$K^n = P_k K^{n-k+1} + P_{k-1} K^{n-k}$$

Proof. We obtain the result as

$$\begin{aligned} K^n &= 2K^{n-1} + K^{n-2} = P_2 K^{n-1} + P_1 K^{n-2} \\ &= 2(2K^{n-2} + K^{n-3}) + K^{n-2} \\ &= 5K^{n-2} + 2K^{n-3} = P_3 K^{n-2} + P_1 K^{n-3} \\ &= 5(2K^{n-3} + K^{n-4}) + 2K^{n-3} \\ &= 12K^{n-3} + 5K^{n-4} = P_4 K^{n-3} + P_3 K^{n-4} \\ &= 12(2K^{n-4} + K^{n-5}) + 5K^{n-4} \\ &= 29K^{n-4} + 12K^{n-5} = P_5 K^{n-4} + P_4 K^{n-5} \\ &= \dots \end{aligned}$$

So

$$K^n = P_k K^{n-k+1} + P_{k-1} K^{n-k}$$

is obtained for any integer k and the assertion is hold.

3.1.2 Generating Matrix For k -Pell Numbers

Definition 3.1.1 Let's define $k \times k$ sized A_k matrix formed as

$$A_k = \begin{bmatrix} 2 & 1 & 0 & 0 & \cdots & 0 & 0 & 0 \\ 1 & 0 & 0 & 0 & \cdots & 0 & 0 & 0 \\ 0 & 1 & 0 & 0 & \cdots & 0 & 0 & 0 \\ 0 & 0 & 1 & 0 & \cdots & 0 & 0 & 0 \\ \vdots & \vdots & \vdots & \vdots & \ddots & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & \cdots & \vdots & \vdots & \vdots \\ 0 & 0 & 0 & 0 & \cdots & 1 & 0 & 0 \\ 0 & 0 & 0 & 0 & \cdots & 0 & 1 & 0 \end{bmatrix}.$$

When the power of the A_k is taken greater than 2, it's noticed that the terms of first two columns of the matrix alter depending the power. They are k -Pell numbers. Their indices vary by the same amount as the power of the matrix varies.

Theorem 3.1.1 n th power of A_k for $n \geq k > 2$ is like the equivalent below.

$$A_k^n = \begin{bmatrix} P_{k+n,k} & P_{k+n-1,k} & 0 & 0 & \cdots & 0 & 0 & 0 \\ P_{k+n-1,k} & P_{k+n-2,k} & 0 & 0 & \cdots & 0 & 0 & 0 \\ P_{k+n-2,k} & P_{k+n-3,k} & 0 & 0 & \cdots & 0 & 0 & 0 \\ P_{k+n-3,k} & P_{k+n-4,k} & 1 & 0 & \cdots & 0 & 0 & 0 \\ \vdots & \vdots & \vdots & \vdots & \ddots & 0 & 0 & 0 \\ P_{n+3,k} & P_{n+2,k} & 0 & 0 & \cdots & \vdots & \vdots & \vdots \\ P_{n+2,k} & P_{n+1,k} & 0 & 0 & \cdots & 0 & 0 & 0 \\ P_{n+1,k} & P_{n,k} & 0 & 0 & \cdots & 0 & 0 & 0 \end{bmatrix}.$$

Proof. First, investigate for $k = 3$.

When $n = 3$,

$$A_3^3 = \begin{bmatrix} 2 & 1 & 0 \\ 1 & 0 & 0 \\ 0 & 1 & 0 \end{bmatrix}^3 = \begin{bmatrix} 12 & 5 & 0 \\ 5 & 2 & 0 \\ 2 & 1 & 0 \end{bmatrix} = \begin{bmatrix} P_{6,3} & P_{5,3} & 0 \\ P_{5,3} & P_{4,3} & 0 \\ P_{4,3} & P_{3,3} & 0 \end{bmatrix}.$$

is hold.

So, the assertion is satisfied. Let's examine for $n = t + 1$ assuming the equivalent is provided for $n = t$.

$$\begin{aligned} A_k^{t+1} &= A_k^t A_k = \begin{bmatrix} P_{k+t,k} & P_{k+t-1,k} & 0 \\ P_{k+t-1,k} & P_{k+t-2,k} & 0 \\ P_{k+t-2,k} & P_{k+t-3,k} & 0 \end{bmatrix} \begin{bmatrix} 2 & 1 & 0 \\ 1 & 0 & 0 \\ 0 & 1 & 0 \end{bmatrix} \\ &= \begin{bmatrix} 2P_{k+t,k} + P_{k+t-1,k} & P_{k+t,k} & 0 \\ 2P_{k+t-1,k} + P_{k+t-2,k} & P_{k+t-1,k} & 0 \\ 2P_{k+t-2,k} + P_{k+t-3,k} & P_{k+t-2,k} & 0 \end{bmatrix} \\ &= \begin{bmatrix} P_{k+t+1,k} & P_{k+t,k} & 0 \\ P_{k+t,k} & P_{k+t-1,k} & 0 \\ P_{k+t-1,k} & P_{k+t-2,k} & 0 \end{bmatrix}. \end{aligned}$$

So the assertion is satisfied for $k = 3$.

Examine $k = l + 1$ case assuming the equivalent is true for $k = l$ so

$$A_l^n = \begin{bmatrix} P_{l+n,l} & P_{l+n-1,l} & 0 & 0 & \cdots & 0 & 0 & 0 \\ P_{l+n-1,l} & P_{l+n-2,l} & 0 & 0 & \cdots & 0 & 0 & 0 \\ P_{l+n-2,l} & P_{l+n-3,l} & 0 & 0 & \cdots & 0 & 0 & 0 \\ P_{l+n-3,l} & P_{l+n-4,l} & 0 & 0 & \cdots & 0 & 0 & 0 \\ \vdots & \vdots & \vdots & \vdots & \ddots & 0 & 0 & 0 \\ P_{n+3,l} & P_{n+2,l} & 0 & 0 & \cdots & \vdots & \vdots & \vdots \\ P_{n+2,l} & P_{n+1,l} & 0 & 0 & \cdots & 0 & 0 & 0 \\ P_{n+1,l} & P_{n,l} & 0 & 0 & \cdots & 0 & 0 & 0 \end{bmatrix}$$

Following equation is obtained by assuming the assertion is satisfied for $n = t \geq l + 1$.

$$A_{l+1}^t = \begin{bmatrix} P_{l+1+t,l+1} & P_{l+1+t-1,l+1} & 0 & 0 & \cdots & 0 & 0 & 0 \\ P_{l+1+t-1,l+1} & P_{l+1+t-2,l+1} & 0 & 0 & \cdots & 0 & 0 & 0 \\ P_{l+1+t-2,l+1} & P_{l+1+t-3,l+1} & 0 & 0 & \cdots & 0 & 0 & 0 \\ P_{l+1+t-3,l+1} & P_{l+1+t-4,l+1} & 0 & 0 & \cdots & 0 & 0 & 0 \\ \vdots & \vdots & \vdots & \vdots & \ddots & 0 & 0 & 0 \\ P_{t+3,l+1} & P_{t+2,l+1} & 0 & 0 & \cdots & \vdots & \vdots & \vdots \\ P_{t+2,l+1} & P_{t+1,l+1} & 0 & 0 & \cdots & 0 & 0 & 0 \\ P_{t+1,l+1} & P_{t,l+1} & 0 & 0 & \cdots & 0 & 0 & 0 \end{bmatrix}$$

Now let's examine equivalent for $n = t + 1$.

$$A_{l+1}^{t+1} = A_{l+1}^t A_{l+1}$$

$$= \begin{bmatrix} P_{l+1+t,l+1} & P_{l+1+t-1,l+1} & 0 & 0 & \cdots & 0 & 0 & 0 \\ P_{l+1+t-1,l+1} & P_{l+1+t-2,l+1} & 0 & 0 & \cdots & 0 & 0 & 0 \\ P_{l+1+t-2,l+1} & P_{l+1+t-3,l+1} & 0 & 0 & \cdots & 0 & 0 & 0 \\ P_{l+1+t-3,l+1} & P_{l+1+t-4,l+1} & 0 & 0 & \cdots & 0 & 0 & 0 \\ \vdots & \vdots & \vdots & \vdots & \ddots & 0 & 0 & 0 \\ P_{t+3,l+1} & P_{t+2,l+1} & 0 & 0 & \cdots & \vdots & \vdots & \vdots \\ P_{t+2,l+1} & P_{t+1,l+1} & 0 & 0 & \cdots & 0 & 0 & 0 \\ P_{t+1,l+1} & P_{t,l+1} & 0 & 0 & \cdots & 0 & 0 & 0 \end{bmatrix} \begin{bmatrix} 2 & 1 & 0 & 0 & \cdots & 0 & 0 & 0 \\ 1 & 0 & 0 & 0 & \cdots & 0 & 0 & 0 \\ 0 & 1 & 0 & 0 & \cdots & 0 & 0 & 0 \\ 0 & 0 & 1 & 0 & \cdots & 0 & 0 & 0 \\ \vdots & \vdots & \vdots & \vdots & \ddots & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & \cdots & \vdots & \vdots & \vdots \\ 0 & 0 & 0 & 0 & \cdots & 1 & 0 & 0 \\ 0 & 0 & 0 & 0 & \cdots & 0 & 1 & 0 \end{bmatrix}$$

$$= \begin{bmatrix} 2P_{l+1+t,l+1} + P_{l+1+t-1,l+1} & P_{l+1+t,l+1} & 0 & 0 & \cdots & 0 & 0 & 0 \\ 2P_{l+1+t-1,l+1} + P_{l+1+t-2,l+1} & P_{l+1+t-1,l+1} & 0 & 0 & \cdots & 0 & 0 & 0 \\ 2P_{l+1+t-2,l+1} + P_{l+1+t-3,l+1} & P_{l+1+t-2,l+1} & 0 & 0 & \cdots & 0 & 0 & 0 \\ 2P_{l+1+t-3,l+1} + P_{l+1+t-4,l+1} & P_{l+1+t-3,l+1} & 0 & 0 & \cdots & 0 & 0 & 0 \\ \vdots & \vdots & \vdots & \vdots & \ddots & 0 & 0 & 0 \\ 2P_{t+3,l+1} + P_{t+2,l+1} & P_{t+3,l+1} & 0 & 0 & \cdots & \vdots & \vdots & \vdots \\ 2P_{t+2,l+1} + P_{t+1,l+1} & P_{t+2,l+1} & 0 & 0 & \cdots & 0 & 0 & 0 \\ 2P_{t+1,l+1} + P_{t,l+1} & P_{t+1,l+1} & 0 & 0 & \cdots & 0 & 0 & 0 \end{bmatrix}$$

$$= \begin{bmatrix} P_{l+1+t+1,l+1} & P_{l+1+t,l+1} & 0 & 0 & \cdots & 0 & 0 & 0 \\ P_{l+1+t,l+1} & P_{l+1+t-1,l+1} & 0 & 0 & \cdots & 0 & 0 & 0 \\ P_{l+1+t-1,l+1} & P_{l+1+t-2,l+1} & 0 & 0 & \cdots & 0 & 0 & 0 \\ P_{l+1+t-2,l+1} & P_{l+1+t-3,l+1} & 0 & 0 & \cdots & 0 & 0 & 0 \\ \vdots & \vdots & \vdots & \vdots & \ddots & 0 & 0 & 0 \\ P_{t+4,l+1} & P_{t+3,l+1} & 0 & 0 & \cdots & \vdots & \vdots & \vdots \\ P_{t+3,l+1} & P_{t+2,l+1} & 0 & 0 & \cdots & 0 & 0 & 0 \\ P_{t+2,l+1} & P_{t+1,l+1} & 0 & 0 & \cdots & 0 & 0 & 0 \end{bmatrix}$$

$$= \begin{bmatrix} P_{l+t+2,l+1} & P_{l+t+1,l+1} & 0 & 0 & \cdots & 0 & 0 & 0 \\ P_{l+t+1,l+1} & P_{l+t,l+1} & 0 & 0 & \cdots & 0 & 0 & 0 \\ P_{l+t,l+1} & P_{l+t-1,l+1} & 0 & 0 & \cdots & 0 & 0 & 0 \\ P_{l+t-1,l+1} & P_{l+1+t-2,l+1} & 0 & 0 & \cdots & 0 & 0 & 0 \\ \vdots & \vdots & \vdots & \vdots & \ddots & 0 & 0 & 0 \\ P_{t+4,l+1} & P_{t+3,l+1} & 0 & 0 & \cdots & \vdots & \vdots & \vdots \\ P_{t+3,l+1} & P_{t+2,l+1} & 0 & 0 & \cdots & 0 & 0 & 0 \\ P_{t+2,l+1} & P_{t+1,l+1} & 0 & 0 & \cdots & 0 & 0 & 0 \end{bmatrix}$$

is obtained and the proof is completed.

Corollary 3.1.3 The following equation can be reached based on the definition of $k \times k$ matrix A_k .

$$\begin{bmatrix} 2 & 1 & 0 & 0 & \cdots & 0 & 0 & 0 \\ 1 & 0 & 0 & 0 & \cdots & 0 & 0 & 0 \\ 0 & 1 & 0 & 0 & \cdots & 0 & 0 & 0 \\ 0 & 0 & 1 & 0 & \cdots & 0 & 0 & 0 \\ \vdots & \vdots & \vdots & \vdots & \ddots & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & \cdots & \vdots & \vdots & \vdots \\ 0 & 0 & 0 & 0 & \cdots & 1 & 0 & 0 \\ 0 & 0 & 0 & 0 & \cdots & 0 & 1 & 0 \end{bmatrix} \begin{bmatrix} P_{k+n,k} \\ P_{k+n-1,k} \\ P_{k+n-2,k} \\ P_{k+n-3,k} \\ \vdots \\ P_{n+3,k} \\ P_{n+2,k} \\ P_{n+1,k} \end{bmatrix} = \begin{bmatrix} P_{k+n+1,k} \\ P_{k+n,k} \\ P_{k+n-1,k} \\ P_{k+n-2,k} \\ \vdots \\ P_{n+4,k} \\ P_{n+3,k} \\ P_{n+2,k} \end{bmatrix}.$$

The proof can be seen in the proof of Theorem 3.1.1.

Now let's define a $k \times k$ sized B_n matrix

$$B_n = \begin{bmatrix} P_{k+n,k} & P_{k+n-1,k} & \cdots & P_{n+1,k} \\ P_{k+n-1,k} & P_{k+n-2,k} & \cdots & P_{n,k} \\ P_{k+n-2,k} & P_{k+n-3,k} & \cdots & P_{n-1,k} \\ P_{k+n-3,k} & P_{k+n-4,k} & \cdots & P_{n-2,k} \\ \vdots & \vdots & \ddots & \vdots \\ P_{n+3,k} & P_{n+2,k} & \cdots & P_{n-k+4,k} \\ P_{n+2,k} & P_{n+1,k} & \cdots & P_{n-k+3,k} \\ P_{n+1,k} & P_{n,k} & \cdots & P_{n-k+2,k} \end{bmatrix}$$

In this case the following equality is obtained by using Corollary 3.1.2.

$$A_k B_n = B_{n+1}$$

Corollary 3.1.4 Due to the equality in Corollary 3.1, we can also write B_n matrix as below.

$$B_n = \begin{bmatrix} P_{k+n,k} & P_{k+n-1,k} & \cdots & P_{n+1,k} \\ P_{k+n,k+1} & P_{k+n-1,k+1} & \cdots & P_{n+1,k+1} \\ P_{k+n,k+2} & P_{k+n-1,k+2} & \cdots & P_{n+1,k+2} \\ P_{k+n,k+3} & P_{k+n-1,k+3} & \cdots & P_{n+1,k+3} \\ \vdots & \vdots & \ddots & \vdots \\ P_{k+n,2k-3} & P_{k+n-1,2k-3} & \cdots & P_{n+1,2k-3} \\ P_{k+n,2k-2} & P_{k+n-1,2k-2} & \cdots & P_{n+1,2k-2} \\ P_{k+n,2k-1} & P_{k+n-1,2k-1} & \cdots & P_{n+1,2k-1} \end{bmatrix}$$

Theorem 3.1.2 The following relation is true since $k \geq 0$.

$$B_n = 2B_{n-1} + B_{n-2}$$

Proof. The equality is obtained when the linear recurrence relation of k -Pell sequences is applied on the elements of the B_n .

$$\begin{aligned}
 B_n &= \begin{bmatrix} 2P_{k+n-1,k} + P_{k+n-2,k} & \cdots & 2P_{n,k} + P_{n-1,k} \\ 2P_{k+n-1,k+1} + P_{k+n-2,k+1} & \cdots & 2P_{n,k+1} + P_{n-1,k} \\ 2P_{k+n-1,k+2} + P_{k+n-2,k+2} & \cdots & 2P_{n,k+2} + P_{n-1,k} \\ 2P_{k+n-1,k+3} + P_{k+n-2,k+3} & \cdots & 2P_{n,k+3} + P_{n-1,k} \\ \vdots & \ddots & \vdots \\ 2P_{k+n-1,k-3} + P_{k+n-2,k-3} & \cdots & 2P_{n,k-3} + P_{n-1,k-3} \\ 2P_{k+n-1,k-2} + P_{k+n-2,k-2} & \cdots & 2P_{n,k-2} + P_{n-1,k-2} \\ 2P_{k+n-1,k-1} + P_{k+n-2,k-1} & \cdots & 2P_{n,k-1} + P_{n-1,k-1} \end{bmatrix} \\
 &= \begin{bmatrix} 2P_{k+n-1,k} & \cdots & 2P_{n,k} \\ 2P_{k+n-1,k+1} & \cdots & 2P_{n,k+1} \\ 2P_{k+n-1,k+2} & \cdots & 2P_{n,k+2} \\ 2P_{k+n-1,k+3} & \cdots & 2P_{n,k+3} \\ \vdots & \ddots & \vdots \\ 2P_{k+n-1,k-3} & \cdots & 2P_{n,k-3} \\ 2P_{k+n-1,k-2} & \cdots & 2P_{n,k-2} \\ 2P_{k+n-1,k-1} & \cdots & 2P_{n,k-1} \end{bmatrix} + \begin{bmatrix} P_{k+n-2,k} & \cdots & P_{n-1,k} \\ P_{k+n-2,k+1} & \cdots & P_{n-1,k} \\ P_{k+n-2,k+2} & \cdots & P_{n-1,k} \\ P_{k+n-2,k+3} & \cdots & P_{n-1,k} \\ \vdots & \ddots & \vdots \\ P_{k+n-2,k-3} & \cdots & P_{n-1,k-3} \\ P_{k+n-2,k-2} & \cdots & P_{n-1,k-2} \\ P_{k+n-2,k-1} & \cdots & P_{n-1,k-1} \end{bmatrix} \\
 &= 2 \begin{bmatrix} P_{k+n-1,k} & \cdots & P_{n,k} \\ P_{k+n-1,k+1} & \cdots & P_{n,k+1} \\ P_{k+n-1,k+2} & \cdots & P_{n,k+2} \\ P_{k+n-1,k+3} & \cdots & P_{n,k+3} \\ \vdots & \ddots & \vdots \\ P_{k+n-1,k-3} & \cdots & P_{n,k-3} \\ P_{k+n-1,k-2} & \cdots & P_{n,k-2} \\ P_{k+n-1,k-1} & \cdots & P_{n,k-1} \end{bmatrix} + \begin{bmatrix} P_{k+n-2,k} & \cdots & P_{n-1,k} \\ P_{k+n-2,k+1} & \cdots & P_{n-1,k} \\ P_{k+n-2,k+2} & \cdots & P_{n-1,k} \\ P_{k+n-2,k+3} & \cdots & P_{n-1,k} \\ \vdots & \ddots & \vdots \\ P_{k+n-2,k-3} & \cdots & P_{n-1,k-3} \\ P_{k+n-2,k-2} & \cdots & P_{n-1,k-2} \\ P_{k+n-2,k-1} & \cdots & P_{n-1,k-1} \end{bmatrix} \\
 &= 2B_{n-1} + B_{n-2}
 \end{aligned}$$

3.1.3 Generalized k -Pell Numbers and Generating Matrix

Definition 3.1.2 Following $k \times k$ matrix K_n is generalized k -Pell matrix for a nonnegative integer k .

$$K_n = \begin{bmatrix} 2 & 1 & 1 & 1 & \cdots & 1 & 1 & 1 \\ 1 & 0 & 0 & 0 & \cdots & 0 & 0 & 0 \\ 0 & 1 & 0 & 0 & \cdots & 0 & 0 & 0 \\ 0 & 0 & 1 & 0 & \cdots & 0 & 0 & 0 \\ \vdots & \vdots & \vdots & \vdots & \ddots & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & \cdots & \vdots & \vdots & \vdots \\ 0 & 0 & 0 & 0 & \cdots & 1 & 0 & 0 \\ 0 & 0 & 0 & 0 & \cdots & 0 & 1 & 0 \end{bmatrix}$$

Also generalized k -Pell equation is defined by

$$P_{i,n} = \begin{cases} 1, & n = 1 - i \\ 0, & n \neq 1 - i \end{cases}, \quad 1 - k \leq n \leq 0$$

and

$$P_{i,n} = 2P_{i,n-1} + \sum_{j=2}^k P_{i,n-j}, \quad n > 0, 1 \leq i \leq k$$

(Kılıç, Altunkaynak and Taşçı, 2006: 511-515).

Corollary 3.1.5

$$K_n \begin{bmatrix} P_{i,n} \\ P_{i,n-1} \\ P_{i,n-2} \\ P_{i,n-3} \\ \vdots \\ P_{i,n-k+3} \\ P_{i,n-k+2} \\ P_{i,n-k+1} \end{bmatrix} = \begin{bmatrix} P_{i,n+1} \\ P_{i,n} \\ P_{i,n-1} \\ P_{i,n-2} \\ \vdots \\ P_{i,n-k+4} \\ P_{i,n-k+3} \\ P_{i,n-k+2} \end{bmatrix}$$

The above equation can be obtained using matrix multiplication property (Kılıç and Taşçı, 2005: 163-174). The proof of this equation is similar with the proof of Corollary 3.1.2.

Let B_n is a matrix that generated from generalized k -Pell sequences, then B_n is

$$B_n = \begin{bmatrix} P_{k,n} & P_{k-1,n} & P_{k-2,n} & \cdots & P_{2,n} & P_{1,n} \\ P_{k,n-1} & P_{k-1,n-1} & P_{k-2,n-1} & \cdots & P_{2,n-1} & P_{1,n-1} \\ P_{k,n-2} & P_{k-1,n-2} & P_{k-2,n-2} & \cdots & P_{2,n-2} & P_{1,n-2} \\ P_{k,n-3} & P_{k-1,n-3} & P_{k-2,n-3} & \cdots & P_{2,n-3} & P_{1,n-3} \\ \vdots & \vdots & \vdots & \vdots & \vdots & \vdots \\ P_{k,n-k+3} & P_{k-1,n-k+3} & P_{k-2,n-k+3} & \cdots & P_{2,n-k+3} & P_{1,n-k+3} \\ P_{k,n-k+2} & P_{k-1,n-k+2} & P_{k-2,n-k+2} & \cdots & P_{2,n-k+2} & P_{1,n-k+2} \\ P_{k,n-k+1} & P_{k-1,n-k+1} & P_{k-2,n-k+1} & \cdots & P_{2,n-k+1} & P_{1,n-k+1} \end{bmatrix}.$$

i -Pell sequence exist in $(k - i + 1)$ th column provided that $1 \leq i \leq k$.

$$B_{n+1} = K_n B_n.$$

is achieved by aid of the equality in Corollary 3.1.4. Therefore

$$\begin{aligned} B_{n+1} &= K_n K_n B_{n-1} \\ &= K_n K_n K_n B_{n-2} \\ &\vdots \\ &= K_n^n B_1. \end{aligned}$$

$$B_n = K_n^n, \quad B_{n+1} = B_1 B_n = B_n B_1$$

The assertion is satisfied because of $B_1 = K_n$ by Definition 3.1.2.

REFERENCES

- Bicknell, M. (1975). A Primer on the Pell Sequence and Related Sequences. *The Fibonacci Quarterly* 4, 345 - 349.
- Catarino, P. and Vasco, P. (2013). Modified k -Pell Sequence: Some Identities and Ordinary Generating Function. *Applied Mathematical Sciences*, 6031 - 6037.
- Catarino, P. and Vasco, P. (2013). On Some Identities and Generating Functions for k -Pell Numbers. *Int. Journal of Math. Analysis*, 1877-1884.
- Daşdemir, A. (2011). On the Pell, Pell-Lucas and Modified Pell Numbers By Matrix Method. *Applied Mathematical Sciences*, 3173 - 3181.
- Horadam, A. F. (1971). Pell Identities. *Fibonacci Quarterly*, 245-252.
- Horadam, A. F. and Mahon, B. (1985). Pell And Pell-Lucas Polinomials. *Fibonacci Quarterly*, 7-20.
- Kılıç, E., Altunkaynak, B., & Taşçı, D. (2006). On the computing of the generalized order- k Pell numbers in log time. *Applied Mathematics and Computation* 181, 515-515.
- Kılıç, E. and Taşçı, D. (2006). The linear algebra of the Pell matrix. *Boletín de la Sociedad Matemática Mexicana* 11(2), 163-174.

An Advanced Method for Classifying Froth Flotation Images Utilizing Attention and Reward Mechanisms to Address Visually Similar Classes

Khalid A. ABOUDA

Central South University, China

Prof. Dr. Xu DEGANG

Central South University, China

Wail M. IDRESS

Central South University, China

Hager M. ELMAKI

Al-Zaiem Al-Azhari University, Sudan

Aala A. AHMED

Al-Zaiem Al-Azhari University, Sudan

Waleed M. IDRESS

School of Electronic Engineering, Sudan University of Science and Technology, Sudan

Abstract

Accurate monitoring of the froth flotation process is essential in mineral processing, as it significantly influences mineral separation efficiency and operational performance. Conventional monitoring approaches, primarily based on manual visual analysis of froth images, are often inconsistent and subjective, compromising the reliability of the process. This research presents a robust image classification model for flotation images, addressing the challenge of distinguishing visually similar classes. The proposed approach integrates an EfficientNetB0 architecture, an attention mechanism, and a custom reward layer to enhance classification accuracy. EfficientNetB0 extracts fine-grained textures, shapes, and structural details from flotation images, while the attention mechanism selectively focuses on salient regions, preventing overemphasis on irrelevant patterns. Additionally, the reward layer adjusts class logits based on class importance and prediction confidence, improving key predictions and reducing overconfidence in ambiguous cases. The model was evaluated on a flotation dataset with four classes, three visually similar. Experimental results show significant improvements in precision, recall, and overall accuracy, achieving 96% accuracy, outperforming recent methods.

Keywords: Froth Flotation Monitoring, Froth Image Classification, Convolutional Neural Networks (CNNs), Attention Mechanism, Visually Similar Classes

Process of Isolation and Characterization of Lycopene from Grapefruit

Dr. Aida SMAJLAGIĆ

University of Tuzla, Bosnia and Herzegovina

Assoc. Prof. Dr. Ermina ČILOVIĆ KOZAREVIĆ

University of Tuzla, Bosnia and Herzegovina

Jasmina SIOČIĆ

University of Tuzla, Bosnia and Herzegovina

Asst. Prof. Dr. Merima IBIŠEVIĆ

University of Tuzla, Bosnia and Herzegovina

Asst. Prof. Dr. Maida ŠLJIVIĆ HUSEINOVIĆ

University of Tuzla, Bosnia and Herzegovina

Asst. Prof. Dr. Amra DŽAMBIĆ

University of Tuzla, Bosnia and Herzegovina

Dr. Enida KARIĆ

University of Tuzla, Bosnia and Herzegovina

Merima SALKOVIĆ

Bosnalijek D.O.O., Bosnia and Herzegovina

Abstract

Lycopene is a natural organic compound that of a red colour and is notable for its antioxidant properties. Red pigment, simple molecular formula ($C_{40}H_{56}$), as a good antioxidant is beneficial for human health. Research indicates the positive properties of lycopene and its protective effect on the cardiovascular system; it reduces blood pressure, prevents the oxidation of LDL cholesterol, lipids, etc. This red carotenoid has a number of health effects resulting from its antioxidant effect. In this experimental research, lycopene was isolated by a simple procedure from red grapefruit. The solvents used for the isolation procedure are acetone and petroleum ether. The identification and characterization of lycopene was confirmed by FTIR, UV/Vis and TLC methods.

Keywords: Isolation, Lycopene, Grapefruit, FTIR

Determination of Crocins in Saffron (*Crocus Sativus* Linn., Iridaceae)"

Assoc. Prof. Dr. Elena Anatolevna SOKOLOVA

North-Western State Medical University named after I.I. Mechnikov (NWSMU), Saint-Petersburg,
Russia

Asst. Prof. Dr. Natalya Petrovna STEPANOVA

North-Western State Medical University named after I.I. Mechnikov (NWSMU), Saint-Petersburg,
Russia

Abstract

Natural apocarotenoids of saffron (*Crocus sativus* Linn., Iridaceae) crocins and crocetin have neuroprotective, cardioprotective, hepatoprotective, antidepressant, anticancer, and antidiabetic effects. Thus, experiments have shown that crocin is hydrolyzed to crocetin by gut microbiota enzymes, and crocetin is further converted into bioactive metabolites that enter the bloodstream, capable of overcoming the blood-brain barrier and providing a cerebroprotective effect.

The purpose of the study is to find the most effective express-method for determining the content of crocins in saffron samples.

Apocarotenoids were extracted with aqueous alcohol solutions. Thin layer chromatography (TLC) on different plates was used to separate the extract components. The best separation of crocins was observed on the "Armsorb" plates, RF.

The total content of crocins in extracts and fractions was determined by the spectral express-method using digentiobiosyl-crocetin molar extinction coefficient $\varepsilon=1.33 \times 10^5$ l/mol \times cm, $\lambda_{\max}=443$ nm.

Apocarotenoids were identified in five fractions: cis- and trans-digentiobiosyl-crocetins, monogentiobiosyl-crocetin, 1- β ,D-glucopyranosyl-16-gentiobiosyl-crocetin, di- β ,D-glucopyranosyl-crocetin, picrocrocetin. Digentiobiosyl-crocetin concentration was the highest (29% of the total amount of apocarotenoids).

Unlike other methods for determining apocarotenoids in aqueous solutions and biological fluids: gas, liquid and high-performance thin layer chromatography (GC-MS, LC-MS/MS, HP-TLC), the proposed express-method is available, effective and has good analytical characteristics (determination degree and selectivity).

Keywords: Saffron, Apocarotenoids, Crocetin, Crocins, Thin Layer Chromatography.

Extraction, Content of Total Polyphenols and Antioxidant Potential of Hibiscus (*Hibiscus sabdariffa*) Using Different Solvents

Asst. Prof. Dr. Edina HUSEINOVIĆ
University of Tuzla, Bosnia and Herzegovina

Asst. Prof. Dr. Jasmina DEDIĆ
University of Tuzla, Bosnia and Herzegovina

Emina MEHMEDOVIĆ
PhD Student, University of Tuzla, Bosnia and Herzegovina

Emir HOROZIĆ
PhD Student University of Tuzla, Bosnia and Herzegovina

Abstract

The aim of this study was to determine the antioxidant activity, as well as the total phenolic and flavonoid content in Hibiscus (*Hibiscus sabdariffa*) extracts. Extraction of bioactive compounds was carried out using water, ethanol, methanol, and acetone as solvents. The phenolic content was quantified using the Folin-Ciocalteu method, while the flavonoid content was determined by the aluminum chloride colorimetric assay. Antioxidant activity was assessed using the DPPH method.

The results of the study showed that the hibiscus extracts obtained using a mixture of solvents and water contained significantly higher amounts of total phenols and flavonoids compared to the extracts obtained with pure solvents. The DPPH test demonstrated a high free radical scavenging capacity, which was particularly pronounced for the methanol extract.

A positive correlation was observed between the content of phenols, flavonoids, and antioxidant activity, confirming the crucial contribution of these compounds to the biological activity of hibiscus. Based on the obtained results, it can be concluded that hibiscus is a promising source of natural antioxidants, with potential applications in the food, pharmaceutical, and cosmetic industries.

Keywords: Extraction, Content of Total Polyphenols, Antioxidant Potential, DPPH, Hibiscus Sabdariffa

Introduction

The term "antioxidant" refers to substances or molecules capable of delaying or even preventing irreversible damage to other substances/macromolecules due to the instability of certain metabolites present in living systems, thereby contributing to health benefits, as oxidative stress is the root cause of several pathophysiological processes. The supply of antioxidants helps neutralize reactive oxygen species (ROS), which are produced in the system during physiological processes. Singlet oxygen, superoxide, hydrogen peroxide (H₂O₂), peroxyxynitrite, hydroxyl radicals, and peroxy radicals are examples of ROS, and they are ubiquitous and potentially harmful to biomolecules. Excessive and uncontrolled production of ROS is referred to as oxidative stress, which can lead to damage such as alterations in cell function associated with several conditions, including chronic inflammation, asthma, neurodegenerative and cardiovascular diseases, aging, and cancer (Mendonça, 2022: 3563).

Hibiscus sabdariffa is a plant cultivated in tropical and subtropical regions of Africa, Asia, and the Americas. It belongs to the Malvaceae family, and its leaves and seeds are used for their various properties. In human nutrition, it is rich in nutrients, including phenolic compounds (Pozos, 2020: 560).

They are also rich in high biological value antioxidants, which are essential for the elimination of free radicals. This crucial role has been confirmed in foods rich in antioxidants, which may help in the prevention of cancer, diabetes, cardiovascular diseases, and neurodegenerative disorders, all of which are critical for the elimination of free radicals (Ngondo, 2023:1056-1068; Abdul-Awal, 2016:1209; Jamrozik, 2022: 2134). Antioxidants are always associated with anticancer effects. Therefore, the reason for discovering antioxidants from a sample is to determine its ability to cure cancer (Samsudin, 2019).

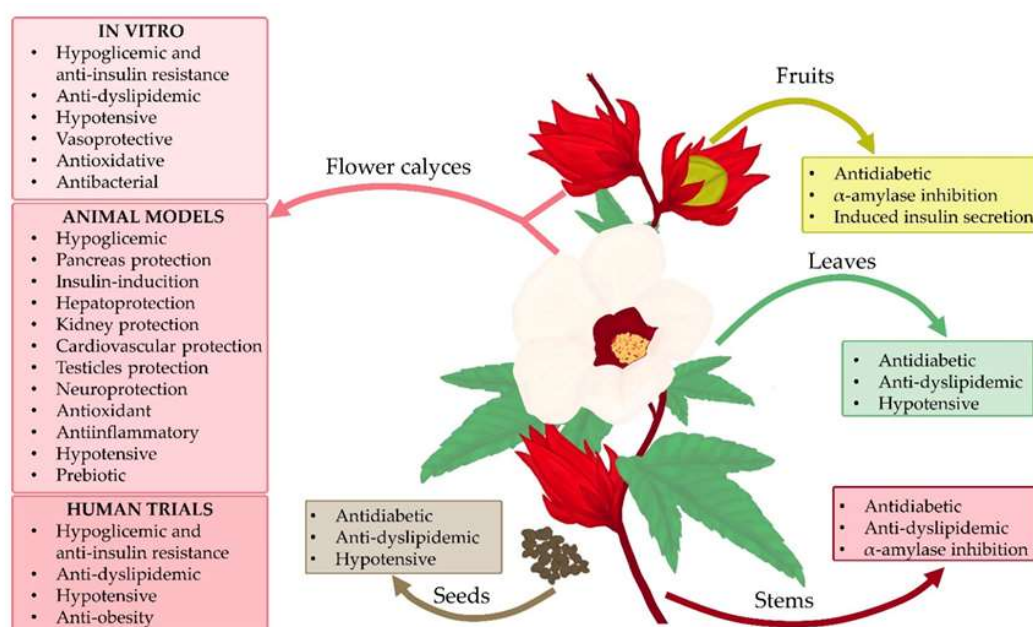


Figure 1. Beneficial effects of various parts of hibiscus in the management of diabetes and its complications (Jamrozik, 2022: 2134).

Hibiscus is a rich source of various phenolic compounds such as simple phenols, flavonoids, and anthocyanins. Additionally, it is abundant in vitamin C, riboflavin, carotene,

niacin, calcium, and iron. It is commonly used to produce wine, juices, jams, syrups, puddings, pickles, cakes, ice cream, or herbal tea (Banwo, 2022: 660831).

Hibiscus sabdariffa is rich in phenolics, primarily anthocyanins such as delphinidin-3-glucoside, sambubioside, and cyanidin-3-sambubioside. Phenolic acids such as neochlorogenic acid and chlorogenic acid have also been identified, along with organic acids like hydroxycitric acid, hibiscus acid, and the hydroxyethyl ester of hibiscus acid (Yagi, 2023: 42511-42521).

The phenolic content and its composition can vary depending on different plant sources. *Hibiscus sabdariffa*, commonly known as roselle, is an edible tropical plant widely used as a food coloring due to the presence of brightly colored anthocyanins, as well as in the pharmaceutical and cosmetic industries for its significant potential as a source of other phenolic compounds. In this regard, anthocyanins, phenolic acids, and flavonoids are the main bioactive compounds it contains. An abundance of bioactive properties, such as antioxidant and antimicrobial activities, has been recorded, which are associated with their proven effectiveness in improving conditions such as obesity, hypertension, and cancer (Duque-Soto, 2023: 963).

METHODS AND MATERIALS

The Hibiscus plant was obtained from a local market in Tuzla, known for its rich offering of natural and environmentally friendly products. The purchased black seed powder underwent rigorous quality control measures to ensure its safety and health suitability. Demineralized water was used to prepare aqueous solutions, ensuring maximum purity and precision in the preparation of the solutions. The reagents used for the analysis were of high purity, labeled as p.a., and applied in their pure form without the need for further purification or processing. For the DPPH radical neutralization analysis, 2,2-diphenyl-1-picrylhydrazyl reagent was used. Sodium nitrite, aluminum chloride, and sodium hydroxide reagents were employed in the determination of total flavonoids in the tested extract. Spectroscopic measurements were conducted using a Perkin Elmer Lambda 25 spectrophotometer, within the wavelength range of 510 nm to 765 nm.

Preparation of Extracts

Hibiscus extracts were prepared through a careful process involving the mixing of 0.5 grams of ground dry plant material with 50 mL of the chosen solvent, or a mixture of solvents, which may include a combination of ethanol, methanol, acetone, and water. This procedure was designed to achieve optimal extraction of bioactive compounds from hibiscus, which is renowned for its medicinal properties.

The plant material was thoroughly ground to increase the contact surface area between the plant matter and the solvent, further enhancing the extraction efficiency. The mixing process was conducted on a vibromixer for 60 minutes, allowing for intense mixing and better solvent penetration into the plant material. This method not only promotes a more complete extraction of beneficial components but also ensures homogeneous mixtures, which are essential for further research and analyses. Through this rigorous approach, the goal was to maximize the potential of the bioactive compounds contained in hibiscus, which could contribute to the development of new pharmaceuticals or dietary supplements.

Both extracts were further diluted as needed to enable precise analysis of their antioxidant capacity, as well as the determination of total phenolic compounds and flavonoid content. This dilution process ensures that the samples are adjusted to the specific

testing methods, allowing for accurate measurement of these important bioactive components.

Determination of Total Phenolic Content (TPC)

The Folin-Ciocalteu test is a well-known method for determining the total phenolic content (TPC) (Lamuela-Raventós, 2018: 107–15). This colorimetric method is based on the reaction of phenols with the Folin-Ciocalteu reagent. The Folin-Ciocalteu reagent is a mixture of phosphotungstic and phosphomolybdic acids, and during the oxidation of phenolic compounds, these acids are reduced to blue-colored tungsten and molybdenum oxides (Ough i Amerine, 1998: 203-221). The intensity of this color change is directly proportional to the concentration of phenolic compounds in the sample. By measuring the absorbance at a specific wavelength, the total phenolic content of the sample can be calculated.

The quantification of total phenolic compounds in the extracts was performed spectrophotometrically using the Folin-Ciocalteu test, according to the protocol of Singleton et al. (Singleton, 1999: 152-178), with slight modifications. 200 µL of the extract was mixed with 2540 µL of 10% Folin-Ciocalteu reagent, which reacts with phenolic compounds to form a blue complex. After 5 minutes of reaction, 420 µL of 10% sodium carbonate was added to enhance color development. The samples were incubated at room temperature for 1 hour, and then diluted with 910 µL of distilled water before measuring absorbance.

The absorbance of the blue-colored solution was measured at 765 nm. The total phenolic content was expressed as milligrams of gallic acid equivalents (GAE) per gram of dry plant material (mg GAE/g) (Dibacto, 2021: 11).

Determination of Total Flavonoid Content (TFC)

The total flavonoid content in the extracts was quantified using a modified colorimetric method, which is based on the formation of a complex between flavonoids and reagents that selectively react with the hydroxyl groups of flavonoids. The resulting complex produces an intense color, the strength of which is proportional to the flavonoid concentration in the sample (Olajire, 2011: 022-029). In the extract solution (1 mL), 0.3 mL of 5% sodium nitrite was added, which initiates the formation of a colored flavonoid complex. After 5 minutes of incubation, 0.3 mL of 10% aluminum chloride was added, which forms stable complexes with the flavonoids. The mixture was incubated for 6 minutes, and then 1 mL of 1 M sodium hydroxide was added. The total volume of the mixture was adjusted to 10 mL with distilled water for precise measurement. The absorbance of the sample was measured at 510 nm against the blank using a spectrophotometer. The results were calculated based on a quercetin calibration curve and expressed as quercetin equivalents (QE) per gram of dry plant material, allowing for the quantification of the total flavonoid content (Chang, 2002:178-182).

DPPH Radical Scavenging Activity

The DPPH (2,2-diphenyl-1-picrylhydrazyl) method is based on assessing the ability of the tested samples to neutralize the stable DPPH radical, thereby quantifying their antioxidant activity. This protocol, under which the analysis was conducted, was previously described by Horozić et al. (Horozić, 2019), with specific adjustments for these studies. The percentage inhibition of DPPH radicals was assessed by mixing 2 mL of the extract (0.5 mg/mL) with 0.5 mL of 0.5 mM DPPH solution. The mixture was incubated for 30 minutes at room temperature in a dark room. For the control, a 0.5 mM DPPH solution diluted with 4 mL of methanol was used to ensure the reference absorbance (Horozić, 2024). The inhibition of DPPH radicals was expressed according to the equation.

$$I (\%) = [(Ac - As) / Ac] \times 100$$

As represents the absorbance of the sample measured at 517 nm, while Ac represents the absorbance of the DPPH radical control solution (without the sample). This calculation allows for the assessment of the antioxidant activity of the sample based on the decrease in absorbance, which reflects the ability to reduce the concentration of DPPH radicals.

RESULTS AND DISCUSSION

Considering its abundance of phenolic compounds, hibiscus has gained increasing attention in studies focused on health protection and disease prevention. Extraction methods, particularly the use of organic solvents, are crucial in isolating bioactive compounds from plant materials. In this regard, maceration is highlighted as an especially effective technique for extracting polyphenols and flavonoids, as it facilitates the optimal release of these beneficial compounds. Natural phenols are known for their positive impact on health, primarily through their antioxidant properties, which play a vital role in combating oxidative stress and supporting overall well-being (Fang, 2002:872-9). These compounds have the ability to reduce oxygen levels, prevent oxidation, remove hydroxyl radicals, scavenge free radicals, and bind metal ions (Naczki, 2004:95-111).

Table 1 presents the quantitative data on the content of bioactive components, phenols, and flavonoids, which were obtained under in vitro experimental conditions.

Table 1. Content of polyphenolic components of *Hibiskus sabdariffa*

Sample	Extraction solvent	Solvent ratio (v/v)	TPC [mg GAE/g]	TFC [mg QE/g]
A-1	EtOH	-	5,58	0,0472
A-2	EtOH:Water	40:10	13,13	0,0877
A-3	EtOH:Water	30:20	12,15	0,0826
A-4	EtOH:Water	20:30	17,95	0,0958
A-5	EtOH:Water	10:40	17,2	0,0933
A-6	MeOH	-	10,47	0,0829
A-7	MeOH:Water	40:10	15,67	0,0995
A-8	MeOH:Water	30:20	17,21	0,0764
A-9	MeOH:Water	20:30	17,95	0,0965
A-10	MeOH:Water	10:40	17,59	0,0883
A-11	Ace	-	1,27	0,0201
A-12	Ace:Water	40:10	14,45	0,0994
A-13	Ace:Water	30:20	18,69	0,1071
A-14	Ace:Water	20:30	19,49	0,0946
A-15	Ace:Water	10:40	19,02	0,0829
A-16	Water	-	15,11	0,0517

The research results indicate significant differences in the phenolic compound content in hibiscus extracts prepared with different solvents, highlighting the crucial role of the solvent in the extraction process. The phenolic content in the extracts obtained using pure solvents decreases in the following order: water > methanol > ethanol > acetone. These results suggest that water, as a solvent, allows for the most efficient extraction of phenolic

compounds, while acetone is the least effective, with its extracts containing the lowest concentrations of phenols.

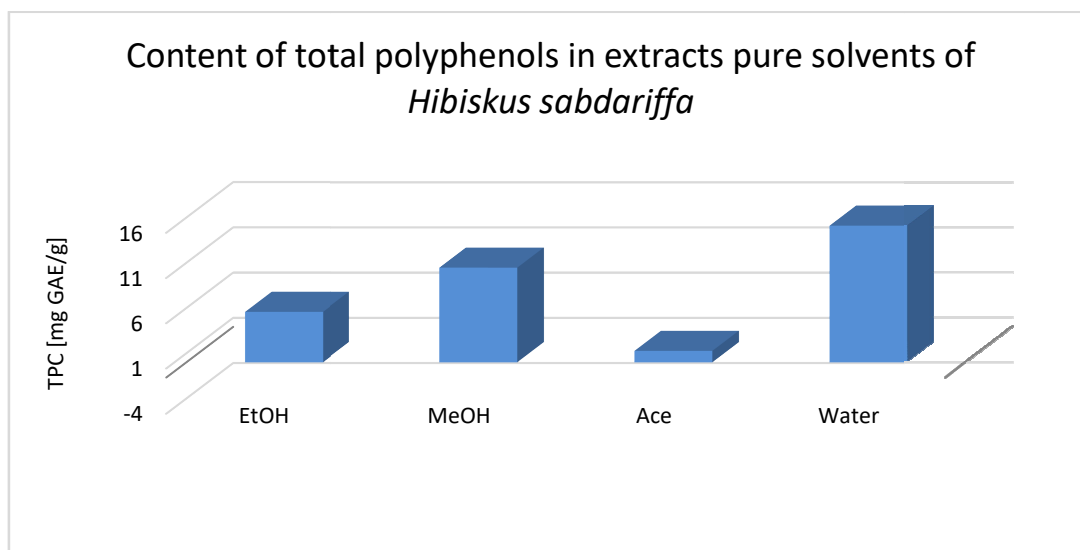


Figure 2. Content of total polyphenols in extracts pure solvents of *Hibiskus sabdariffa*

Regarding the use of aqueous solvent mixtures, the highest content of phenolic compounds was observed in solvent mixtures at a 20:30 ratio, which suggests that combining water with another solvent, in this case acetone, offers a significant advantage in the extraction of bioactive components. Acetone, as a solvent, exhibited the highest efficiency in this mixture, likely due to its specific chemical properties that facilitate enhanced extraction of phenolic compounds from plant material (Kumar, 2023; 887). These findings indicate that by employing certain solvent combinations, the solvent's efficiency in extracting phenolic compounds can be substantially increased, thereby improving both the qualitative and quantitative properties of the final extracts.

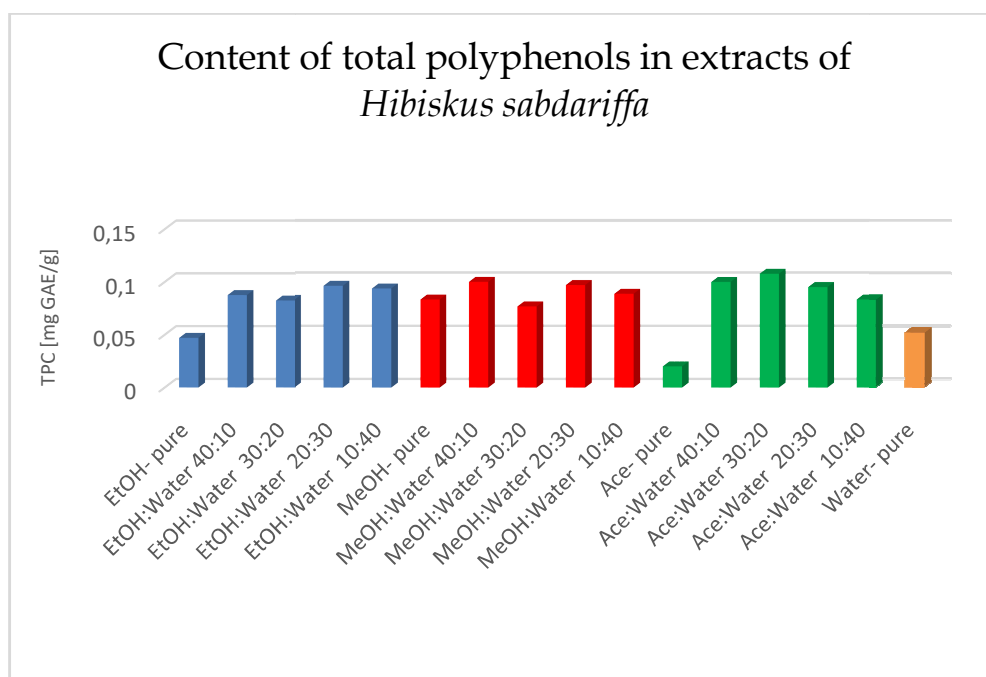


Figure 3. Content of total polyphenols in extracts of *Hibiskus sabdariffa*

The research results regarding the determination of flavonoid content in hibiscus extracts prepared using different solvents indicate significant variations in their concentrations. The flavonoid content in extracts obtained with pure solvents decreases in the following order: methanol > water > ethanol > acetone. The highest flavonoid content was recorded in extracts prepared using a mixture of acetone and water in a 30:20 ratio. This result suggests a synergistic effect of this mixture, where acetone, with its ability to dissolve lipophilic components, effectively facilitates the extraction of flavonoids, while water contributes to the dissolution of polar components, including certain types of flavonoids. The mixture of these two solvents enables a balance between the extraction of lipophilic and hydrophilic components, thereby achieving optimal extraction of flavonoid compounds, which is crucial for the quality of the extract. From a chemical perspective, methanol and ethanol, as more polar solvents, are better at dissolving polar flavonoids, while acetone, a less polar solvent, is capable of dissolving flavonoids with a more lipophilic nature. Water, although a highly polar solvent, is less efficient in extracting flavonoids in their pure form, highlighting the need for solvent combinations that allow for better utilization of the full spectrum of flavonoid compounds present in the plant material (Lee, 2024; 3151).

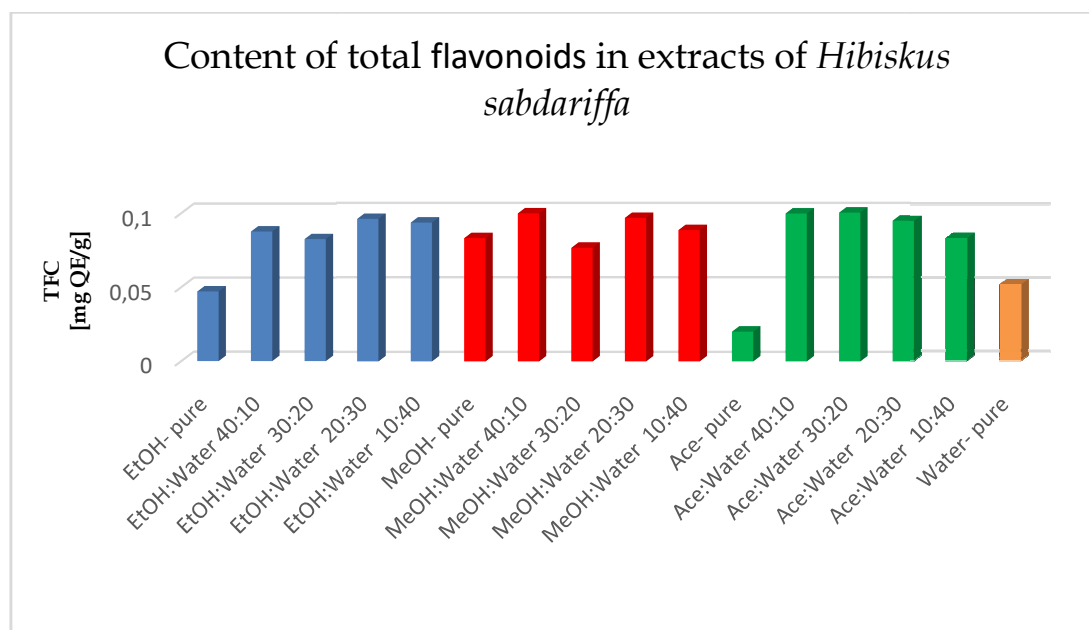


Figure 4. Content of total flavonoids in extracts of *Hibiskus sabdariffa*

The antioxidant activity of hibiscus extracts was evaluated using the DPPH (2,2-diphenyl-1-picrylhydrazyl) method. This method is based on the ability of the sample to inhibit DPPH free radicals, which induces a color change, thereby allowing precise measurement of antioxidant activity. The results showing the radical scavenging capacity are presented in Table 2.

Table 2. DPPH radical inhibition efficiency

Sample	Extraction solvent	Solvent ratio (v/v)	DPPH inhibition [%]
A-1	EtOH	-	28,29
A-2	EtOH:Water	40:10	66,27
A-3	EtOH:Water	30:20	73,84
A-4	EtOH:Water	20:30	76,41
A-5	EtOH:Water	10:40	79,69
A-6	MeOH	-	48,66
A-7	MeOH:Water	40:10	69,56
A-8	MeOH:Water	30:20	73,79
A-9	MeOH:Water	20:30	78,24
A-10	MeOH:Water	10:40	71,78
A-11	Ace	-	5,40
A-12	Ace:Water	40:10	63,09
A-13	Ace:Water	30:20	79,09
A-14	Ace:Water	20:30	80,93
A-15	Ace:Water	10:40	81,66
A-16	Water	-	72,60

Hibiscus extracts obtained using pure solvents demonstrated weak radical scavenging ability, indicating the limited efficiency of these solvents in extracting bioactive components with antioxidant properties. Chemically, organic solvents such as acetone, ethanol, and methanol, while effective in extracting certain polar and non-polar compounds, are not fully capable of isolating all types of bioactive compounds from plant materials.

When considering the order of radical scavenging ability, the following sequence is observed: acetone < ethanol < methanol < water. This trend can be explained by the different chemical properties of the solvents, particularly their polarity and ability to dissolve specific bioactive components. This sequence of radical scavenging capacity can be further elucidated by the chemical interactions between the solvents and the bioactive components. Considering that polyphenols and other bioactive compounds with antioxidant properties typically possess hydroxyl groups (-OH) which are polar, solvents with higher polarity (such as methanol and water) facilitate better extraction of these compounds, while less polar solvents (such as acetone) have a more limited ability to extract them. Therefore, as the polarity of the solvent increases, there is an increase in the concentration of bioactive compounds in the extracts, which is reflected in a higher antioxidant capacity (Dedić, 2024).

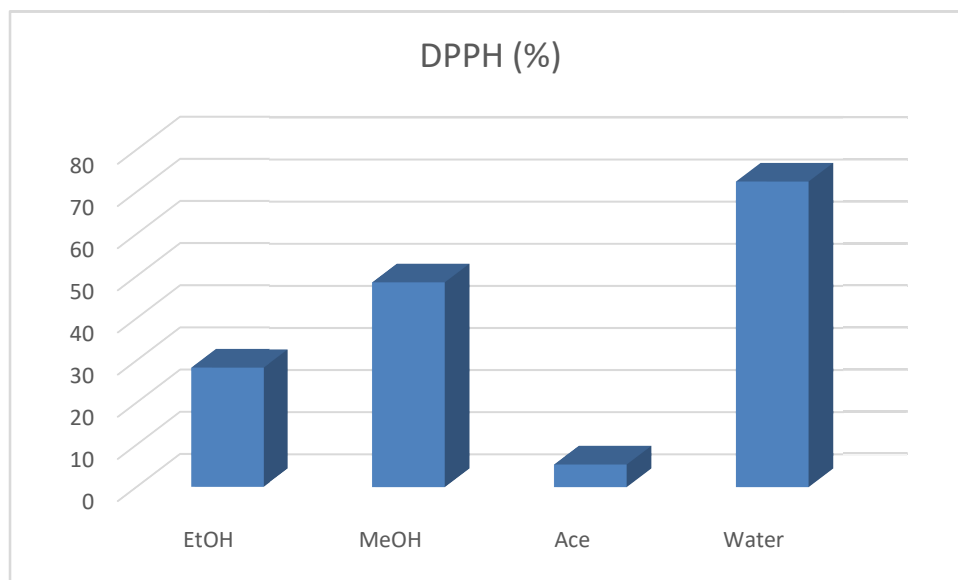


Figure 5. Antioxidant activity of *Hibiskus sabdariffa* extracts pure solvents

The addition of water to the extraction system led to an increase in the radical scavenging activity. The enhanced radical scavenging activity in hibiscus extracts with higher water content can be explained by the higher capacity of water to dissolve hydrophilic bioactive components with pronounced antioxidant properties, such as flavonoids and phenolic acids, the synergistic effect between water and organic solvents, as well as the improved efficiency of extraction and stabilization of antioxidant molecules (Dent, 2013: 84-91). The combination of these factors contributes to a stronger inhibition of free radicals, reflected in the higher antioxidant capacity of these extracts.

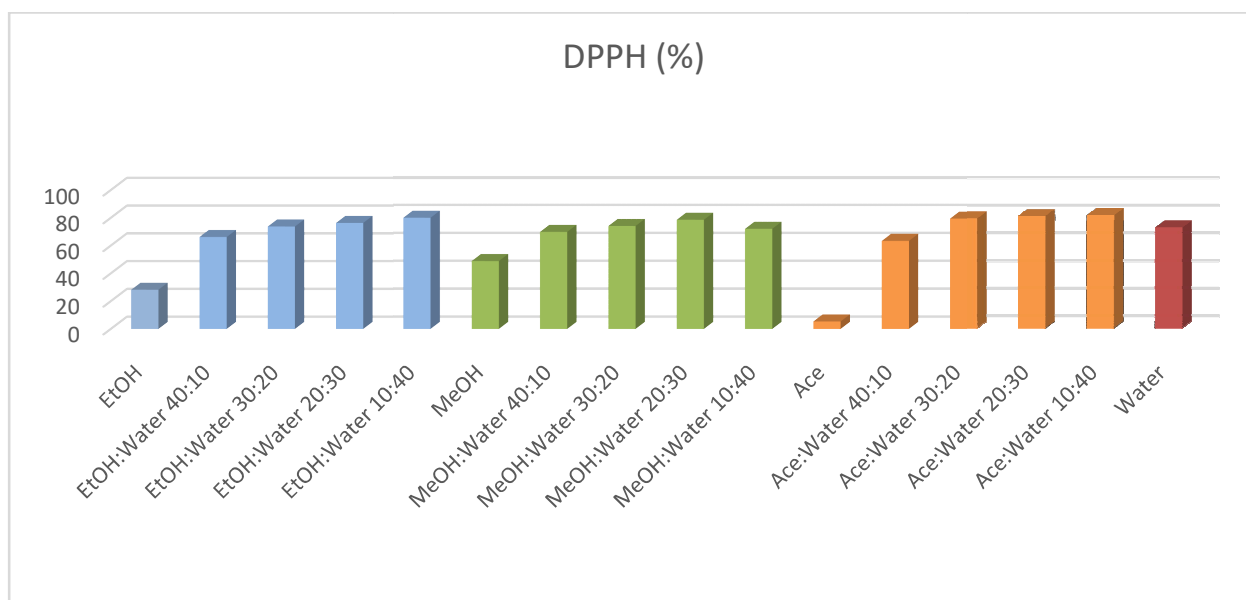


Figure 6. Efficiency of DPPH radical inhibition depending on the concentration of the extracts

CONCLUSION

This study analyzed the efficiency of various solvents, as well as their aqueous mixtures, in the extraction of bioactive components with pronounced antioxidant activity

from hibiscus. Based on the obtained results, it was determined that water, as a solvent, enables the most efficient extraction of phenolic compounds, while acetone is the least efficient, with its extracts containing the lowest concentrations of phenols. The results of the tests showed that the combination of water with organic solvents provides a significant advantage in the extraction of bioactive components. The highest content of phenolic compounds was observed in aqueous solvent mixtures in a 20:30 ratio. Pure acetone proved to be the least effective in the extraction of flavonoids, while the combination with water in a 30:20 ratio exhibited the highest concentration of flavonoids. Hibiscus extracts prepared using pure solvents demonstrated weak radical scavenging activity, suggesting a limited efficiency of these solvents in extracting bioactive components with antioxidant properties. Water showed the best results in terms of free radical inhibition.

REFERENCES

- Mendonça, Jenifer da Silva; Guimarães, Rita de Cássia Avellaneda; Zorgetto-Pinheiro, Verônica Assalin; Fernandes, Carolina Di Pietro; Marcelino, Gabriela; Bogo, Danielle; Freitas, Karine de Cássia; Hiane, Priscila Aiko; de Pádua Melo, Elaine Silva; Vilela, Marcelo Luiz Brandão; Nascimento, Valter Aragão Do; (2022) Natural Antioxidant Evaluation: A Review of Detection Methods. *Molecules*. 1;27(11):3563.
- PeredoPozos, Gregorio Iván; Ruiz-López, Mario Alberto; Zamora Nátera, Juan Francisco; Álvarez Moya, Carlos; Barrientos Ramírez, Lucia; Reynoso Silva, Mónica; Rodríguez Macías, Ramón; García-López, Pedro Macedonio; González Cruz, Ricardo; Salcedo Pérez, Eduardo; & Vargas Radillo, Jesus; (2020) Antioxidant Capacity and Antigenotoxic Effect of *Hibiscus sabdariffa* L. Extracts Obtained with Ultrasound-Assisted Extraction Process: *Applied Sciences*. 10;(2):560.
- Ngondo, Blaise Pascal; Mpika, Joseph; and Mbon, NguekouChrichinaAttibayeba; (2023) Antioxidant activity of phenolic compounds in *Hibiscus sabdariffa* from Congo. *African Journal of Agricultural Research*. 19;(11):1056-1068.
- Abdul-Awal, SM; Nazmir, Sonia; Nurunnabi, Tauhidur Rahman; Uddin Shaikh Jamal; (2016) Evaluation of pharmacological activity of *Hibiscus tiliaceus*. *Springerplus*. 29;5(1):1209.
- Jamrozik, Daniel; Borymska, Weronika; Kaczmarczyk-Żebrowska, Ilona; (2022) *Hibiscus sabdariffa* in Diabetes Prevention and Treatment-Does It Work? An Evidence-Based Review. *Foods*. 19;11(14):2134.
- Samsudin, Mohamad Syahmie; Andriani, Yosie; Sarjono, PurbowatiningrumRia and Syamsumir, DesyFitrya; (2019) study on *Hibiscus tiliaceus* leaves as antibacterial and antioxidant agents. *Alotrop*. 3;(2).
- Banwo, Kolawole; Sanni, Abiodun; Sarkar, Dipayan; Ale, Oluwatosin; Shetty, Kalidas; (2022) Phenolics-Linked Antioxidant and Anti-hyperglycemic Properties of Edible Roselle (*Hibiscus sabdariffa* Linn.) Calyces Targeting Type 2 Diabetes Nutraceutical Benefits in vitro. 6:660831.
- Yagi, Sakina; Uba, Abdullahi Ibrahim; Sinan, Kouadio Ibrahim; Piatti, Diletta; Sagratini, Gianni; Caprioli, Giovanni; Eltigani, Sayadat M.; Lazarova Irina and Zengin Gökhan; (2023) Comparative Study on the Chemical Profile, Antioxidant Activity, and Enzyme Inhibition Capacity of Red and White *Hibiscus sabdariffa* Variety Calyces. *ACS Omega*. 30;8(45):42511-42521.
- Duque-Soto, Carmen; Expósito-Almellón, Xavier; García, Paula; Pando, María Elsa; Borrás-Linares, Isabel and Lozano-Sánchez, Jesús; (2023) Extraction, Characterization, and Bioactivity of Phenolic Compounds—A Case on *Hibiscus* Genera. *Foods*. 12;(5):963.
- Lamuela-Raventós, M. Rosa; (2018) Folin-Ciocalteu method for the measurement of total phenolic content and antioxidant capacity. In: *Measurement of antioxidant activity & capacity*. New York: Wiley.
- Ough C.S.; Amerine, Maynard Andrew; (1988) Phenolic compounds. U: Ough CS, Amerine MA (ur.) *Methods for analysis of musts and wines*. New York, John Wiley & Sons, Inc.
- Singleton, Vernon L.; Orthofer, Rudolf; Lamuela-RaventósSingleton, Rosa M. , V.L., Orthofer, R. and Lamuela-Raventós, M. Rosa; (1999) Analysis of Total Phenols and Other Oxidation Substrates and Antioxidants by Means of Folin-Ciocalteu reagent. *Methods in Enzymology*. 299; 152-178.

- Dibacto, Ruth Edwige Kemadjou; Tchuenta, Boris Ronald Tonou; Nguedjo, Maxwell Wandji; Tientcheu, Yves Martial Tongue; Nyobe, Emilienne Carine; Edoun, Ferdinand Lanvin Ebouel; Kamini, Melanie Flore Godam; Dibanda, Romelle Feumba; Medoua, Gabriel Nama; (2021) Total Polyphenol and Flavonoid Content and Antioxidant Capacity of Some Varieties of *Persea americana* Peels Consumed in Cameroon, *The Scientific World Journal*. 1; 8882594
- Chang, Chia-Chi; Yang, Ming-Hua; Wen, Hwei-mei and Chern, Jiing-Chuan; (2002) Estimation of total flavonoid content in propolis by two complementary colometric methods. *Journal of food and drug analysis*. 10;(3):178-182.
- Olajire, AbassAbiola and Azeez, LuqmonAdeyemi; (2011) Total antioxidant activity, phenolic, flavonoid and ascorbic acid contents of *Nigerian vegetables*. *African Journal of Food Science and Technology*, 2;(2):022-029.
- Horozić, Emir; Zukić, Amila; Kolarević, Lamija, Bjelošević, Demir; Ademović, Zahida; Šarić-Kundalić, Broza; Husejnagić, Darja; Kudumović, Azra; Hamzić, Sadeta; (2019) Evaluation of antibacterial and antioxidant activity of methanol needle extracts of *Larix Decidua* Mill., *PiceaAbies* (L.) H. Karst. and *PinusNigra* J. F. Arnold. *Technics Technologies Education Management*. 14;(1): 14-19.
- Horozić, Emir; Dedić, Jasmina and Huseinović, Edina; (2024) Utjecaj omjera vode i organskih otapala na antioksidativno djelovanje i sadržaj bioaktivnih komponenti u ekstraktima *Artemisia annua* L. i *Artemisia absinthium* L. *Radovi Šumarskog Fakulteta Univerziteta u Sarajevu*. 54;(2).
- Fang, Yun-Zhong; Yang, Sheng; Wu, Guoyao; (2002) Free radicals, antioxidants, and nutrition. *Nutrition*. 18;(10): 872-9.
- Naczka, Marian; Shahidi, Fereidoon; (2004) Extraction and analysis of phenolics in food, *Journal of Chromatography A*, 1054;(1-2): 95-111.
- Kumar, Ashwani; Nirmal P; Mukul, Kumar; Anina, Jose; Vidisha, Tomer; Emel, Oz; Charalampos, Proestos; Maomao, Zeng; Tahra, Elobeid; Sneha, K and Fatih, Oz; (2023) Major Phytochemicals: Recent Advances in Health Benefits and Extraction Method. *Molecules* 28;(2): 887.
- Lee, Ji-Eun; Jayakodyge, Thilini; Madushani, Jayakody; Jae-Il, Kim; Jin-Woo, Jeong; Kyung-Min, Choi; Tae-Su, Kim; Chan, Seo; Iman, Azimi; Jimin, Hyun and Bomi, Ryu; (2024) The Influence of Solvent Choice on the Extraction of Bioactive Compounds from Asteraceae: A Comparative Review. *Foods* 13;(19): 3151.
- Dent, Maja; Dragović-Uzelac, Verica; Penić, Marija; Brnčić, Mladen; Bosiljkov, Tomislav; Levaj, Branka; (2013) The effect of extraction solvents, temperature and time on the composition and mass fraction of polyphenols in dalmatian wildsage (*Salvia officinalis* L.) extracts. *Food Technol. Biotech.* 51: 84-91.
- Dedić, Jasmina; Huseinović, Edina; Mehmedović, Emina; Horozić, Emir; (2024). The Effect of Different Solvents and Their Aqueous Mixtures on the Polyphenol Content and Antioxidant Activity of *Nigella Sativa* Seed Extracts. *International Scientific Research Congress, Congress book*. 355-367.

Analysis of Polyphenol Content and Antioxidant Capacity of Aqueous Extracts of Commercial Sage (*Salvia officinalis* L.)

Emir HOROZIĆ

PhD Student, University of Tuzla, Bosnia and Herzegovina

Dr. Edina HUSEINOVIĆ

University of Tuzla, Bosnia and Herzegovina

Dr. Jasmina DEDIĆ

University of Tuzla, Bosnia and Herzegovina

Emina MEHMEDOVIĆ

PhD Student, University of Tuzla, Bosnia and Herzegovina

Dr. Mirela BRIGA

University of Tuzla, Bosnia and Herzegovina

Abstract

Sage (*Salvia officinalis* L.) is a perennial, evergreen semi-shrub native to the Mediterranean region. It is considered one of the most important medicinal plants and is renowned for its antibacterial properties. In addition to its therapeutic benefits, sage is rich in polyphenolic compounds, which has led to its widespread use in traditional medicine for various health benefits, including the enhancement of digestive health, improvement of cognitive function, and the mitigation of oxidative stress.

This study investigated the polyphenol content and antioxidant activity of three commercial sage samples purchased from a market in Tuzla. Two of the tested samples originated from Bosnia and Herzegovina, and one sample came from Croatia. The results indicated that all sage samples contained approximately the same concentration of polyphenols, suggesting that the geographical origin of the plant does not significantly affect its polyphenol content.

One extract, prepared from a domestic sage sample (Bosnia and Herzegovina), exhibited significantly higher antioxidant capacity compared to the other two extracts. This suggests that, despite similar polyphenol concentrations, the antioxidant activity may be influenced by other factors, such as the specific composition of polyphenols or the presence of other bioactive compounds in the sage samples.

This research highlights the potential of sage as a source of antioxidants, with varying antioxidant capacities among different samples, even when polyphenol content is similar. Further studies may be necessary to explore the underlying factors contributing to these differences in antioxidant activity and to assess the full therapeutic potential of sage in combating oxidative stress and associated health issues.

Keywords: Sage, FRAP, DPPH, Polyphenols, Antioxidants, Polyphenols

INTRODUCTION

Sage (*Salvia officinalis* L.) is a perennial plant from the Lamiaceae family, encompassing nearly 900 species. It naturally grows in the coastal areas of the Mediterranean, but due to its remarkable medicinal properties, it is cultivated worldwide. Studies have demonstrated a wide range of pharmacological activities of this plant, including anticancer, antioxidant, and antimicrobial effects. The main phytochemicals found in the flowers, leaves, and stems of sage include alkaloids, carbohydrates, fatty acids, glycosidic derivatives, phenolic compounds, and others (Dent et al., 2015; Ghorbani et al., 2017). Some of the phenolic compounds in sage have shown excellent ability to eliminate reactive oxygen species, such as anionic acid radicals, hydroxyl radicals, and singlet oxygen toxins, which inhibit lipid peroxidation. Consequently, appropriate extracts have been used to stabilize foods containing fats (Hamrouni-Sellami et al., 2013). Sage is cultivated in several countries, primarily for the production of dried leaves, which are used in medicine and cosmetics, as well as for herbal teas and food flavoring (Pop et al., 2015; Abdelkader et al., 2014).

EXPERIMENTAL PROCEDURE

Preparation of extracts

For the determination of total phenol content and antioxidant activity, three sage tea samples were selected. Two of the samples originate from Bosnia and Herzegovina, while the third sample is from Croatia. To prepare the extracts for analysis, 1 gram of each sage sample was added to 100 mL of boiling distilled water. The mixture was stirred for 3 minutes to ensure proper extraction of the bioactive compounds from the sage leaves into the water. After the mixing process, the solution was left to cool to room temperature, ensuring that the temperature did not interfere with the stability of the extracted compounds. Once the solution had cooled, dilutions of the sage tea solution were made depending on the specific analysis being conducted, such as the determination of total phenol content and antioxidant activity.

Determination of Total Phenol Content

The total phenol content was determined using the Folin-Ciocalteu (FC) method. Diluted tea solutions (1:2, tea:distilled water) were prepared. To a test tube, 0.2 mL of the tea solution, 2.5 mL of FC reagent, and 0.42 mL of Na₂CO₃ were added. After 1 hour, 910 µL of distilled water was added, and the absorbance was recorded using a spectrophotometer at a wavelength of 765 nm. The results are calculated from the calibration curve of gallic acid, which is previously prepared and expressed in mg GAE/L of extract (Singleton, 1999).

FRAP (Ferric Reducing Antioxidant Power) Assay

The FRAP method is based on the ability of antioxidants to donate electrons in acidic medium (pH 3.6) reduces the yellow Fe³⁺ complex with 2,4,6-tris(2-pyridyl)-s-triazine (TPTZ) in blue colored Fe²⁺-TPTZ complex. 0.2 mL of tea extract and 6 mL of FRAP reagent were mixed in a test tube and incubated at 37 °C. After 30 minutes it is measured absorbance at 593 nm (Benzie and Strain, 1999).

DPPH (2,2-diphenyl-1-picryl-hydrazyl-hydrate) method

Different volumes of the tea solution were transferred to test tubes and then supplemented with methanol up to 4 mL. 1 mL of 0.5 mM DPPH reagent was added to the samples thus prepared. The contents of the test tubes are shaken and incubated for 30 minutes in a dark place. Absorbance is measured at 517 nm. 1 mL of 0.5 mM DPPH solution

diluted with 4 mL of methanol represents the control. DPPH radical inhibition is calculated according to equation:

$$I = \frac{A_k - A_s}{A_k} \cdot 100 [\%]$$

The symbol A_k in the above equation represents the absorbance of the control and A_s the absorbance of the sample (Horozić et al., 2019).

RESULTS AND DISCUSSION

The results of the polyphenol content and antioxidant capacity of aqueous extracts of sage are shown in Table 1. A graphical representation of the above results is shown in Figure 1. The concentration of polyphenolic compounds, which are commonly used as indicators of the antioxidant potential of plant extracts, varies between 138.28 and 149.62 mg GAE/L (gallic acid equivalent) of extract. Although the total phenolic content is relatively similar across all three analyzed samples, the highest level of total phenols was recorded in Sample 1, which originates from domestic sage, specifically the plant grown in the territory of Bosnia and Herzegovina. These results suggest that geographical factors may have a significant impact on the concentration of phenolic compounds in plant extracts, which could be related to the specific agroecological conditions under which the plant is cultivated.

In comparison to other types of sage extracts, such as acetonic extracts previously analyzed in various studies, aqueous sage extracts exhibit particularly high polyphenolic content. Antioxidant activity is associated with the presence of polyphenols, as their concentration influences the ability to neutralize free radicals. Phenolic compounds are well known for their pronounced antioxidant properties, making extracts containing high concentrations of these compounds potentially significant in the prevention of oxidative stress, which is a key factor in the pathogenesis of numerous chronic diseases, including cardiovascular and neurodegenerative disorders. These data indicate that aqueous sage extracts, considering their total phenolic content, could be beneficial for therapeutic purposes, as well as a valuable source of natural antioxidants in the functional food and herbal product industries. Given the importance of phenolic compounds in biological processes and their potential for the development of natural therapeutic agents, further research into these extracts would be beneficial to explore in greater detail the specific types of phenols present in different sage samples, as well as their synergy and impact on health.

Table 1. Results of the polyphenol content and antioxidant capacity of aqueous extracts of Sage

Extract sample	TPC [mg GAE/L]	FRAP value [$\mu\text{mol/L}$]	IC ₅₀ [$\mu\text{g/mL}$]
E-1	149.62	7473	114.44
E-2	138.28	5241	119.06
E-33	141.20	5576	124.31

In the DPPH analysis, the concentration of the extract required to achieve 50% neutralization of DPPH radicals, referred to as IC₅₀, ranges from 114.44 to 124.31 $\mu\text{g/mL}$. This range of IC₅₀ values indicates a moderate antioxidant activity of the analyzed sage extracts. Since lower IC₅₀ values indicate greater efficiency of the extract in neutralizing free

radicals, the obtained values suggest that the sage extracts have the potential to neutralize DPPH radicals, but they are not among the most efficient extracts available.

Upon reviewing the scientific literature regarding similar analyses of sage, a difference in IC_{50} values for various sage samples is observed. These differences may be attributed to variations in sample preparation methods, such as different treatments of plant material, choice of solvent for extraction, and environmental factors that influence the metabolism of the plant. Variations in IC_{50} values may also result from differences in polyphenol content, which can be specific to particular sage cultivars or influenced by climatic conditions affecting the synthesis of these compounds.

For the FRAP method, which measures the ability of an extract to reduce Fe^{3+} to Fe^{2+} (an indicator of the extract's reducing power), the results were obtained using a calibration curve, with values ranging from 5.241 to 7.473 $mg/mL Fe^{2+}$. This method provides insights into the ability of the extract to donate electrons and reduce oxidized metal ions, offering additional information about its antioxidant potential. High FRAP values indicate a significant ability of the extract to act as a reducing agent, thereby contributing to the reduction of oxidative stress.

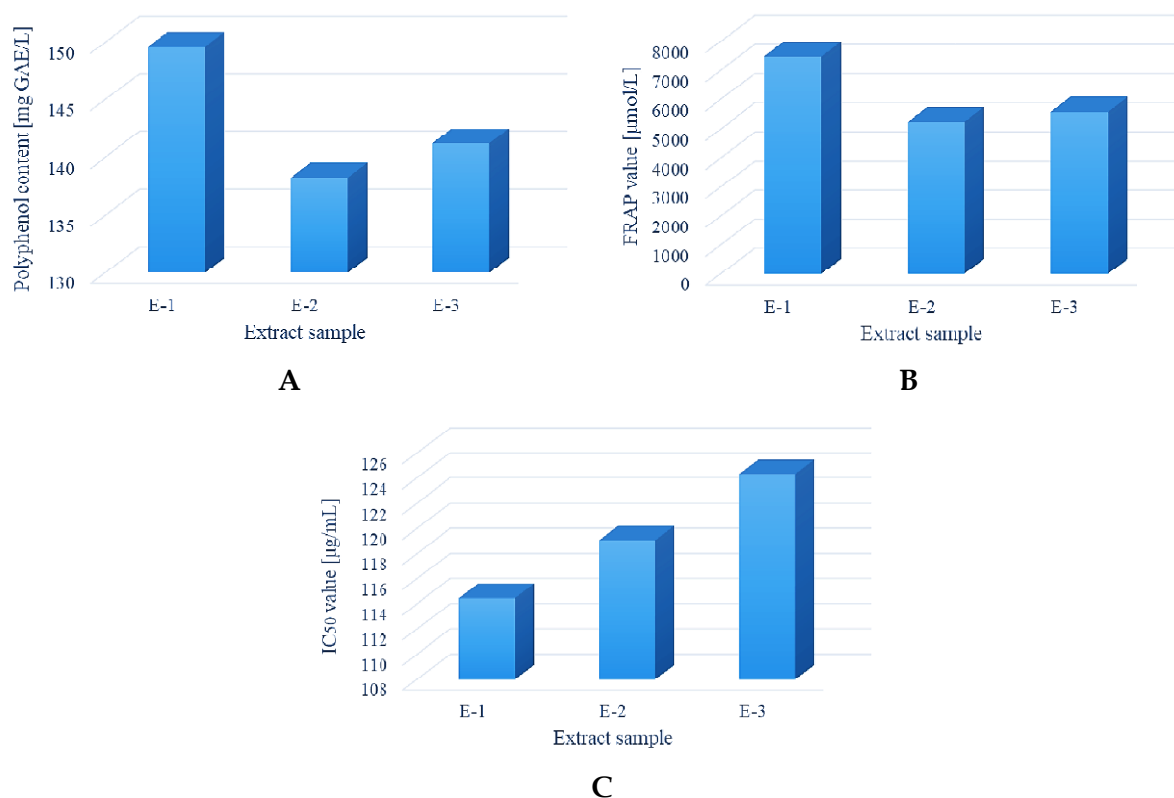


Figure 1. Graphic representation: (A) Polyphenol content, (B) FRAP values and (C) IC_{50} values for aqueous extracts of sage

Among the analyzed samples, the highest antioxidant activity according to the DPPH method was exhibited by the aqueous extract of sample 1, originating from domestic sage (locally produced), with an IC_{50} value of 114.44 μ g/mL. This extract also contains the highest concentration of total phenols (149.62 mg GAE/L of extract), which confirms its superiority over the other samples. Total phenols are key bioactive components known for their pronounced antioxidant capabilities, which likely explains why this sample demonstrates the best efficiency in neutralizing free radicals.

On the other hand, sample 2, which has the lowest total phenol content (138.28 mg GAE/L of extract), also shows the lowest antioxidant activity according to the FRAP method (5.241 mg/mL Fe²⁺). These data suggest a negative correlation between the total polyphenol content and the antioxidant activity of sample 2, further emphasizing the importance of polyphenolic compounds in achieving a high antioxidant potential.

CONCLUSION

The results obtained from both the DPPH and FRAP methods provide valuable insights into the antioxidant activity of sage extracts and their potential therapeutic applications. The IC₅₀ and FRAP values show variations in activity between the samples, suggesting that factors such as geographic origin, sample preparation methods, and choice of solvent significantly affect the efficiency of the extracts. These findings contribute to the understanding of the factors that shape the antioxidant potential of plant extracts and provide a foundation for further research aimed at optimizing extraction methods and improving the bioactive properties of sage.

REFERENCES

- Abdelkader, Mekhalidi; Ahcen, Bouznad; Rachid, Djibaoui; Hakim, Hamoum (2014) Phytochemical Study and Biological Activity of Sage (*Salvia officinalis* L.). International Journal of Bioengineering and Life Sciences. 8;(11): 1253-1257.
- Benzie, IFF; Strain, JJ. (1999) Ferric reducing antioxidant power assay: Direct measure of total antioxidant activity of biological fluids and modified version for simultaneous measurement of total antioxidant power and ascorbic acid concentration. Methods in Enzymology. 299; 15-27.
- Dent M.; Dragović-Uzelac V.; Elez Garofulić I.; Bosiljkov T.; Ježek D.; Brnčić D. (2015) Comparison of Conventional and Ultrasound-assisted Extraction Techniques on Mass Fraction of Phenolic Compounds from Sage (*Salvia officinalis* L.). Chemical and Biochemical Engineering Quarterly. 29;(3): 475-484.
- Ghorbani, Ahmad; Esmaeilzadeh, Mahdi (2017) Pharmacological properties of *Salvia officinalis* and its components. Journal of Traditional and Complementary Medicine. 7: 433-440.
- Hamrouni-Sellami, Ibtissem; Zohra Rahali, Fatma; Bettaieb Rebey, Iness; Bourgou, Soumaya; Limam, Ferid; Marzouk, Brahim (2013) Total Phenolics, Flavonoids, and Antioxidant Activity of Sage (*Salvia officinalis* L.) Plants as Affected by Different Drying Methods. Food and Bioprocess Technology. 6;(3): 806-817.
- Horozić, Emir; Zukić, Amila; Kolarević, Lamija, Bjelošević, Demir; Ademović, Zahida; Šarić-Kundalić, Broza; Husejnagić, Darja; Kudumović, Azra; Hamzić, Sadeta; (2019) Evaluation of antibacterial and antioxidant activity of methanol needle extracts of *Larix Decidua* Mill., *Picea Abies* (L.) H. Karst. and *Pinus Nigra* J. F. Arnold. Technics Technologies Education Management. 14;(1): 14-19.
- Pop (Cuceu), Ana-Viorica; Tofană, Maria; Socaci, Sonia A.; Nagy, Melinda; Borș, Maria-Doinița; Salanță, Liana; VLAIC, Romina (2015) Studies on Total Polyphenols Content and Antioxidant activity of Methanolic Extracts from Selected *Salvia* Species. Bulletin UASVM Food Science and Technology. 72;(1): 86-90.
- Singleton, Vernon L.; Orthofer, Rudolf; Lamuela-Raventós Rosa M. (1999) Analysis of Total Phenols and Other Oxidation Substrates and Antioxidants by Means of Folin-Ciocalteu reagent. Methods in Enzymology. 299; 152-178.

Enhanced CT Imaging Using Super-Resolution Generative Adversarial Networks for Improved Diagnostic Accuracy

Wail M. IDRESS

Central South University, China

Prof. Dr. Yuqian ZHAO

Central South University, China

Khalid A. ABOUDA

Central South University, China

Aala A. AHMED

School of Electronic Engineering, Sudan University of Science and Technology, Sudan

Osama Ziad SHAHIN

School of Electronic Engineering, Sudan University of Science and Technology, Sudan

Dr. Eman Ali Elhussin AHMED

Federal Ministry of Health Sudan

Wleed M. IDRESS

School of Electronic Engineering, Sudan University of Science and Technology, Sudan

Abstract

Enhancement of medical images is vital for diagnostic accuracy, particularly in CT imaging, where high-resolution reconstructions are essential. Super-Resolution Generative Adversarial Networks (SRGANs) address low-resolution (LR) limitations by generating high-resolution (HR) outputs with preserved diagnostic details. This research introduces an enhanced SRGAN framework for CT reconstruction, aiming to improve resolution, reduce noise, and enhance clarity for better diagnostic accuracy and reduced interpretation variability. Our approach features: (1) a high-capacity Residual-in-Residual Dense Block (RRDB) generator with learnable attention mechanisms; (2) a relativistic discriminator stabilized via spectral normalization and gradient penalty; and (3) a hybrid loss combining perceptual VGG-19 features, L1 loss, and adversarial loss, optimized for CT imaging. Evaluated on LiTS17, IRCADb 3D, and MSD datasets (7,585 CT scans), our model achieves a PSNR of 35 dB and SSIM of 0.96 using progressive upsampling (4×). Results demonstrate high-quality image generation with preserved diagnostic integrity, especially in low-dose CT. The efficient, GPU-optimized design underscores its potential for real-world clinical deployment, advancing medical imaging quality and diagnostic utility.

Keywords: Medical Image Enhancement, Super-Resolution Generative Adversarial Networks (SRGANs), Residual-in-Residual Dense Block (RRDB), Low-Dose CT Image.

Investigation of the Geometric Design of the Uhp Fan Blade Profile of Advanced Turbomachinery

Fatima RAMAZANOVA

PhD Student, Researcher, National Aviation Academy, Baku, Azerbaijan

Abstract

This study investigates the geometric design of the Ultra-High-Bypass (UHBP) fan blade profile for advanced turbomachinery operating under supersonic flow conditions. The primary objective is to optimize the blade profile to minimize aerodynamic resistance while maximizing mechanical strength, crucial for durability and reliability under high load and speed conditions. A theoretical framework is developed, highlighting the importance of precise inlet and outlet angles to minimize shock wave impacts and ensure uniform pressure and temperature distribution along the blade. Furthermore, the curvature of the midline is optimized to manage shock waves, direct flow effectively, and reduce wave losses. The blade thickness is strategically varied across its profile, reducing it at the leading edge to minimize losses from shock waves, while increasing it at the trailing edge and midsection to enhance strength and resistance to loads.

The aerodynamic investigation is divided into two stages: first, generating the blade profile geometry based on empirical data, using MATLAB code; second, analyzing the aerodynamic performance using flow simulations in ANSYS Fluent to assess pressure distribution and minimize turbulence and shock waves.

Keywords: UHBP Fan Blade, ANSYS Fluent, Blade Thickness, Supersonic Aerodynamic Profile

Introduction

The aim of the study is the development of the topology of a supersonic profile with subsequent optimization.

Research tasks:

- Selection of the optimal distribution of thickness and curvature of the midline
- Analysis of the influence of installation angles and flow inlet/outlet

State of the art

A key element in the design of highly efficient fan stages is the selection of the blade profile. It is important that the blade profile minimizes friction losses and maximizes energy conversion efficiency, while also ensuring stable operation under various flow conditions.

The design of these profiles involves a delicate balance between aerodynamic performance and structural integrity, necessitating precise modeling techniques.

Theoretical Framework

For a blade operating in supersonic flows with a small angle of attack, it is critically important to consider the precise inlet and outlet angles to minimize the impact of shock waves and ensure a uniform distribution of pressure and temperature along the entire blade length. An incorrectly selected inlet angle may lead to the formation of a zone with high friction losses, while an incorrect outlet angle may cause turbulence, deteriorating the stability of the device's operation.

For supersonic regimes, the curvature of the midline must be calculated to effectively manage shock waves, directing them in the desired direction and minimizing wave losses. Under these conditions, optimal curvature helps balance flow behavior and prevents the formation of shock waves, which could lead to overloads on the blade and degrade its aerodynamic characteristics. In such a blade, excessive curvature at the front can intensify shock waves, while excessive curvature at the rear can lead to flow separation.

Design features:

- o The leading edge is rounded to reduce shock waves at supersonic speeds.
- o The trailing edge is thin to minimize vortex losses.
- o The profile curvature changes smoothly, which reduces the likelihood of flow separation

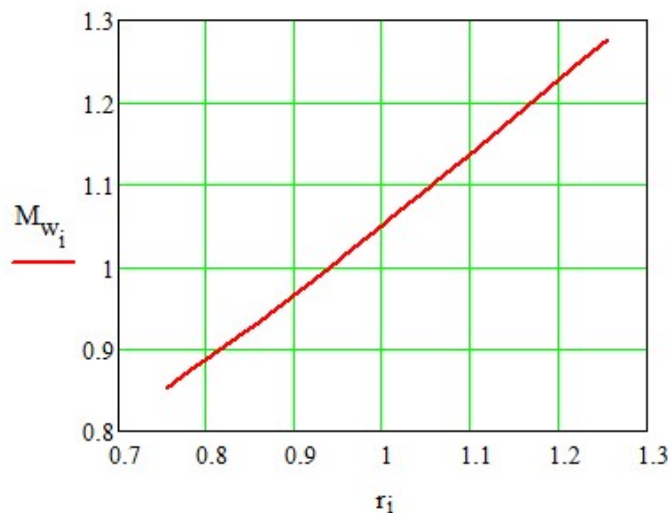


Figure 1. Distribution of the Mach number along the length of the fan blade

To reduce resistance, a supersonic blade should have a small thickness.

The optimal distribution of blade profile thickness affects both the aerodynamic resistance and the mechanical strength of the blade, which is critical for its durability and reliability under high load and speed conditions. During the profile optimization process, it is essential to consider that the thickness at the leading edge of the profile should be reduced to minimize losses from shock waves, while the thickness at the trailing edge and in the middle section of the profile should be increased to enhance mechanical strength and load resistance. [2]

Thus, blade profiling is a complex task that involves various methods. [6]

Among the analytical methods for describing the profile shape, the aerodynamic profile method (NACA), the Zhukovsky method, and the spline method, which use mathematical functions, can be highlighted. [5]

In inverse approaches, numerical methods are used, where the profile shape is determined based on the desired aerodynamic characteristics. This includes the inverse problem method, as well as optimization methods.

An aerodynamic profile can also be constructed using specialized CAD programs, where a simulation model is based on the so-called blade element theory (BET). This is known as computer-aided design (CAD). Programs such as CATIA, SolidWorks, and NX allow the construction of 2D and 3D profiles based on specified parameters. CFD-oriented approaches are also well-known, including profile generation in CFD programs (such as ANSYS BladeGen or NUMECA). [3], [4]

The empirical approach involves constructing a profile based on experimental data, such as using 3D scanners to obtain the geometry of existing profiles. [1]

Research Methodology

An aerodynamic calculation of the blade was performed, consisting of two main stages:

1. Selection of the blade profile geometry, which affects the flow velocity and direction, as well as pressure losses.
2. Analysis of the impact of this geometry on the flow, including an assessment of the pressure distribution on the blade surface.

In the first stage, the relevant geometric characteristics were calculated using empirical formulas based on the analysis of similar profiles and experimental data. A MATLAB code was written, which implemented the methodology for constructing the aerodynamic profile, considering geometric parameters such as the radius of the leading and trailing edges, chord length, flow inlet and outlet angles, curvature angle of the midline, and installation angle (Table 1).

Table 1. Distribution of the Mach number, chords, and characteristic angles in fan profile sections

No	Chord, m	curvature angle, °	Installation angle, °	Mach	Thickness, m
1	0.408	10.649	59.447	0.852	0.031824
2	0.422	9.755	57.28	0.872	0.030384
3	0.437	8.934	55.251	0.893	0.028842
4	0.451	8.18	53.35	0.913	0.027511
5	0.465	7.49	51.568	0.934	0.02604
6	0.479	6.859	49.894	0.956	0.024429
7	0.493	6.281	48.321	0.977	0.023171
8	0.508	5.752	46.841	0.999	0.022352
9	0.522	5.268	45.447	1.021	0.02088
10	0.536	4.824	44.131	1.044	0.019832
11	0.55	4.418	42.889	1.066	0.0187
12	0.564	4.044	41.713	1.089	0.017484
13	0.579	3.701	40.6	1.112	0.016791
14	0.593	3.386	39.545	1.135	0.015418
15	0.607	3.095	38.543	1.158	0.014568
16	0.621	2.827	37.591	1.181	0.013662
17	0.636	2.58	36.685	1.205	0.013356
18	0.65	2.351	35.822	1.228	0.01235
19	0.664	2.139	34.999	1.252	0.011288
20	0.678	1.943	34.213	1.275	0.010848

The mathematical model of the profile includes the description of the midline using a third-order polynomial, as well as the distribution of profile thickness (1) (Figure 2).

$$T_i := 0.034b \cdot \left(1.2 \cdot \sin\left(\pi \cdot \frac{x_i}{b}\right) - 0.2 \cdot \sin\left(\pi \cdot \frac{x_i}{b}\right)^2 \right) \quad (1)$$

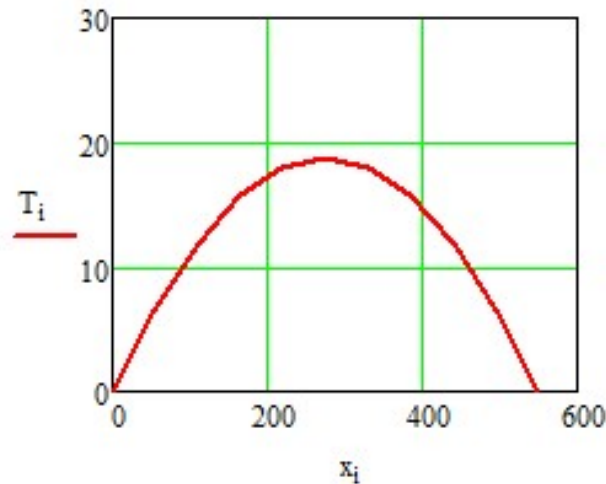


Figure 2. Thickness distribution of the profile

The coordinates of the upper and lower surfaces are exported to a CSV file (Figure 3), which can be imported into Ansys Design Modeler for further analysis. A graphical representation of the profile is also implemented. Smoothness is ensured by using splines to automatically maintain continuity.

In the second stage, computational methods are used to analyze the impact of the blade geometry. Flow is simulated in ANSYS Fluent, and pressure distribution along the blade is predicted to minimize turbulence and shock waves.

Thus, the interaction between the blade and the flow is studied.

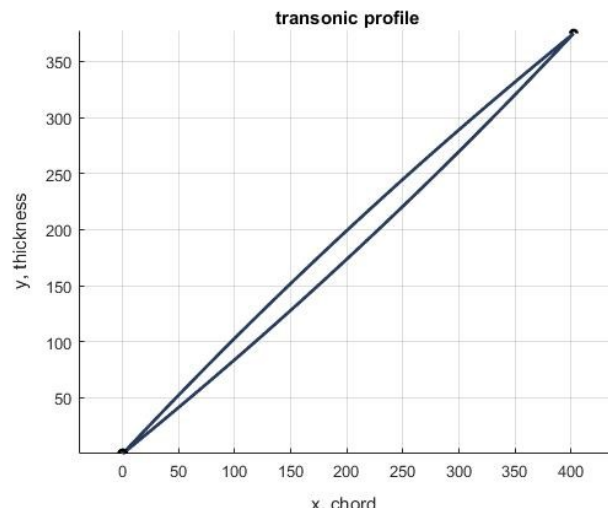


Figure 3. The 11th section of the Fan blade

Design Analysis

The analysis of the transonic profile in ANSYS Fluent includes the study of the aerodynamic characteristics of the flow that occurs during the transition from a subsonic to a supersonic state, as well as the distribution of flow parameters along a given profile. The 11th section was selected for the analysis.

Task settings:

- Boundary conditions: The initial state of the flow (velocity, pressure, temperature) is set
- Simulation of the flow
- Using the Navier-Stokes equations to model the behavioral properties of a gas

To approximate the solution of the equations of gas dynamics using numerical methods, a triangular mesh was generated around the profile. The triangular grid (Figure 4) was chosen because it allows complex curved geometries such as fan blades.

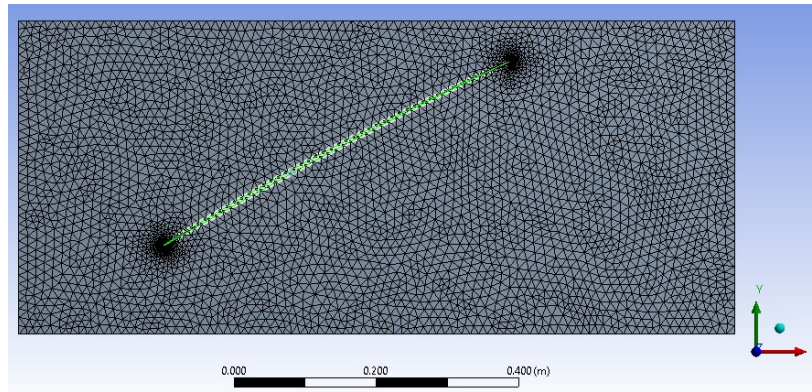


Figure 4. Creating a mesh for calculating the profile calculation area

As a result of numerical simulation in ANSYS Fluent, the aerodynamic characteristics of the transonic fan profile were analyzed (Figure 5).

Research on the Boundary layer shows that the presence of blue zones near the surfaces, indicating “a thickening of the boundary layer”. Analysis of velocity gradients near the walls shows the presence of “flow separation zones”, which indicates a local deterioration of flow.

A significant increase in velocity is observed in places where the flow accelerates, especially in the front of the profile and in areas of narrowing. They are shown as red and yellow zone.

At the exit beyond the trailing edge of the profile, there is a sharp drop in speed, which indicates the presence of a strong speed gradient. A shock wave is formed, represented in the calculations as an inclined slope.

However, overall a thin boundary layer is observed, which ultimately means a well-attached flow.

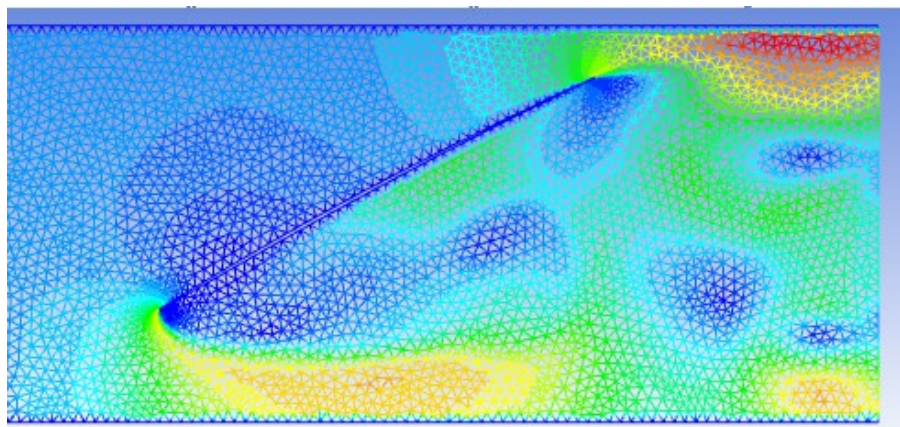


Figure 5. Velocity distribution along the calculated area

Figure 6 represents the contour plot of the Adaption Function in ANSYS Fluent used to refine the mesh in areas with sharp gradients, such as shock waves.

The contour plot shows areas with high velocity gradients, indicating the presence of shock waves. These areas require additional mesh refinement to improve the accuracy of shock wave modeling.

The region near the walls plays a key role in the formation of the boundary layer.

Refining the mesh in these areas will allow more accurate predictions of flow separation and its interaction with shock waves.

Additional local mesh refinement is recommended in areas with sharp velocity changes.

This will allow more accurate modeling of vortex structures that occur near shock waves and airfoil edge effects.

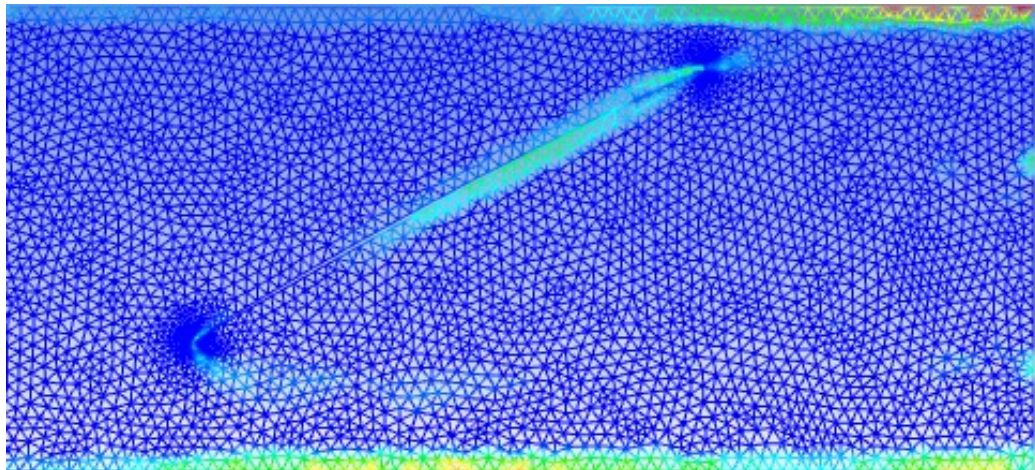


Figure 6. Adaptation Function

Conclusion and future work

Optimization of the blade profile shape requires a comprehensive approach, including the selection of the ideal distribution of thickness and curvature, as well as the analysis of installation angles and flow inlet/outlet conditions.

Reduction of friction losses and minimization of turbulence are achieved through the proper distribution of curvature, which allows for smoother flow redirection and reduces shock impacts. Modeling curvature using parametric dependencies and equations for flow velocity provides the opportunity to develop more efficient blades for supersonic conditions. At the same time, reducing thickness at the leading edge helps minimize aerodynamic losses and shocks, while increasing thickness in the midsection and at the trailing edge enhances the mechanical strength and load resistance of the blade.

Further analysis requires a detailed study of the interaction of shock waves with the boundary layer and the development of vortex structures.

The research underscores the complexity of blade profiling, emphasizing the need for advanced modeling techniques to ensure high efficiency and stability in supersonic turbomachinery. Future work will focus on refining the optimization process and expanding the application of these methods to improve fan blade designs in diverse operating environments, with potential benefits in both performance and operational reliability.

A combined approach to solving these problems using advanced modeling techniques enables the creation of blades that ensure high efficiency and reliability in various operating conditions of the aircraft engine. The employed methodology provides realistic modeling of aerodynamic characteristics, considering the fundamental principles of supersonic turbomachine profile design.

REFERENCES

1. Arkhipov A. N. et al. Automated construction of a fan blade model according to data of CAD profile measurements //Vestnik of Samara University. Aerospace and Mechanical Engineering. - 2018. - T. 17. - №. 4. - C. 7-17.
2. Amoo L. M. On the design and structural analysis of jet engine fan blade structures //Progress in Aerospace Sciences. - 2013. - T. 60. - C. 1-11.
3. Idahosa U., Golubev V. V., Balabanov V. O. An automated optimal design of a fan blade using an integrated CFD/MDO computer environment //Engineering applications of computational fluid mechanics. - 2008. - T. 2. - №. 2. - C. 141-154.
4. Podgaietsky G. L., Ronzoni A. F., Hermes C. J. L. A model-based design approach for low-pressure axial fan blades considering the air flow system characteristics //International Journal of Refrigeration. - 2024. - T. 168. - C. 484-491.
5. Shi, H. A Parametric Blade Design Method for High-Speed Axial Compressor. Aerospace 2021, 8, 271. <https://doi.org/10.3390/aerospace8090271>
6. Yang J. et al. Design optimization of a supersonic through-flow fan rotor based on the blade profiles //International Journal of Turbo & Jet-Engines. - 2023. - T. 40. - №. 4. - C. 503-517.

Walrus Optimization Algorithm (WaOA)-based Load Frequency Control in Multi-area Interconnected Power System

Dr. Jahanzeab HUSSAIN
Central South University, China

Dr. Akhtar SAMINA
Wuhan University, China

Dr. Ali DANISH
Dalian University of Technology, China

Abstract

The imbalance between generated power and load demand often causes undesirable fluctuations in system frequency and tie-line power. To address this issue, load frequency control (LFC) is essential. This study introduces a nature-inspired optimization technique called the Walrus Optimization Algorithm (WaOA) and explores its application in optimizing the parameters of a Proportional-Integral-Derivative with filter N (PIDN) controller for a multi-area interconnected power system. The effectiveness of the WaOA-optimized PIDN controller is evaluated and compared with other optimization techniques, including Genetic Algorithm (GA), White Shark Optimizer (WSO), and Whale Optimization Algorithm (WOA), under step load perturbation (SLP). The results reveal that WaOA achieves faster convergence, with an Integral of Time-weighted Absolute Error (ITAE) value of 0.3641, outperforming WOA, WSO, and GA, which yield ITAE values of 0.3972, 0.4806, and 0.5086, respectively. This demonstrates that WaOA improves ITAE by 8.33%, 24.24%, and 28.41% compared to WOA, WSO, and GA, highlighting its superior performance in optimizing LFC.

Keywords: Walrus Optimization Algorithm, Integral of Time-weighted Absolute Error, Load Frequency Control, Interconnected Power System.

Analysis of DFIG-Based Wind Turbines with Superconducting Fault Current Limiter Operation

Prof. Dr. Ziyodulla YUSUPOV
Karabük University, Türkiye

Gabdoulbe Noel MBOURING
Karabük University, Türkiye

Abstract

This paper analyzes the performance of Doubly-Fed Induction Generator (DFIG)-based wind turbines integrated with Superconducting Fault Current Limiters (SFCLs) to enhance Fault Ride-Through (FRT) capabilities. DFIG-based wind turbines, while offering advantages in power control and adaptability, are vulnerable to grid faults which can cause excessive rotor currents and damage the Rotor Side Converter (RSC). Traditional Fault Ride-Through (FRT) solutions, such as crowbar system, have limitations, including increased reactive power consumption and reduced grid voltage support. In this study, we explore the integration of Superconducting Fault Current Limiters (SFCLs) as an alternative approach to enhance the FRT capability of DFIG-based wind turbines. The performance of DFIG-based wind turbines with SFCL implementation is analyzed through simulations in MATLAB/Simulink. The study examines the impact of SFCL on rotor and stator currents, as well as voltage dips under fault conditions, considering different resistance values for comparison. The results aim to demonstrate the potential benefits of SFCLs in enhancing the stability and resilience of wind energy systems, contributing to the reliability of future renewable energy grids.

Keywords: Wind Turbine, Doubly-Fed Induction Generator, Superconducting Fault Current Limiter, Fault Ride-Through, Crowbar.

Methylene Blue (MB) Loaded ZIF-8 Synthesis, Characterization and Investigation of Photodynamic Therapy Activity on Breast Cancer

Derya METE

Researcher, İzmir Institute of Technology, Türkiye

Pınar ÖZTÜRK

MSc, İzmir Institute of Technology, Türkiye

Tuğçe AKBAŞ

İzmir Institute of Researcher, İzmir Institute of Technology, Türkiye

Assoc. Prof. Dr. Muhammed ÜÇÜNCÜ

Izmir Katip Celebi University, Türkiye

Prof. Dr. Gülşah Şanlı MOHAMMED

İzmir Institute of Technology, Türkiye

Abstract

Conventional methods for breast cancer diagnosis and treatment often present limitations, including drug resistance, toxic side effects, metastasis, and the potential for relapse. This necessitates the development of innovative strategies for early detection and enhanced therapeutic interventions. In this context, photodynamic diagnosis and therapy have emerged as promising approaches in recent years. This study aims to explore the use of Metal-Organic Frameworks to incorporate Methylene Blue in photodynamic therapy for breast cancer treatment. The cytotoxic effects of a nanodelivery system using methylene blue were evaluated on MDA-MB-231 and MCF-7 breast cancer cell lines. ZIF-8 was expected to contribute an additional therapeutic benefit besides photodynamic therapy by cleaving zinc and releasing it into cells. Furthermore, the study was assessed the combined effects of multiple cytotoxic components within a single nanoparticle. These next-generation nanocarriers are engineered to selectively release methylene blue within cancer cells under low pH conditions. This targeted delivery minimizes harm to healthy tissues and improves the overall quality of the treatment process. By combining the benefits of photodynamic therapy with a targeted drug delivery system, this research hopes to provide a more effective and less harmful treatment approach for breast cancer.

Keywords: Methylene Blue, ZIF-8, Photodynamic Therapy, Breast Cancer

Using Digital "Control" Technologies to Improve the Performance of Oil and Gas Extraction Facilities

Rana Elkhan MAMMADOVA

Azerbaijan State Oil and Industry University, Azerbaijan

Abstract

The oil and gas industry is on the brink of a digital revolution. Changes in supply and demand, reducing costs and carbon emissions, while improving the reliability and availability of private assets, remaining competitive, increasing attention to processes in the global economy and environmental sustainability are driving oil and gas organizations to use digital technologies to improve their current economic operating models and make them more efficient. International organizations recognize digitization as a key tool for realizing these goals. Advances in key technologies such as data analytics, artificial intelligence (AI), cloud computing and blockchain are opening up vast opportunities for optimizing, automating and streamlining processes, asset "tracking" and data management in the oil and gas industry.

Keywords: Oil, Gas, Digital Technology, Green Energy, Environment, Industry, Resources

Introduction

Oil and gas companies have long used digital technologies to improve decision-making around exploration and production assets, including reservoirs and pipelines. The industrial sector has used process control and automation for decades, especially in heavy industry, to maximize quality and productivity while minimizing energy use. Smart transportation systems use digital technologies in all modes of transportation to improve safety, reliability, and efficiency.

During the transition of the oil and gas industry to the mode of saving energy types, the reduction of operating costs due to the potential of specific new technologies is changing the role of methods of exploration and production.

The effective application of digital technologies in the leading oil and gas companies of the Russian Federation is one of the clear examples of the transition to the mode of saving energy types and the expansion of investment trends in innovative technologies.

In the world, the share of traditional energy subjects (mining, fuel and energy, utilities, production and servicing of energy equipment) is getting smaller every year: for example, if in 2012-2015 the investment of these subjects made up 49% of total investments, in 2016 - In the period covering 2019, the comparison indicator decreased to 23%. The main task of society is to move to a new energy paradigm based on technologies that do not allow climate change. For the analysis period, 50% of the companies that traditionally invest in the

energy sector are directly involved in the oil and gas business of the economy. However, the investments made by these companies decreased by 290 million US dollars in 2018 compared to 2017, and the direction of investments included bioenergy "start-ups": for example, "Punjab invest" - renewable energy sources; "Chevron" - reducing carbon emissions; "Equinor and Oxford PV" - to use solar energy.

Investment in energy technology scientific startups, including venture capital, peaked in 2019 (\$5 billion). Corporate capital has been used by companies as part of the process of realizing a flexible and open innovation strategy in the energy sector.

One of the main tasks of the global society is to reduce the negative effects of the industry, especially the oil and gas extraction industry, on the natural environment, to establish a new energy production and consumption program based on technologies that do not allow climate change. The studied program will have an important role in the formation of the world's energy balance, in reducing the rate of active greenhouse gas emissions.

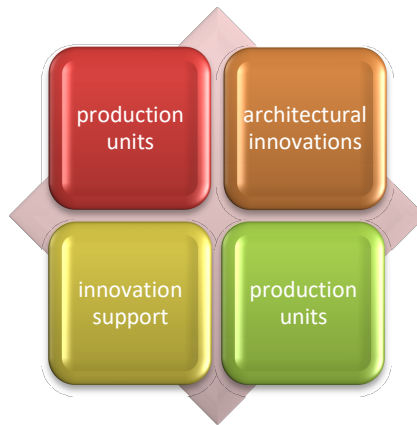
In the 2020 calendar year, the world's oil and gas business experienced a double "shock effect", unrecorded in global economic history. Reduced demand due to the global COVID-19 pandemic and oversupply caused by competition among the world's major suppliers have changed the market for energy resources unexpectedly and rapidly. As a result, there will be new ways to develop and implement technologically superior goods and services projects for the common global market of resources, goods and services. It is clear that under such conditions, oil and gas production companies must be ready to flexibly apply industrial technologies in response to rapid changes.

The role of technological innovation in oil and gas exploration and production during the energy transition is considered. At the current stage, the main trends in the development of oil and gas innovations, the volume of financing and the main participants are determined. Types of innovations are described and the role of "disruptive" innovations is shown. The potential for reducing special operating costs due to new technologies is shown.

In 2019, total capital investment in energy technology startups, including growth capital for all types of investments, was \$16.5.

According to the application principles of the technological strategy, the responsibility for increasing the efficiency of production falls not only on the technological project group, but on the company as a whole. In other words, before the implementation of the technological project, it is necessary to understand how the company will earn profit by means of innovative production resources. The results of a survey conducted by IBM's Business Value Institute and Oxford University's working group among 350 managers of companies specializing in oil and gas extraction from 25 countries showed that: "... more than 40% of the respondents said that the efficiency of value creation was achieved through the implementation of an innovative strategy. There are different types or directions of innovation. Innovation types are presented in their full variety in the "Innovation landscape map". In the "innovation landscape map", the new technical skills (set of competencies) required by each type and direction of innovation and the corresponding business model are characterized...".

For example, in the "Pisano Matrix" business model (matrix 1), the "innovation support" cluster is shown in the lower left corner (characterized by changes directed to economic growth in a small amount). Many large operating companies with actual implemented systems for new product development are located here. In the upper left and lower right squares of the diagram are the most likely production units that can generate income with the limited resources in the cluster.



Matrix 1. "Pisano Matrix" business model

Another business model is characterized by the application of "destructive" ("disruptive") technologies in oil fields. Despite being labeled as such, "disruptive" innovation does not require large-scale investment in technologies.

According to the heuristic definition given by K. Christensen: "... "disruptive" innovations include the introduction of products and services with lower performance characteristics than the existing technology, but the products and services have a lower cost, and the technology is simpler to implement and use." .

Because "disruptive" technologies have performance problems, data on proven practical, commercial applications are not made public and therefore not widely known. Nevertheless, "disruptive" technologies have the effect of significantly changing the lifestyle, work and activities of the public, business, and even the global economy.

Back in the 2013 calendar year, the Mckinsey Global Institute published a list of 12 potential "disruptive" technologies that could affect the world economy:

1. Mobile Internet communication;
2. Automation of mental work;
3. "Internet of Things";
4. Advanced robotics;
5. "Cloud" technologies;
6. Remotely controlled (autonomous) vehicles (unmanned vehicles, flying machines, etc.);
7. New generation technologies of accumulation, storage and transformation of energy types, including energy accumulators with different electrical power;
8. 3D printing technology;
9. Production technology of synthetic materials, including raw materials;
10. Digital technologies of exploration of oil and gas fields;
11. Advanced technologies of extraction of hydrocarbon resources. The impact of these technologies on the oil and gas business is expressed in the improvement of the reliability of informative sensors, the quality of software, the productivity and sustainability of oil fields of nanomaterials. According to the opinion of the majority of field experts, the most "disruptive" innovation in the development of oil fields in the last 30 years is the use of shale oil in production. The use of hydraulic fracturing and horizontal drilling technologies has influenced the rapid commercialization of shale oil and natural gas production. This unexpected technological advance has led to severe, non-cyclical fluctuations in the oil markets as well as in the global natural gas and liquefied natural gas markets. Ten years ago, the United States of America had to be an importer of natural gas, and specialized companies built terminals for receiving and storing liquefied natural gas in order to ensure the volume

of imports. Currently, on the contrary, terminals are put into operation in the United States of America for the purpose of exporting liquefied natural gas. Such a commercial "wave" in the energy market was related to the application of the described technologies and was an unexpected conjuncture, financial and economic event for market subjects.

It is clear that organizing "easy" production conditions at low cost is more attractive for decision-makers. However, in this case, a decision must be made as to whether a low level of performance is acceptable. According to our conclusion, various systems applied by large companies (for example, "stage-gate") should serve to gradually improve the products and services offered to the market. As the results of the activity change in a positive direction, at a certain point in time, the production performance of constantly adjusted systems exceeds the performance required by the market. The performance of regulated systems according to the market rules exceeds the performance required by the market in the specified time period. After that, the "disruptive" innovation moves to a situation that more efficiently satisfies the market demands, at the same time, the simplicity of the innovation increases and the costs decrease. The ideal state of the process can be considered when a new, "disruptive" product or service has capabilities and features that will allow it to surpass a traditional business entity in an average calendar-time period.

The primary benefit of the "disruptive" effect is to increase the market share of the business entity by offering a lower price and simpler products (or services) that meet the needs of the customer base.

One of the examples of "disruptive" technologies in the oil industry is the "circular management system" that enables low-cost operation and exclusion of complex, overlapping, repetitive functions. Application of the "circular management system" to production coincided with 2016, but its principles remain relevant even for the current period. Another example of "disruptive" innovation in the mining industry is the installation of simpler and less expensive solids determination devices (MWD) on drilling equipment. This method makes it possible to change the capital costs at each stage of drilling operations and, similarly, the costs of staged maintenance of MWD devices, while providing productivity indicators. Through its MWD architecture, the provider can perform preventive maintenance based on the results of data analysis, which corresponds to Christensen's definition of "disruptive" innovation based on simple and inexpensive solutions to improve productivity.

The production of "simple" products increases the level of employment and directly leads to the expansion of service and repair volumes at workplaces. The work experience gained in servicing and repairing equipment at workplaces, combined with the simplicity of technology, is a provider of employment in the local geographical area by expanding the possibilities of manufacturing and assembling the mentioned devices in local conditions. At the same time, the formation of these factors provides a basis for local operators and their suppliers ("supply chains") to achieve the goals of regulating the "cost of service" of program providers in the country. An example is the certification of software producers and consumers in the United Arab Emirates, which meets the interests of all parties.

Table 1. With digital technology used by major oil and gas companies

Shell	Smart Field
Chevron	I-Field
BP	The field of the future
Petoro	Smart Transactions
Halliburton	Real time operation
Schlumberger	Smart Wells
Gazpromneft, Rosneft	Digital field
Lukoil	Life field

Repair of oil and gas extraction equipment on a local production scale (or equipment maintenance) aims to solve several tasks in a complex way: due to the low training costs of the industrial-production yard, the production of the equipment with the maximum production capacity positively describes the competitiveness of the prices; Exclusion of transport of equipment for repair and service leads to reduction of waste during transportation (waste of vehicles) (service for fulfilling environmental duties)

Innovations called "architectural innovations" are shown in the square on the upper right side of the "Pisano Matrix" mentioned in the previous text. An example of this is the digital images provided by "Kodak" company, online versions of newspapers and magazines of press companies. In order to achieve economic efficiency in the activities of these enterprises, both new technologies and new business models were required.

It is known that in the current period of continuous changes in the economic situation, ensuring economic efficiency depends on the joint application of business models with new technologies. It is difficult to imagine technological advances in the field of oil and gas extraction of the industry in the conditions of limited resources. In this context of the scientific research problem, we consider it important to take into account again that innovations are not only technologies.

In scientific and practical terms, technologies are not a method of increasing income, but a means. For example, Samsung, a manufacturer of electronic goods, is the world's most inventive company in terms of the turnover of patents and grants (8,000 patents per year, 9,000 multi-patent grants). Despite the fact that it operates on the basis of intellectual property, "Samsung" is a supporter of "open innovation". On the basis of "open innovation", the management of the company transforms selected ideas into start-ups and partnerships using various means, including investment. In the production of electric car batteries, Samsung cooperates with Bosch, but most of the "open innovation" is directed to the expansion of work experience in the field of software and services in order to maintain a leading position in the market segment of device-making goods.

The approach of industrial companies' management of technological advantages, rather than intellectual property rights, as a stimulating tool for innovation, expands joint activity in the involvement of technologies.

Companies whose activities are related to the provision of services to oil and gas extraction enterprises cooperate on a large scale with companies that create technological values. For example, provision of "cloud consulting" services for the purpose of joint storage and use of data.

ISPs were starting to run ventures, that is, service companies were able to appreciate the advantages of "open innovation" as a way to attract external (external) technologies. For example, one of the large companies specializing in the geological exploration and production of oil and natural gas imitated the behavior of the "Samsung" company by implementing a project to accelerate the activities of start-up companies.

"Open innovations" can be efficient and beneficial for both large and small-scale companies specializing in geological exploration and production of oil and natural gas. As a result of the application of "open innovations", unlike proprietary technologies developed (to be developed) for this and other companies, companies benefit from the division of risks, that is, from the reduction of the level of risk per company and from the conditions of having technologies at low costs. In fact, many of the world's oil and gas production companies benefit from the availability of their technologies (remotely controlled technologies) beyond their territorial boundaries.

The combined use of technologies through formal and informal means is the basis of successful field clusters. In this case, field action partners are purposefully concentrated in a

small geographic area, benefiting from a wealth of shared resources, including subcontractors and employees. For this reason, the governments of a number of countries have started the development of entrepreneurial ecosystems aimed at establishing higher education institutions, financial institutions, enterprises providing auxiliary services and companies regulating support for local start-ups. From the perspective of application in the oil and gas extraction industry, the low market prices of "disruptive" technologies for the customer-enterprise increase the attractiveness of their use in the field of geological exploration and production of oil and natural gas.

When radical changes are required, "open innovation" and collaboration with other stakeholders can reduce the trade price of technological developments without adversely affecting the performance of suppliers.

According to a survey conducted by OIL & Gas IQ among representatives of the largest international oil and gas companies, "How can intelligent enterprise systems affect your business?" when answering the question, 65% favored cost reduction, 45% - process optimization, 44% - business modernization, 42% - time saving, 35% - winning the competition

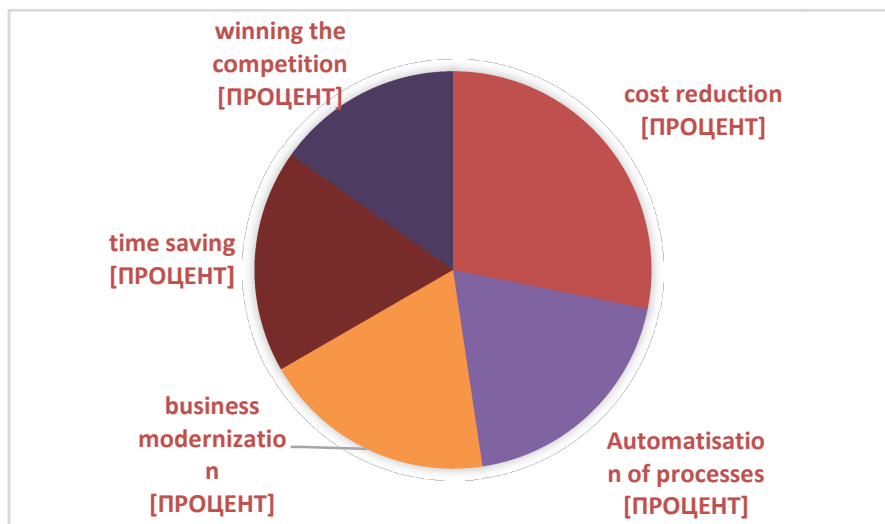


Figure 1. "Impact of intelligent enterprise systems on business"

Data published in 2021 showed that total costs in the oil and gas extraction industry were reduced by 35-40% in the period spanning 2014-2016. However, according to the opinions of field scientists and specialists, the current development trends do not allow the realization of such indicators. Because 2/3 of the cost reduction was achieved due to the price concessions of service and supply companies, and for some important cost items (for example, offshore drilling rigs and drilling equipment installation vessels, equipment and steel) the reduction was 20-30%. 1/3 of the costs were reduced due to the standardization and simplification of drills and production facilities.

Stakeholders' pressure on oil companies to reduce greenhouse gas emissions within the framework of the requirements of the new climate policy currently prevailing in the world is increasing. However, in economic approaches, it should be taken into account that the efforts of oil and gas companies to reduce the gas-greenhouse effect will inevitably increase the costs of geological exploration and exploitation of oil and natural gas deposits. With this logic, the scientific and practical dilemma of the problem is formed. We see the solution to the scientific-practical dilemma in the close correlation of the activities of the most

efficient operator-companies and the companies that put more effort into reducing carbon emissions. Literally, the absolute majority of the application of digital technologies and the automation of processes are related to initiatives that provide the advantages of both indicated functional areas. We will substantiate these considerations with scientific and practical facts:

- Optimizing the "supply chain" and logistics reduces the number of transport operations (traveling any distance) to perform work in synthesis with remote control operations. At this time, increasing the efficiency of the production potential will be accompanied by a reduction in vehicle emissions, while the replacement of the vehicle fleet with electric vehicles will further reduce the amount of these emissions;

- Correlation between the amount of consumed heat units and the volume of carbon waste indicates the advantages of the energy efficiency method of reducing carbon waste. Thus, increasing energy efficiency by 5-15% means reducing CO₂ emissions in that equivalent;

- Equipment methane emissions monitoring and mitigation can also be used to determine and predict equipment failures of various degrees. "Stationary devices" such as those installed on drones, aircraft, and satellites communicate with maintenance management systems that can alert maintenance personnel of current or anticipated methane emissions and then coordinate automatic repairs.

The result. Taking long-term predicted price fluctuations in energy markets and public concern about climate change as global eco-economic factors, oil and gas extraction enterprises can achieve partial success in a short period of time, as the influence of digital technologies on the formation of a portfolio of affordable solutions expands by reducing carbon emissions to an authoritative level.

Digital technologies are improving production performance in the oil and gas industry by streamlining processes and creating new frontiers for operations. These technologies are well suited to extracting new hydrocarbon deposits, increasing operational efficiency and reducing methane emissions.

REFERENCES

1. <https://oilcapital.ru/news/2017-12-05/tsifrovaya-revolyutsiya-kak-budet-menyatsya-neftegazovaya-promyshlennost-1028989>
2. Samylovskaya E. et al. Digital technologies in arctic oil and gas resources extraction: global trends and russian experience //Resources. – 2022. – T. 11. – №. 3. – C. 29.
3. **google.com**
4. World Energy Investment 2020 – Analysis – IEA mai 2020
5. Pisano, G., 2015. You Need An Innovation Strategy. Harvard Business Review, June.

Determination of Lipocalin 2 and Lipocalin 13 balance before and after Laparoscopic Sleeve Gastrectomy

Laparoskopik Sleeve Gastrektomi Öncesi ve Sonrası Lipokalin 2 ve 13 Dengesinin Tespiti

Res. Asst. Fatma TEKSAR
Kafkas Üniversitesi, Türkiye

Assoc. Prof. Dr. Kenan BİNNETOĞLU
Kafkas Üniversitesi, Türkiye

Abstract

Objectives: This study aims to determine Lipocalin 2 and Lipocalin 13 levels in the blood and tissue samples of patients who underwent laparoscopic sleeve gastrectomy and how it changes before and after one year of the surgery.

Method: Lipocalin 2 and Lipocalin 13 levels were obtained and then assessed from samples taken from 30 morbidly obese patients with a BMI over 40 .Samples were collected from blood after an 8-hour fasting on the morning of the laparoscopic sleeve gastrectomy operation, at the fat tissue taken perioperatively from around the gastric fundus, and from the blood samples taken after an 8-hour fasting at the end of 1 year post-operatively.

Results: While Lipocalin 2 and Lipocalin 13 values were close to each other in the healthy group, an increase in Lipocalin 13 was observed in obese patients. After LSG(Laparoscopic Sleeve Gastrectomy), Lipocalin 2 and Lipocalin 13 levels were found to be close to each other. Lipocalin 2 was found to be lower in the healthy group than in the obese group, but no statistically significant difference was obtained.

Results: While BMI and HOMA-IR values were low in the healthy group, they are increased in the obese. It was concluded that as the balance between Lipocalin 2 and Lipocalin 13 is broken, BMI and HOMA-IR values also increase.

Keywords: Obesity, sleeve gastrectomy, Lipocalin 2, Lipocalin 13

Özet

Amaç: Bu çalışmada laparoskopik sleeve gastrektomi (LSG) yapılan hastaların ameliyat öncesi ve ameliyattan bir yıl sonraki kan örneklerinde Lipokalin 2 ve Lipokalin 13 düzeylerinin nasıl değiştiğini göstermek hedeflenmiştir.

Yöntem: BMI'i 40 üzerinde olan 30 morbid obez hastadan laparoskopik sleeve gastrektomi operasyonu sabahı 8 saat açlık sonrası alınan kan ve post operatif 1 yılın

sonunda yine 8 saat açlık sonrası alınan kan örneklerinden Lipokalin 2 ve Lipokalin 13 düzeyleri çalışılmıştır.

Bulgular: Lipokalin 2 ve Lipokalin 13 değerleri sağlıklı grupta birbirine yakın iken obez hastalarda Lipokalin 13 yönünde artış görülmüştür. LSG sonrası ise Lipokalin 2 ve Lipokalin 13 düzeyleri birbirine yakın bulunmuştur. Lipokalin 2 sağlıklı grupta obez gruba göre daha düşük bulunmuştur ancak istatistiksel olarak anlamlı fark elde edilememiştir.

Sonuç: BMI ve HOMA-IR verileri sağlıklı grupta düşük iken obezlerde bu iki veri de yükselmektedir. Lipokalin 2 ve Lipokalin 13 arasındaki paralellik bozuldukça BMI ve HOMA-IR değerlerinin de yükseldiği sonucuna varılmıştır.

Anahtar Kelimeler: Obezite, sleeve gastrektomi, lipokalin 2, lipokalin 13

Obezite, günümüzde görülme sıklığı ve risk altındaki kişi sayısı bakımından adeta bir pandemi gibi dünya genelinde artarak devam etmektedir (Blüher, 2019: 288-298). Dünya üzerinde önlenebilir ölüm nedenlerine bakıldığında ise obezite ikinci sırada yer almaktadır (Obezite Tanı Ve Tedavi Kılavuzu, Türkiye Endokrinoloji ve Metabolizma Derneği. 6. Baskı. 2018: 11). Obezite genetik, kültürel ve sosyoekonomik durumların bir araya gelip psikolojik, biyolojik ve davranışsal faktörleri etkilemesi ile ortaya çıkan bir hastalıktır (Skelton, 2011: 1333-1354). Son zamanlarda yapılan çalışmalarda, genetik ve çevresel faktörlerin yanı sıra adipokinlerde meydana gelen düzensizliğin, beyaz ve kahverengi yağ doku anormalliklerinin ve bağırsaklardaki bozulmuş mikrobiyotanın obeziteye bağlı patolojik süreçlere zemin hazırladığı gösterilmiştir (Zhang, 2023: 16-27). İştah mekanizmaları da obezitenin patogenezinde rol almaktadır. Kanda azalan glikoz, amino asit ve yağ asitleri konsantrasyonu hormonların da etkisiyle açlık hissi oluşturmaktadır. Açlık hissinden sonra ilk olarak özellikle midenin fundusundan ghrelin salgılanır. Ghrelin, hipotalamustaki açlık merkezinde bulunan Nöropeptid Y (NPY) ve Agouti ile ilişkili peptit (AgRP) aktivasyonu sağlamaktadır. NPY ve AgRP'nin eksprese olması doğrudan NPY reseptörleri ile veya AgRP'nin Alfa melanosit uyarıcı hormonunu (α -MSH) ve Proopiomelanokortin (POMC) uyarılarını da inhibe ederek iştahı artırıcı etki yapmaktadır. α -MSH diğer nöronlar aracılığıyla iştahı azaltmaktadır. İnce bağırsaktan salgılanan peptit Y (PYY3-36) ve glukagon benzeri peptit 1 (GLP-1), NPY ve AgRP uyarıcı nöronları inaktive ederek iştahı azaltıcı etki göstermektedir. Leptin ve insülin ise NPY ve AgRP yi üreten nöronları inaktive eder, POMC nöronlarını aktifleştirerek α -MSH ile iştahı azalmaya neden olmaktadır (Arslan, 2023: 15-43). Yağ dokuda meydana gelen artış, adiposit hipertrofisine ve yeni adipositlerin hiperplazisine neden olmaktadır. Yağ dokudaki bu değişiklikler ise obezite, metabolik sendrom, non alkolik yağlı karaciğer hastalığı, tip2 diyabetes mellitus (DM), kardiyovasküler hastalıklar gibi patolojiler ile kendini göstermektedir (Gustafson, 2019: 10, Shen, 2022: 13).

Obezite, DM, kardiyovasküler hastalıklar, inme, hepatosteatoz, hipertansiyon, dislipidemi, hematolojik patolojiler, osteoartrit, uyku apnesi, kolelitiazis, astım ve bazı onkolojik hastalıkların görülme sıklığını artırmaktadır (Purnamasari, 2011: 117-21).

Gün geçtikçe daha önemli bir sağlık sorunu olan obezitenin tedavisinde diyet, egzersiz, yaşam tarzı değişiklikleri, farmakolojik ve cerrahi tedavi seçeneklerinden faydalanılmaktadır. Yaşam tarzı değişiklikleri ve farmakolojik tedaviden fayda göremeyen obez bireylerde en etkin yöntem bariatrik cerrahidir. Ancak cerrahi olarak tedavinin uygulanabilmesi için hasta seçimi belirli kriterler göre yapılmaktadır.

Cerrahi için hasta seçiminde; VKİ>40kg/m² veya, VKİ>35kg/m² ile eşlik eden en az bir komorbidite varlığı (T2DM, hipertansiyon, dislipidemi, uyku-apne sendromu, non alkolik yağlı karaciğer hastalığı, psödötümör serebri, astım, venöz staz hastalığı, ileri derecede üriner inkontinans, günlük yaşamı etkileyen artrit hastalığı), diyetin yetersiz olması, psikolojik ve hormonal bozukluk olmaması şeklinde sıralanmaktadır.

Obeziteyi cerrahi olarak tedavi edebilmek amacıyla birçok yöntem geliştirilmiştir. Yöntemler kendi içinde hacim küçültücü ve emilim azaltıcı olarak gruplandırılabilir (Townsend, 2018: 1160-1187). Tüm bariatrik tedavilerin en yaygın olanı laparoskopik sleeve gastrektomi (LSG) uygulamasıdır (Angrisani, 2018: 3783-3794). LSG'ye yönelim ise cerrahi güvenliğinin, teknik olarak daha uygulanabilir olması ve uzun dönemde daha yüz güldürücü sonuçlarından dolayı artmıştır. Cerrahi yöntemlerin uzun dönem sonuçları, artan obezite vakaları için çok büyük önem arz etmektedir. Uzun dönem kilo kaybının korunması, obeziteye eşlik eden komorbid hastalıkların düzelmesi, remisyonu, artan kaliteli yaşam beklentisi nedeniyle şiddetli obezite hastaları için en etkili tedavi yöntemi olarak popülerliğini korumaktadır (Salminen, 2022: 656-666). LSG'de kilo kaybının %55, komplikasyonun %8 ve mortalitenin ise %0.19 civarında olduğu bilinmektedir (Melissas, 2008: 1251-1256). LSG sonrası görülen en ciddi ve mortaliteye neden olan komplikasyon kaçaktır. Genelde His açısı dolaylarında kaçak görülmektedir. Son staplerin özofagusa yakın olması, insisura angularis darlığı ve tübüler midenin spiral hal alması kaçak nedenleri olarak görülmektedir. LSG sonra hasta refahını olumsuz etkileyen diğer bir komplikasyon ise dirençli gastroözofageal reflü (GÖRH)'dür (Bohdjalian, 2010: 535-540). LSG sonrası uzun dönemde gastrik stenoz görülme insidansı %1 civarındadır ve bu değer revizyon operasyonlarında %10'a ulaşmaktadır. Postoperatif yaklaşık 3-4 hafta sonra gıda intoleransı, yutma güçlüğü, bulantı ve kusma ile kendini göstermektedir. Kaçak, apse, kardiyanın mediastene herniye olması, stapler hattında intramural hematoma, gastrik tüpün torsiyonu sonucunda görülmektedir (Turcu, 2018: 826-36).

Lipokalinler, çok işlevli salgılanan lipoprotein moleküllerinin bir sınıfıdır (Du, 2024: 17). Lipokalin 2 (LCN2) besinlerle ilişkili olarak osteoblastlar tarafından üretilen bir hormon olup vücutta çok çeşitli görevleri vardır. LCN2, Nötrofil jelatinaz ilişkili lipokalin (NGAL) adıyla da anılmakla beraber immün sistemin düzenlenmesi ve inflamatuvar süreçlerde rol almaktadır (Lim, 2021: 883-894). LCN2 glikoz metabolizmasını düzenlerken anoretik etki gösterir ve yağ kitlesinde azalmaya neden olmaktadır (Greenhill, 2017: 250). LCN2 eksikliği, glikoz intoleransı, insülin direnci, hiperfaji, obezite ve azalmış kemik yoğunluğuna neden olmaktadır (Meyers, 2020: 14589). Lipokalin 13 (LCN13) ise farelerde karaciğer, pankreas ve iskelet kasları gibi birden çok dokuda salgılanmaktadır (Cho, 2011: 450-7). Farelerde yapılan çalışmada LCN13'ün ekspresyonu ve salgılanmasının sabit olmadığı ve metabolizma değişikliklerine göre değiştiği görülmüştür. Sistemik dolaşımdaki LCN13 düzeyleri tokluk halinde açlık haline göre daha yüksek ölçülmüştür. Bu tespit LCN13'ün besin ve metabolik düzenlemelerde görev alacağını düşündürmüştür. Daha mühim olarak da obezite LCN13'ün düşük seviyeleri ile ilgilidir ve dolaşımdaki LCN13 seviyeleri genetik veya diyet nedeniyle obez olan farelerde son derece düşük bulunmuştur. LCN13'ün karaciğerdeki ekspresyonu da zayıf farelerde daha yüksektir (Zhou, 2013: 369-83). Obezite ekseninde besin metabolizmasında görev aldığı bilinen lipokalinler iki grupta incelenebilmektedir. LCN13 ve majör üriner protein (MUP1) aynı grupta iken retinol bağlayıcı protein (RBP4) ve LCN2 diğer grupta yer almaktadır. İlk grup lipokalinler obezlerde insülin direncini, bozulmuş glikoz toleransını ve karaciğer yağlanmasını düzeltirken, diğer gruptaki lipokalinler ters etkiler göstermektedir. Obezite, hem ilk grubun eksikliği hem de 2. grubun fazlalığı ile ilişkilendirilmektedir. Bu nedenle bu iki grup LCN'ler arasındaki bozulmuş denge neticesinde klinik olarak obezite ve T2DM gibi metabolik bozukluklar görülmektedir (Binnetoğlu, 2023: 89).

MATERYAL VE YÖNTEM

Çalışmanın tasarımı ve etik kurul izni

Çalışma Kafkas Üniversitesi Tıp Fakültesi Genel Cerrahi Anabilim Dalı tarafından gerçekleştirilmiştir. Çalışmaya şiddetli obezite nedeniyle LSG uygulanacak olan 30 hasta ve obezitesi olmayan ek hastalığı olmayan semptomatik kolelitiazis nedeniyle elektif laparoskopik kolesistektomi uygulanan 30 hasta olmak üzere iki grup hasta dahil edilmiştir.

LSG öncesi obez bireylerden rutin biyokimyasal tetkikler için alınan kanlar ve kontrol grubu olarak ise semptomatik kolelitiazis nedeniyle cerrahi düşünülen bireylerin rutin biyokimyasal tetkikler için alınan kanlarından artakalan numunelerde serum LCN seviyeleri ölçülmüştür.

LSG sonrası 1. Yıl sonunda kontrol amaçlı kliniğimize başvuran hastalardan rutin biyokimyasal tetkikler için alınan kanlar kullanılmıştır. Böylelikle LSG öncesi ve sonrası serum LCN seviyeleri karşılaştırılmıştır.

İstatistiksel Analizler

Verilerin istatistiksel analizinde SPSS IBM 21.0 yazılımı kullanılmıştır. İkili karşılaştırmalarda Ki-kare testi kullanılmıştır. Verilerin normal dağılımı Kolmogrov Smirnov testi ile değerlendirilip parametrik varsayımlar için student T testi ve Tek yönlü anova testi post hoc dunnett testi kullanılmıştır. LCN düzeyleri ile diğerleri arasında Pearson korelasyon testi kullanılmıştır. Sonuçlar %95 güven aralığında değerlendirilerek $p < 0,05$ istatistiksel olarak anlamlı kabul edilmiştir.

Serum örneklerinin elde edilmesi

8 saatlik açlık sonrasında kolesistektomi veya sleeve gastrektomi yapılacak hastalardan operasyon sabahı, postoperatif 1. Yılı dolan sleeve gastrektomi yapılmış hastalardan ise sabah aç karnına alınan 5 mL kan örnekleri düz jelli biyokimya tüplerine alınmış, ardından berrak serum numuneleri elde etmek için, üreticinin belirttiği ELISA kit prosedürü dikkate alınarak $+4^{\circ}\text{C}$ 'de 20 dakika boyunca 1000g'de santrifüj edilmiştir. Ayrılan serum numuneleri eppendorf tüplerine alikuatlandırılmış ve kantitatif analizleri yapılana kadar -80°C 'de saklanmıştır. ELISA ile LCN2 ve LCN 13 seviyeleri belirlenmiştir.

BULGULAR

Demografik veriler (yaş, cinsiyet ve VKİ) tablo 1'de özetlenmiştir. Çalışmamızın sonuçlarına göre; cinsiyet dağılımı açısından kadın ve erkek bireyler arasındaki istatistiksel fark anlamlılık oluşturmamaktadır ($p=0,754$). Çalışmaya dahil edilen bireylerin yaş dağılımları da gruplar arası istatistiksel fark oluşturmamaktadır ($p=0,204$). Obezite ameliyatı nedeniyle başvuran bireylerin VKİ ortalaması; 44,09 iken, sağlıklı olarak değerlendirdiğimiz grubun VKİ ortalaması; 22,49 dur. Obezite ameliyatından 1 yıl sonra aynı bireylerin VKİ ortalamasının (25,10) düştüğü sağlıklı bireylerin VKİ değerine oldukça yaklaştığı görülmektedir. Obezitesi olan bireyler ile sağlıklı bireylerin VKİ ortalamaları çok yüksek düzeyde istatistiksel fark oluşturarak anlamlı değişim göstermektedir ($p < 0,001$). Aynı bireylerin LSG öncesine (obezitesi olan bireyler) göre LSG sonrası (1 yıl) VKİ ortalamaları büyük oranda düşüş göstermiş ve çok yüksek düzeyde istatistiksel fark oluşturmuştur ($p < 0,001$). Obezitesi olan ve LSG sonrası zayıflayan bireylerin VKİ ortalamalarının gösterdiği düşüş sağlıklı bireylerin seviyelerine oldukça yaklaşmıştır ancak istatistiksel fark oluşturmuştur ($p=0,005$).

Demografik veriler	Ortama \pm standart sapma			P
	S	O	LSG sonrası	
Cinsiyet	17 kadın	19 kadın	19 kadın	
	13 erkek	11 erkek	11 erkek	
Yaş	40,50 \pm 11,03	36,14 \pm 7,98	37,15 \pm 8,68	
VKİ	22,49 \pm 1,52	44,09 \pm 3,73	25,10 \pm 3,58	*, +, @

Tablo 1: S: sağlıklı, O: obez, LSG sonrası: LSG 1 yıl sonrası. Sağlıklı grup ile obezitesi olan bireyler grubu kıyaslandığında *, obezitesi olan bireyler grubu ile LSG sonrası obezitesi giderilen bireylerin grubu kıyaslandığında +, sağlıklı grup ile LSG sonrası obezitesi giderilen bireylerin grubu kıyaslandığında @

Çalışmamıza dahil edilen bireylerde hipertansiyon ve diyabet gibi komorbidite varlığı belirlenmiştir. Elde edilen bulgular tablo 2'de özetlenmiştir. Çalışma sonuçlarımıza göre sistolik ve diyastolik kan basıncı obezitesi olan bireylerde yüksekken sağlıklı bireylerde düşük bulunmuştur. İki grup arasındaki bu farklılık istatistiksel olarak çok yüksek düzeyde anlamlılık oluşturmuştur ($p < 0,001$). Obeziteli bireylerde diyabet varlığı kan parametreleri ile hesaplanan HOMA-IR değerlerinden ve HbA1c değerinden görülmektedir. LSG sonrası obezitesi giderilen bireylerde diyabet varlığından söz edilemeyecek düzeyde veriler elde edilmiştir. Sağlıklı gruba göre kıyaslandığında obeziteli bireylerin sırasıyla glikoz, HOMA-IR, İnsülin, HbA1c sonuçları yüksek olup istatistiksel olarak çok yüksek düzeyde anlamlılık oluşturmuştur ($p = 0,001$, $p < 0,001$, $p < 0,001$, $p < 0,001$). Obezitesi olan bireylere göre LSG sonrası obezitesi giderilen bireylerin sırasıyla glikoz, HOMA-IR, İnsülin, HbA1c sonuçları düşüş göstermiştir. Bu düşüş olup istatistiksel olarak yüksek düzeyde anlamlılık oluşturmuştur ($p = 0,003$, $p < 0,001$, $p < 0,001$, $p < 0,001$). LSG sonrası obezitesi giderilen bireylerin sırasıyla glikoz, HOMA-IR, İnsülin, HbA1c sonuçları sağlıklı grup seviyelerine yaklaşmıştır. LSG sonrası obezitesi giderilen bireylere göre sağlıklı bireylere ait sırasıyla glikoz, HOMA-IR, İnsülin, HbA1c verilerinde istatistiksel fark gözlemlenmemiştir ($p = 0,221$, $p = 0,907$, $p = 0,787$, $p = 0,264$).

Komorbidite varlığı	Ortama \pm standart sapma			P
	S	O	LSG sonrası	
Sistolik kan basıncı	115,23 \pm 10,96	129,09 \pm 11,41	119,42 \pm 7,38	*
Diyastolik kan basıncı	70,68 \pm 6,78	78,18 \pm 5,47	75,24 \pm 4,23	*
Glikoz	91,68 \pm 4,42	102,14 \pm 16,37	92,55 \pm 6,62	*, +
İnsülin	8,06 \pm 2,32	21,33 \pm 10,37	8,55 \pm 4,46	*, +
HOMA-IR	1,83 \pm 0,53	5,48 \pm 2,93	1,98 \pm 1,08	*, +
HbA1c	5,09 \pm 0,41	6,08 \pm 0,34	5,28 \pm 0,30	*, +

Tablo 2: S: sağlıklı, O: obez, LSG sonrası: LSG 1 yıl sonrası. Sağlıklı grup ile obezitesi olan bireyler grubu kıyaslandığında *, obezitesi olan bireyler grubu ile LSG sonrası obezitesi giderilen bireylerin grubu kıyaslandığında +, sağlıklı grup ile LSG sonrası obezitesi giderilen bireylerin grubu kıyaslandığında @

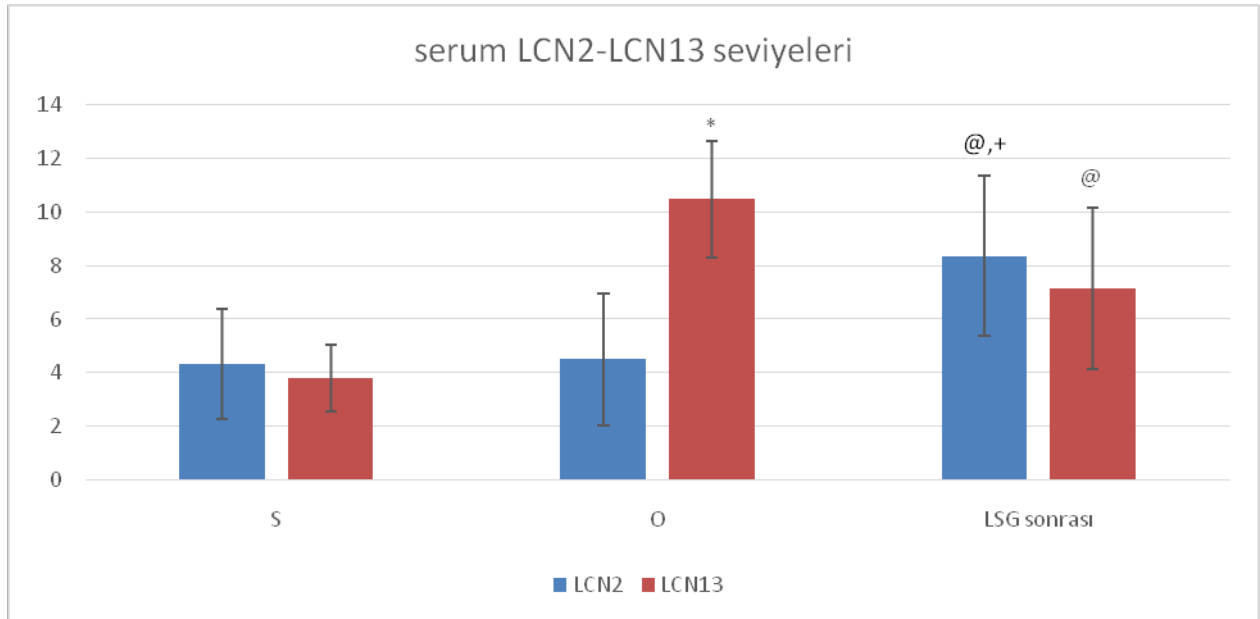
Çalışmamıza dahil edilen bireylerin serum lipid profili incelenmiş ve tablo 3'de özetlenmiştir. Sağlıklı gruba göre obezitesi olan bireylerin verileri kıyaslandığında LDL ve trigliserid seviyeleri çok yüksek düzeyde istatistiksel fark oluşturarak yüksek bulunmuştur ($p < 0,001$, $p < 0,001$). HDL seviyeleri ise çok yüksek düzeyde istatistiksel fark oluşturarak

düşük bulunmuştur ($p<0,001$). Kolesterol seviyeleri obezitesi olan bireylerde yüksek bulunsa da istatistiksel fark oluşmamıştır ($p=0,291$). Obezitesi olan bireylere göre LSG sonrası obezitesi giderilen bireylerin LDL, trigliserid ve kolesterol seviyeleri düşmüştür. Bu düşüş LDL ve trigliserid seviyelerinde çok yüksek düzeyde istatistiksel fark oluştururken ($p<0,001$, $p<0,001$) kolesterol düzeylerinde ise fark oluşturmamıştır ($p=0,733$). LSG sonrası obezitesi giderilen bireylerin HDL seviyeleri ise yükselmiştir. Bu yükselme çok yüksek düzeyde istatistiksel fark oluşturmuştur ($p<0,001$). LSG sonrası obezitesi giderilen bireylerin sırasıyla HDL, trigliserid, kolesterol sonuçları sağlıklı grup seviyelerine yaklaşmıştır. Bu nedenle istatistiksel fark gözlemlenmemiştir ($p=0,572$, $p=0,851$, $p=0,655$). LDL seviyelerinde gözlemlenen düşüş sağlıklı birey seviyelerine ulaşamamıştır ve çok yüksek düzeyde istatistiksel fark oluşmuştur ($p<0,001$).

Serum lipidi profili	Ortama \pm standart sapma			P
	S	O	LSG sonrası	
HDL	49,22 \pm 6,25	32,91 \pm 8,06	47,68 \pm 3,27	*,+
LDL	69,27 \pm 11,72	130,06 \pm 22,68	83,33 \pm 13,67	*,+,@
Trigliserid	86,64 \pm 23,83	137,41 \pm 64,03	89,27 \pm 26,09	*,+
Kolesterol	159,32 \pm 20,3	165,45 \pm 34,44	158,86 \pm 30,39	

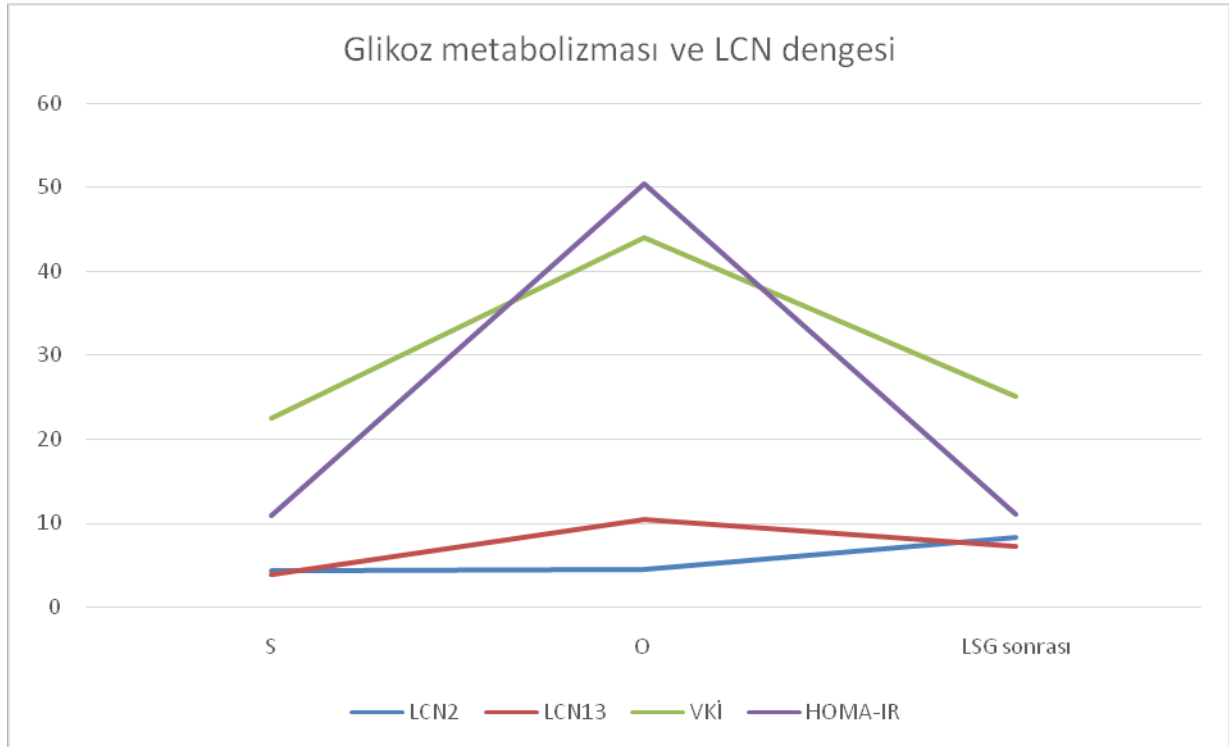
Tablo 3: S: sağlıklı, O: obez, LSG sonrası: LSG 1 yıl sonrası. Sağlıklı grup ile obezitesi olan bireyler grubu kıyaslandığında *, obezitesi olan bireyler grubu ile LSG sonrası obezitesi giderilen bireylerin grubu kıyaslandığında +, sağlıklı grup ile LSG sonrası obezitesi giderilen bireylerin grubu kıyaslandığında @

Çalışma gruplarının serum LCN seviyeleri şekil 1’de özetlenmiştir. Bulgularımıza göre; sağlıklı bireylerde LCN2 ve LCN13 seviyelerinin yakın olduğu görülürken obezitesi olan bireylerde bu denge LCN13 artışıyla büyük oranda bozulmuştur. LSG sonrası obezitesi giderilen bireylerde ise yeniden LCN2 ve LCN13 seviyeleri birbirine yaklaşmıştır.



Şekil 1: S: sağlıklı, O: obez, LSG sonrası: LSG 1 yıl sonrası. Sağlıklı grup ile obezitesi olan bireyler grubu kıyaslandığında *, obezitesi olan bireyler grubu ile LSG sonrası obezitesi giderilen bireylerin grubu kıyaslandığında +, sağlıklı grup ile LSG sonrası obezitesi giderilen bireylerin grubu kıyaslandığında @

Glikoz metabolizması ile LCN denge ilişkisi şekil 2’de özetlenmiştir. Sağlıklı grupta VKİ ile HOMA-IR verileri düşük seyrederken, obezitesi olan bireylerde her ikisi de artmaktadır. LSG sonrası obezitesi giderilen bireylerde VKİ ve HOMA-IR seviyeleri azalarak sağlıklı birey seviyelerine ulaşmıştır. LCN2 ve LCN 13 verilerinin de yer aldığı şeklimizde LCN2 ve LCN13 ün yakın seviyelerde seyretmesinin düşük VKİ ve HOMA-IR değerleri ile ilişkili olduğu görülmektedir. LCN2 ve LCN13 seviyelerindeki paralelliğin bozulması durumunda VKİ ve HOMA-IR artışının söz konusudur. LCN2 ve LCN13 dengesinin bozulmasının glikoz metabolizmasında bozulmaya neden olduğu görülmektedir.



Şekil 2: S: sağlıklı, O: obez, LSG sonrası: LSG 1 yıl sonrası.

TARTIŞMA

Çalışmamızda VKİ’nin, LSG sonrası azalarak sağlıklı bireylerin VKİ ortalamasına yaklaştığı gözlemlenmiştir. Yoshida ve ark. yaptıkları çalışmada da bizim bulgularımıza benzer şekilde VKİ’nin LSG sonrası gerilediği sonucu elde edilmiştir. LSG hem malabsoritif hem de hacim azaltıcı bir operasyon olduğu için hastalarda kilo kaybına neden olur.

HOMA-IR, LSG sonrası gerileyerek sağlıklı gruba yakın değerlere ulaşmıştır. Batman ve ark. yaptıkları bir çalışmada LSG sonrası birinci yıl takibinde HbA1c ve HOMA-IR de iyileşme tespit etmişlerdir. Obezite insülin direncine ve diyabete zemin hazırlamaktadır. Obezitesi giderilen hastalarda HOMA-IR ve HbA1c gibi insülin direnci ile ilişkili değerlerde sağlıklı insanlara yakın değerlere yaklaşma görülür. HbA1c verilerimiz obezlerde sağlıklı gruba göre daha yüksek olmakla beraber LSG sonrası sağlıklı gruba yaklaşmıştır. Çalışmamızda insülin değerlerinin de LSG sonrası düştüğü tespit edilmiştir. Aksoy ve ark. yaptığı bir çalışmada LSG’ den bir yıl sonra ağırlık, VKİ, HbA1c, glukoz, insülin, HOMA-IR, HDL, trigliserit değerlerinin düştüğünü tespit etmişlerdir. Bu sonuçlar da obezitenin diyabete neden olabileceğini, LSG sonrası obezite giderilince de diyabete ya da prediyabete iyileşme sağlanacağını göstermiştir. Serum lipid profilini belirlemek amacıyla yaptığımız ölçümler sonucunda; LSG sonrası LDL, trigliserit ve total kolesterol düzeyleri düşerken, HDL değerlerinde de yükselme görülmüştür. Arzu ve ark. yaptıkları çalışmada da

bulgularımızı destekler sonuçlar elde etmişlerdir. Obezite sadece diyabete değil başka birçok komorbiditeye neden olmaktadır. Bunlardan biri de hiperlipidemidir. LSG ile uygun kiloya gelen obez hastalarda HDL yükselirken LDL, trigliserit ve total kolesterol değerleri düşerek hastada daha normal bir lipid profili ortaya çıkmaktadır. Bu da hiperlipidemiye ve buna bağlı birçok hastalıkta (koroner arter hastalıkları vs.) iyileşme olacağı düşüncesini doğurmaktadır.

Tüm bunların yanı sıra sağlıklı bireylerde LCN13 seviyelerinin obezitesi olan bireylere göre daha yüksek olduğu görülmüştür. LCN2 seviyeleri ise sağlıklı grupta obez gruba göre düşük olduğu görülürken bu değişimler istatistiksel olarak fark oluşturmamıştır. İhsan ve ark. yaptığı bir çalışmada obez çocukların Lipokalin 2 düzeylerini istatistiksel olarak anlamlı olmamakla beraber sağlıklı çocuklara oranla daha yüksek düzeyde bulunmuştur. Deng ve ark. yaptıkları bir çalışmada pankreas duktal adenokarsinoma sahip hastalarda ölçülen Lipokalin 2 değerlerinin kaşektik olan ya da olmayan hastalarda anlamlı fark olmamakla beraber sağlıklı gruba göre daha yüksek olduğunu ve yüksek lipokalin 2 değerine sahip olan kaşektik hastalarda daha yüksek kalprotektin, miyeloperoksidaz ve elastaz ve CRP/Albümin seviyeleri tespit etmişlerdir. LCN2 nötrofil içerisinde çok miktarda bulunan bir protein olduğu için klinikten önce baskılanan iştahın sebebi olarak yüksek LCN2 seviyeleri suçlanmıştır. Ayrıca pankreas duktal adenokarsinoma sahip kötü beslenen hastalarda kaşeksiden bağımsız olarak yine LCN2 seviyelerinin yüksek olması da LCN2'nin inflamasyon ve anoretik etkisini açıklamaktadır.

Zhou ve ark. ise çalışmalarında obez farelerde LCN13'ün sağlıklı farelere göre daha düşük seviyelerde olduğunu tespit etmişlerdir. LCN13 antisteatoz ve özellikle antidiyabetik etkilere sahiptir. LCN13 eksikliği obezitede görülen diyabet ve hepatosteatoz ile ilişkilendirilebilir. Çünkü LCN13 hepatositlerde lipogenezi ve glikoz üretimini baskılar. Cho ve ark. yaptıkları bir çalışmada obezite ile ilişkili insülin direncinde serumda LCN13 seviyelerini düşük bulmuşlardır. Farelerde kanda dolaşan LCN13 farklı şekillerde artırıldığında ise diyabet, insülin direnci gibi durumlarda iyileşme gözlenmiştir. Boshra ve ark. çalışmalarında obezite ile birlikte T2DM hastalığı olanlarda LCN2 değeri obez olmayan T2DM hastalarına göre daha düşük bulunmuştur. Bu da LCN2'nin diyabetten çok yağ kütlesi ve obezite ile ilişkili olduğunu düşündürmüştür. Ioanna ve ark. ise obez prediyabet ya da diyabet olan farelerde β hücre yetmezliği üzerine yararlı etki sağladığını fare deneyleri ile tespit etmişlerdir. Obez fareleri LCN2 ile tedavi etmeye çalışmışlar ve bunun sonucunda β hücre hiperplazisi ve insülin duyarlılığında artış sağlamışlardır. LCN2'nin iştah baskılayıcı etkisinin yağ doku üzerinde, antidiyabetik etkisinin ise β hücre çoğalmasında destekleyerek göstermektedir. Obezlerde düşük LCN2 seviyeleri ise hem hiperfajiye ile vücut kitlesinde artışa hem de β hücre azalması ile diyabete sebep olmaktadır. Lea ve arkadaşlarının ise LCN13 insülinotropik ve adacık hücre proliferasyonu özelliğinin ancak laboratuvar ortamında gösterildiğini, canlı dokuda hepatik LCN13'ün glikoz ya da insülin ile ilgili bir etkiye sahip olmadığını tespit ettiği bir çalışması mevcuttur. Özellikle diyetten çok etkilenen LCN13 için canlı dokuda etkisinin tespit edilmesi zorlaşmıştır. Ama LCN13'ün insülin duyarlılaştırıcı özelliği halihazırda bilinmektedir. Lipokalinlerin hala net ortaya konamamış karmaşık yapısı bu konuda daha fazla araştırma yapmayı gerektirmektedir.

Sonuç olarak lipokalinler hala tam olarak aydınlatılamamakla beraber obezite, diyabet ve hiperlipidemi gibi birçok komorbiditede etkili olduğu düşünülmektedir. Lipokalin2 anoreksijenik etkisiyle iştah baskılayarak yağ kitlesinde azalma, β hücre proliferasyonu ile de antidiyabetik etki göstermektedir. Lipokalin 13 ise hepatositlerde lipogenezi, glikoneogenezi baskılayarak diyabet ve hepatosteatozdan koruyucudur. Literatürde obez hastalarda görülen düşük LCN2 ve LCN13 seviyeleri obezite ve bununla ilişkili olarak diyabet, hepatosteatoz gibi komorbiditeleri artırdığı yönünde çalışmalara rağmen bizim çalışmamızda LCN2 istatistiksel olarak anlamlı olmasa da obezlerde yüksek

bulunmuştur. LCN13'de obezlerde sağlıklı gruba göre yüksek bulunmuştur. Ancak LCN2 ve LCN13 sağlıklı grupta birbirine yakındır. Obez bireylerde ise özellikle LCN13 yönünde olmak üzere hem LCN13 hem de LCN2 yüksek bulunmuştur. LSG sonrası obezitesi giderilen bireylerde LCN2 artarak LCN13 ise azalarak aralarındaki paralellik tekrar sağlanmıştır.

Aslında LCN2 ve LCN13'ün obez bireyde bazı çalışmalarda yüksek bazı çalışmalarda düşük olması tek tek değerlendirilmeleri sonucudur. Bizim çalışmamızın amacı bir noktada bunu göstermekti. Sağlıklı bir VKİ ve HOMA-IR için lipokalin dengesi az ya da çok salınmasından daha önemlidir. Bu paralel denge bozulduğunda eş zamanlı olarak HOMA-IR ve VKİ de bozulmaktadır.

KAYNAKÇA

1. Blüher, Matthiass (2019). Obesity: global epidemiology and pathogenesis. *Nature reviews, Endocrinology*, 15, 5, 288-298.
2. Obezite Tanı Ve Tedavi Kılavuzu, Türkiye Endokrinoloji ve Metabolizma Derneği. 6. Baskı. 2018, 11.
3. Skelton Joseph A, Irby Megan B, Grzywacz Joseph G, Miller Gary (2011). Çocuklarda obezitenin etyolojileri: doğa ve yetiştirme. *Pediatr Clin North Am*, 58, 6, 1333-1354.
4. Zhang Xiang, Ha Suki, Lau Harry Cheuk-Hay, Yu Jun(2023). Excess body weight: Novel insights into its roles in obesity comorbidities. *Semin Cancer Biol*, 92, 16-27.
5. Arslan Turgay(2023). Obezitede farmakolojik tedavi. *Tusad*, 1, 1, 15-43.
6. Purnamasari, Dyah ve diğerleri(2014). Yetişkinlerde Aşırı Kilo ve Obezitenin Tanımlanması, Değerlendirilmesi ve Tedavisi: Obezite Kliniğinin Klinik Uygulama Kılavuzları. *ASEAN Endokrin Toplulukları Federasyonu Dergisi*, 26, 2 , 117.
7. Gustafson Birgit, Nerstedt Annika, Smith Ulf (2019). 34wReduced subcutaneous adipogenesis in human hypertrophic obesity is linked to senescent precursor cells. *Nature communications*, 10, 1, 2757. Shen Hongyu, Huang Xun, Zhao Yiheng ve diğerleri (2022). The Hippo pathway links adipocyte plasticity to adipose tissue fibrosis. *Nature Communications*, 13, 1, 6030.
8. Townsend, Courtney M.(2018). Sabiston Cerrahi - Modern Cerrahi Pratiğin Biyolojik Temeli. Ankara: Elsevier.
9. Angrisani Luigi ve diğerleri (2018).IFSO Dünya Çapında Anket 2016: birincil, endolüminal ve revizyonel prosedürler. *Obes Surg*, 28, 12, 3783-3794.
10. Salminen Paulina, Grönroos, Sofia, Helmiö Mika ve diğerleri (2022).Effect of Laparoscopic Sleeve Gastrectomy vs Roux-en-Y Gastric Bypass on Weight Loss, Comorbidities, and Reflux at 10 Years in Adult Patients With Obesity. *The SLEEVEPASS Randomized Clinical Trial*, 1, 157, 656-666.
11. Melissas, John, Daskalakis, Markos, Koukouraki, Sofya, et al(2008). Sleeve gastrectomy-a "food limiting" operation. *Obes Surg*, 18, 1251-1256.
12. Bohdjalian, Arthur, Langer, Felix B, Shakeri-Leidenmuhler Soheila, et al (2010). Sleeve gastrectomy as sole and definitive bariatric procedure: 5-year results for weight loss and ghrelin. *Obes Surg*, 20, 535-540.
13. Du, Hanjian, Lai, Jun, Lin, Bo, Pan, Jinyu, et al (2024). LCN2 Regulates Microglia Polarization Through the p38MAPK-PGC-1 α -PPAR γ Pathway to Alleviate Traumatic Brain Injury. *Cell Biochem Biophys*, 17.
14. Lim, Daejin, Jeong, Jae Ho, Song, Juhyun(2021). Lipocalin 2 regulates iron homeostasis, neuroinflammation, and insulin resistance in the brains of patients with dementia: Evidence from the current literature. *CNS Neurosci Ther*, 27, 8, 883-894.
15. Greenhill, Claire (2017). Osteoblast-derived lipocalin 2 suppresses appetite. *Nature Reviews Endocrinology*, 13, 5, 250.
16. Meyers, Keya, López, Maria, Ho, Joanna, et al (2020).Lipocalin-2 deficiency may predispose to the progression of spontaneous age-related adiposity in mice. *Sci Rep*. **10**, 14589.
17. Cho, Kae Won, Zhou, Yingjiang, Sheng, Liang, Rui, Liangyou (2011). Lipocalin-13, hem İnsüline Bağımlı Hem de İnsüline Bağımsız Mekanizmalarla Glikoz Metabolizmasını Düzenler. *Mol Cell Biol*, 31, 450-7.

18. Zhou, Yingjiang, Rui Liangyou (2013). Lipocalin 13 regulation of glucose and lipid metabolism in obesity. *Vitam Horm*, 91, 369-83.
19. Binnetođlu, Kenan(2023). Sađlık Bilimlerinde Gncel Tartıřmalar 9. Ankara:Bidge Yayınları.
20. Lowry, AH, Rosebrough, NJ, Farr, AL, Randall RJ (1951). Protein measurement with the Folin phenol reagent. *J Biol Chem*, 193, 265-75. Cantay, Hasan, Binnetoglu, Kenan, Gul, Hseyin Fatih, & Bingol, Seyit Ali (2022). Investigation of serum and adipose tissue levels of asprosin in patients with severe obesity undergoing sleeve gastrectomy. *Obesity*, 30, 8, 1639-1646.
21. Yoshida, Naofumi, Kitahama, Seiichi, Yamashita, Tomoya, Hirono, Yasuko, Tabata, Tokito, et al (2021).Metabolic alterations in plasma after laparoscopic sleeve gastrectomy. *J Diabetes Investig*, 12, 1, 123-129.
22. Batman, Burin, Altun, Hasan (2020). Laparoskopik Sleeve Gastrektomi'nin vcut kitle indeksi 35 kg/m² nin altındaki hastalarda glukoz metabolizması zerine etkisi. *Med Bull Sisli Etfal Hosp*, 54, 1, 36-40.
23. Kahramanođlu Aksoy, Evrim, Gktař, Zeynep, Albuz zgr, Akpınar, Muhammet Yener, ztrk, Dođan, Buluř, Hakan, Uzman, Metin (2025). Sleeve Gastrektomi Uygulanan Hastalarda Ađırlık Kaybının Nonalkolik Yađlı Karaciđer İle İlgili Bazı Yeni Parametreler zerine Etkisi. *Bes Diy Derg [Internet]*, 46, 3, 240-7.
24. Koca, Arzu, Buluř, Hakan (2023). Metabolic outcomes in the first year after laparoscopic sleeve gastrectomy: a high-volume single-center experience. *Eur Rev Med Pharmacol Sci*, 27, 6, 2485-2493.
25. etin, İhsan, Muhtarodđlu, Sabahattin, Yılmaz, Birsen, Kurtođlu, Selim (2015). Obez ocuklarda Small Dense LDL, Endotelin-1 ve Lipokalin-2 Seviyelerinin Deđerlendirilmesi. *Batman niversitesi Yařam BilimleriDergisi*, 5, 1, 151-161.
26. Deng, Min, Aberle, Merel R et al (2023).Lipocalin-2 and neutrophil activation in pancreatic cancer cachexia. *Front Immunol*, 15, 14, 1159411.
27. Zhou, Yingjiang, Rui, Liangyou et al (2013). Lipocalin 13 Regulation of Glucose and Lipid Metabolism in Obesity. *Vitam Horm*, 91, 369-83.
28. Cho, Kae Won, Zhou, Yingjiang et al (2011).Lipocalin-13 regulates glucose metabolism by both insulin-dependent and insulin-independent mechanisms. *Mol Cell Biol*, 31, 3, 450-7.
29. Al-Absi, Boshra, Al-Habori, Molham, Saif-Ali, Riyad (2021). Plasma Lipocalin-2 and Adiponectin are Affected by Obesity Rather Than Type 2 Diabetes Mellitus per se. *Diabetes Metab Syndr Obes*, 16, 14, 4547-4556.
30. Mosialou, Ioanna, Shikhel, Steven, Luo, Na et al(2020).Lipocalin-2 counteracts metabolic dysregulation in obesity and diabetes. *J Exp Med*, 5, 217, 10.
31. Bhler, Lea, Maida, Adriano, Vogl, Elena Sophia et al (2021). Lipocalin 13 enhances insulin secretion but is dispensable for systemic metabolic control. *Life Sci Alliance*, 3, 4, 4.

An Overview of Tissue Adhesives and Biomimetic Adhesives

Doku Yapıştırıcıları ve Biyomimetik Yapıştırıcılara Genel Bir Yaklaşım

Tuğçe KARTAL

PhD Student, Atatürk Üniversitesi, Veteriner Fakültesi Cerrahi Anabilim Dalı

Assoc. Prof. Dr. M. Gökhan ŞENOCAK

Atatürk Üniversitesi, Veteriner Fakültesi Cerrahi Anabilim Dalı

Abstract

Tissue repair and wound closure processes have evolved throughout human history with the use of various natural and artificial adhesives. In this study, the use of tissue adhesives and biomimetic adhesives in surgical applications was investigated. The focus is on tissue adhesives, particularly natural polymers such as fibrin, gelatin and albumin, and synthetic polymers such as cyanoacrylate, polyethylene glycol (PEG) and polyurethane (PU). While these adhesives offer advantages such as ensuring tissue integrity, stopping bleeding and accelerating wound healing, they also bring some disadvantages. Biomimetic adhesives, on the other hand, are environmentally friendly and biocompatible alternatives inspired by nature and provide effective adhesion, especially in humid and underwater environments. The adhesion mechanisms of creatures such as the marine sandworm, mussel, Australian toad and gecko have inspired the design of these adhesives. The study concluded that tissue adhesives are more advantageous for short-term surgical needs, while biomimetic adhesives are promising for long-term and innovative solutions. Both types of adhesives offer significant advantages in their respective application areas and the right choice depends on the application requirements and targeted performance.

Keywords : Tissue Adhesives, Biomimetic Adhesives, Adhesive

Özet

Doku onarımı ve yara kapama süreçleri, insanlık tarihi boyunca çeşitli doğal ve yapay yapıştırıcıların kullanımıyla gelişmiştir. Bu çalışmada, doku yapıştırıcıları ve biyomimetik yapıştırıcıların cerrahi uygulamalardaki kullanımı incelenmiştir. Doku yapıştırıcıları, özellikle fibrin, jelatin ve albümin gibi doğal polimerler ile siyanoakrilat, polietilen glikol (PEG) ve poliüretan (PU) gibi sentetik polimerler üzerine odaklanılmıştır. Bu yapıştırıcılar, doku bütünlüğünü sağlama, kanamayı durdurma ve yara iyileşmesini hızlandırma gibi avantajlar sunarken, bazı dezavantajları da beraberinde getirmektedir. Biyomimetik yapıştırıcılar ise doğadan esinlenerek geliştirilmiş, özellikle nemli ve su altı

ortamlarda etkili yapışma sağlayan çevre dostu ve biyouyumlu alternatiflerdir. Deniz kumkalesi solucanı, midye, Avustralya kurbağası ve geko gibi canlıların yapışma mekanizmaları, bu yapıştırıcıların tasarımına ilham vermiştir. Çalışmada, doku yapıştırıcılarının kısa vadeli cerrahi ihtiyaçlar için daha avantajlı olduğu, biyomimetik yapıştırıcıların ise uzun vadeli ve inovatif çözümler için gelecek vaat ettiği sonucuna varılmıştır. Her iki yapıştırıcı türü de kendi uygulama alanlarında önemli avantajlar sunmakta olup, doğru seçim uygulama gereksinimlerine ve hedeflenen performansa bağlıdır.

Anahtar Kelimeler: doku yapıştırıcıları, biyomimetik yapıştırıcılar, yapıştırıcı

1. GİRİŞ

İnsanlık tarihinden günümüze kadar, doku onarımı ve yara kapama süreçlerinde çeşitli doğal ve yapay yapıştırıcılar kullanılmıştır. Antik dönemlerde bitki özleri, bal ve hayvansal proteinler gibi doğal maddeler yara kapamada temel araçlar olmuştur. Bu erken dönem uygulamaları zamanla gelişmiş, modern tıpta biyolojik yapıştırıcıların temelini oluşturmuştur. Özellikle 20. yüzyılın ikinci yarısında, fibrin ve siyanoakrilat gibi yapıştırıcıların cerrahi operasyonlarda kullanılması, bu alandaki en önemli dönüm noktalarından biri olmuştur. Bu süreçte bir başka önemli gelişme ise doğanın yapışma mekanizmalarının mühendislik çözümlerine ilham vermesiyle ortaya çıkan biyomimetik yapıştırıcılar olmuştur. Canlı organizmalarda, özellikle su altında yapışma sağlayan deniz canlıları gibi örneklerin yapışma yöntemleri, biyomedikal ve endüstriyel yapıştırıcı teknolojilerinin gelişimine yön vermiştir. Biyomimetik yaklaşım, çevre dostu, dayanıklı ve biyouyumlu yapıştırıcıların geliştirilmesine olanak tanımış, bu yenilikler tıp, mühendislik ve birçok farklı alanda yaygın olarak kullanılmaya başlanmıştır.

Biz de bu çalışmamızda doku ve biyomimetik yapıştırıcılar hakkında genel bilgi vererek hangi yapıştırıcı türünün kullanımının bizim için daha avantajlı olduğunu göstermeyi hedefledik.

2.YÖNTEM

Doku ve biyomimetik yapıştırıcılar hakkında çeşitli veri tabanları kullanılarak sistematik bir literatür taraması yapılmıştır. Doku ve biyomimetik yapıştırıcılarının ne olduğu, kökeni, kullanımının sağladığı avantaj ve dezavantajlar, içerdikleri malzemeler, uygulama alanları ve bir yapıştırıcının taşıması gereken özellikler dikkate alınarak karşılaştırmaları yapılmıştır.

3.BULGULAR

3.1 İdeal Bir Doku Yapıştırıcısının Özellikleri

1.Lokal olmayan tahriş, anti-inflamatuar aktivite, toksik olmama ve antijen olmama ile biyouyumluluk (Han ve ark,2023:57);

2.Hedef doku yüzeyinde kolay uygulanabilirlik (Han ve ark,2023:57);

3.İşlevlerini yerine getirdikten sonra biyolojik olarak parçalanabilirlik (Han ve ark,2023:57);

4.Operasyon gereksinimlerine bağlı olarak, vücut sıvılarının varlığında kısa sürede retikülyasyon sürecinin meydana gelmesi (Han ve ark,2023:57);

5.Hedef dokunun fizyolojik koşullarına bağlı olarak genişleme ya da daralmayı takip etmek için hedef dokuya benzer esneklik (Han ve ark,2023:57);

6.Yeterli mekanik özelliklerin sağlanması için güçlü bir bağlayıcı etkinlik (Han ve ark,2023:57);

7.İslak fizyolojik bir ortamda bağlanmanın sürdürülmesi (Han ve ark,2023:57).

3.2 Doku Yapıştırıcılarının Tanımı ve Türleri

Doku yapıştırıcıları özellikle cerrahi ve tıbbi işlemlerde doku bütünlüğünü sağlamak, kanamayı durdurmak, yara kapama ve onarım işlemlerini desteklemek amacıyla kullanılan biyolojik veya sentetik yapıştırıcı maddelerdir. Bu yapıştırıcılar, dikiş veya zımba gibi geleneksel yöntemlere alternatif olarak geliştirilmiş olup, doku yüzeylerine hızlı ve güçlü bir şekilde yapışarak iyileşme sürecini hızlandırır ve komplikasyonları azaltır (Han ve ark,2023:57).

3.2.1 Doğal Polimer Bazlı Doku Yapıştırıcıları

a) Fibrin

Fibrin yapıştırıcılar 100 yıldan uzun süredir kullanılmaktadır, bu nedenle tüm yapıştırıcılar arasında en uzun geçmişe sahiptirler (Flemming,1992:79-88). Fibrin ilk olarak 1924'te insan hastalara uygulandı (Nam, S.,& Mooney, 2021: 11336-11384) ve 1998'de Amerika Birleşik Devletleri FDA tarafından onaylandı (Nam, S.,& Mooney, 2021: 11336-11384). Fibrin doku yapıştırıcıları fibrinojen, trombin, faktör XIII ve Ca²⁺ iyonları gibi çeşitli maddelerden oluşur (Nam, S.,& Mooney, 2021: 11336-11384). Bunlar normalde vücutta üretilir; bu nedenle biyoyumluluk, biyolojik olarak parçalanabilirlik, inflamasyonsuz ve yabancı cisim reaksiyonları ve doku nekrozu olmayan özellikler gösterirler (Nam, S.,& Mooney, 2021: 11336-11384).

Uygulama Alanları

Kardiyovasküler, hepatik, pankreatik, torasik, akciğer, endoskopik sinüs ve total diz artroplastisi ameliyatları gibi farklı cerrahilerde yaygın olarak hemostatik ajan olarak kullanılmaktadır (Duarte ve ark, 2012: 1031-1050). Ek olarak, fistül kapatma ve travmatik karın yaralanmalarında kullanılırlar (Sakaguchi ve ark, 2015: 336-340).

Ağrı azaltma, semptom iyileştirme ve uzun vadeli işlevsellik dahil olmak üzere başarılı ortopedik tedaviler içinde kullanılır. Total kalça artroplastisinde postoperatif kan kaybını ve transfüzyonu azaltmak için kullanılır (Ahmed ve ark, 2011: 323-335).

Avantajları ve Dezavantajları

Hücre büyümesini destekleme, toksik olmama, inflamatuvar yanıtlar, yabancı cisim reaksiyonları, doku nekrozu ve fibrozu olmaksızın biyoyumluluk ve biyolojik olarak parçalanabilirlik gibi çeşitli avantajlar sunar çünkü insan vücudunda bulunan bileşenlerden üretilmiştir (Le Guéhennec ve ark, 2004:1e11). Bununla birlikte, düşük kohezyon mukavemeti ile zayıf mekanik özellikler, virüs nedeniyle kan yoluyla bulaşan hastalıkların bulaşması ve sığır türevi maddeler kullanıldığında alerjik veya anafilaktik reaksiyon riski gibi çeşitli dezavantajlara da sahiptir (Kawamura ve ark,2002:1098-1100).

b) Jelatin

Kolajenin termal denatürasyonundan elde edilen jelatin, biyoyuymulluğu, biyolojik olarak parçalanabilirliği, düşük immünojenitesi, suda çözünürlüğü, düşük maliyeti ve diğer malzemelerle kimyasal çapraz bağlama yoluyla kolay modifikasyonu nedeniyle farmasötik formülasyonlar, hücre kültürü ve doku mühendisliği gibi çeşitli biyomedikal uygulamalarda kullanılır (Rose ve ark, 2014:3106-3135).

Uygulama Alanları

Formaldehit ve glutaraldehit ile çapraz bağlanan jelatin yapıştırıcılar vasküler cerrahide kullanıldı (Walker ve ark, 1997:78-78).

Fotopolimerizasyon yoluyla hazırlanan jelatin doku yapıştırıcılar bir doku sızdırmazlık maddesi olarak gastrointestinal cerrahide kullanıldı (Elvin ve ark, 2010: 8323-8331).

Sani ve arkadaşları(Sani ve ark, 2019: eaav128.), kornea yaralanmalarının tedavisi için görünür ışık altında jelatin ve metakrilik anhidrit arasındaki bir reaksiyon yoluyla metakrile edilmiş jelatin içeren bir biyoadhezif hidrojel hazırladılar. Metakrile edilmiş jelatin, görünür ışığa kısa süreli maruziyet yoluyla fotopolimerize edildi. Hazırlanan şeffaf hidrojel kornea dokusuna sıkıca yapıştı ve ticari yapıştırıcılardan daha yüksek doku yapışması gösterdi. Ek olarak, bu hassas biyoadhezif kütleme için korneaya kolay iletimi kolaylaştırdı.

Avantajları ve Dezavantajları

Jelatin bazlı doku yapıştırıcıları biyoyuymulluk, biyolojik olarak parçalanabilirlik, iltihapsız ve yabancı cisim reaksiyonları ve hücre yapışmasının indüklenmesi gibi çeşitli avantajlar sunar. Bununla birlikte jelatinin moleküler ağırlığı, kolajen denatürasyon yöntemine göre geniş bir aralığı kapsar (Gómez-Guillén ve ark,2011:1813-1827). Ek olarak, domuzdan elde edilen jelatin, yüksek amino asit içeriği nedeniyle oda sıcaklığında jel benzeridir; bu nedenle domuzdan elde edilen jelatin kullanılarak hazırlanan jelatin doku yapıştırıcıları, cerrahide kullanılmadan önce ısı işlemi gerektirir (Karim ve ark, 2009:563-576).

c) Albümin

Toplam plazma protein içeriğinin yaklaşık %50-60'ı, karaciğer hücreleri tarafından salgılanan monomerik tek zincirli bir protein olan insan serum albüminidir (Higuchi ve ark,2007: 83-88). Albümin, plazma hacminin düzenlenmesi ve ozmotik basıncın korunması gibi çeşitli biyolojik özellikler gösterir ve ilaç taşıyıcıları ve doku yapıştırıcı olarak işlev görür (Shaz ve ark,2013).

Uygulama Alanları

Albümin bazlı doku yapıştırıcıları, pulmoner hava kaçaklarını kapatmak (Park ve ark,2016:1-8) ve nefron koruyucu (Bahouth ve ark, 2017:67-72), kardiyak(Bhamidipative ark, 2012: P6), nazal septum (Subasi ark,2021:516-521) proksimal aort (Khoynzhad ve ark, 2018:1357-1364), dalak (Biggs ve ark, 2005:882-e3) ve kasık fıtığı ameliyatlarını gerçekleştirmek (Escolino ve ark, 2020: 847-853) için kullanılır. Ancak, bu doku yapıştırıcılar aktif kanamayı kontrol edemez; bu nedenle, yalnızca kansız bir alana yapıştırmak için kullanılabilirler.

Albümin bazlı doku yapıştırıcıları, tam etkili yaralanmalarda periferik sinir onarımı için kullanılır çünkü dikişler, rejenerasyon yapan sinirden intranöral sıvıların sızması olmadan yaralı siniri iyileştiremez ve sıklıkla zararlı yara izlerine neden olur (Barton ve ark, 2014:585-595).

Avantajlar ve Dezavantajlar

Albümin bazlı doku yapıştırıcılar, mükemmel kesme ve çekme mukavemetleri ve hızlı çapraz bağlama ile kolay bulunabilirlikleri nedeniyle akciğer ve kalp onarımı için uygundur. Fakat, düşük viskozite, zor kullanım ve kötü sonuçlanan komplikasyonlar, viral enfeksiyon riskleri gibi çeşitli dezavantajlar da bu yapıştırıcılar için bildirilmiştir (Reiss ve ark, 1996: 85-92).

3.2.2 Sentetik Polimer Bazlı Doku Yapıştırıcıları

a) PCA (POLİ-SİYANOAKRİLAT)

PCA bazlı doku yapıştırıcılar tıp, endüstri ve ev kullanımında yaygın olarak kullanılır çünkü su ve aminler gibi nükleofillerle temas ettikten sonra yaklaşık 5-6 saniye içinde hedef yüzeye yapışarak bağlanır ve 60 saniye içinde güçlü bir film oluştururlar (Ayyıldız ve ark, 2017:14).

Uygulama Alanları

PCA tabanlı doku yapıştırıcıları, kanamaları kontrol etmedeki mükemmel yetenekleri nedeniyle gastrik varis kanaması (Seewald ve ark, 2002: 926-932), laparoskopik fundoplikasyon (Fan ve ark, 2013:356-360), peptik ülserler (Repici ve ark, 2002: 349-355), rüptüre hepatosellüler karsinom (Al-Fraij ve ark, 2011:297-299), varis dışı üst gastrointestinal kanama (Huang ve ark, 2014:1850-1857), pulmoner ven-özofageal fistül (Barclay ve ark, 2009:1037-1038) ve özofageal varis ligasyonu kaynaklı ülser kanaması (Kim ve ark, 2011:57(3)) ile ilgili tedavilerde hemostatik ajanlar olarak klinik olarak kullanılırlar.

Toriumi ve diğerleri (Toriumi ve ark, 1988: 2209-2219), yüz, baş ve boyun yaralarının kapatılmasında klinik uygulamalar için 2-oktil CA kullanan PCA tabanlı bir doku yapıştırıcı hazırladılar ve güçlü bir kapanma ve hoş yara izleri elde ettiler. Ek olarak, PCA tabanlı doku yapıştırıcısı, dikiş hatlarını örtmek ve postauriküler alanda kulak kepçesini herhangi bir yara enfeksiyonuna (Patel ve ark, 2011:245-247), büyük cilt nekrozuna, yara dehisansına veya deri altı hematoma neden olmadan tutmak için pansuman olarak kullanılırlar.

PCA tabanlı doku yapıştırıcıları, yapışıklıkları ve rahatsız edici parietal sinir sıkışmasını önlemek için geleneksel dikişlerin yerini almak üzere fitik cerrahisinde kullanılır. Losi ve arkadaşları, fitik onarımı sırasında mesh fiksasyonu için 2-bütül CA kullanarak PCA tabanlı bir doku yapıştırıcısı sentezlediler (Losi ve ark, 2010:e53-e58) ve doku yapıştırıcısının herhangi bir inflamatuvar reaksiyon olmadan fitik onarımı sırasında mesh ile başarılı bir şekilde fiksasyon sağladığını gösterdiler.

Hosseini ve arkadaşları (Hosseini ve ark, 2011: 54), doku kırılabilirliği nedeniyle ve hastanın büyük bir ameliyattan kaçınması için fistül kapatmada pediatrik cerrahide kullanılmak üzere 2-bütül CA kullanarak PCA bazlı bir doku yapıştırıcısı sentezlediler. Sentezlenen doku yapıştırıcıları, klokal ekstrofi yaralarını kolostomi kontaminasyonundan ve enfeksiyonundan koruyarak fistül için ümit verici bir tedavi olduğunu gösterdi.

Ong ve ark. (Ong ve ark, 2010:899-905), 2-oktil CA bazlı PCA doku yapıştırıcıları kullanılarak karın yaralarının kapatılmasını geleneksel deri zımbalama cihazları kullanılarak yapılan kapatmayla klinik olarak karşılaştırdılar. PCA bazlı doku yapıştırıcıları, deri zımbalarına kıyasla daha iyi kozmetik sonuçlar ve daha yüksek hasta memnuniyeti gösterdi.

Avantajlar ve Dezavantajlar

PCA tabanlı doku yapıştırıcılar, hızlı ve ağrısız uygulama, karmaşık cerrahi ve karmaşık pansumanlara gerek olmaması, mikroorganizmaların yaralara girmesinin önlenmesi, düşük dehisans oranları ve yüksek hasta memnuniyetiyle iyi tolerans ve konfor gibi çeşitli avantajlar sunar (García Cerdá ve ark, 2015:939-956). Buna karşılık, su veya kan

varlığında sınırlı güç, düşük çekme dayanımı, hastalarda alerjik endişeler, astıma ve derin yanık yaralarına karşı olumsuz reaksiyonlar ve potansiyel toksisite gibi çeşitli dezavantajlar da PCA tabanlı doku yapıştırıcılar için bildirilmiştir (Martín-Ballester ve ark , 2014: 573-597).

b) PEG (POLİETİLEN GLİKOL)

PEG tabanlı doku yapıştırıcıları, PEG'nin hidrofilik ve biyouyumlu özellikleri, kolay kimyasal modifikasyonu ve işlevselleştirilmesi, immünojen olmaması ve suda çözünürlüğü nedeniyle ilaç dağıtım sistemlerinde ve doku mühendisliğinde biyomalzeme olarak yaygın olarak kullanılması nedeniyle ilgi görmüştür (Zhu ve ark, 2010:4639-4656).

Uygulama Alanları

PEG esteri ve trilyisin kullanılarak hazırlanan PEG bazlı doku yapıştırıcıları, etkili yara kapatma ile spinal cerrahide uygulandı (Sternberg ve ark, 2010: 318-326) ancak, önemli yapışkan şişmesi sergilediler.

Hoshi ve arkadaşları (Hoshi ve ark, 2015:4705-4711), (PEG-co-PLADA) ve (PEG-co-PTMC) DA kullanılarak hazırlanan, PEG tabanlı doku yapıştırıcıları kullanılarak domuz ve tavşan gözlerindeki retinol kırıklarını kapatmak için ksenon ışınlaması altında berrak, esnek ve sıkıca yapışan bir hidrojel sentezlediler. Yapıştırıcı, retinadan ayrılmadan retina kırıklarını etkili bir şekilde kapattı ve gözlerde 28 gün boyunca herhangi bir inflamatuvar reaksiyon veya toksisite gözlemlenmedi.

Avantaj ve Dezavantajlar

PEG tabanlı yapıştırıcılar, biyouyumluluk ve işlevsellikleri için kimyasal modifikasyon üzerinde kolay kontrol gibi avantajlar sunar. Ancak zayıf mekanik özellikler, kırılabilirlik ile düşük kohezyon mukavemeti, hidrofilik yapıları nedeniyle yüksek şişme özellikleri ve yapıştırıcı uygulaması için çoklu hazırlama adımları bu yapıştırıcıların başlıca dezavantajlarıdır (Bouten ve ark, 2014:1375-1255).

c) PU (POLİÜRETAN)

PU'lar, mekanik esneklikleri, iyi ıslanabilirlikleri, biyouyumlulukları, özelleştirilebilir köpükleri ve yüksek yırtılma mukavemetleri (Ju ve ark, 2022:891-912) nedeniyle kateterler, stentler, kan oksijenatörleri, kalp kapakçıkları, pansumanlar, ilaç taşıyıcıları, doku mühendisliği (Ga ve ark, 2022:1-13) ve doku yapıştırıcıları gibi biyomedikal uygulamalarda giderek daha fazla ilgi görmektedir. Poliüretanlar, izosiyanat ve polioller bileşiklerindeki nükleofilik ekleme polimerizasyonu yoluyla sentezlenebilir (Akindoyo ve ark, 2016: 114453-114482).

Uygulama Alanları

PU bazlı doku yapıştırıcıları böbrek (Ferreira ve ark, 2007:144-152), endokrinoloji (Komissarenko ve ark, 1985:19-20), pankreas kanalı tıkanıklığı (Zemskov ve ark, 1986:3-5) ve kolorektal cerrahilerde (Phaneuf ve ark, 2001: 463-469) kullanılır. Özellikle, lizin izosiyanat ve diollerin reaksiyona sokulmasıyla hazırlanan PU bazlı doku yapıştırıcılar, köpeklerde ve insanlarda sıvı birikimi olmaksızın karın germe ameliyatlarında kullanılır (Gilbert ve ark, 2008: 95-102).

PU bazlı doku yapıştırıcılar, 4,4-difenilmetan diizosiyanatın (MDI) poli (tetrametilen eter glikol) (PTMEG) ile reaksiyonu ve ardından 2,2-bis (hidroksimetil)-propiyonik asit eklenmesi yoluyla hazırlandı. Hazırlanan yapıştırıcı kemik fiksasyonu için kullanıldı (Han ve ark,2023:57).

Lei ve arkadaşları (Lei ve ark, 2019:5489-5497), poliölün bir hint yağı türeviden olan Polycin D-290'ı, su ve kemik dokusu büyümesini teşvik eden bir katalizör varlığında poliizosiyanat prepolimeri ve β -trikalsiyum fosfat ile reaksiyona sokarak köpük benzeri PU bazlı bir doku yapıştırıcısı hazırladılar. Yapıştırıcının ex vivo bir deneyde domuz kaburga kemiğine yapışma mukavemeti, klinik olarak poli (metil metakrilat) (PMMA) kemik çimentosundan iki kat daha yüksek olduğu onaylanmıştır.

Blanquer ve diğerleri (Blanquer ve ark, 2012: 177-184), omurlar arası disk dejenerasyonunda anulus fibrosus (AF) tedavi etmek için poli (trimetilen karbonat) (PTMC) diolün bütan diizosiyanat (BDI) ile reaksiyonu yoluyla PU bazlı doku yapıştırıcıları geliştirdiler. Bu doku yapıştırıcılarının yapışkan özellikleri, bir lap-kesme çekme testinde değerlendirildi ve hazırlanan yapıştırıcıların fibrin yapıştırıcısından çok daha güçlü bir şekilde kaudal AF dokusuna yapıştığını gösterdi ancak in vivo deneyler yapılmadı.

Balcioğlu ve arkadaşları, sternal kapatma için iki aşamada sentezlenen bir ön polimer olarak UV ile kürlenebilir PU akrilat bazlı hızlı kürlenen çok işlevli gentamisin yüklü doku yapıştırıcıları hazırladılar (Balcioğlu ve ark, 2022: 41819-41833).

Avantajlar ve Dezavantajlar

PU bazlı doku yapıştırıcıları, biyouyumluluk, biyolojik olarak parçalanabilirlik, dokularda bulunan proteinlerin amino gruplarıyla reaksiyona girme, fizyolojik sıcaklıkta mükemmel termal kararlılık ve hemolitik olmayan davranış gibi çeşitli avantajlar sunar (Han ve ark,2023:57). Buna karşılık, bu yapıştırıcılar PU hazırlama sırasında izosiyanatlar, polioller, katalizörler, zincir uzatıcılar ve çapraz bağlayıcıların çeşitli bileşenlerini içeren bozunma ürünleri nedeniyle potansiyel toksisiteye neden olabilir. Dahası, bu yapıştırıcıları farklı doku tiplerine göre optimize etmek zordur.

3.3 Biyomimetik Yapıştırıcılar

Canlı organizmaların ve dokuların işlevini ve yapısını taklit etmek üzere tasarlanan bu yapıştırıcılara biyo-esinli yapıştırıcılar veya biyomimetik yapıştırıcılar denir (Favi ve ark, 2019: 290-319).

Biyoyapıştırıcı salgılayan deniz ve kara organizmalarının en bilinen örnekleri deniz kumkalesi solucanı *Phragmatopoma californica* (Shao ve ark, 2010: 729), midye *Mytilus edulis* (Pandey ve ark, 2020 : 1240-1255), Avustralya kurbağası *Notaden bennetti* (Graham ve ark, 2010 : 429-441) ve gekolardır (Geim ve ark, 2003 : 461-463). Bu organizmalar esas olarak yuvalar, can simidi bağlantısı gibi yapıları inşa etmek veya ipek liflerini toplamak ve korumak için yapıştırıcılar uygularlar. Bu doğal yapıştırıcıların çoğu, farklı koşullar altında işlev görme konusundaki olağanüstü yetenekleri nedeniyle agresif bir şekilde takip edilmiştir (Shokri ve ark ,2022: 102706).

a)Deniz Kumkalesi Solucanı (*Phragmatopoma californica*)

Kum solucanları, yaşadıkları çamurlu ortamda kendilerini sabitlemek için güçlü protein bazlı bir yapıştırıcı salgılar (Shokri ve ark ,2022: 102706).

Karmaşık koaservatlar (protein ve polisakkarit karışımları) yoluyla güçlü yapışma sağlar (Shokri ve ark ,2022: 102706).

Uygulama Alanları

Kompleks koaservatların yapısı, kemik yapıştırıcılarının ıslak ortamlarda etkili olmasını sağlamak için taklit edilmektedir (Shokri ve ark ,2022: 102706).

b) Midye (*Mytilus edulis*)

Deniz midyeleri, kayalara ve diğer yüzeylere güçlü bir şekilde yapışmak için "dopa" (3,4-dihidroksifenilalanin) adı verilen bir amino aside sahip özel proteinler üretir. Bu proteinler, su altında bile kuvvetli yapışmayı sağlar (Shokri ve ark ,2022: 102706).

Organik ve inorganik yüzeylere, farklı tuzluluk ve nem seviyelerinde yapışabilir (Shokri ve ark ,2022: 102706).

Uygulama Alanları

DOPA yapısı (dihidroksifenilalanin) gibi yapılar, kemik yapıştırıcılarının geliştirilmesinde kullanılmaktadır (Shokri ve ark ,2022: 102706).

c)Avustralya Kurbağası (*Notaden bennetti*)

Yapışkan sıvılar üretir, bu sıvılar güçlü bir tutuş sağlar (Shokri ve ark ,2022: 102706).

Uygulama Alanı

Biyouyumlu, çevre dostu yapıştırıcıların geliştirilmesinde ilham kaynağıdır (Shokri ve ark ,2022: 102706).

d) Gekolar

-Geko ayaklarının yüzeylere yapışma mekanizmasını taklit ederek biyolojik dokular için biyobozunur ve biyouyumlu bir yapıştırıcı geliştirmek hedefleniyor. Yapıştırıcı, yara kapama, dikiş/stapler yerine kullanılma ve doku iyileştirmeyi teşvik eden ilaç veya büyüme faktörlerini taşıma potansiyeline sahip (Mahdavi ve ark, 2008 : 2307-2312).

3.3.1 Biyomimetik Yapıştırıcıların Avantajları

- Su altında ve nemli yüzeylerde etkili yapışma (Nuswantoro ve ark, 2022: 96),
- Biyouyumlu ve çevre dostu (Nuswantoro ve ark, 2022: 96),
- Yüksek esneklik ve dayanıklılık sunar (Nuswantoro ve ark, 2022: 96),
- Doğadan esinlenildiği için enerji verimliliği sağlar (Nuswantoro ve ark, 2022: 96).

3.3.2 Biyomimetik Yapıştırıcılarda Karşılaşılan Zorluklar

-Karmaşık Doğal Mekanizmaların Taklit Edilmesi

Doğadaki yapışma sistemlerinin karmaşıklığı ve bunların yapay olarak taklit edilmesinin zorluğu, biyomimetik tasarımın temel zorluklarından biridir (Nuswantoro ve ark, 2022: 96).

-Yüksek Performanslı ve Reversibl Yapışma Sağlama

Doğal yapışkan sistemlerin yüzeye yapışmayı ve gerektiğinde hızlı bir şekilde ayrılmayı sağlaması, biyomimetik yapıştırıcıların geliştirilmesinde önemli bir hedefdir (Nuswantoro ve ark, 2022: 96).

- Çevresel Faktörlere Dayanıklılık

-Biyomimetik yapıştırıcıların su, nem ve sıcaklık değişimleri gibi çevresel faktörlere karşı hassasiyeti, bu alandaki araştırmaların odak noktalarından biridir (Nuswantoro ve ark, 2022: 96).

- Üretim ve Maliyet

Nano ve mikro ölçekte hassas yapılar içeren biyomimetik yapıştırıcıların üretimindeki karmaşıklık ve maliyet, seri üretim ve ticari uygulamaları sınırlayan faktörler arasındadır (Nuswantoro ve ark, 2022: 96).

-Biyoyumluluk ve Toksikite

Tıbbi uygulamalarda kullanılacak biyomimetik yapıştırıcıların insan vücudu ile uyumlu ve toksik olmaması gerekliliği, bu alandaki araştırmaların önemli bir parçasıdır (Nuswantoro ve ark, 2022: 96).

-Yapışma Kuvvetinin Yüzeğe Bağlılığı

Farklı yüzeylerde aynı yapışma kuvvetini sağlama zorluğu, biyomimetik yapıştırıcıların geliştirilmesinde karşılaşılan teknik zorluklardan biridir (Nuswantoro ve ark, 2022: 96).

4. GENEL DEĞERLENDİRME VE SONUÇ

Kısa vadeli ihtiyaçlar ve yaygın cerrahi uygulamalar açısından bakıldığında, doku yapıştırıcıları mevcut durumda daha avantajlıdır. Bu tür yapıştırıcılar, hızlı etki göstermesi ve klinik güvenilirliğinin yüksek olması nedeniyle tercih edilmektedir. Uzun vadeli ve inovatif çözümler için biyomimetik yapıştırıcılar daha avantajlı hale gelebilir. Özellikle nemli ve su altı ortamlarında yüksek performans göstermesi, biyomimetik yapıştırıcıları gelecekteki cerrahi ve doku mühendisliği uygulamaları için umut verici bir seçenek haline getirmektedir. Sonuç olarak, her iki yapıştırıcı türü de kendi alanlarında avantajlıdır, doğru seçim uygulama gereksinimlerine ve hedeflenen performansa bağlıdır.

KAYNAKÇA

1. Flemming, I. (1992). Fibrin glue in face lifts. *Facial plastic surgery*, 8(01), 79-88.
2. Nam, S., & Mooney, D. (2021). Polymeric tissue adhesives. *Chemical reviews*, 121(18), 11336-11384.
3. Duarte, A. P., Coelho, J. F., Bordado, J. C., Cidade, M. T., & Gil, M. H. (2012). Surgical adhesives: Systematic review of the main types and development forecast. *Progress in Polymer Science*, 37(8), 1031-1050.
4. Le Guéhennec, L., Layrolle, P., & Daculsi, G. (2004). A review of bioceramics and fibrin sealant. *Eur Cell Mater*, 8(13), 1e11.
5. Ahmed, T. A., Giulivi, A., Griffith, M., & Hincke, M. (2011). Fibrin glues in combination with mesenchymal stem cells to develop a tissue-engineered cartilage substitute. *Tissue Engineering Part A*, 17(3-4), 323-335.
6. Kawamura, M., Sawafuji, M., Watanabe, M., Horinouchi, H., & Kobayashi, K. (2002). Frequency of transmission of human parvovirus B19 infection by fibrin sealant used during thoracic surgery. *The Annals of thoracic surgery*, 73(4), 1098-1100.
7. Rose, J. B., Pacelli, S., El Haj, A. J., Dua, H. S., Hopkinson, A., White, L. J., & Rose, F. R. (2014). Gelatin-based materials in ocular tissue engineering. *Materials*, 7(4), 3106-3135.
8. Walker, J. D., Kratz, J. M., Basler, C. G., Meck, L. P., Stratton, J. R., Kribbs, S. B., ... & Spinale, F. G. (1997). Fate of gelatin-resorcinol-formaldehyde/glutaraldehyde adhesive on femoral vessel morphology. *Journal of Surgical Research*, 71(1), 73-78.
9. Elvin, C. M., Vuocolo, T., Brownlee, A. G., Sando, L., Huson, M. G., Liyou, N. E., ... & Werkmeister, J. A. (2010). A highly elastic tissue sealant based on photopolymerised gelatin. *Biomaterials*, 31(32), 8323-8331.
10. Sani, E. S., Kheirkhah, A., & Rana, D. (2019). Sutureless repair of corneal injuries using naturally derived bioadhesive hydrogels. *Sci Adv* 5: eaav128.
11. Gómez-Guillén, M. C., Giménez, B., López-Caballero, M. A., & Montero, M. P. (2011). Functional and bioactive properties of collagen and gelatin from alternative sources: A review. *Food hydrocolloids*, 25(8), 1813-1827.

12. Karim, A. A., & Bhat, R. (2009). Fish gelatin: properties, challenges, and prospects as an alternative to mammalian gelatins. *Food hydrocolloids*, 23(3), 563-576.
13. Higuchi, A., Ueno, R., Shimmura, S., Suematsu, M., Dogru, M., & Tsubota, K. (2007). Albumin rescues ocular epithelial cells from cell death in dry eye. *Current eye research*, 32(2), 83-88.
14. Shaz, B. H., & Hillyer, C. D. (Eds.). (2013). *Transfusion medicine and hemostasis: clinical and laboratory aspects*. Newnes.
15. Park, B. J., Snider, J. M., Bates, N. R., Cassivi, S. D., Jett, G. K., Sonett, J. R., & Toloza, E. M. (2016). Prospective evaluation of biodegradable polymeric sealant for intraoperative air leaks. *Journal of cardiothoracic surgery*, 11, 1-8.
16. Bahouth, Z., Moskovitz, B., Halachmi, S., & Nativ, O. (2017). Bovine serum albumin-glutaraldehyde (BioGlue®) tissue adhesive versus standard renorrhaphy following renal mass enucleation: a retrospective comparison. *Therapeutic Advances in Urology*, 9(3-4), 67-72.
17. Bhamidipati, C. M., Coselli, J. S., & LeMaire, S. A. (2012). BioGlue® in 2011: what is its role in cardiac surgery?. *The Journal of extra-corporeal technology*, 44(1), P6.
18. Subasi, B., & Guclu, E. (2021). The effects of using Bioglue in nasal septal surgery. *Ear, Nose & Throat Journal*, 100(7), 516-521.
19. Khoynzhad, A., DelaRosa, J., Moon, M. R., Brinkman, W. T., Thompson, R. B., Desai, N. D., ... & PROTECT Investigators. (2018). Facilitating hemostasis after proximal aortic surgery: results of the PROTECT trial. *The Annals of Thoracic Surgery*, 105(5), 1357-1364.
20. Biggs, G., Hafron, J., Feliciano, J., & Hoenig, D. M. (2005). Treatment of splenic injury during laparoscopic nephrectomy with BioGlue, a surgical adhesive. *Urology*, 66(4), 882-e3.
21. Escolino, M., Esposito, C., Eaton, S., Di Maro, E., Cozzolino, S., Vitagliano, G., ... & De Coppi, P. (2020). Laparoscopic injection of tissue adhesives for inguinal hernia repair in a rabbit model: Results of an experimental comparative study with the standard laparoscopic inguinal hernia repair. *Journal of Laparoendoscopic & Advanced Surgical Techniques*, 30(7), 847-853.
22. Barton, M. J., Morley, J. W., Stoodley, M. A., Lauto, A., & Mahns, D. A. (2014). Nerve repair: toward a sutureless approach. *Neurosurgical review*, 37, 585-595.
23. Reiss, R. F., & Oz, M. C. (1996). Autologous fibrin glue: production and clinical use. *Transfusion Medicine Reviews*, 10(2), 85-92.
24. Ayyıldız, S. N., & Ayyıldız, A. (2017). Cyanoacrylic tissue glues: Biochemical properties and their usage in urology. *Turkish journal of urology*, 43(1), 14.
25. Seewald, S., Sriram, P. V. J., Naga, M., Fennerty, M. B., Boyer, J., Oberti, F., & Soehendra, N. (2002). Cyanoacrylate glue in gastric variceal bleeding. *Endoscopy*, 34(11), 926-932.
26. Fan, Y., Wu, S. D., Kong, J., Su, Y., & Tian, Y. (2013). Transumbilical single-incision laparoscopic fundoplication: a new technique for liver retraction using cyanoacrylate. *Journal of Laparoendoscopic & Advanced Surgical Techniques*, 23(4), 356-360.
27. Repici, A., Ferrari, A., De Angelis, C., Caronna, S., Barletti, C., Paganin, S., ... & Saracco, G. (2002). Adrenaline plus cyanoacrylate injection for treatment of bleeding peptic ulcers after failure of conventional endoscopic haemostasis. *Digestive and Liver Disease*, 34(5), 349-355.
28. Al-Fraij, A. K., Dhar, P. M., Al-Khalejy, A., & Abu Najem, F. (2011). Massive hemorrhage from spontaneous ruptured hepatocellular carcinoma controlled by isoamyl 2-cyanoacrylate: a case report. *Medical Principles and Practice*, 20(3), 297-299.
29. Huang, Y. S., Chang, C. C., Liou, J. M., Jaw, F. S., & Liu, K. L. (2014). Transcatheter arterial embolization with N-butyl cyanoacrylate for nonvariceal upper gastrointestinal bleeding in hemodynamically unstable patients: results and predictors of clinical outcomes. *Journal of Vascular and Interventional Radiology*, 25(12), 1850-1857.
30. Barclay, S., Cameron, I., Stewart, I., & Forrest, E. (2009). Massive hemorrhage from a pulmonary vein-esophageal fistula: a late complication of Histoacryl glue injection. *Gastrointestinal endoscopy*, 70(5), 1037-1038.
31. Kim, E. K., Sohn, J. H., Kim, T. Y., Kim, B. K., Yu, Y. H., Eun, C. S., ... & Han, D. S. (2011). Esophageal Sinus Formation due to Cyanoacrylate Injection for Esophageal Variceal Ligation-induced Ulcer Bleeding in a Cirrhotic Patient. *The Korean journal of gastroenterology*, 57(3).
32. Toriumi, D. M., O'Grady, K., Desai, D., & Bagal, A. (1998). Use of octyl-2-cyanoacrylate for skin closure in facial plastic surgery. *Plastic and reconstructive surgery*, 102(6), 2209-2219.
33. Patel, A. J., & Price, R. D. (2011). The use of tissue glue in prominent ear correction surgery. *Aesthetic plastic surgery*, 35, 245-247.

34. Losi, P., Burchielli, S., Spiller, D., Finotti, V., Kull, S., Briganti, E., & Soldani, G. (2010). Cyanoacrylate surgical glue as an alternative to suture threads for mesh fixation in hernia repair. *Journal of surgical research*, 163(2), e53-e58.
35. Hosseini, S. M. V., Bahador, A., Foroutan, H. R., Sabet, B., Geramizadeh, B., & Zarenezhad, M. (2011). The application of a new cyanoacrylate glue in pediatric surgery for fistula closure. *Iranian Journal of Medical Sciences*, 36(1), 54.
36. Ong, J., Ho, K. S., Chew, M. H., & Eu, K. W. (2010). Prospective randomised study to evaluate the use of DERMABOND ProPen (2-octylcyanoacrylate) in the closure of abdominal wounds versus closure with skin staples in patients undergoing elective colectomy. *International journal of colorectal disease*, 25, 899-905.
37. García-Cerdá, D., Ballester, A. M., Aliena-Valero, A., Carabén-Redaño, A., & Lloris, J. M. (2015). Use of cyanoacrylate adhesives in general surgery. *Surgery today*, 45, 939-956.
38. Martín-Ballester, A., García-Cerdá, D., Prieto-Moure, B., Martín-Martínez, J. M., & Lloris-Carsí, J. M. (2014). Use of cyanoacrylate adhesives in dermal lesions: a review. *Journal of Adhesion Science and Technology*, 28(6), 573-597.
39. Zhu, J. (2010). Bioactive modification of poly (ethylene glycol) hydrogels for tissue engineering. *Biomaterials*, 31(17), 4639-4656.
40. Sternberg, K., Rohm, H. W., Lurtz, C., Wegmann, J., Odermatt, E. K., Behrend, D., ... & Schmitz, K. P. (2010). Development of a biodegradable tissue adhesive based on functionalized 1, 2-ethylene glycol bis (dilactic acid). I. *Journal of Biomedical Materials Research Part B: Applied Biomaterials*, 94(2), 318-326.
41. Hoshi, S., Okamoto, F., Arai, M., Hirose, T., Sugiura, Y., Kaji, Y., & Oshika, T. (2015). In vivo and in vitro feasibility studies of intraocular use of polyethylene glycol-based synthetic sealant to close retinal breaks in porcine and rabbit eyes. *Investigative ophthalmology & visual science*, 56(8), 4705-4711.
42. Bouten, P. J., Zonjee, M., Bender, J., Yauw, S. T., van Goor, H., van Hest, J. C., & Hoogenboom, R. (2014). The chemistry of tissue adhesive materials. *Progress in Polymer Science*, 39(7), 1375-1405.
43. Ju, D. B., Lee, J. C., Hwang, S. K., Cho, C. S., & Kim, H. J. (2022). Progress of polysaccharide-contained polyurethanes for biomedical applications. *Tissue Engineering and Regenerative Medicine*, 19(5), 891-912.
44. Ga, D. H., Lim, C. M., Jang, Y., Son, T. I., Han, D. K., & Joung, Y. K. (2022). Surface-Modifying effect of zwitterionic polyurethane oligomers complexed with metal ions on blood compatibility. *Tissue Engineering and Regenerative Medicine*, 1-13.
45. Akindoyo, J. O., Beg, M., Ghazali, S., Islam, M. R., Jeyaratnam, N., & Yuvaraj, A. R. (2016). Polyurethane types, synthesis and applications—a review. *Rsc Advances*, 6(115), 114453-114482.
46. Ferreira, P., Pereira, R., Coelho, J. F. J., Silva, A. F., & Gil, M. H. (2007). Modification of the biopolymer castor oil with free isocyanate groups to be applied as bioadhesive. *International journal of biological macromolecules*, 40(2), 144-152.
47. Komissarenko, I. V., Kebuladze, I. M., Lysenko, A. G., & Shumova, T. V. (1985). Use of medical glues MK-6 and KL-3 in surgical endocrinology. *Klinicheskaiia khirurgiia*, (12), 19-20.
48. Zemskov, V. S., Biletskiĭ, V. I., Panchenko, S. N., Shchitov, V. S., & Blagodarov, V. N. (1986). Clinico-morphological characteristics of chronic pancreatitis in pancreatic duct occlusion using KL-3 glue. *Klinicheskaiia khirurgiia*, (11), 3-5.
49. Phaneuf, M. D., Dempsey, D. J., Bide, M. J., Quist, W. C., & LoGerfo, F. W. (2001). Coating of Dacron vascular grafts with an ionic polyurethane: a novel sealant with protein binding properties. *Biomaterials*, 22(5), 463-469.
50. Gilbert, T. W., Badylak, S. F., Gusenoff, J., Beckman, E. J., Clower, D. M., Daly, P., & Rubin, J. P. (2008). Lysine-derived urethane surgical adhesive prevents seroma formation in a canine abdominoplasty model. *Plastic and reconstructive surgery*, 122(1), 95-102.
51. Lei, K., Zhu, Q., Wang, X., Xiao, H., & Zheng, Z. (2019). In vitro and in vivo characterization of a foam-like polyurethane bone adhesive for promoting bone tissue growth. *ACS Biomaterials Science & Engineering*, 5(10), 5489-5497.
52. Blanquer, S. B., Sharifi, S., & Grijpma, D. W. (2012). Development of poly (trimethylene carbonate) network implants for annulus fibrosus tissue engineering. *Journal of applied biomaterials & functional materials*, 10(3), 177-184.

53. Balcioglu, S., Noma, S. A. A., Ulu, A., Karaaslan-Tunc, M. G., Ozhan, O., Koytepe, S., ... & Ates, B. (2022). Fast Curing Multifunctional Tissue Adhesives of Sericin-Based Polyurethane-Acrylates for Sternal Closure. *ACS applied materials & interfaces*, 14(37), 41819-41833.
54. Favi, P. M., Yi, S., Lenaghan, S. C., Xia, L., & Zhang, M. (2014). Inspiration from the natural world: from bio-adhesives to bio-inspired adhesives. *Journal of Adhesion Science and Technology*, 28(3-4), 290-319.
55. Xu, R., Wu, Y., Ma, Y., Zhang, Y., Ma, S., Cai, M., ... & Liu, W. (2021). Synthesis of novel copolymer/Mn⁺ biomimetic adhesives based on temperature strengthened coacervation effect. *Chemical Engineering Journal*, 425, 127249.
56. Shao, H., & Stewart, R. J. (2010). Biomimetic underwater adhesives with environmentally triggered setting mechanisms. *Advanced materials (Deerfield Beach, Fla.)*, 22(6), 729.
57. Pandey, N., Soto-Garcia, L. F., Liao, J., Zimmern, P., Nguyen, K. T., & Hong, Y. (2020). Mussel-inspired bioadhesives in healthcare: design parameters, current trends, and future perspectives. *Biomaterials science*, 8(5), 1240-1255.
58. Graham, L. D., Danon, S. J., Johnson, G., Braybrook, C., Hart, N. K., Varley, R. J., ... & Ramshaw, J. A. (2010). Biocompatibility and modification of the protein-based adhesive secreted by the Australian frog *Notaden bennetti*. *Journal of Biomedical Materials Research Part A: An Official Journal of The Society for Biomaterials, The Japanese Society for Biomaterials, and The Australian Society for Biomaterials and the Korean Society for Biomaterials*, 93(2), 429-441.
59. Geim, A. K., Dubonos, S. V., Grigorieva, I. V., Novoselov, K. S., Zhukov, A. A., & Shapoval, S. Y. (2003). Microfabricated adhesive mimicking gecko foot-hair. *Nature materials*, 2(7), 461-463.
60. Shokri, M., Dalili, F., Kharaziha, M., Eslaminejad, M. B., & Tafti, H. A. (2022). Strong and bioactive bioinspired biomaterials, next generation of bone adhesives. *Advances in Colloid and Interface Science*, 305, 102706.
61. Mahdavi, A., Ferreira, L., Sundback, C., Nichol, J. W., Chan, E. P., Carter, D. J., ... & Karp, J. M. (2008). A biodegradable and biocompatible gecko-inspired tissue adhesive. *Proceedings of the National Academy of Sciences*, 105(7), 2307-2312.
62. Han, G. Y., Hwang, S. K., Cho, K. H., Kim, H. J., & Cho, C. S. (2023). Progress of tissue adhesives based on proteins and synthetic polymers. *Biomaterials Research*, 27(1), 57.
63. Nuswantoro, N. F., Lubis, M. A. R., Juliadmi, D., Mardawati, E., Antov, P., Kristak, L., & Hua, L. S. (2022). Bio-based adhesives for orthopedic applications: Sources, preparation, characterization, challenges, and future perspectives. *Designs*, 6(5), 96.

A Comprehensive Overview of Hernias in Veterinary Surgery

Veteriner Cerrahisinde Hernialara Kapsamlı Bakış

Tuğçe KARTAL

PhD Student, Atatürk Üniversitesi, Veteriner Fakültesi Cerrahi Anabilim Dalı

Assoc. Prof. Dr. Sıtkıcan OKUR

Atatürk Üniversitesi, Veteriner Fakültesi Cerrahi Anabilim Dalı

Abstract

This study provides a detailed evaluation of hernias commonly observed in small animals within veterinary surgery. A hernia occurs when an organ or tissue protrudes through its natural anatomical boundaries into a surrounding cavity, often associated with weakness in muscle or connective tissues. Hernias can be classified based on their etiology (genetic or traumatic), anatomical location (inguinal, umbilical, or perineal), and complication status. Clinical symptoms include swelling, pain, loss of appetite, vomiting, and respiratory distress. Diagnosis is performed using various methods such as physical examination, ultrasonography, radiography, and endoscopy. Treatment is generally achieved through surgical repair. The main treatment options include open surgery, laparoscopic surgery, and the application of mesh implants. Meshes are particularly used to provide structural support in large or complicated hernias. Minimally invasive surgical techniques are favored for their shorter recovery periods and lower risk of complications. Treatment approaches vary depending on the type of hernia; for instance, small umbilical hernias may resolve spontaneously, while diaphragmatic hernias require urgent surgical intervention.

This study comprehensively examines the etiology, classification, clinical findings, diagnostic methods, and treatment approaches for hernias in veterinary medicine.

Keywords: Hernia, Rupture, Veterinary Surgery, Surgical Repair, Diagnostic Methods

Özet

Bu çalışma, küçük hayvanlarda sık görülen herniaların veteriner cerrahisinde detaylı bir değerlendirmesini sunmaktadır. Hernia, bir organ veya dokunun doğal anatomik sınırlarını aşarak çevredeki bir boşluğa kayması sonucu oluşur ve genellikle kas veya bağ dokularındaki zayıflıklarla ilişkilidir. Hernialar, oluşum nedenine (genetik, travmatik), anatomik bölgeye (inguinal, umbilikal, perineal) ve komplikasyon durumuna göre sınıflandırılabilir. Klinik belirtiler arasında şişlik, ağrı, iştahsızlık, kusma ve solunum zorluğu yer alır. Teşhis; fiziksel muayene, ultrasonografi, radyografi ve endoskopi gibi yöntemlerle yapılır. Tedavi genellikle cerrahi onarım ile gerçekleştirilir. Açık cerrahi, laparoskopik cerrahi ve mesh (ağ) uygulamaları başlıca tedavi seçenekleridir. Meshler, özellikle büyük veya komplike fıtıklarda yapısal destek sağlamak amacıyla kullanılır. Minimal invaziv

cerrahi teknikler, daha kısa iyileşme süresi ve düşük komplikasyon riski ile öne çıkmaktadır. Hernia türüne göre tedavi yaklaşımları farklılık gösterebilir; örneğin, umbilikal herniler küçükse kendiliğinden iyileşebilirken, diyafragmatik herniler acil cerrahi müdahale gerektirir.

Bu çalışma, veteriner hekimlikte herniaların etiyolojisi, sınıflandırılması, klinik bulguları, teşhis ve tedavi yöntemlerini kapsamlı bir şekilde ele almaktadır.

Anahtar Kelimeler: Hernia, fitik, veteriner cerrahi, cerrahi onarım, teşhis yöntemleri.

1.GİRİŞ

Veteriner hekimlikte sıkça rastlanan hernialar, farklı hayvan türlerinde gözlemlenen patolojik durumlar arasında yer alır. Hernia, bir organ ya da dokunun normal yerleşiminden koparak, vücudun zayıf bir noktasından ya da alışılmadık bir açıklıktan dışarı çıkması olarak tanımlanabilir. Bu durum genellikle karın duvarında mevcut olan zayıflıklardan kaynaklanır ve ilgili organ veya dokunun alışılmadık konumlara kaymasına yol açar. Böyle bir durum, hayvanların yaşam kalitesinde düşüşe neden olabilirken bazı vakalarda hayati risk de oluşturabilir. Son yıllarda veteriner cerrahi alanında, herniaların nedenleri, tanı yöntemleri ve tedavi stratejileri üzerine önemli araştırmalar yapılmıştır. Minimal invaziv cerrahi tekniklerin ilerlemesi ve biyomateryallerin kullanımı, hernia tamirinde yeni ve etkili yöntemlerin geliştirilmesini sağlamıştır. Bunun yanı sıra, genetik etkenlerin hernia oluşumundaki rolü ve çeşitli hayvan türlerinde hernia görülme sıklığı üzerine yapılan çalışmalar da literatüre katkıda bulunmaktadır.

Bu derlemede, herniaların tanımı, sınıflandırılması, ortaya çıkış nedenleri, klinik belirtileri, tanı yöntemleri ve tedavi seçenekleri detaylı bir şekilde ele alınacaktır.

2. HERNİALARIN TANIMI VE SINIFLANDIRILMASI

Hernia, bir organ veya dokunun, ait olduğu doğal anatomik sınırlardan çıkarak komşu bir bölgeye kayması durumudur. Bu olağandışı hareket, çoğunlukla kas duvarları veya destekleyici dokularda bulunan zayıflıklar veya defektler sonucunda meydana gelir. Bir fitik; fitik halkası, fitik kesesi ve kesede yer alan fitik içeriklerinden oluşur.

2.1 Herniaların Sınıflandırılması

Herniaların sınıflandırmasını anatomik bölgeye, redükte edilebilmesine, oluşum nedenine ve komplikasyon durumuna göre birçok farklı kriterlere bağlı olarak yapabiliriz.

2.1.1 Oluşum Nedenine Göre Sınıflandırma

Genetik ve Konjenital Hernialar: Doğumla birlikte mevcut olan, genetik veya embriyonik gelişim sırasında kas ve bağ dokularının yetersiz gelişmesiyle ilişkili hernialardır.

Edinsel (Acquired) Hernialar: Kazalar, düşmeler, veya fiziksel darbeler, kas duvarlarında veya destek dokularda yırtılmaya sebep olarak, gebelik, ağır yük taşıma, kabızlık veya kronik öksürük gibi durumlar, karın içi basıncın artmasına neden olarak ya da

daha önceden yapılan cerrahi müdahaleler sonrasında yara yerinde zayıflıklar oluşabilir, bu gibi durumlar fitik oluşumuna sebebiyet verebilir.

2.1.2 Anatomik Bölgeye Göre Sınıflandırma

2.1.2.1 Eksternal (Dış) Hernialar: Organ veya dokunun deri altından fark edilebilecek şekilde çıktığı hernia türleridir.

a) Inguinal Hernia

İnguinal fitikler, kasık halkasındaki doğuştan anormallikler nedeniyle veya travma sonucu gelişebilir. Kasık halkası defekti, karın içeriğinin (örneğin bağırsak, mesane, uterus) deri altı boşluklara geçmesine yol açar. Konjenital herniler, göbek fitikleri, perineal fitikler ve kriporşidizm gibi diğer doğumsal anormalliklerle ilişkilendirilebilir. İnguinal fitiklerinin çoğunun ırkta kalıtsal olup olmadığı net değildir; genetiği bilinene kadar, travmatik olmayan fitikleri olan köpeklerde kısırlaştırma önerilmektedir.

Küçük hayvanlarda inguinal herniasyonun kesin nedenleri henüz tam olarak anlaşılammıştır. Hem kısırlaştırılmış hem de sağlam erkek ve dişi köpeklerde nontravmatik inguinal fitik gelişebilir (Fossum,2013:522-523).

Bu fitikler tek taraflı veya çift taraflı olabilir; ancak tek taraflı inguinal fitikleri genellikle sol tarafta daha fazla görülür. İnguinal fitiğin oluşumunda farelerde cinsiyet hormonlarının rolü olduğu düşünülmüşse de köpeklerdeki etkisi belirsizdir. Hamilelik ve obezite de inguinal fitik gelişimiyle ilişkilendirilebilir. Travmatik inguinal fitikler, kas sisteminin doğuştan zayıflığı veya inguinal halkadaki anormallikler nedeniyle ortaya çıkabilir (Fossum,2013:522-523).

Travmatik olmayan inguinal fitikler en sık, sağlıklı, orta yaşlı dişi köpeklerde veya genç erkek köpeklerde (<2 yaş) görülür. İnguinal fitikleri, özellikle genç erkek köpeklerde daha yaygındır, çünkü geç testis inişi kasık halkasının kapanmasını geciktirir. Bu duruma yatkın ırklar arasında Pekingesese, Cairn terrier, basset hound, Basenji ve West Highland White terrier yer alır. Yaşlı dişi köpekler ise kısa bir kanala sahip, nispeten büyük çaplı bir kasık halkasına sahip oldukları için inguinal fitik geliştirmeye daha yatkın olabilirler, kedilerde ise nadiren görülür (Fossum,2013:522-523).

b) Umbilikal Hernia

Umbilikal fitikler, genellikle doğuştan gelen ve fetal gelişim sırasında karın duvarının tam kapanmaması sonucu oluşan durumlardır. Özellikle yavru köpekler, kediler ve çiftlik hayvanlarında (buzağı, kuzu) umbilikal herni yaygın olarak görülür. Bu hayvanlar, kriporşidizm ve diyafram defekti gibi diğer doğumsal anormalliklere de sahip olabilir (Yool, 2012:149-170).

Cerrahi onarım, fitik halkasının bulunduğu bölgeye doğrudan cerrahi müdahale ile yapılır. Komplike vakalarda ise daha geniş bir insizyon gerekebilir.

c) Scrotal Hernia

Skrotal fitikler, abdominal organların spermatik kord ile bağlantılı olan vaginal çıkıntıya doğru kaymasına izin veren inguinal halka defektleri nedeniyle meydana gelir. Özellikle köpekler ve atlar gibi bazı hayvan türlerinde daha sık görülür. Skrotal fitikler seyrek görülür. Genellikle unilateraldir ve abdominal içeriğin strangulasyonu yaygındır (Fossum,2013:522-523).

d) Perineal Hernia

-Perineal herniler, pelvik diyafram kaslarının zayıflaması veya işlevini yitirmesi sonucunda meydana gelir. Bu durum çoğunlukla orta yaşlı ve yaşlı erkek köpeklerde yavaş ilerleyen bir problem olarak ortaya çıkar, ancak nadiren dişi köpeklerde ve kedilerde de rastlanabilir (Pratschke,2002: 570-581).

Tedavisinde birçok cerrahi yöntem vardır. Genelde tercih edilen cerrahi yöntem pelvik diyafram kaslarının dış anal sfinkter kası ile yeniden birleştirilmesine dayanır. İç obturator kas flebi kullanımı yöntemi, daha güvenli bir tamir sağlar ve tekrar fitik oluşma oranını %10'a kadar azaltabilir. Kolopleksi, sistopeksi veya vas deferensopeksi destekleyici cerrahi girişimlerdir, özellikle ciddi ya da nüksetmiş fitik vakaları için tercih edilir (Pratschke,2002: 570-581).

e) Femoral Henia

Femoral fitiklar, karın duvarının en alt kısmında bulunan femoral kanal aracılığıyla meydana gelir. Bu kanal, femoral damarlar ve sinirin karın bölgesinden geçişini sağlar. Femoral kanal, inguinal kanallardan kaudal ve lateral yönde yer alır ve femoral arter, ven ile sinir içerir. Konjenital femoral fitiklar nadir görülür, ancak travmatik femoral fitiklar sıklıkla prepubik tendon avülsiyonu ile birlikte ortaya çıkar (Fossum,2013:522-523).

Femoral sinir, arter ve ven fitik bölgesinden geçtiği ve defektin alt sınırında yeterli sütür ankraj noktası olmadığı için, femoral fitikların cerrahi onarımı zordur. Bu tür onarımlarda, femoral sinir hasarı ve femoral arterden kanama gibi potansiyel komplikasyonlar görülebilir Fossum,2013:522-523).

2.1.2.2 Internal (İç) Hernialar: Organ veya dokunun, anatomik olarak komşu olan bir iç bölgeye kaymasıyla oluşan hernialardır.

a) Diyafragmatik Hernia

Diyafram fitikleri, nadir görülen bir durum olmakla birlikte, trafik kazalarına bağlı travmaların %1-9'unda ortaya çıkabilir. Bu durumda diyaframın kas yapısında yırtıklar oluşur ve karın organları göğüs boşluğuna geçebilir. Yırtılmalar, diyaframın sağ ve sol taraflarında benzer oranlarda görülür. Göğüs boşluğuna en sık geçen organlar ise karaciğer, mide ve ince bağırsaklardır (Pratschke,2002: 570-581).

Tedavi için cerrahi müdahale şarttır ve genellikle ventral orta hat insizyonu ile uygulanır. Mide genişlemesi, bağırsak tıkanıklığı veya organ strangülasyonu gibi akut durumlar acil cerrahi gerektirir (Pratschke,2002: 570-581).

b) Hiatal Hernia

Hiatal fitik, karın içi organlardan birinin diyaframda bulunan özofageal açıklıktan geçerek göğüs boşluğuna kaymasıdır. Köpekler ve kedilerde nadiren rastlanan bu durum, insanlarda %40'a kadar subklinik vakalarla bildirilmektedir (Sfara ve ark,2019:321).

Dört tipi vardır;

Tip 1: Kaymalı (Aksiyel) Hiatal Fıtık - Özofagusun alt kısmı ve mide, diyaframdaki açıklıktan göğüs boşluğuna kayar (Sfara ve ark,2019:321).

Tip 2: Paraözofageal Fıtık - Mide, özofagusun yan tarafına doğru göğüs boşluğuna çıkar (Sfara ve ark,2019:321).

Tip 3: Kombine Fıtık - Tip 1 ve Tip 2'nin özelliklerini bir arada barındırır (Sfara ve ark,2019:321)

Tip 4: Kompleks Fıtık - Kolon, dalak, pankreas veya ince bağırsak gibi organların yer aldığı fıtık türüdür; hayvanlarda görülmemiştir (Sfara ve ark,2019:321).

c) İnsizyonel Hernia

İnsizyonel fitik, abdominal bir insizyondan organların dışa doğru kayması sonucu gelişir. Kötü cerrahi uygulamaların örneğin, linea alba kapamasında dış

rektus kılıfının dahil edilmemesi, yanlış str seimi, kt dm atma gibi uygulamaların çou insizyonel fıtıktan sorumlu olduu dnlmektedir. En ciddi durumlarda, insizyonel fıtık ciltte aılmaya yol aarak i kanamaya sebep olabilir.İnsizyonel fıtıklar, str yerleimine dikkat edilerek orijinal insizyonun revizyonu ile onarılır. Onarım genellikle devitalize olmu veya enfekte dokunun defektin kenarlarından debride edilmesini gerektirir (Yool, 2012:149-170).

2.1.3 Redkte Edilebilirliine Gre Sınıflandırma

Redkte Edilebilir Hernia: Hernialı dokunun, manuel baskı ile orijinal yerine geri dndrlebildii trlerdir.

Redkte Edilemeyen (İrredktibl) Hernia: Hernialı dokunun, yırtık blgesine geri dnrlemedii durumları ifade eder.

2.1.4 Komplikasyon Durumuna Gre Sınıflandırma

Basit Hernia: Komplikasyon gelimemi, genellikle cerrahi ile kolayca tedavi edilebilen hernialardır.

Komplike Hernia: Hernialı organın kan dolaımının bozulduu, stranglasyon veya gangren gibi ciddi komplikasyonlarla karakterize edilen trlerdir.

3) KLİNİK BULGULAR VE TEHİS

İnguinal Hernia

-Genellikle kpek, kedi ve at gibi evcil hayvanlarda grlr. zellikle erkek hayvanlar, testislerin inguinal kanaldan gemesi nedeniyle daha yksek risk altındadır.

-İnguinal blgede tek veya ift taraflı Őilik, arı nedeniyle hayvanda huzursuzluk, srekli inleme, kasık blgesini yalama veya ineme gibi davranılar ve baırsakların sıkıması durumunda kusma, itahsızlık, kabızlık gibi belirtiler geliebilir (Holzheimer, 2005: 121-34).

-Tehis iin ounlukla fiziksel muayene ve ultrason muayenesi tercih edilir. BT taraması, MRT, rntgen rutin kullanım iin nerilmez.

Umbilikal Hernia

-Gbek blgesinde yumuak ve dıarı doru ıkıntı Őeklinde Őilik fark edilir. Őilik genellikle basıldıında geri itilebilir ancak bazı durumlarda sıkıabilir. Herni kesesi iindeki baırsakların veya dokuların sıkıması stranglasyona yol aabilir (Yool, 2012:149-170).

-Tehiste gbek blgesi elle muayene edilir, Őilik geri itilebilir mi yoksa sıkımı mı olduuna bakılır, baırsak tıkanıklıı gibi komplikasyonların deerlendirilmesi iin radyografi kullanılabilir.

Scrotal Hernia

-Klinik bulgularda fiziksel muayenede skrotal keselerden birinde Őilik fark edilir ve bu Őilik genellikle yumuak ve arısızdır ancak komplikasyon geliirse arılı hale gelebilir. Skrotum gergin ve dokunmaya karı hassas olabilir. Arı belirtileri olabilir, hayvan sık sık skrotumunu yalayabilir. Mesanenin de skrotal keseye fıtıklaması durumunda idrar yapmada glk veya tamamen idrar yapamama grlebilir (Yool, 2012:149-170).

-Tehis iin fiziksel muayene, ultrasonografi ve radyografi tercih edilir.

Perineal Hernia

-Rektum etrafında tek taraflı ya da çift taraflı şişlik, kabızlık, zorlu dışkılama (tenesmus) ve ağrılı defekasyon, kronik olgularda dışkı ve idrar tutamama klinik bulgularıdır (Pratschke,2002: 570-581).

Hiatal Hernia

-Aşırı salya üretimi, regürjitasyon ve kusma, sürekli kilo kaybı ve solunum güçlüğü, yutma zorluğu (disfaji) ve anemi klinik bulgularıdır. Tedavi, cerrahi müdahaleyle veya medikal yöntemlerle gerçekleştirilir. Medikal tedavide asit baskılayıcı ilaçlar ve prokinetik ajanlar kullanılır (Yool, 2012:149-170).

- Tanı koymada klinik semptomlar, radyografik incelemeler ve kontrastlı görüntüleme teknikleri kullanılır. Baryumlu yutma radyografisi, fıtıklaşmış midenin boyutu ve gastroözofageal bağlantının yeri hakkında değerli bilgiler verir[5]. Ayrıca, endoskopi ile özofajit, gastroözofageal reflü ve striktürler doğrulanabilir (Pratschke,2002: 570-581).

Diyafragmatik Hernia

- Farklı şiddetlerde solunum güçlüğü, göğüs boşluğunda sıvı birikimi (plevral efüzyon), %10-12 oranında kalp ritim bozuklukları egzersiz yapmada zorluk, depresyon belirtileri ve kilo kaybı gibi klinik bulguları vardır (Yool, 2012:149-170).

- Diyafram fıtıklarının tanısı genellikle radyografi ve ultrasonografi ile konur. Ultrasonografi, özellikle plevral efüzyonun detaylı incelenmesinde faydalıdır.

Femoral Hernia

-Klinik bulgularında karın bölgesinde dikkat çeken bir şişlik görülür ve bu şişlik hareket sırasında veya sonrasında belirginleşebilir. Hareket esnasında özellikle ağrılı durumlarda topallama, yavaş hareket veya sürekli yatma eğilimi görülebilir. Ultrasonografi ve radyografi teşhiste önemli yol gösterici olarak kullanılabilir (Yool, 2012:149-170).

İnsizyonel Hernia

-İnsizyonel fıtık şüphesi uyandıran klinik bulgular, abdominal insizyon hattı üzerinde subkutanöz şişlik, cilt insizyonundan sıvı sızıntısı (organ boğulması ve sıvı transudasyonu belirtisi) ve cilt insizyonundan dışarıya doğru çıkan doku olarak sıralanabilir (Yool, 2012:149-170).

4) HERNİALARIN TEDAVİSİ

Fıtıkların cerrahi onarımı, gerçekleştirilen en yaygın cerrahi prosedürlerden biridir ve fıtık onarımında standart olan tek bir cerrahi teknik yoktur. Mümkün olduğunca biyolojik bir yaklaşım benimsenir. Ana bileşenler şunlardır;

- Organların normal konumlarına geri döndürülmesi,
- Hasar görmüş organların rezeksiyonu veya onarımı,
- Hernial halkanın lokal ve otolog dokular kullanılarak kapatılması,
- Doku gücü, kan temini ve fonksiyonlarına dikkat ederek nazik doku manipülasyonu,
- Onarım üzerindeki gerilimi azaltmak için uygun olduğunda lokal flepler veya protezler kullanılması,
- Yer değiştiren organların normal pozisyonlarında sabitlenmesi,
- Yardımcı cerrahi ve/veya tıbbi yönetim.

Başarılı herni onarımı, dikiş materyalinin kopma gücüne veya inflamatuvar bir reaksiyon oluşturarak ek fibroz doku gelişimini sağlama amacına bağlı değildir. Dikiş materyalleri, lokal doku gücüne uygun seçilmelidir. Zayıf bir kasa sert ve kalın bir dikiş materyali kullanmanın pek bir anlamı yoktur. Daha önemli olan, lokal dokuları minimum gerilme ve maksimum kan temini ile hareket ettirmek ve iyileşme kapasitesini korumaktır. Yara iyileşme süresi boyunca ve matürasyon fazında gücünü koruyacak bir emilebilir dikiş materyali (örneğin polidioxanone) kullanılmalıdır (Hunt, 2010).

4.1. Açık Cerrahi (Open Herniorrhaphy)

- Fıtık bölgesi açılır, fıtık kesesi içindeki organlar doğru pozisyonlarına yerleştirilir ve fıtık kapatılır.

4.2. Laparoskopik Cerrahi (Minimal İnvaziv)

Karın bölgesine küçük kesiler açılır, kamera ve cerrahi aletler yardımıyla işlem gerçekleştirilir.

4.3. Mesh (Ağ) Onarımı

Zayıf bölgeyi desteklemek için biyolojik veya sentetik ağ yerleştirilir. Özellikle geniş fıtıklarda kullanılır.

4.3.1 Mesh Türleri ve Özellikleri

- Sentetik Meshler

Polipropilen Mesh: En yaygın kullanılan mesh türüdür. Dayanıklısıdır, ancak enfeksiyon riski yüksek olabilir (See ve ark, 2020:19-33).

Polietilen Tereftalat (PET) Mesh: Polipropilene benzer, ancak daha az inflamatuvar reaksiyon oluşturabilir (See ve ark, 2020:19-33).

Poliglolik Asit (PGA) Mesh: Emilime açık (biyo-yıkılabilir) meshlerdir. Zamanla vücutta çözünür, ancak yeterli uzun vadeli dayanıklılık sağlamayabilir (See ve ark, 2020:19-33).

- Biyolojik Meshler

Kolajen Bazlı Meshler: Hayvansal kaynaklı kollajen dokulardan elde edilir. Daha az enfeksiyon riski taşır ancak maliyeti yüksektir (Brown ve ark, 2010:272-278).

İnsan Derisi veya Domuz Derisinden Elde Edilen Meshler: Özellikle büyük fıtıklarda tercih edilir (Brown ve ark, 2010:272-278).

-Nanoteknolojik Meshler

Hidroksiapatit veya Nanokompozit Kaplamalı Mesh: Kemik ve kas dokularıyla daha iyi entegrasyon sağlar. Bu tür meshler üzerine yapılan araştırmalar, hayvan cerrahisinde deneysel aşamalarda (Brown ve ark, 2010:272-278).

4.4 Herni Türüne Özel Tedavi Yöntemleri

- İnguinal ve Skrotal Herni

Cerrahi onarım temel tedavidir. Kastrasyon çoğu zaman eş zamanlı olarak yapılır.

Laparoskopik cerrahi veya açık cerrahi teknikleri uygulanabilir.

- Umbilikal Herni

Küçük umbilikal herniler bazen kendiliğinden iyileşebilir, ancak büyük veya komplikasyonlu vakalarda cerrahi gerekir.

Mesh kullanımı genellikle gerekmez.

-Perineal Herni

Perineal bölgedeki kaslar zayıfladığı için kas grefti veya sentetik destek kullanımı yaygındır.

Kastrasyon, perineal herni tedavisinde tekrar oluřma riskini azaltmak için sıklıkla uygulanır.

-Diyafragmatik Herni

Göğüs ve karın boşluęu arasındaki diyaframın onarılması cerrahi olarak yapılır.

Acil müdahale gerektiren bir durumdur ve genellikle genel anestezi altında gerçekleştirilir.

KAYNAKÇA

Yool, D.A. (2012). *Small Animal Soft Tissue Surgery*. Oxfordshire: CABI Publishing.

Pratschke, K. (2002). Management of hernias and ruptures in small animals. *In Practice*, 24(10), 570-581.

Fossum, T.W. (2013). *Small Animal Surgery*, Fifth Edition. Philadelphia: Elsevier.

Hunt, G. B. (2006). *Hernia repair: principles & practice*.

Sfara, A., & Dumitrascu, D. L. (2019). The management of hiatal hernia: an update on diagnosis and treatment. *Medicine and pharmacy reports*, 92(4), 321.

Holzheimer, R. G. (2005). Inguinal hernia: classification, diagnosis and treatment. *Eur J Med Res*, 10(3), 121-34.

See, C. W., Kim, T., & Zhu, D. (2020). Hernia mesh and hernia repair: a review. *Engineered Regeneration*, 1, 19-33.

Brown, C. N., & Finch, J. G. (2010). Which mesh for hernia repair?. *The Annals of The Royal College of Surgeons of England*, 92(4), 272-278.

Bellenger, C. R. (1995). The treatment of hernias. *Veterinary Quarterly*, 17(sup1), 2-4.

Exploring the Effect of Oral Exam Stress on Physiological Parameters in Students: Insights from Smart Bracelet Monitoring – A Pilot Study

Ana DZONLIC

Student, Faculty of Health Studies, University of Rijeka, Croatia

Asst. Prof. Dr. Silvije SEGULJA

Faculty of Health Studies, University of Rijeka, Croatia

Julijana PELIIVAN

Student, Faculty of Health Studies, University of Rijeka, Croatia

Assoc. Prof. Dr. Bojan MILETIIC

Faculty of Health Studies, University of Rijeka, Croatia

Abstract

Stress is any internal or external stimulus that causes a biological response and occurs when that stimulus overwhelms a person's ability to adapt. Chronic stress leads to long-term health consequences, such as a higher risk of cardiovascular disease and metabolic disorders.

This study aimed to determine the changes in physiological parameters (heart rate, blood pressure, and blood glucose levels) in students during oral examinations. Data on these parameters were collected using smart bracelets worn by the participants during oral exams and at rest.

The study involved 35 first-year students of the Professional Physiotherapy Program (23 women and 12 men). The average resting heart rate was 78.97 bpm and 101.28 bpm during the exam. Blood pressure readings at rest were 113.06/76.37 mmHg, compared to 121.439/79.6 mmHg during the exam. Blood glucose levels ranged from 5.89 mmol/L at rest to 6.50 mmol/L during the test.

The results of this study show a statistically significant increase in measured values during the oral examination, indicating a clear physiological response to the oral examination as an acutely stressful experience for students. Studying physiological parameters helps to understand students' reactions to stressful situations. With this knowledge, it is possible to develop intervention strategies and therapeutic methods to maintain health and prevent illness.

Keywords: Blood Glucose, Blood Pressure, Heart Rate, Stress, Students

The Importance of Evaluating the Degree Satisfaction of Hospitalized Patients

Assoc. Prof. Dr. Frâncu VIOLETA

Lucian Blaga University, Faculty of Medicine, Sibiu, Romania

Abstract

The purpose of the study

Evaluation of the hospitalized patients degree satisfaction, regarding to the hotel conditions and the quality of medical services and care.

Working method: qualitative study (questionnaire), evaluating the opinion of 289 patients, hospitalized between January and December 2024 in the Pneumology Hospital of Sibiu.

Results

The patients who answered the questions are predominantly from rural areas, are more often male and mainly aged between 50-79 years.

Conclusions

Patients are satisfied with the way they were admitted in the hospital and the way their health problems, diagnosis and treatment were communicated to them by the attending physician.

Patients received all the necessary medication for the treatment from the hospital. They were satisfied with their relationship with the medical staff, who offered them a climate of trust and safety during the hospitalization.

Finally, they were asked to rate the quality of medical services and care. Thus, the overwhelming majority gave only qualifications of "very good" and "good" for all medical personnel, the best qualifications being in descending order for doctors, nurses and cleaners.

Most of the patients declared that they would return to the hospital if they needed to.

Keywords: Hospitalized Patients, Patient's Opinion, Degree of Satisfaction

Anatomy of Speech

Konuřmanın Anatomisi

Asst. Prof. Dr. Ayře ÖMERLİ

Nuh Naci Yazgan University

Abstract

Speech is the process by which sound vibrations generated in the larynx gain meaning through resonance and articulation in the subsequent sections. The act of producing sound occurs after sensory inputs from the environment are processed in the brain.

The sense of hearing originates from the inner ear, vision from cone cells in the retina, and taste, smell, touch, and proprioception from respective receptors. These signals are first transmitted to the Wernicke's area, where interpretation, recognition, understanding, memory recording, and evaluation occur. Then, to generate a motor response, the information is sent to Broca's speech center.

Once instructions from the Broca's area reach the motor centers, speech is prepared. The axons of these motor cortical neurons connect to the second-order neurons, which, as relevant cranial nerves, reach the tongue, lips, palate, cheeks, jaw, larynx, and respiratory muscles. Consequently, the expiration of respiratory air, combined with the activity of phonatory and articulatory muscles, produces speech.

The production of human voice requires an energy source and a vibrating structure. The energy source is the moving, pressurized respiratory air from the lungs, while the vibrating structure is the vocal cords in the larynx.

These complex mechanisms of sound production are under the integrative control of the central nervous system. Efferent signals from areas and organs involved in producing sound—such as the mouth, jaw, pharynx, larynx, lungs, abdomen, back muscles, ligaments, joints, and superficial mucosal receptors—are evaluated by the central nervous system. Commands are then issued to ensure the necessary muscle tension is achieved for the production of the most appropriate sound.

Keywords: Speech, Voice, Anatomy

Ses; ses bir varlığın kendini ifade biçimidir. Dil ile ifade, insanı diğer canlılardan ayıran en temel özelliktir (1). Nöropsikolojik açıdan dil, uzun bir sosyal gelişme sürecinde yaratılan kodlar sistemidir. Bu sistem sesbilim, biçimbilim, sözdizim anlambilim ve kullanımbilim düzlemlerinden oluşmaktadır. Dil, bütün bu düzlemlerin aktif kullanımı ve beynin tümünün katılımıyla ortaya konur (2). Psikofizyolojik açıdan dilin kazanılması ve

ortaya konması, beyindeki aktif oluşumlara bağlıdır. Eğer sinir sistemi içinde bu fonksiyon için yüksek derecede özelleşmiş ve aynı zamanda esneklik kazanmış fizyolojik bir ön hazırlık yoksa dilin, ne kazanılması ne de kullanılması olasıdır (3). Nörolojik bakış açısıyla yapılan araştırmaların verileri ışığında, beynin sol yarıküresindeki üç kortikal alanın ve bu alanlar arasındaki bağlantıların dilin gerçekleşmesinde önemli rol oynadığı ortaya konmuştur (2).

Broca alanı, wernicke alanı, gyrus angularis. Frontal lobda yer alan broca alanı, primer motor korteksin seslerin oluşması ve ortaya konmasıyla ilgili dudak, dil, velum, farenks ve larenksle ilgili alanların hemen önündedir. Görevi, komşu alanlar tarafından üretilmiş olan seslerin, konuşulan dil biçimine dönüştürülmesine yardımcı olmaktır. Superior temporal gyusun arka yarısında ve üst yüzeyde yer alan wernicke alanı; duyulanların söylenenler biçimine dönüştürülmesinde kodlama ve duyulanların çözümlenmesini sağlamada yardımcı olur. Parietal lobda bulunan gyrus angularis işitilenin yazılması, dokunulan cismin adının yazılması, görülen nesnenin adının yazılabilmesi ve okuma işlevleriyle ilişkilidir (1). Broca ve wernicke alanları arasındaki bağlantı sayesinde insanlar, karşılıklı duyma ve konuşma biçiminde kesintisiz bir iletişim sağlarlar. İnsanın duyduğunu doğru olarak yinelemesi de arkuat fasikülüs yoluyla gerçekleşmektedir. Wernicke alanıyla angüler gyrus arasındaki bağlantı, anlama işlevinin tamamlanmasını sağlar. Doğuştan anatomik olarak var olan bu bağlantı, eğitim sonucu okuma-yazmanın öğrenilmesiyle işlerlik kazanır. Angüler gyrus ile broca alanı arasındaki bağlantının en önemli işlevi, sesli okumanın gerçekleşmesidir (1).

Konuşma; konuşmanın gerçekleşebilmesi için iki tür bağlantıya gerek vardır: birincisi primer motor korteksin ses üretimiyle ilgili alanlarının broca alanıyla olan bağlantısıdır. Bu bağlantı, ses üretim işlevini daha üst düzeyde bir işleve, konuşmaya dönüştürmektedir. İkinci bağlantı ise broca ve wernicke alanları arasındaki bağlantıdır ve bu bağlantı, wernicke alanının düzenli konuşma emrinin ya da kodlamasının broca alanına iletilmesini sağlar (3). Anlamada iki bağlantı söz konusudur; birincisi, primer işitme korteksiyle wernicke alanı arasındaki bağlantı, ikincisi ise wernicke ile angüler gyrus arasındaki bağlantıdır. Birinci bağlantının etkilenmesi işitme ancak anlamlandırılmama ile sonuçlanmakta, ikinci bağlantının etkilenmesi ise okuyarak anlamayı etkilemektedir (3). Konuşma anatomisi ve fizyolojisinin üretim ve algılama şeklinde iki boyutu, her boyutun nörolojik ve periferik organ şeklinde iki komponenti vardır. Konuşma üretiminin periferik organ komponenti anatomik açıdan üç sistem oluşturur; solunum sistemi, larenks, ses yolu. Glotisten dudaklara ve burun deliklerine kadar uzanan birbiriyle bağlantılı kaviteleden oluşan bölgeye ses yolu adı verilir. ses yolu; farengeal, oral ve nazal olmak üzere üç ana kaviteden oluşur. Farengeal kavite (yutak boşluğu): supraglotik larengeal, hipofarengeal ve orofarengeal kaviteleden oluşur. Bu kaviteyi; supraglotik larenks ve farenks çevreler. Nazal kaviteyle arasında yer alan ve farengeal kapı, oral konuşma seslerinin artikülasyonu sırasında iki boşluğu birbirinden ayırır. Oral kavite (ağız boşluğu): esas oral kavite ve bukkal kaviteden (vestibül) oluşur. Oral kaviteyi; sert ve yumuşak damak, dil, dişler, alveolar çıkıntılar ve dudaklar çevreler. mandibüla, oral kaviteyi çevreleyen bir yapı olmamakla birlikte ağız açıklığını kontrol etmesi açısından önemlidir. Nazal kavite (burun boşluğu): nazofarengel kavite ile sağ ve sol nazal kaviteleden oluşur. (5)

Ses (konuşma) bir oral iletişim ihtiyacından doğmakta ve organizmanın değişik bölgelerinin uyumlu bir işbirliği halinde konuşma olarak çevreye verilmektedir. Bu yüzden konuşma olayında ses çıkarma ihtiyacını doğuran faktörler ve buna cevap veren bir sistemler topluluğu söz konusudur. Konuşma ihtiyacını doğuran impuls çok defa işitme, görme ve bazen de diğer duyuşal fonksiyonların yaptığı uyarımlardır (6).

İşitsel uyarılar; iç kulaktan alınıp, temporal lob transvers gyrus heschl merkezinde sonlanırlar. [broadman (br.) 41]. Her iki işitme merkezindeki uyarı sol hemisferde bulunan wernicke alanına (br. 22) transfer edilir. Bu merkezde yorum, tanıma, anlama, hafıza, kayıt

ve değerlendirme gibi işlemlere uğradıktan sonra cevap için fasciculus arcuatus aracılığıyla bu uyarılar frontal lobda brocca merkezine (br. 44-45) iletilir. Burada uyarıya göre motor cevap düzenlenir.

Görsel ve yazılı uyarılar; retinada rod ve koni hücrelerinden başlayan, retinanın bipolar hücrelerince alınan bu impulslar, beyinde oksipital lobda, fissura kalkarina çevresinde kuneus ve lingual gyrusda bulunan görme merkezinde sonlanır. (br 17). Yardımcı görme merkezlerini de (br. 18,19) uyarıcı impulslar buradan gyrus angularis (pariyetal lob. br. 39) ve gyrus supramarginalis (pariyetal lob. br. 40) ulaşır. bu iki merkezde yorumlanan bilgiler, önce wernicke merkezine gönderilir, gerekli işlemi takiben fasciculus arcuatus aracılığıyla motor cevap için brocca merkezine yollanır.

Diğer duyuşsal impulslar, tad, koku, temas ve derin duyuya ait impulslar pariyetal veya temporal kortekste ilgili merkezlerde sonlanır. Önce wernicke merkezine sonra da brocca merkezine iletilir. Vizüel impulslar oksipital, işitsel impulslar temporal diğer duyuşsal impulslar ise pariyeto-temporal kortekste algılandıktan sonra, bu bilgiler entegrasyon merkezinde (gyrus angularis) değerlendirilir ve wernicke merkezine gönderilir. Buradaki işlemi takiben de motor cevap oluşması amacıyla brocca merkezine ulaştırılır.

Konuşma ile ilgili organların dil, dudak, çene, yanak, gırtlak, solunum kasları v.s. kortikal kumanda merkezleri gyrus presentralisin alt bölümündedir. Konuşma olabilmesi için sol hemisferdeki motor konuşma merkezi (brocca) ile gyrus presentralisin alt bölümü arasında bağlantı kurulması şarttır. Bu bağlantıyı kapsula eksterna içindeki lifler temin eder (6).

Konuşma sırasında kasların iki yönlü ve koordine bir hareketi gerekli olduğu için sol serebral hemisferde konuşma ile yükümlü kortikal merkezleri, korpus kallosum aracılığıyla sağ serebral hemisferin aynı bölgesiyle temas haline geçer.

Brocca merkezinden çıkan talimat gyrus presentralisin alt yüzündeki motor merkezlere ulaştınca konuşma hazırlanmış olur. Bu motor kortikal nöronların aksonları piramidal traktus içinde aşağı doğru iner ve çaprazlaşır pons ve bulbusda v. (trigeminus),vii. (fasialis), x. (vagus) ve xı. Kafa çifti (hipoglossus) 'nin çekirdeklerinde sonlanır. Buradaki sinapsı takiben ikinci nöronların aksonları ilgili kranial sinir olarak dil, dudak, damak, yanak, çene, gırtlak ve solunum kaslarına erişirler

Neticede solunum havasının ekspirasyonu, fonatuar ve artikülator kasların çalışması ile konuşma ortaya çıkar. Bu yolun koordinasyonunda bazı serebral ve serebellar yollar ve bağlantılar da rol oynamaktadır. Normal bir konuşmada, bir kelime söylenmeden önce zihinde onun bir düşüncesi veya kavramı gelişir, bu kavram sembolize edilir, sonra da düşüncenin telaffuzu yapılır. İşte bu durumda konuşma, yüksek serebral merkezler ile solunum fonksiyonu, larengeal düzenleme, yumuşak damak, oral kavitedeki yumuşak dokular, çene eklemi ve yüzdeki bazı anatomik yapıların işbirliği sonucu ortaya çıkan nöromuskuler bir işlem olarak tanımlanabilir.

İnsan sesinin oluşmasında bu anatomik nörokontrol altında olan, birisi enerji kaynağı, diğeri ise titreşen yapı olarak 2 eleman gerekmektedir. İnsanda enerji kaynağı akciğerlerden gelen hareketli, basınçlı, ekspiriyum havasıdır. Titreşen yapı ise larenksdeki kord vokallerdir. trakeadan gelen ekspiriyum havası, larenks hiç işe karışmadan yükselir ve sadece ağızda artiküle edilirse çıkan bu sese fısıltı denir. Buna karşılık trakeadan gelen basınçlı ekspiriyum havası larenksin işe karışması ve kord vokallerin faaliyet göstermesiyle vibrasyon kazanırsa ve supraglottik vokal traktusta rezonans ve artikülasyona uğrarsa, konuşma sesi ortaya çıkar. Bu durumda ses oluşumunda ilk planda akciğerler, larenks ve oral kavitenin kombine ve uyumlu bir işbirliği gerekir. Aslında solunum sisteminin esas görevi hematoz, larenksin temel görevi solunum sistemini korumak, orofarengeal pasajın başlıca işlevi ise sindirim olayını başlatmaktır. Ses çıkarmak bu yapıların sekonder olarak

sonradan üzerine aldığı bir görevdir. Ayrıca organizmanın karın, pelvis, boyun gibi bazı yapıları metabolik ihtiyaçlar, psikoaffektif duygulan ve emosyonel olaylar da sesin oluşumunda dolaylı veya doğrudan etkili olabilirler. Ekspirasyon havası ses için gerekli enerjiyi taşıdığı gibi sesin çevreye yayılımını da sağlar. Bunun için havanın yeterli bir basıncı ve akım hızı olmalıdır. Normalde pasif bir hareket olan ekspiryum olayına, diyafragma ve karın kasları şiddetlendirici etki yaparlar. Alt solunum yollarından gelen basınçlı hava akımı glottis seviyesinde kesilerek kordların açılmasını sağlar. Bu sırada kordların titreşimine bağlı primer glottik ses oluşur. Bu değişimde subglottik basınç, kord vokallerin kitlesi, uzunluğu, gerginliği ve mukoza mobilitesi önemli rol oynar. Primer glottik ses, üst rezonatör ve artikülatör yapıların etkisiyle modüle edilerek harf, hece ve kelime şeklinde ağızımızdan çıkarak konuşma halinde çevreye yayılır (6).

Ses en özet anlatımıyla "akciğerlerden gelen havanın larenkste vibrasyon kazanması, supraglottik traktusta rezonans ve artikülasyon sonucu ağızdan harf,hece, kelime ve cümle şeklinde çıkmasıdır" şeklinde tanımlanabilir. Kord vokal vibrasyonu sonucunda larenkste oluşan ses, ancak supraglottik vokal traktusta rezonans kazanıp artiküle edildikten sonra konuşma haline gelir. Primer glottik sesin supraglottik larenks, farenks, paranasal sinüsler, nazal kavite ve oral kavitede rezonansa uğraması ile bazı frekanslarda güçlenir, bazılarında ise söner. Damak, dil ve dudak hareketlerinin dinamik faaliyetleri sonucunda ses artikülasyonu tamamlanarak konuşma elde edilir. Ses oluşumundaki bu kompleks mekanizmalar merkezi sinir sisteminin entegrasyon etkisi altındadır. Sesi ortaya çıkaracak faaliyeti gösteren bölge ve organlardaki ağız, çene, farenks, larenks, akciğer, karın, sırt, vb. kas ve ligamentlerden eklemlerden ve yüzeysel mukoza reseptörlerinden merkezi sinir sistemine gelen efferent sinyaller değerlendirilir ve gerekli kas gerginliği sağlanarak en uygun sesin çıkartılması için emirler gönderilir. Konuşma oluşan ses titreşimlerinin larinksten sonraki kısımlarda rezonasyon ve artikülasyon ile anlam kazandırılmasıdır. Dışardan aldığımız duyar beyinde değerlendirildikten sonra ses çıkarma olayı gerçekleşir. İşitme duyusu iç kulaktan, görme duyusu retinada koni hücrelerinden, tad, koku, temas ve derin duyu reseptörlerinden alınarak önce wernicke merkezine iletilir. Burada yorum tanıma anlama hafıza kayıt ve değerlendirme yapılır, sonra motor cevap oluşması amacıyla brocca konuşma merkezine ulaştırılır. Brocca merkezinden çıkan talimat motor merkezlere ulaşınca konuşma hazırlanmış olur. Bu motor kortikal nöronların aksonları ikinci nöronların aksonları ilgili kranial sinir olarak dil, dudak, damak, yanak, çene, gırtlak ve solunum kaslarına erişirler. Neticede solunum havasının ekspirasyonu, fonatuar ve artikülatör kasların çalışması ile konuşma ortaya çıkar. İnsan sesinin oluşmasında enerji kaynağı ve titreşen bir yapı gerekmektedir. Enerji kaynağı akciğerlerden gelen hareketli, basınçlı, solunum havasıdır. Titreşen yapı ise larinksdeki vokal kordlardır. Ses oluşumundaki bu kompleks mekanizmalar merkezi sinir sisteminin entegrasyon etkisi altındadır. Sesi ortaya çıkaracak faaliyeti gösteren bölge ve organlardaki ağız, çene, farinks, larinks, akciğer, karın, sırt, vb. kas ve ligamentlerden eklemlerden ve yüzeysel mukoza reseptörlerinden merkezi sinir sistemine gelen efferent sinyaller değerlendirilir ve gerekli kas gerginliği sağlanarak en uygun sesin çıkartılması için emirler gönderilir.

KAYNAKÇA

- 1- Uysal İ. Ö. İlkay M. Sesin Anatomi Ve Fizyolojisi (Ses Oluşumu). Türkiye Klinikleri J E. Koşar N.T.- Special Topics. 2011;4(2):1-8
- 2- Tanrıdağ, O. (1993), Afazi, Gata Basımevi, Ankara, S. 5, 7-9, 29-30, 39-45, 86 98 .
- 3- Ergenç, I. (1995), Konuşma Dili Ve Türkçenin Söyleyiş Sözlüğü, Simurg, Ankara, S. 11-13.
- 4- Sataloff Rt. Profesyonel Ses: Bilim Ve Klinik Sanatı Bakım. 3. Baskı San Diego (Ca): Çoğul Yayıncılık, Inc .; 2006. S. 143-77
- 5- Behrman A: Speech And Voice Science, 3rd Ed, San Diego Ca, Plural Publishing Inc, 2018.Dr.
- 6- Gerçeker M. ve Ark. Ses Ve Konuşma. K.B.B. Ve Baş Boyun Cerrahisi Dergisi, 2000, 8 (1) ; 71-78.

Is Bilateral Block Necessary in Spinal Anesthesia?

Spinal Anesteziye Bilateral Bloğa Gerek Var mı

Asst. Prof. Dr. Mehtap BALCI

Nuh Naci Yazgan University

Abstract

Anesthesia practices are tailored based on the patient's age, gender, general health condition, and the type of procedure planned. In patients receiving spinal anesthesia, better hemodynamic stability can often be achieved compared to those undergoing general anesthesia. Prehydration performed before spinal anesthesia reduces complications associated with the procedure and facilitates easier maintenance of hemodynamic balance.

Spinal anesthesia is administered by injecting a local anesthetic into the subarachnoid space. Using a small amount of local anesthetic effectively blocks all sensations in the lower part of the body. This procedure is typically performed below the level where the spinal cord ends.

Unilateral spinal block is applied to achieve one-sided distribution of the anesthetic agent in the subarachnoid space. Bilateral spinal block, on the other hand, ensures symmetrical distribution of the drug within the subarachnoid area.

With unilateral spinal block, hemodynamic effects such as systemic hypotension and cardiovascular instability are less common. By providing anesthesia specific to the surgical side, a more effective approach can be achieved. The preservation of sensory and motor functions on the non-surgical side contributes to faster recovery during the postoperative period.

Keywords: Spinal Anesthesia, Unilateral, Bilateral

Özet

Anestezi uygulamaları, hastanın yaşı, cinsiyeti, genel sağlık durumu ve planlanan girişim türüne göre şekillendirilmektedir. Spinal anestezi uygulanan hastalarda genel anestezi uygulananlara göre daha iyi hemodinamik stabilite sağlanabilmektedir. Spinal anestezi öncesinde yapılan prehidrasyon, spinal anesteziye bağlı komplikasyonları azaltırken hemodinamik dengeyi daha kolay sağlamaktadır.

Spinal anestezi, cerrahi müdahalelerde ağrı hissini engellemek için kullanılan bir **bölgesel anestezi yöntemidir**. Bu yöntemde, omurga kemiklerinin arasında bulunan subaraknoid boşluğa (genellikle bel bölgesinde) ince bir iğne ile girilerek, omurilikten çıkan sinirlerin çevresindeki beyin omurilik sıvısına anestetik madde enjekte edilir. Bu işlem, alt vücut bölgesindeki sinirlerin geçici olarak uyuşmasına neden olur ve bu sayede hasta, belirli bir süre boyunca ağrı hissetmez.

Spinal anestezi, lokal anesteziğin subaraknoid aralığa enjekte edilmesiyle gerçekleştirilir. Küçük bir miktar lokal anestetik kullanılarak vücudun alt bölgesindeki tüm duyarlar etkili bir şekilde bloke edilir. Bu işlem, genellikle omuriliğin sonlandığı seviyenin altında uygulanır.

Unilateral spinal blok, anestetik maddenin subaraknoid boşluğa tek taraflı bir dağılımını sağlamak amacıyla uygulanmasıdır. Bilateral spinal blok, ilacın subaraknoid alanda simetrik olarak dağılmasını sağlar.

Unilateral spinal blok ile sistemik hipotansiyon ve kardiyovasküler stabilite kaybı gibi hemodinamik etkiler daha az görülür,sadece cerrahi tarafa özel anestezi sağlanarak daha etkili bir uygulama yapılabilir.Diğer tarafın duyuşsal ve motor fonksiyonlarının korunması, hastaların postoperatif dönemde daha çabuk iyileşmesine katkı sağlar.

Anahtar Kelimeler: Spinal anestezi, Unilateral, Bilateral

GİRİŞ:

Spinal anestezi, 1898 yılından bu yana anestezistler tarafından sıklıkla tercih edilen cerrahi müdahalelerde ağrı hissini engellemek için kullanılan bir bölgesel anestezi yöntemi olmuştur. Son 10 yıl içerisinde, anestezistlerin bilgi, deneyim ve yeteneklerinin artmasıyla birlikte, spinal anestezinin kullanımı giderek yaygınlaşmıştır. Bu yöntemde, omurga kemiklerinin arasında bulunan subaraknoid boşluğa (genellikle bel bölgesinde) ince bir iğne ile girilerek, omurilikten çıkan sinirlerin çevresindeki beyin omurilik sıvısına anestezi madde enjekte edilir. Bu işlem, alt vücut bölgesindeki sinirlerin geçici olarak uyuşmasına neden olur ve bu sayede hasta, belirli bir süre boyunca ağrı hissetmez.Bu işlem, genellikle omuriliğin sonlandığı seviyenin altında uygulanır.

Bu yöntemin sağladığı avantajlar; mortalite ve morbidite oranlarının düşürülmesinden, doku oksijenasyonunun artmasına ve etkili ağrı kontrolüne kadar geniş bir yelpazeyi kapsamaktadır. Spinal anestezi, ağrı kontrolü için güvenli, etkili ve ekonomik bir teknik olması ve uzun süreli postoperatif analjezi sağlama avantajını da beraberinde getirmesine rağmen tekniklerin gelişmesi ve uygulama yöntemlerindeki yenilikler sayesinde daha sık uygulanması, potansiyel komplikasyonlarda da bir artışa yol açmıştır. Her ne kadar spinal anestezi komplikasyonları oldukça nadir görülse de ortaya çıktıklarında ciddi sorunlara neden olabilmektedir.

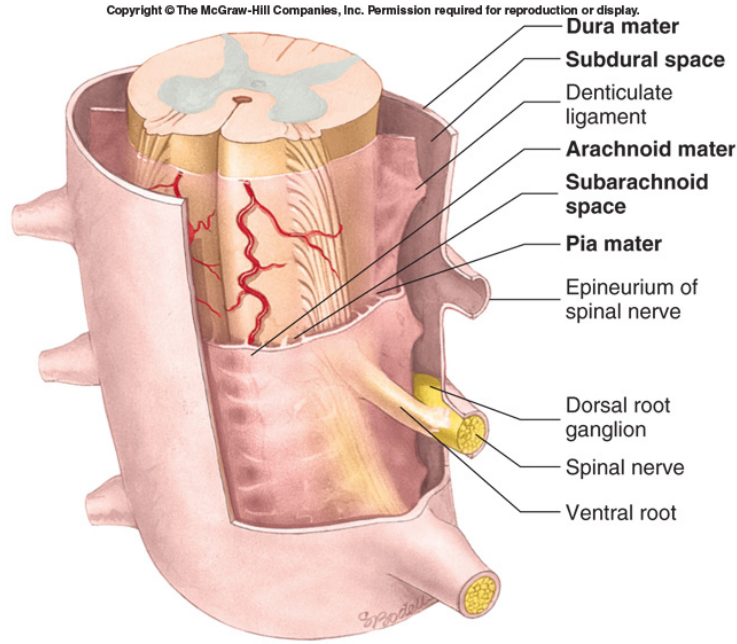
ANATOMİK OLUŞUMLAR:

Spinal anestezinin uygulanması, nöraksiyel anatominin uygun şekilde konumlandırılmasını ve anlaşılmasını gerektirir.

Omurga, 7 servikal, 12 torasik, 5 lomber ve 5 kaynaşmış sakral vertebradan oluşur. Omurlar, konumlarına ve yapısal farklılıklarına göre adlandırılmıştır. Bu kemikler, eklemli bağlantılar ve bağlarla bir araya gelerek omurilik kanalını oluşturan içi boş bir tünel şeklinde sıralanır. Omurilik, bu kanal içinde yer alır. Omurilikten çıkan sinirler ise bitişik omurların pedikülleri arasındaki yan boşluklardan geçerek omurilik kanalını terk eder.

Medull spinalis, meninges adı verilen üç kat zar ile sarılıdır. Bu zarların isimleri dıştan içe doğru duramater spinalis, arachnoidea mater spinalis ve piamater spinalis'dir.(1)(Şekil1)

Şekil 1



(a) Anterolateral view

Dura mater

Dura mater, en dış tabaka olup oldukça dayanıklı bir yapıya sahiptir. Dura, dura periostealis ve dura encephali olmak üzere iki tabakadan oluşur. Her iki tabaka da kollajen liflerden zengin, sıkı fibröz bağ dokusundan meydana gelir.(1,2,3,4)

Arachnoidea mater

Dura mater ile pia mater arasında bulunan, damarsız ve örümcek ağı benzeri bir zarıdır. Arachnoidea mater, dura mater ile arasında spatium subdurale adı verilen bir aralık oluşturur. (1,2,3,4)

Pia mater

Merkezi sinir sistemini çevreleyen üç meninks zarından en içte olanıdır. pia mater, beyin ve omuriliği doğrudan saran ince, saydam ve elastik bir bağ dokusu tabakasıdır. (1,2,3,4)

Subaraknoid aralık

arachnoidea mater ile pia mater arasında yer alan boşluktur. Bu yapı, hem beynin hem de medulla spinalis'in çevresinde bulunur ve birbirinin devamı niteliğindedir. Bu boşluk, bazı kafa çiftlerinin etrafında da görülür; özellikle n. olfactorius, n. opticus ve n. vestibulocochlearis gibi sinirler çevresinde cavum subarachnoidea'ya rastlanır. Spatium subarachnoideum, beyin omurilik sıvısı (BOS) ile doludur ve merkezi sinir sistemi için önemli bir koruyucu ve besleyici ortam sağlar. (1,2,3,4)

Beyin Omurilik Sıvısı (BOS)

beyin ve omurilikte bulunan, berrak ve renksiz bir sıvıdır. Beyin ventriküllerindeki plexus choroideus yapılarında üretilen BOS, beynin fiziksel ve bağışıklık korumasında önemli bir rol oynar. Çoğunlukla lateral ventriküllerde, ayrıca üçüncü ve dördüncü ventriküllerde üretilen BOS, yüksek klorid içeriğine sahip olup az miktarda protein, birkaç epitel hücresi ve yaklaşık 2-3 lenfosit/mm³ içerir. Sıvının büyük kısmı kranial ve spinal subaraknoidal boşluklarda yer alırken, yaklaşık %20'si ventriküler sistemi doldurur. Beyin için bir tampon veya yastık görevi görerek hem fiziksel koruma sağlar hem de çeşitli metabolik süreçlere katkıda bulunur. Son yapılan çalışmalar %50sinin 5-6 saat içerisinde

yenilendiğini göstermektedir. Beyin omurilik sıvısı (BOS), kranial boşluk ile vertebral kanalın subaraknoidal bölümleri arasında serbestçe dolaşabilir. (1,2,3,4)

UYGULAMA YÖNTEMİ:

Anestezi uygulamaları, hastanın yaşı, cinsiyeti, genel sağlık durumu ve planlanan girişim türüne göre şekillendirilmektedir. Bölgesel anestezi (rejyonel anestezi), belirli bir bölgedeki sinir ya da sinirlerin çevresine lokal anestetik maddelerin enjekte edilmesiyle elde edilir. Sinir bloklarını, periferik ve santral bloklar olmak üzere iki ana gruba ayırabiliriz. Periferik sinir, gangliyon ve pleksus blokları periferik sinir bloğu; spinal ve epidural bloklar ise santral sinir bloğu kategorisine girer. Her bir yöntemin uygulanabilmesi için anatomik ve fizyolojik bilgilere hâkim olunması, özel eğitim ve beceri gerektirir.(5-6)

Doğru şekilde uygulandığında, nöroaksiyal anestezi genel anesteziye göre birçok avantaj sunar. Bu avantajlar arasında minimal hava yolu müdahalesi, düşük kardiyopulmoner depresyon riski, etkili bir postoperatif analjezi, opioid ihtiyacının azalması (özellikle uzun etkili lokal anestetikler kullanıldığında), daha az postoperatif bulantı ve kusma görülmesi ile hastanede kalış süresinin kısalması yer alır.(7)

Spinal anestezi, lokal anesteziğin subaraknoid aralığa enjekte edilmesiyle gerçekleştirilir. Küçük bir miktar lokal anestetik kullanılarak vücudun alt bölgesindeki tüm duyuvar etkili bir şekilde bloke edilir. Bu işlem, genellikle omuriliğin sonlandığı seviyenin altında uygulanır.(8)

Spinal anestezi, omuriliğe zarar vermemek ve intratekal olarak enjekte edilen ilaçların üst torasik ve servikal bölgelerde etkili olmasını engellemek için bel bölgesinde, özellikle orta ve alt bel seviyelerinde uygulanır. Omuriliğin kaudal ucu olan konus medullaris genellikle birinci, bazen de ikinci lomber omurun alt sınırında bulunur. Pediatrik hastalarda bu seviye biraz daha düşüktür ve genellikle L3 civarında sonlanır. Yetişkinlerde, konus medullarisin ortalama pozisyonu L1'in alt üçte birlik bölgesindedir (aralık: T12'nin orta üçte birinden L3'ün üst üçte birine kadar değişir). Konus pozisyonundaki bu farklılıklar normal bir dağılım gösterir ve cinsiyetler arasında ya da yaşla birlikte anlamlı bir değişiklik görülmez.(9)

Dural kese genellikle S2/3 seviyesine kadar uzanır. Bu nedenle, spinal anestezi uygulaması sırasında spinal iğne genellikle L3/4 veya L4/5 intervertebral aralığa yerleştirilir. Daha yüksek seviyelerin seçilmesi, özellikle obez hastalarda, omurilik yaralanması riskini artırabilir. İğne, giriş noktası olan deriden başlayarak birkaç anatomik yapıyı geçer. Bu yapılar, uygulama tekniği ve yaklaşımın türüne bağlı olarak değişiklik gösterebilir.(10)

hemodinamik stabilite Spinal anestezi uygulanan hastalarda daha iyi sağlanabilmektedir. Spinal anestezi öncesinde yapılan prehidrasyon, spinal anesteziye bağlı komplikasyonları azaltırken hemodinamik dengeyi daha kolay sağlamaktadır. Ancak, prehidrasyonun uygulanmadığı hastalarda hemodinamik dengeyi sağlamak için efedrin kullanımına daha fazla ihtiyaç duyulmaktadır. Serebral oksijenizasyonun sürdürülebilmesi açısından kolloid veya kristaloid kullanımı arasında fark yoktur, prehidrasyon yapılmayan hastalarda ise efedrin desteğiyle benzer bir hemodinamik stabilitenin sağlandığını ve böylece serebral oksijenizasyonun korunduğunu bilmekteyiz.

SPİNAL ANESTEZİ KOMPLİKASYONLARI

Hipotansiyon (Düşük Kan Basıncı): Spinal anestezi, sempatik sinir sistemini bloke ederek kan damarlarının genişlemesine ve kan basıncının düşmesine neden olabilir. Bu

durum, özellikle yüksek seviyeli bloklarda daha belirgindir. Hipotansiyonun önlenmesi ve tedavisi için intravenöz sıvı desteği ve vazopressör ilaçlar kullanılabilir. (11)

Bradikardi ve Kardiyak Arrest: Spinal anestezi sırasında ani kalp durması nadir görülmekle birlikte ciddi bir komplikasyondur. Sempatik blokajın etkisiyle kalbe dönen kan miktarının azalması, refleks mekanizmaları tetikleyerek bradikardiye ve nadiren kardiyak arreste yol açabilir. Risk faktörleri arasında düşük bazal kalp hızı, yüksek blok seviyeleri ve genç yaş bulunur. (11)

Baş Ağrısı (Postdural Ponksiyon Baş Ağrısı): Beyin omurilik sıvısının sızması sonucu oluşan bu baş ağrısı, özellikle genç ve kadın hastalarda daha sık görülür. Tedavisinde yatak istirahati, hidrasyon ve kafein kullanımı önerilir. (11)

Bel Ağrısı: Spinal anestezi sonrası bel ağrısı, paraspinoz kasların gevşemesi ve belin desteksiz kalmasına bağlanmaktadır. Ancak, bu ağrı genellikle kısa sürelidir ve ciddi bir soruna işaret etmez. (11)

Enfeksiyonlar: Aseptik koşullara uyulmadığında menenjit gibi ciddi enfeksiyonlar gelişebilir. Bu nedenle, spinal anestezi uygulaması sırasında steril tekniklere dikkat edilmesi esastır. (11)

Nörolojik Komplikasyonlar: Nadir de olsa, sinir hasarı, parestezi veya daha ciddi nörolojik defisitler görülebilir. Bu komplikasyonların önlenmesi için anatomik yapıya uygun tekniklerin kullanılması önemlidir. (11)

İdrar Retansiyonu: Mesane fonksiyonlarının geçici olarak bozulması sonucu idrar yapamama durumu ortaya çıkabilir. Bu durum genellikle geçicidir ve mesane fonksiyonu anestezinin etkisi geçtikçe normale döner. (11)

Spinal Hematom: Kanama bozukluğu olan veya antikoagülan tedavi alan hastalarda nadiren spinal hematom gelişebilir. Bu ciddi bir durum olup, acil cerrahi müdahale gerektirebilir. (12)

UNILATERAL SPİNAL BLOK

Unilateral spinal blok, anestezik maddenin subaraknoid boşluğa tek taraflı bir dağılımını sağlamak amacıyla uygulanmasıdır. Bu teknikte, hastanın pozisyonu ve enjeksiyon hızı gibi faktörler, ilacın dağılımında belirleyici rol oynar. Unilateral spinal blok, avantajları aşağıdaki gibidir:

- 1. Minimal Hemodinamik Etkiler:** Tek taraflı etkisi sayesinde, sistemik hipotansiyon ve kardiyovasküler stabilite kaybı gibi hemodinamik etkiler daha az görülür.
- 2. Hedefe Yönelik Anestezi:** Cerrahi alanın bulunduğu tarafa özel anestezi sağlanarak daha etkili bir uygulama yapılabilir.
- 3. Hastanın Konforu:** Diğer tarafın duyuşal ve motor fonksiyonlarının korunması, hastaların postoperatif dönemde daha çabuk iyileşmesine katkı sağlar.

Dezavantajları:

- Teknik hassasiyet gerektirir ve uygulama sırasında hata riski daha yüksektir.
- Anestezi maddenin dağılımındaki tutarsızlıklar, yetersiz blok oluşmasına neden olabilir.
- Post-spinal baş ağrısı gibi komplikasyonlar görülebilir.

BİLATERAL SPİNAL BLOK

Bilateral spinal blok, ilacın subaraknoid alanda simetrik olarak dağılmasını sağlar. Bu yöntem daha yaygın olarak tercih edilir ve şu avantajları sunar:

1. **Geniş Kapsamlı Anestezi:** Vücudun alt yarısını etkileyen ameliyatlarda etkin bir duyuşal ve motor blok sağlar.
2. **Uygulama Kolaylığı:** Teknik olarak daha basit ve standart bir yöntemdir.
3. **Daha Tutarlı Sonuçlar:** Anestezinin her iki tarafı da kapsamı, cerrahi başarı oranını arttırabilir.

Dezavantajları:

- Sistemik hipotansiyon ve bradikardi gibi hemodinamik komplikasyonlar daha sık görülebilir.
- Postoperatif iyileşme süreci unilateral bloğa kıyasla daha uzun olabilir.

Guido fanelli ve arkadaşları yaptıkları çalışmada tek taraflı spinal blok girişiminin, ameliyat tarafında daha yoğun motor blokaj ve duyuşal seviyenin daha yavaş gerilemesine yol açtığını, kardiyovasküler homeostazın daha stabil olduğunu ve geleneksel bilateral spinal anestezi ile karşılaştırıldığında iyileşme profili veya ev taburcu süresi açısından bir fark yaratmadığını göstermişlerdir. Bu avantajlar, spinal enjeksiyondan cerrahi bloğun sağlanmasına kadar geçen sürede sadece üç dakikalık bir artış maliyetine sahip olduğunu tespit etmişlerdir(13)

Al Malyan ve arkadaşları yaptıkları çalışmada tek taraflı bloğun daha yüksek bir başarı oranı sağlamada, cerrahiye daha hızlı hazırlık ve daha hızlı iyileşme süreci sunmada, az yan etki ve komplikasyon ile özellikle ayaktan cerrahilerde önemli bir avantaj sağladığını göstermişlerdir.(14)

SONUÇ

Unilateral ve bilateral spinal bloklar, uygun hastada ve uygun cerrahi durumlarda etkili çözümler sunar. **Unilateral spinal blok bilaterale göre daha avantajlı olsa da**

Her iki yöntemin de kendine özgü avantaj ve dezavantajları vardır. Klinik karar verirken hastanın durumu, cerrahi gereksinimler ve anesteziistin tecrübesi dikkate alınmalıdır.

Unilateral ve bilateral spinal bloklar arasındaki tercih, genellikle cerrahi müdahalenin niteliğine, hastanın klinik durumuna ve anesteziistin tecrübesine bağlıdır. Şu kriterler, hangi tekniğin tercih edileceğine yön verir:

1. **Cerrahi Alan:** Tek taraflı müdahalelerde unilateral blok tercih edilirken, bilateral uygulama daha geniş alanlarda tercih edilir.
2. **Hastanın Genel Durumu:** Kardiyovasküler risk taşıyan hastalarda unilateral blok daha güvenli bir alternatiftir.
3. **Cerrahin Süresi:** Kısa süreli müdahalelerde unilateral blok, daha uzun süreli operasyonlarda ise bilateral blok önerilir.

KAYNAKÇA

- 1- Standring, S. (2021). Gray's anatomy (42nd ed., pp. 955–985). ANZ Elsevier Health Bookshop. <https://www.elsevierhealth.com.au/grays-anatomy-9780702077050.html>
- 2- Adeeb, N., Mortazavi, M. M., Deep, A., Griessenauer, C. J., Watanabe, K., Shoja, M. M., Loukas, M., & Tubbs, R. S. (2013). The pia mater: A comprehensive review of literature. Child's Nervous System, 29(10), 1803–1810. <https://doi.org/10.1007/S00381-013-2044-5>
- 3- Alaittin Elhan, K. A. (2006). Anatomi 2. Cilt. Ankara: Güneş Kitabevi.

- 4- Arifođlu, Y. (2022). Her Yönuyle Nöroanatomi. İstanbul: İstanbul Tıp Kitabevi.
5. Auroy Y, Benhamou D, Bargues L, et al. Major Complications of Regional Anesthesia in France. *Anaesthesiology* 2002;97(5):1274-80.
6. Nielsen KC, Steele SM. Outcome after regional anaesthesia in the ambulatory setting- is it really worth it? *Best Pract Res Clin Anaesthesiol* 2001;16(2):145-57.
- 7- Cotter JT, Nielsen KC, Guller U, et al. Increased body mass index and ASA physical status IV are risk factors for block failure in ambulatory surgery - an analysis of 9,342 blocks. *Can J Anesth* 2004; 51: 810-816.
8. Mordecai MM, Brull SJ. Spinal anesthesia. *Curr Opin Anaesthesiol* 2005;18(5):527-33.
- 9)Saifuddin A, Burnett SJ, Beyaz J. Erişkin bir popülasyonda konus medullaris pozisyonunun deđişimi. Manyetik rezonans görüntüleme çalışması. *Omurga (Phila Pa 1976)*. 1998 Temmuz 01; 23(13):1452-6. [PubMed (İngilizce)]
- 10.Broadbent CR, Maxwell WB, Ferrie R, Wilson DJ, Gawne-Cain M, Russell R. Anesteziistlerin belirgin bir lomber interboşluğu tanımlama yeteneđi. *Anestezi*. 2000 Kasım; 55(11):1122-6. [PubMed (İngilizce)]
- 11)Dogru, S., Kaya, Z., & Dogru, H. Y. (2012). Spinal Anestezi Komplikasyonları. *Çađdaş Tıp Dergisi*, 2(2), 127-134.
- 12)Tıp ve Sađlık Bilimlerinde Multidisipliner Bakış. Editör: Doç. Dr. Ş. Cem Yücetaş, ISBN: 978-625-367-130-3, June / 2023 Ankara / Türkiye
- 13)Fanelli, G., Borghi, B., Casati, A. *et al.* Unilateral bupivacaine spinal anesthesia for outpatient knee arthroscopy. *Can J Anesth* 47, 746-751 (2000). <https://doi.org/10.1007/BF03019476>
- 14)Al Malyan, M.*; Becchi, C.*; Falsini, S.*; Lorenzi, P.*; Boddi, V.†; Marsili, M.*; Boncinelli, S.*. Role of patient posture during puncture on successful unilateral spinal anaesthesia in outpatient lower abdominal surgery. *European Journal of Anaesthesiology* 23(6):p 491-495, June 2006

Explaining the Perceptions and Fear of Tooth Extraction: A Qualitative Study

Prof. Dr. Ebrahim YARMOHAMADI

Faculty of Dentistry, Hamadan University of Medical Sciences, Hamadan, Iran

Prof. Dr. Vahid Molla BASHI

Faculty of Dentistry, Hamadan University of Medical Sciences, Hamadan, Iran

Asst. Prof. Dr. Elahe EZATI

Faculty of Dentistry, Hamadan University of Medical Sciences, Hamadan, Iran

Abstract

Aim: Tooth extraction fear can significantly impact a patient's oral, general, and mental health. This study aims to explain the perceptions and fear of tooth extraction.

Methods: The present study was a qualitative study of Content analysis. sampling was conducted purposively and heterogeneously, the target population of the study was those who visited a dental clinic for tooth extraction.

In this study, a semi-structured interview was used to collect data. The tool used in this study was an interview guide designed and developed by the researchers.

All interviews were conducted individually and face to face by one person; each interview lasted approximately 15 to 20 minutes; All the answers of the participants were recorded and at the same time with the consent of the interviewee, which was obtained from him in advance in the form of a written informed consent.

Results: One of the identified components is Gender and environmental factors in dental fear. two categories were identified under this theme: female admission of fear, male reluctance to admit fear. "Psychological responses" with three subcategories of "fear" and "pain", "worry" were other components of the study.

The category of "physical disorders" with subcategories of "heart palpitations", "dry mouth" and "shortness of breath" and the category of "environmental factors", with subcategories of "bad experiences of those around them", "fear of the dental environment" identified.

Conclusion: The results of such studies can help to design interventions to reduce stress and moderate the stimuli that increase fear of tooth extraction.

Keywords: Fear, Tooth Extraction, Qualitative Study

Mass Spectrometry of Human Brain Gangliosides in Health and Disease

Mirela SARBU

Researcher, National Institute for Research and Development in Electrochemistry and Condensed Matter, Timisoara, Romania

Raluca ICA

Researcher, National Institute for Research and Development in Electrochemistry and Condensed Matter, Timisoara, Romania

Roxana BIRICIOIU

PhD Student and Res. Asst., National Institute for Research and Development in Electrochemistry and Condensed Matter, Timisoara, Romania & West University of Timisoara, Faculty of Physics, Vasile Parvan, 4, 300223, Timisoara, Romania

Prof. Dr. Liana DEHELEAN

University of Medicine and Pharmacy "Victor Babes", Timisoara, Romania

Prof. Dr. David E. CLEMMER

Department of Chemistry, Indiana University, Bloomington, Indiana, United States of America

Prof. Dr. Alina D. ZAMFIR

National Institute for Research and Development in Electrochemistry and Condensed Matter, Timisoara, Romania & Department of Technical and Natural Sciences, "Aurel Vlaicu" University of Arad, Arad, Romania

Abstract

Gangliosides (GGs) represent a class of glycosphingolipids, highly expressed in the central nervous system (CNS) where they are involved in vital biological functions of the brain. Hence, GGs are valuable indicators in the early diagnosis of CNS pathologies, being in the focus of our research as potential biomarkers and/or therapeutic targets.

In this context, we report here on the development of a novel, high performance nanoelectrospray ionization (nanoESI) ion mobility separation (IMS) mass spectrometry (MS) and tandem MS (MS/MS) by collision-induced dissociation (CID) approach for glycolipidomics of CNS GGs. The methodology was systematically implemented for: i) screening and structural characterization of GGs expressed in different normal adult and fetal brain regions such as the frontal lobe, hippocampus, and cerebellum; ii) GG biomarker discovery in malignant primary (melanoma, glioblastoma multiforme) and secondary (lung

adenocarcinoma) tumors and iii) GG profiling in human cerebrospinal fluid. IMS MS represents also a novel concept in structural analysis of GG biomarkers, due to its unique ability to separate isomers, isobars and conformers. The conducted studies have shown that the modified expression together with the observed overexpression of certain glycolipids in human patient biopsies as compared to healthy controls, have the potential to serve for disease diagnosis.

Keywords: Ion Mobility Separation Mass Spectrometry; Ganglioside Biomarkers; Screening and Structural Characterization; Healthy and Malignant Human Tissue; Cerebrospinal Fluid.

Legal Responsibility of Professionals in the Filed of Pharmacovigilance

Asst. Prof. Dr. Sonia Bianca BLAJ

University of Medicine, Pharmacy, Science and Technology (UMFST) "G.E.Palade" Tîrgu-
Mureş, Romania

Abstract

Discussing the benefits of drug therapy is redundant in the context of the continuous modernization of diagnostic and treatment methods.

However, monitoring drug safety, viewed as a complex process, throughout the entire period of their use, is an essential premise to ensure that patients can access the treatments they need without being exposed to unacceptable side effects.

From this perspective, the field of pharmacovigilance has been designed, with its defining feature being the continuous monitoring of the risk-benefit balance of medicines and the adoption of the necessary measures to prevent possible adverse reactions.

This study aims to identify the national and European legal framework, to analyze the responsibilities of professionals in the field of pharmacovigilance, as well as the legal consequences arising from their failure to comply with legal obligations.

Essentially, only appropriate regulation combined with the awareness of pharmaceutical professionals regarding the reporting of adverse reactions, can achieve the goal of effectively protecting public health.

Keywords: Pharmacovigilance, Regulation, Legal Responsibility, Obligations, Professionals

Microbiological Safety of Baby and Dietary Foods

Anđela BOJANIĆ

PhD Student, University of Banja Luka, Faculty of Medicine, Pharmacy Department, Bosnia and Herzegovina

Prof. Dr. Mirjana ĐERMANOVIĆ

University of Banja Luka, Faculty of Medicine, Pharmacy Department, Bosnia and Herzegovina

Abstract

The microbiological integrity of food is an important factor in ensuring the health safety of food. Microbiological contamination is often the cause of acute foodborne illnesses. The aim of the conducted research is to analyze the microbiological safety of infant and other dietary foods in the Republic of Srpska. In order to monitor microbiological quality, 122 samples of baby food and dietary foods were analyzed in **2021** at the Public Health Institute of the Republic of Srpska, while in **2022**, that number was 88. In 2021, a total of 122 samples were analyzed, all of which were tested for the presence of *Listeria monocytogenes*. Also, 41 samples were tested for the presence of *Salmonella*, while 2 samples were tested for the presence of *Enterobacteriaceae*. In 2022, 88 samples were examined, of which 87 were tested for the presence of *Listeria monocytogenes*, 31 samples for the presence of *Salmonella*, 2 samples for *Enterobacteriaceae*, 1 sample for yeasts and molds, and 1 for *Staphylococci*. The results showed that all samples were microbiologically correct, with no signs of contamination. Continuous control of the microbiological correctness of food is necessary and of great importance for the protection of the health of the population.

Keywords: Food Safety, Baby Food, Dietary Foods

Patulin as A Potential Risk in Children's Food

Anđela BOJANIĆ

PhD Student, University of Banja Luka, Faculty of Medicine, Pharmacy Department,
Bosnia and Herzegovina

Prof. Dr. Mirjana ĐERMANOVIĆ

University of Banja Luka, Faculty of Medicine, Pharmacy Department,
Bosnia and Herzegovina

Abstract

Patulin, a secondary metabolite produced by molds, primarily *Penicillium*, *Aspergillus*, and *Byssochlamys*, is classified as a mycotoxin. It is a well-known food contaminant, associated with negative effects on the immune, neurological and gastrointestinal systems. As an enteropathogenic mycotoxin, patulin can disrupt intestinal function. The method for determining patulin is outlined in AOAC method 995.10. In this method, patulin is extracted three times with ethyl acetate, then purified with a sodium carbonate solution. After the organic solvent is evaporated, patulin is quantified using a C-18 reverse phase column with UV detection. A total of 19 baby fruit juice samples were analyzed. Patulin was detected in average concentrations below **10 µg/kg**. The maximum recorded amount of patulin was 3,3 µg/kg. None of the 19 juice samples had a patulin levels above 10 µg/kg, meaning all the samples comply with the legal requirements for patulin levels. The safety rating of the tested samples was determined by comparing the results with the maximum permitted levels established by the legislation in the Republic of Srpska. To protect health, it is important to monitor exposure to patulin in the population.

Keywords: Patulin, Baby Juices

PIK3CA Mutation Analysis in Breast Cancer Patients by HRM-COLD-PCR

Dr. Saoussen DEBOUKI-JOUDI

University of Jendouba-Tunisia and University of Sfax-Tunisia

Dr. Wala BEN KRIDIS

University of Sfax-Tunisia

Asst. Prof. Dr. Fatma TRIFA

University of Sfax-Tunisia

Asst. Prof. Dr. Wajdi AYADI

University of Sfax-Tunisia

Dr. Abdelmajid KHABIR

University of Sfax-Tunisia

Prof. Dr. Tahia SELLAMI-BOUDAWARA

University of Sfax-Tunisia

Prof. Dr. Jamel DAOUD

University of Sfax-Tunisia

Prof. Dr. Afef KHANFIR

University of Sfax-Tunisia

Prof. Dr. Raja MOKDAD-GARGOURI

University of Sfax-Tunisia

Abstract

Background: Deregulation of the PI3K/AKT/mTOR pathway through PIK3CA mutation is frequent in different tumors. Therefore it is important to identify hotspot mutation at exons 9 and 20 in breast cancer Tunisian patients.

Methods: Tumor tissues were collected from Tunisian patient with breast cancer and analyzed (42 sporadic cases and 21 hereditary cases) to screening Hotspot mutations of the *PIK3CA* gene by QPCR-High Resolution Melting followed by COLD-PCR and sequencing. HRM experiments were used MCF7 and BT20 breast cancer cell lines as controls harboring the PIK3CA hotspot mutations E545K and H1047R in exon 9 and exon 20 respectively.

Results: PIK3CA hotspot mutations were detected in 66.7% of sporadic BC cases, and in 14.3% of hereditary BC. The E545K and the H1048Y were the most common mutations identified in our patients, whereas the H1047R hotspot mutation was not found. Statistical analysis showed that PIK3CA mutation associated with an aggressive behavior in sporadic BC patients, while it's correlated with age, tumor stage and tumor size in hereditary BC patients.

Conclusions: Our results showed a novel PIK3CA hotspot mutation in Tunisian breast cancer patients detected by HRM-COLD-PCR. Additionally, the absence of PIK3CA hotspot mutation associated with good prognosis.

Keywords: Breast Cancer, COLD-PCR, HRM, Novel Hot-spot Mutations, PIK3CA Gene

Integrative Management of Tibial Plateau Fracture and Medial Gonarthrosis with High Tibial Open Wedge Osteotomy: A Comprehensive Case Study

Valentin VEJSELI

PhD Student, Dr. Specialist in Traumatology, Ss. Cyril and Methodius University in Skopje (UKIM)

Radmila Mila MIHAJLOVA ILIE

PhD Student, Dr. Specialist in Traumatology, Ss. Cyril and Methodius University in Skopje (UKIM)

Edmond BRAVA

Medical Student, Ss. Cyril and Methodius University in Skopje (UKIM)

Abstract

Post-traumatic knee osteoarthritis (PTOA) is a significant long-term complication of tibial plateau fractures (TPFs), leading to joint degeneration and impairment. This study presents a comprehensive case analysis of a 72-year-old male diagnosed with a Schatzker Type VI tibial plateau fracture after a high energy trauma, managed through a staged surgical approach. Initial open reduction and internal fixation (ORIF), achieved fracture alignment, leaving a residual varus deformity, accelerating medial compartment degeneration. The patient developed progressive pain, restricted mobility, and radiographic signs of osteoarthritis within six months post-ORIF.

A high tibial open wedge osteotomy (OWHTO) was performed to correct varus malalignment, redistribute mechanical loads, and delay the need for total knee arthroplasty (TKA). Preoperative radiographs determined a correction angle for biomechanical restoration. The osteotomy was stabilized using a TomoFix locking plate, and rehabilitation followed a structured weight-bearing protocol. At the three-year follow-up, the patient showed pain relief, functional recovery, and joint stability, returning to daily activities with minimal limitations.

This study shows the critical role of OWHTO in managing post-traumatic gonarthrosis, as a joint-preserving alternative to early TKA. It explores biomechanical principles, surgical considerations, and rehabilitation strategies advocating for staged interventions in complex knee trauma to optimize long-term function.

Keywords: Tibial Plateau Fracture, Post-traumatic Osteoarthritis, High Tibial Open-Wedge Osteotomy, Varus Deformity, Knee Biomechanics, Joint Preservation

Determination of Some Trace Metal Levels in Cheese Samples by ICP-MS

Assoc. Prof. Dr. Sevda Pehlivanlar ÖNEN

Department of Food Hygiene and Technology, Faculty of Veterinary Medicine,
Hatay Mustafa Kemal University, Türkiye

Res. Asst. Eray BURTAÇGİRAY

Department of Food Hygiene and Technology, Faculty of Veterinary Medicine,
Hatay Mustafa Kemal University, Türkiye

Abstract

In the study, 51 cheese samples obtained from local producers and markets around Iskenderun were examined in terms of aluminum (Al), nickel (Ni), copper (Cu) and tin (Sn) heavy metals and it was aimed to reveal possible public health risks. These trace elements have an important place due to their relationship with environmental pollution, milking, tools and equipment used in dairy production and packaging materials.

In cheese samples, the presence of heavy metals Al, Ni, Cu and Sn were determined using an Inductively Coupled Plasma Mass Spectrometer (ICP-MS) device. In all cheese samples (51/51), the mean Al was 9.54 ppm (1.37-18.4), Ni was 760.83 ppb (142.96-2036.28), Cu was 524.95 ppb (130.59-1919.25) and Sn was 38,98 ppb (1,02-92,85).

Samples sourced from local producers and markets are produced in small dairies or on the farm, using different equipment of variable quality. The release of metals from cheese containers is significant. Therefore, cheese containers should not contain these toxic metals, and the use of appropriate equipment and materials should be ensured. The results of the study suggest that the presence of contamination due to the tools-equipment used during production may pose a public health risk.

Keywords: Cheese, Trace Metals, ICP-MS, Public Health

• This study was supported by Hatay Mustafa Kemal University Scientific Research Projects Coordination Unit within the scope of project no. 20. GAP. 061.

Policysttic Ovary Syndrome - What do Women in Poland Know about It?"

Julia BYWALEC

MSN, WSEI University, Poland

Dr. Dorota NALEPA

PhD in Medical Science, The Academy of Zamość, Poland

Olga SMOLIŃSKA

MSN, WSEI University, Poland

Dr. Iwona MORAWIK

PhD in Medical Science, Medical University of Lublin, Poland

Mariusz SUTRYK

MSN, WSEI University, Poland

Abstract

Introduction: Polycystic ovary syndrome (PCOS) is a multisystem disorder characterized by reproductive dysfunction as well as metabolic disturbances. This condition most commonly occurs in women during adolescence and reproductive age. It is estimated to affect 4-12% of women of reproductive age.

Aim of the Study: Assessment of the level of knowledge among polish women regarding polycystic ovary syndrome.

Research Methods and Tools: The research method used was a diagnostic survey, with a questionnaire as the technique. The research tool applied was an original questionnaire designed by the author.

Results and Conclusions:

1. The level of knowledge among women with polycystic ovary syndrome was average (51.40%).
2. Younger women had a higher level of knowledge than older women ($p>0.05$).
3. Education level did not affect the level of knowledge about polycystic ovary syndrome.
4. No correlation was found between marital status and the level of knowledge about polycystic ovary syndrome.
5. Place of residence did not differentiate the level of knowledge about polycystic ovary syndrome ($p>0.05$).
6. Women suffering from polycystic ovary syndrome had a higher level of knowledge about the disease than healthy women.

Keywords: Polycystic Ovaries, Health Behaviors, Knowledge, PCOS

The Role of the Nurse in the Reduction of the Pre-operative Stress of the Patients Qualify for the Surgery

Monika GESEK

MSN, Medical University of Lublin, Poland

Assoc. Prof. Dr. Iwona MORAWIK

Medical University of Lublin, Poland

Abstract

Stress constantly appears in people's lives. Illness, and the associated need for surgical intervention, is a difficult, often unexpected situation for the patient, causing anxiety. The patient often feels lost, needs information, fears the course of anaesthesia and the procedure itself. Assessing the significance of a situation or event and the person's ability to cope with its consequences plays a significant role in the emergence of stress. A stressful situation disrupts thinking, activities or makes it difficult to fulfil needs. A stay in hospital is usually associated with reduced privacy, as well as a temporary separation from one's home environment. Waiting for anaesthesia and surgery causes considerable emotional strain. The stress accompanying the patient may be related to their personality, age, gender or previous experiences, as well as the type of anaesthesia planned and the kind of surgery. Therefore, an extremely important part of the patient's preparation is a conversation and a detailed explanation of any issues of interest to the patient. The mental preparation of the patient for the procedure is important and should not be overlooked. Obtaining reliable information from the staff allows the patient to understand the purpose of the procedures and the principles of pre-operative preparation.

Keywords: Nursing, Surgery, Anaesthesia, Patient, Preoperative Stress

Radiotherapy-Induced Thyroid Dysfunction

Dr. Brunilda HAXHIU

University of Prishtina, University Clinical Centre of Kosovo

Prof. Dr. Goran KONDOV

Medical faculty Skopje at University Clinic of Thoracic and Vascular Surgery

Fesal SELIMI

University Clinical Centre of Kosovo

Dr. Doriana PALOJI

University Clinical Centre of Kosovo

Assoc. Prof. Dr. Ilir KURTISHI

University of Prishtina, University Clinical Centre of Kosovo

Prof. Dr. Naser GJONBALAJ

University of Prishtina, University Clinical Centre of Kosovo

Abstract

Introduction: The most common malignancy among Albanian women is carcinoma of the breast. There is an increased incidence of hypothyroidism (HT) among BC patients after RT involving the SCLN area. The aim of our prospective study is to evaluate the effects of radiotherapy on thyroid function in 100 breast cancer patients, comparing those treated only on chest wall with those who also received supraclavicular (SC) nodal irradiation.

Material and Methods: This is a single institute prospective study ($n = 100$). The blood samples were drawn before radiotherapy and evaluated by measuring the serum thyroid stimulating hormone (TSH), free triiodothyronine (fT3) and free thyroxine (fT4) levels. None of the women were on thyroid substitution therapy. The thyroid function both of the TSH, fT3 and fT4 levels were monitored in patients every 6 months after the completion of radiation.

Results: Results revealed a significant impact on thyroid function, particularly an increased incidence of hypothyroidism in the SC irradiation group. The study reported that after six months of radiotherapy, 35% of patients developed hypothyroidism, while this figure decreased to 27% after twelve months. This suggests that while many patients may experience immediate thyroid dysfunction following radiotherapy, some may recover over time, though a substantial portion remains affected.

Conclusions: The data presented highlights a concerning trend of increased hypothyroidism among breast cancer patients undergoing radiotherapy, particularly those receiving SCV irradiation. The study's findings indicate that a substantial proportion of patients may experience lasting thyroid dysfunction, necessitating vigilant monitoring and management.

Keywords: Breast Cancer, Radiotherapy, Thyroid Disorder, Supraclavicular