

# ADDICTA

The Turkish Journal on Addictions

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## ABOUT

Addicta: The Turkish Journal on Addictions is a peer reviewed, open access journal published by the Turkish Green Crescent Society.

Addicta: The Turkish Journal on Addictions is a quarterly journal that is published in English in March, June, September and December.

### Abstracting and Indexing

Addicta: The Turkish Journal on Addictions is covered in the following abstracting and indexing databases;

- Web of Science-Emerging Sources Citation Index
- DOAJ
- CNKI
- TUBITAK ULAKBIM TR Index
- EBSCO
- Turkish Psychiatry Index
- InfoBase
- Gale
- Scopus

All content published in the journal is permanently archived in Portico.

### Aims, Scope, and Audience

Addicta: The Turkish Journal on Addictions aims to publish studies of the highest scientific and clinical value, and encourage the submission of high-quality research that advances the understanding and treatment of addictions.

Addicta: The Turkish Journal on Addictions covers a wide range of topics related to addiction and related disorders as well as forming a scientific forum by producing quality debate on various disciplines. The journal is interested in publishing original research that addresses important clinical questions and advances the understanding and treatment of these conditions. This may include studies on addictions to tobacco, alcohol, drugs, gambling and technology.

Addicta: The Turkish Journal on Addictions publishes research articles, reviews, case reports, case-based reviews, letters to the editors, and book reviews within its scope. Conference proceedings may also be considered for publication.

The target audience of the journal includes researchers in the area of addiction from health, social, educational, natural and applied sciences fields.

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## INSTRUCTIONS TO AUTHORS

It is strongly advised to review the journal's policies before submitting any manuscripts to ensure compliance with the journal's guidelines.

### Manuscript Preparation

Manuscripts submitted for evaluation should be original and not previously presented or published in any electronic or print medium. If a manuscript was previously presented at a conference or meeting, authors should provide detailed information about the event, including the name, date, and location of the organization.

Manuscripts should be prepared in accordance with ICMJE-Recommendations for the Conduct, Reporting, Editing, and Publication of Scholarly Work in Medical Journals (updated in May 2023).

Authors are required to prepare manuscripts in accordance with the relevant guideline listed below:

- Randomized research studies and clinical trials: CONSORT guidelines (for protocols, please see the SPIRIT guidance)
- Observational original research studies: STROBE guidelines
- Studies on diagnostic accuracy: STARD guidelines
- Systematic reviews and meta-analysis: PRISMA guidelines (for protocols, please see the PRISMA-P guidelines)
- Experimental animal studies: ARRIVE guidelines and Guide for the Care and Use of Laboratory Animals, 8th edition
- Nonrandomized evaluations of behavioral and public health interventions: TREND guidelines
- Case report: the CARE case report guidelines
- Genetic association studies: STREGA
- Qualitative research: SRQR guidelines
- To find the right guideline for your research, please complete the questionnaire by Equator Network [here](https://www.equator-network.org/).

Addicta: The Turkish Journal on Addictions encourages authors to follow the 'Sex and Gender Equity in Research – SAGER – guidelines' when preparing their manuscripts to promote the inclusion of sex and gender considerations in research. Before submission, authors can consult EASE Guidelines for Authors and Translators to produce clear, concise and accurate manuscripts that are easy to understand and free of common errors and pitfalls.

The style of manuscripts should follow the Publication Manual of the American Psychological Association (APA), Seventh Edition (2020).

Manuscripts can only be submitted through the journal's online manuscript submission and evaluation system. Manuscripts submitted via any other medium and submissions by anyone other than one of the authors will not be evaluated.

In addition to the manuscript files, authors are required to submit the following during the initial submission:

- Copyright Agreement and Acknowledgement of Authorship Form, and
- ICMJE Disclosure Form (should be filled in by all contributing authors) These forms are available for download at <https://www.addicta.com.tr/EN>.

### Preparation of the Manuscript

Title page: A separate title page should be submitted with all submissions and this page should include:

- The full title of the manuscript as well as a short title (running head) of no more than 50 characters,
- Name(s), affiliations, highest academic degree(s), and ORCID IDs of the author(s),
- Grant information and detailed information on the other sources of support,
- Name, address, telephone (including the mobile phone number), and email address of the corresponding author,

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- Acknowledgment of the individuals who contributed to the preparation of the manuscript but who do not fulfill the authorship criteria.
- If the author(s) is a member of the journal's Editorial Board, this should be specified in the title page.

**Abstract:** An abstract should be submitted with all submission except for Book Reviews and Letter to the Editors. The abstract of Research Articles should be unstructured. Please check Table 1 below for word count specifications.

**Extended Abstract:** As of 2020, Addicta: The Turkish Journal on Addictions publishes Turkish extended abstracts of the articles in the journal's webpage for educational purposes. Therefore, the Turkish authors are required to submit a 1000 word-long Turkish extended abstract of their article during initial submission. International authors, on the other hand, are expected to submit the extended abstract in English. The Turkish Green Crescent Society will translate English extended abstracts before publication. Extended abstracts should include Introduction, Methods, Results, and Discussion subheadings. Please do not include references.

**Keywords:** Each submission must be accompanied by a minimum of three to a maximum of six keywords for subject indexing at the end of the abstract. The keywords should be listed in full without abbreviations. The keywords should be selected from the National Library of Medicine, Medical Subject Headings database (<https://www.nlm.nih.gov/mesh/MBrowser.html>).

**Main Points:** All submission except letters to the editor should be accompanied by 3 to 5 "main points." These main points should highlight the most important results of the study and emphasize the main message of the manuscript. The main points should be structured as a list and should be written in a clear and straightforward manner. Since the main points are intended for experts and specialists in the field, they should be written in plain language that is easy to understand. By including main points with the manuscript, authors can help ensure that the most important findings and messages of their study are conveyed clearly to the reader.

## Manuscript Types

**Original Articles:** Original articles provide new information based on original research. The acceptance of original articles is typically based on the originality and importance of the research. The main text of an Original Article should be structured with subheadings, including Introduction, Material and Methods, Results, and Discussion.

Limitations, drawbacks, and the shortcomings of original articles should be mentioned in the Discussion section before the conclusion paragraph.

Please check Table 1 for the limitations for Original Articles.

## Clinical Trials

Addicta: The Turkish Journal on Addictions adopts the ICMJE's clinical trial registration policy, which requires that clinical trials must be registered in a publicly accessible registry that is a primary register of the WHO International Trials Registry Platform (ICTRP) or in ClinicalTrials.gov. By registering clinical trials in a publicly accessible registry, authors can help to promote transparency and accountability in their research.

Instructions for the clinical trials are listed below.

- Clinical trial registry is only required for the prospective research projects that study the relationship between a health-related intervention and an outcome by assigning people to different groups.
- To have their manuscript evaluated in the journal, authors should register their research to a public registry at or before the time of first patient enrollment.
- Based on most up to date ICMJE recommendations, Addicta: The Turkish Journal on Addictions accepts public registries that include minimum acceptable 24-item trial registration dataset.
- Authors are required to state a data sharing plan for the clinical trial registration. Please see details under the "Data Sharing" section.
- For further details, please check ICMJE Clinical Trial Policy and COPE Data and Reproducibility guidelines.

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## Reporting Statistical Analysis

Statistical analysis to support conclusions is usually necessary. Statistical analyses must be conducted in accordance with international statistical reporting standards (Altman DG, Gore SM, Gardner MJ, Pocock SJ. Statistical guidelines for contributors to medical journals. *Br Med J* 1983;7; 1489-93). Information on statistical analyses should be provided with a separate subheading under the Materials and Methods section and the statistical software that was used during the process must be specified.

When reporting statistical data in a research paper, it is important to present the values in a clear and consistent manner. P values, confidence intervals (CIs), and other statistical measures should be rounded appropriately and expressed according to the guidelines provided. For example, P values should be expressed to two digits to the right of the decimal point unless the first two digits are zeros, in which case three digits should be provided (eg, instead of  $P < .01$ , report as  $P = .002$ ). However, values close to .05 may be reported to three decimal places because .05 is an arbitrary cut-off point for statistical significance (eg,  $P = .053$ ). P values less than .001 should be designated as  $P < .001$  rather than providing the exact value (eg,  $P = .000006$ ).

Units should be prepared in accordance with the International System of Units (SI).

## Review Articles

Review articles that are written by authors with extensive knowledge and expertise in a particular field and a strong track record of publication are welcomed. These authors may even be invited to contribute a review article to the journal. Review articles should provide a comprehensive overview of the current state of knowledge in studies on addictions to tobacco, alcohol, drugs, gambling, and technology and should include discussions and evaluations of relevant research. The subheadings of the review articles can be planned by the authors. However, each review article should include an "Introduction" and a "Conclusion" section. Please check Table 1 for the limitations for Review Articles.

## Case Reports

The journal has limited space for case reports, and prioritizes publishing reports on rare cases or challenging conditions that provide new insights into diagnosis and treatment, offer novel therapies, or reveal knowledge not yet included in the literature. Interesting and educational case reports are also welcomed for publication. The text of a case report should include Introduction, Case Presentation, and Discussion sections. An unstructured abstract should also be included. Please check Table 1 for the limitations for Case Reports.

## Case-Based Reviews

Case-based reviews are reports on rare cases or conditions that constitute challenges in diagnosis and treatment. They should incorporate a short literature review of similar cases published in the literature, including a description of the search strategy and a summary table of the cases found. These manuscripts should provide insight into the diagnosis and treatment of these challenging cases and highlight the importance of considering rare conditions in clinical practice. Please check Table 1 for the limitations of Case-Based Reviews.

## Letters to the Editor

A "Letter to the Editor" is a type of manuscript that discusses important or overlooked aspects of a previously published article. This type of manuscript may also present articles on subjects within the scope of the journal that are of interest to readers, particularly educational cases. Readers can also use the "Letter to the Editor" format to share their comments on published manuscripts. The text of a "Letter to the Editor" should be unstructured and should not include an abstract, keywords, tables, figures, images, or other media. The manuscript that is being commented on must be properly cited within the "Letter to the Editor."

## Editorial Comments

Invited editorial comments on selected articles are published in the journal to provide expert insight and critical analysis of the research presented. These comments are written by authors who have demonstrated expertise or a high reputation in the topic of the research article. The journal carefully selects and invites these authors to contribute their comments. The editorial comments should not exceed 1000 words in length and should not include an abstract, keywords, tables, figures, images, or other media.

## Book Reviews

The journal welcomes reviews of contemporary and noteworthy books within the journal's scope, provided that they have been reviewed by an external expert on the relevant topic. These reviews should provide a critical evaluation of the book, highlighting its strengths and weaknesses, as well as its relevance to the journal's readership. Please refer to Table 1 for the limitations of Book Reviews.

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Table 1.  
*Limitations for each manuscript type*

| Type of manuscript   | Word limit | Abstract word limit | Referencelimit | Table limit | Figure limit             |
|----------------------|------------|---------------------|----------------|-------------|--------------------------|
| Original Research    | 4000       | 200                 | 35             | 6           | 5 or total of 10 images  |
| ReviewArticle        | 5000       | 250                 | 50             | 6           | 10 or total of 15 images |
| CaseReport           | 1200       | 200                 | 15             | No tables   | 4 or total of 8 images   |
| Letter to the Editor | 400        | No abstract         | 5              | No tables   | No media                 |
| Case-based Review    | 2500       | 250                 | 40             | 2           | 2                        |
| Editorial Comments   | 2500       | No abstract         | 5              | No tables   | No media                 |

\*Word limit should not include the abstract, references, tables, and figure legends.

## Tables

Tables should be included in the main document, after the referencelist, and they should be numbered consecutively in the order they are referred to within the text. Each table should have a descriptive title placed above it, and any abbreviations used in the table should be defined below the table by footnotes (even if they are defined in the main text). Tables should be created using the "insert table" command of the Word processing software, and they should be arranged clearly to make the data easy to read and understand. The data presented in the tables should not be a repetition of the data presented in the main text, but should support and enhance the main text.

## Figures and Figure Legends

Figures should be submitted as separate files in TIFF or JPEG format, and they should not be embedded in the Word document or the main manuscript file. If a figure has subunits, each subunit should be submitted as a separate file, and the subunits should not be merged into a single image. The figures should not be labeled (a, b, c, etc.) to indicate subunits. Instead, the figure legend should be used to describe the different parts of the figure. Thick and thin arrows, arrowheads, stars, asterisks, and similar marks can be used on the images to support figure legends. Images should be anonymized to remove any information that may identify individuals or institutions. The minimum resolution of each figure should be 300 DPI, and the figures should be clear and easy to read. Figure legends should be listed at the end of the main document. Figures should be referred to within the main text, and they should be numbered consecutively in the order in which they are mentioned.

## Abbreviations

All acronyms and abbreviations used in the manuscript should be defined at first use, both in the abstract and in the main text. The abbreviation should be provided in parentheses following the definition, and it should be used consistently throughout the paper.

## Identifying products

When mentioning a drug, product, hardware, or software program in a manuscript, it is important to provide detailed information about the product in parentheses. This should include the name of the product, the producer of the product, and the city and country of the company. For example, if mentioning a Discovery St PET/CT scanner produced by General Electric in Milwaukee, Wisconsin, USA, the information should be presented in the following format: "Discovery St PET/CT scanner (General Electric, Milwaukee, WI, USA)." Providing this information helps to ensure that the product is properly identified and credited.

## References

Both in-text citations and the references must be prepared according to the Publication Manual of the American Psychological Association (APA), Seventh Edition (2020).

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When citing publications, preference should be given to the latest, most up-to-date sources. Citing the latest sources can help to ensure that the paper is relevant and timely, and that it reflects the latest developments in the field.

It is the responsibility of the authors to ensure the accuracy of the references in their article. All sources must be properly cited, and the citations must be formatted correctly.

To avoid plagiarism, it is necessary to acknowledge other sources in your paper through in-text citations. For every in-text citation, a corresponding reference list entry must be provided.

The APA in-text citation style includes the author's last name and the year of publication, such as (Field, 2005). If quoting directly from a source, the page number should also be added, such as (Field, 2005, p. 14).

If an ahead-of-print publication is cited, the DOI number should be provided in the reference list.

The reference styles for different types of publications are presented in the following examples.

Journal Article: Edwards, A. A., Steacy, L. M., Siegelman, N., Rigobon, V. M., Kearns, D. M., Rueckl, J. G., & Compton, D. L. (2022). Unpacking the unique relationship between set for variability and word reading development: Examining word- and child-level predictors of performance. *Journal of Educational Psychology*, 114(6), 1242–1256. <https://doi.org/10.1037/edu0000696>

Book Section: Zeleke, W. A., Hughes, T. L., & Drozda, N. (2020). Home-school collaboration to promote mind-body health. In C. Maykel & M. A. Bray (Eds.), *Promoting mind-body health in schools: Interventions for mental health professionals* (pp. 11–26). American Psychological Association. <https://doi.org/10.1037/0000157-002>

Books with a Single Author: Haslwanter, T. (2022). *An introduction to statistics with Python*. New York, NY: Springer International Publishing.

Editor(s) as Author: Rhodewalt, F. (Ed.). (2008). *Personality and social behavior*. Psychology Press.

Thesis: Valentin, E. R. (2019, Summer). *Narcissism predicted by Snapchat self-sharing, filter usage, and editing* [Master's thesis, California State University Dominguez Hills]. CSU ScholarWorks. <https://scholarworks.calstate.edu/concern/theses/3197xm925?locale=en>

Websites: Chandler, N. (2020, April 9). What's the difference between Sasquatch and Bigfoot? howstuffworks. <https://science.howstuffworks.com/science-vs-myth/strange-creatures/sasquatch-bigfootdifference.htm>

Epub Ahead of Print Articles: Muldoon, K., Towse, J., Simms, V., Perra, O., & Menzies, V. (2012). A longitudinal analysis of estimation, counting skills, and mathematical ability across the first school year. *Developmental Psychology*. Epub ahead of print. doi:10.1037/a0028240.

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## INVITED REVIEW

# Global Tobacco Industry

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## Main Points

- The tobacco industry's marketing strategies specifically target young people and former smokers prone to relapse, using new products with appealing designs, various flavors, and the impression of being safer.
- The global tobacco industry poses a significant public health threat by introducing new products that may increase tobacco use and associated health problems.
- Governments and health organizations need to intensify tobacco control measures, provide comprehensive smoking cessation support, and strictly monitor the advertising techniques of the industry.

## Abstract

The global tobacco industry, with its dynamic product range, poses ongoing health and socio-economic challenges, demanding attention from policymakers, healthcare experts, and the public. This study aimed to explore the history, economic tactics, marketing strategies, and product evolution of the industry to underscore its health impacts and aid informed public health decisions and actions. This review looks at sources from key databases such as Google Scholar, PubMed, Cochrane, and ScienceDirect, as well as World Health Organization (WHO) reports, focusing on key terms like “global tobacco industry,” “health effects,” “marketing strategies,” “new tobacco products,” “tobacco control policies,” and “economic impacts.” The tobacco industry, one of the most profitable global sectors, spans cultivation, production, and sale with an intent for profit. Facing reduced smoking rates, the industry has shifted focus to alternatives like Heated Tobacco Products (HTPs) and electronic cigarettes (E-Cigarettes), designed to deliver nicotine through vapor, targeting younger and former smokers. The tobacco industry's economic pursuits conflict with the objectives of tobacco control, especially as they introduce new products that could increase health risks. As the industry aims to expand globally, it's crucial for authorities to strengthen tobacco control, offer cessation support, and oversee practices to protect public health.

**Keywords:** Global, marketing strategies, new tobacco products, tactics and messages, tobacco industry

## Introduction

Tobacco is one of the most commonly addictive substances in the world and stands as the leading cause of preventable deaths. By the end of the 2000s, the number of tobacco users worldwide approached 1 billion, and by 2023, it has reached 1.3 billion (İlhan et al., 2016; WHO, 2023a). It results in 8.7 million deaths annually (WHO, 2023b), afflicting tens of millions with preventable diseases such as cancer, heart disease, lung disease, and other chronic illnesses. Reducing tobacco use is critically important in terms of decreasing

the burden of non-communicable diseases, which account for 71% of deaths worldwide (WHO, 2023a, 2023b). The tobacco industry stands as one of the world's largest, most profitable sectors, and serves as a major employer globally. Beyond merely producing tobacco products, the industry encompasses a spectrum of businesses involved in the cultivation, production, and sale of tobacco, all of which operate with the primary objective of generating profit. The tobacco industry is also defined as encompassing “tobacco products, wholesale distributors, and tobacco product importers” (WHO, 2023a, 2023b).

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In the 1990s, amid intensifying legal pressures in the United States of America and the World Health Organization's (WHO) escalating commitment to tobacco control, the tobacco industry attempted to strategically position itself as a "solution" to the challenges posed by tobacco consumption (WHO, 2000). A significant endeavor in this direction was Philip Morris' "Project Sunrise" initiated in 1995 (McDaniel et al., 2006). This project aimed at fragmenting the tobacco control community while promoting policies that would minimally impact the industry's interests. The tobacco industry pursued strategies like projecting an image of "social responsibility," but these largely amounted to ineffective public relations campaigns. The Framework Convention on Tobacco Control (FCTC) was adopted by the World Health Assembly on May 21 2003 and came into force on February 27 2005, despite the industry's maneuvers (Mamudu et al., 2008). The WHO FCTC, which emphasizes the right of individuals to the highest health standards, has been adopted by 182 Parties, covering over 90% of the global population (WHO, 2012, 2023a). The FCTC seeks to curtail tobacco use and its associated morbidity and mortality. It encompasses significant policy recommendations, including restrictions on tobacco advertising, the incorporation of health warnings on packaging, and measures to elevate the pricing and taxation of tobacco products. This treaty, ratified by numerous countries, epitomizes the global endeavors in tobacco control. With the implementation of the FCTC and the observed global decline in tobacco consumption (notably, the prevalence of adult smoking decreased from 24% in 2007 to 21% in 2015) (Hilamo & Glantz, 2015; WHO, 2017), tobacco companies might have been prompted to consider alternative products to safeguard their profits and political interests.

The tobacco industry invests heavily in the development of new products, which are nicotine-containing and marketed as less harmful than traditional tobacco products. These products are also promoted as a way to reduce tobacco consumption. However, there is no scientific consensus on whether they are actually less harmful. This marketing strategy ensures that consumers are attracted to these new products. In addition, these new products are strategically marketed to counteract the effects of tobacco control measures. Worryingly, these nicotine-containing new products are targeted at young people and people who have quit smoking (Bialous & Glantz, 2018; Stella & Stanton, 2018).

The global tobacco industry, renowned as one of the world's most lucrative sectors, is persistently associated with a multitude of health and socio-economic challenges, including the introduction of new and potentially harmful products. For policymakers, healthcare professionals, and the general public, grasping its intricate mechanisms, strategies, and implications is paramount. This review offers a comprehensive examination of the global tobacco industry, encompassing its historical trajectory, economic maneuvers, marketing tactics, and the evolution of novel products, all while elucidating the health repercussions. The overarching goal is to shed light on this industry to steer informed public health decisions and initiatives in the future.

### Components and History of the Tobacco Industry

The tobacco industry encompasses more than just tobacco companies and tobacco-funded organizations. It includes a range of entities and sectors that operate under the umbrella of the

"tobacco industry." This broad definition covers tobacco industry-funded tobacco associations, leaf-buying, and processing entities, retailers' associations, daily and fine retailers engaged in the tobacco trade and industries like advertising that have regulatory associations closely tied with tobacco promotion. Additionally, it encompasses state-owned national or multinational tobacco companies, their subsidiaries, and representatives, as well as distributor bodies, importers, exporters, and duty-free distributors (WHO, 2019a).

With the industrial revolution, cigars appeared at the beginning of the 19th century and cigarettes at the end of the 19th century (Schivelbusch, 2000). While the current Philip Morris International (PMI) was established in 1847 and R.J. Reynolds was established in the USA in 1875, British American Tobacco (BAT) began operations in 1902 with the cooperation of the United States and England (Randall, 1999). Tobacco companies entered the Latin American market in the 1960s, and in 1976 they acquired 12 companies, most of which were state monopolies, and controlled 75% of the Latin American tobacco products market (Cunningham, 1996). With the 1980s, the tendency of transnational companies to spread their production all over the world in search of low production costs and new markets has gradually increased. With the liberalization regulations, tobacco companies entered Asia in the 1980s, Central and Eastern Europe, China, and Vietnam in the 1990s (Cunningham, 1996). From 2015 to 2020, 4 tobacco companies, PMI, BAT, Japan Tobacco International (JTI), and Imperial Brands (IMB), formed a monopoly on a large part of the global cigarette market (Hiscock et al., 2023; Rajani et al., 2023). Some firms, like Swisher International, are primarily significant for smaller tobacco product markets, such as cigars and cigarillos, while others, like Altria (USA), China National Tobacco Company (China), and Indian Tobacco Company Limited (ITC) (India), are geographically restricted (Hiscock et al., 2023). Pyxus (Alliance One) and Universal Corp, the 2 major suppliers of tobacco leaf globally, wield significant influence on the worldwide tobacco market. These companies had become the sole global tobacco leaf suppliers, with a presence in all major tobacco-producing regions. These major companies (Pyxus, Universal Corp, PMI, BAT, JTI, and IMB) together have some decision-making authority and can adapt their operations to local needs (Kedia, 2020). These companies may also be collectively referred to as Transnational Tobacco and Leaf Companies (TTLCs). Each of these TTLCs has numerous subsidiaries (Hiscock et al., 2023). Transnational tobacco and leaf companies (TTLCs) increasingly contract directly with farmers for tobacco leaves (Lencucha et al., 2022). Tobacco control efforts face challenges, especially in countries with significant employment in tobacco farming and production (Gilmore et al., 2015; Mathers et al., 2019; Zatoński et al., 2023). Mapping the supply chains of companies with global reach is recommended to better understand where public health, equity, and environmental policies can be undermined by company activities and where workers and the environment can be exploited to increase profits (Goldstein & Newell, 2019; Hiscock et al., 2023). Mapping can facilitate the development and implementation of measures that protect policies from tobacco industry pressure (Assunta & Dorotheo, 2016). Low- and middle-income countries (LMICs) have been found to be particularly vulnerable to tobacco industry interference due to a lack of resources and political will (Hebbar et al., 2022).

The global tobacco products market experienced growth from \$253.3 billion in 2022 to \$266.93 billion in 2023. This growth is anticipated to continue, reaching an estimated value of \$316.79 billion by 2027 (ResearchandMarkets., 2023). The market offers a diverse range of products such as cigarettes, cigars, cigarillos, snuff, chewing tobacco, pipe tobacco, and other smokeless varieties, distributed through various channels including supermarkets, convenience stores, e-commerce platforms, specialty tobacco stores, and more. Notably, the Russia-Ukraine conflict and the ensuing economic sanctions have imposed challenges on global markets, causing supply chain disruptions and impacting the tobacco industry. Additionally, the outbreak of Coronavirus disease 2019 (COVID-19) significantly constrained the tobacco market in 2020, but the market is projected to recover in the coming years. The Asia-Pacific region dominated the market in 2022, followed by North America. Major countries involved in the tobacco market span across continents such as North America, Europe, and Asia-Pacific, and include nations like Argentina, China, USA, India, Brazil, UK, France, and more (ResearchandMarkets., 2023).

### **Tobacco Industry Tactics and Messages**

The tobacco industry employs specific tactics, both in traditional cigarettes and new products, to counteract life-saving tobacco control measures. These strategies range from discrediting scientific research, and aggressively lobbying in favor of industry-aligned measures, to spreading misleading information about the economic significance, and positive societal role of the industry (WHO, 2019a). Tobacco companies are increasing their investments in electronic cigarettes and new tobacco products, and making advertising efforts for these products is also one of their significant strategies in many countries.

The tobacco industry has employed strategic packaging and labeling tactics to manipulate consumers' perceptions and safeguard its interests. Over the past decade, the industry has leveraged international trade and investment treaties to challenge plain packaging regulations, delaying legislative actions in some countries. Meanwhile, despite the industry's objections and interventions, global health organizations and governments continue to push for more transparent and health-centered labeling to diminish the health concerns associated with tobacco products (WHO, 2019b).

In examining the tobacco industry's strategies, it is evident that there is a consistent pushback against the bans on advertising, promotion, and sponsorship (TAPS). The industry often champions the value of advertising by citing constitutional rights to freedom of speech and commercial speech, suggesting that comprehensive TAPS bans are unnecessary and that self-regulation would be sufficient. However, studies indicate that only partial restrictions can lead to shifts in advertising focus, potentially exposing young and impressionable audiences to the dangers of tobacco. Moreover, the industry's tactics extend beyond mere advertising arguments. Historical documents reveal their attempts to discredit proven science and exaggerate the economic importance of the tobacco sector. This is further complicated by their legal maneuvers, where they have tried to manipulate political and legislative processes and intimidate governments with the threat of litigation. As governments and organizations work

towards a smoke-free world, understanding and countering these tactics become crucial (WHO, 2019e).

The tobacco industry aims to deceive the public with "smoke-free" and "safe" messages. The authenticity of these messages is a matter of significant debate. A leaked strategy from PMI in 2014 reveals the company's plan to market new products and cigarettes simultaneously. This strategy involves collaboration with third-party actors like scientists and harm reduction advocates. The company leans towards presenting itself as a "solution provider" and opposes excessive regulations. Tobacco giants are attempting to position themselves as contributors to public health using new products like electronic cigarettes (e-cigarettes). However, sustainability reports and public statements shed light on the realities behind the promotion of "smoke-free" products. These products are not entirely safe according to international standards. This exemplifies how the industry can mislead the public (WHO, 2019d). The tobacco industry seeks to influence policy through their "smoke-free" product messages. They strategically fund third-party groups to weaken tobacco control measures and employ deceptive youth marketing tactics. Additionally, the industry's funding of certain scientific studies raises concerns about potential bias in research findings.

A recent evaluation of tobacco industry interference has highlighted differences in how various countries are influenced by the sector. The countries most affected by interference, based on the overall rankings, are Japan, Indonesia, Zambia, and Romania. In stark contrast, nations such as Brunei Darussalam, Uganda, France, New Zealand, and the United Kingdom have demonstrated the least interference, maintaining commendable stances against tobacco industry influences. It's worth noting that Türkiye's position in this assessment is moderately influenced, holding the 17th rank in the global list (Assunta, 2020).

### **New Tobacco Products: The Rise of Electronic Cigarettes and Heated Tobacco Products in the Last 10 Years**

The mitigation of harmful effects from tobacco use can only be achieved by ending its production, sale, and consequently, consumption. International organizations and governments are implementing various legislative measures to curb tobacco use. Meanwhile, the tobacco industry adapts by modifying existing products, such as adding filters to cigarettes, and introducing new ones, claiming they are "harmless" or "less harmful." Additionally, the age-old practice of hookah smoking has been rebranded with innovations like fruit-flavored tobacco, targeting especially the youth (Bilir, 2018). While the harm reduction approach suggests developing products to assist those unable to quit smoking, the only true protection from the harms of tobacco is complete cessation. However, some smokers either choose to continue or struggle to quit. In response, the tobacco industry has introduced "less harmful" alternatives. Instead of forcing a "quit or die" choice on smokers unable to quit, this strategy aims to guide them toward using these purportedly less harmful products (Bilir, 2018; Hatsukami et al., 2004).

Since the 1960s, tobacco companies have created alternatives to support the cigarette market. Historically, products like Premier, Eclipse, Accord, and HeatBar were developed but commercially failed (Jesse et al., 2018; Stella & Stanton, 2018). The recent introduction of heated tobacco products (HTPs) and e-cigarettes could

be a response to declining cigarette consumption and the success of tobacco control measures. The industry's strategy involves positioning itself as a harm-reduction partner and seeking alliances with governments and scientists to promote new products (Noel et al., 2018; Özdemir & Yaman Üzümcü, 2019; Saloojee & Dagli, 2000).

There are 4 main types of nicotine products that don't involve combustion: heated pure nicotine-based products (e.g., e-cigarettes), unheated pure nicotine-based products (e.g., nicotine gum), heated tobacco-based products (e.g., vaporizers), and unheated tobacco-based products (e.g., chewing tobacco) (Peitsch et al., 2018). Major international tobacco companies—including PMI, BAT/RJ Reynolds, Imperial Tobacco, and JTI—have increased their interest and investments in new tobacco products such as electronic cigarettes (e-cigarettes)/electronic nicotine delivery systems (ENDS), and HTPs over the past decade (Mathers et al., 2019; WHO, 2019d). Table 1 provides examples of the “transformation” messages conveyed by major tobacco companies and the ENDS/HTP brands they are marketing. In promoting these new devices, tobacco companies claim to offer a “broader range of choices” and assert that ENDS and HTPs are “safer alternatives.” They also state that these products will “save” millions of people from traditional, more harmful cigarettes and express support for “harm reduction” initiatives.

#### Heated Tobacco Products

These devices heat actual tobacco but at lower temperatures than traditional cigarettes. By heating the tobacco instead of burning it, HTPs produce an aerosol that contains nicotine and other chemicals, which is then inhaled by the user (Znyk et al., 2021). As of 2018, major tobacco companies such as PMI, BAT, and JTI have been actively promoting their HTPs globally (Stella & Stanton, 2018). Often referred to as “heat-not-burn” or “smoke-free”

tobacco, these products are marketed as safer alternatives to traditional cigarettes. Some promotional materials even suggest that HTPs can aid smokers in quitting. British American Tobacco introduced its “iFuse” product in 2015, followed by “glo” in 2016, expanding its market presence to countries including Romania, Japan, Switzerland, Canada, South Korea, and Russia. In 2016, JTI debuted its “Ploom” and “TECH” products, primarily focusing on the Japanese and Swiss markets. Korea Tobacco & Ginseng Corporation (KT&G Corp.) launched its “Lil” product in South Korea in 2017. Meanwhile, PMI, having released its “IQOS” in 2014, has achieved the most extensive global reach, with distribution spanning from Canada all the way to New Zealand (Stella & Stanton, 2018). In 2018, the tobacco industry rapidly introduced HTPs to the market. Although the sale of HTP is not legally permitted in Türkiye, it is marketed in over 40 countries worldwide (Eke & Yüce, 2022). In 2020, the import of e-cigarettes, HTPs, and any related components, spare parts, and solutions was prohibited by a Presidential Decree in Türkiye. However, online sales and smuggling continue to introduce these products into the country. During travels, passengers are still bringing these products into the country in specified amounts (Eke & Yüce, 2022). Some media reports suggest that HTPs reduce harmful tobacco constituents by 90–95% when compared to traditional cigarettes. Studies have found that using I-Quit-Ordinary-Smoking (IQOS) results in the release of toxic formaldehyde cyanohydrin, even without direct tobacco combustion (Auer et al., 2017). While some toxic compounds might be reduced in IQOS compared to regular cigarettes, they aren't completely absent, and their health impact is still under evaluation. The WHO has also stated that it does not endorse the claims made by tobacco companies regarding their products (WHO, 2018).

These companies are trying to influence governments to roll back tobacco control policies or to create exemptions for their

**Table 1.**  
*Transformation Messages and Tobacco Industry Brands (WHO, 2019d)*

| Tobacco Company             | Initiative/Campaign                                                          | Industry Jargon                                         | Electronic Nicotine Delivery Systems (ENDS) | Heated Tobacco Products (HTPs) | Key Markets (ENDS/HTPs)                                                                                                             |
|-----------------------------|------------------------------------------------------------------------------|---------------------------------------------------------|---------------------------------------------|--------------------------------|-------------------------------------------------------------------------------------------------------------------------------------|
| British American Tobacco    | Transforming tobacco, a better tomorrow                                      | Next generation products (NGPs)                         | Vype                                        | Glo                            | Poland, United Kingdom, United States/Japan                                                                                         |
| RJ Reynolds                 | –                                                                            | –                                                       | Vuse                                        | Eclipse Revo Neocore           | –                                                                                                                                   |
| Imperial Tobacco            | European citizens initiative: let's demand smarter vaping regulations        | NGPs                                                    | Blu<br>Jai<br>Puritane                      | Pulze                          | France, Japan, United Kingdom, United States/Japan                                                                                  |
| Japan Tobacco International | It's time to rethink tobacco, rethink music                                  | Reduced-risk products (RRPs)                            | Logic cig-a-like<br>E-lites                 | Ploom                          | Japan, United Kingdom, Republic of Korea, United Kingdom                                                                            |
| Philip Morris               | Smoke-free future, hold my light unsmoke your world, its time mission winnow | RRPs, Harm reduction equation<br>Heat-not-burn products | Nicocig<br>Juul                             | IQOS                           | Canada, Germany, Indonesia, Israel, Philippines, Republic of Korea, Switzerland, United Kingdom, United States/Egypt, Japan, Russia |

Note: NGPs, next generation products; RRP, reduced-risk products; ENDS, electronic nicotine delivery systems; HTP, heated tobacco products.

HTP. The industry's marketing of HTP is making these products more visible and accessible to the public. Governments need to ensure the regulation of HTP to protect public health (Lempert & Glantz, 2018; Stella & Stanton, 2018). Before launching HTPs in a country, tobacco corporations have engaged in high-level governmental discussions to persuade regulators of the purported health benefits of HTPs, contending they should not be subjected to the same restrictions as cigarettes. These companies lobby for distinct taxation, labeling, and marketing regulations for HTPs. However, it is imperative to recognize that HTPs should be treated analogously to other tobacco products, necessitating the same regulatory measures to safeguard public health (González, 2017; Stella & Stanton, 2018).

### Electronic Cigarettes (e-cigarettes)

The invention of the electronic cigarette dates back to the year 1963. Electronic cigarettes (e-cigarettes) are battery-operated and heat the nicotine liquid inside to create an aerosol. Users inhale this aerosol into their lungs and exhale it into the environment. E-cigarettes are shaped like a cigarette-sized or slightly longer stick and contain a replaceable cartridge containing nicotine and propylene glycol. Additives such as tobacco, fruit, mint, chocolate, coffee, cola, and so forth are utilized in the cartridge's liquid. It is possible to mimic certain cigarette brands or add other flavors. Propylene glycol creates an odor similar to cigarette smoke. A battery-powered microprocessor lights a red-orange LED light that mimics the burning tip of a real cigarette. During combustion, the heat of around 50 – 60 degrees is generated, which heats the nicotine and provides a cigarette-like smoking experience. Although e-cigarettes are considered "safe" because they do not contain tar, the aerosol contains many harmful compounds, including nicotine and carcinogens (Börekçi et al., 2015; Özdemir & Yaman Üzümcü, 2019). Electronic cigarettes (E-cigarettes) were first launched in China in 2004 as a smoking cessation tool. In 2005 – 2006, exports started from China and spread to different countries. However, quality control of the device was inadequate, and users were found to be able to modify the device for substances such as cannabis (Anna & Prue, 2011; Börekçi et al., 2015). Community-based studies indicate that e-cigarettes are primarily used by ongoing cigarette smokers (dual use), followed by ex-smokers and those who have never smoked (Brown et al., 2014; Owusu et al., 2019; Samantha et al., 2015). Dual use with cigarettes is common, and e-cigarette usage rates are rising three times faster among youth than adults (Owusu et al., 2019). Recently, some youths who've never smoked but tried e-cigarettes continue to use them, becoming nicotine-dependent, highlighting the serious health concerns of e-cigarettes (Boyle et al., 2019; Cullen et al., 2019).

The health effects of electronic cigarettes (e-cigarettes) have become an important research topic in recent years. Unlike conventional cigarettes, e-cigarettes deliver nicotine without combustion, which means that they can reduce exposure to potentially toxic substances. However, it is not possible to say that e-cigarettes are completely risk-free (Gülşen & Uslu, 2020). The e-cigarette aerosol contains harmful substances such as nicotine and volatile organic compounds, which can lead to negative effects, especially on the developing brains of young people. Furthermore, e-cigarette use has been associated with a number of health complications, including acute eosinophilic pneumonia,

hypersensitivity pneumonitis, organized pneumonia, diffuse alveolar hemorrhage, multiple reactive pulmonary nodules, sub-acute bronchiolitis, myocardial infarction, and nicotine poisoning (Börekçi et al., 2015; Gülşen & Uslu, 2020; Hua & Talbot, 2016; Özdemir & Yaman Üzümcü, 2019). There have also been reports of complications from substances directly contained in the devices and injuries to the mouth, teeth, and tongue from device explosions and combustions (Gülşen & Uslu, 2020).

### Marketing Strategies of the Tobacco Industry

The tobacco industry has traditionally zeroed in on susceptible groups, and its modern approaches remain consistent. Current nicotine-containing tobacco products, like e-cigarettes and heat-not-burn devices, predominantly target youths and former smokers prone to relapse. The appeal of fresh designs, diverse flavors, and an illusion of "safety" intensify their attraction. Young adults are notably more drawn to tobacco advertisements, likely to possess tobacco promotional items, and frequently visit venues with such promotions. Compared to older adults, they exhibit a heightened vulnerability to tobacco marketing. Overall, the evidence underscores young adults as a particularly sensitive target for tobacco promotion activities (Biener & Albers, 2004; WHO, 2020a). In an attempt to rebrand and appeal to a health-conscious audience, the tobacco industry often advertises certain products as "less harmful" or "reduced risk." These claims, however, can be misleading. While some products may reduce certain risks compared to traditional cigarettes, they are not without their own sets of health concerns. It's crucial for the public to critically assess these claims and rely on scientific research rather than industry-promoted information (Cappella et al., 2015; Hatsukami et al., 2004).

Prominent themes in e-cigarette marketing center around health, lifestyle, and personalization. Terms suggesting a healthier alternative, like "natural," are often employed, hinting at the contents, be it the plastics, e-liquids, or more specifically, the nicotine used (Staal et al., 2018). The attractive packaging, design aesthetics, range of colors, flavors, and tech features of these products seem tailored to pique the interest of younger audiences and novice users. Flavors added to e-liquids often resemble sweet and fruity tastes such as apple or melon, mimicking tobacco or even invoking feelings of energy (like coffee or energy drinks) or relaxation. It's vital for the public to approach these marketing strategies with skepticism, prioritizing scientific research over industry-led narratives.

Literature indicates that product marketing plays a significant role in increasing the visibility of e-cigarettes to potential users (Czoli et al., 2016; Wackowski et al., 2016). Factors that might enhance the likelihood of potential users trying e-cigarettes include the absence of health warnings on the product, the presence of various flavors, and either the lack of nicotine content or its presence in minimal amounts. Similar findings have been reported for hookah products (Jawad et al., 2015). Recently, a new marketing opportunity has emerged through social media. Retailers can easily advertise and promote their products to a broad audience via websites like Twitter and Instagram (Allem et al., 2017; Lazard et al., 2016). These marketing aspects, both inherent in the products and featured in advertisements, can lead to rapid increases in product popularity.

Advertising remains a cornerstone of the tobacco industry's *modus operandi*. Historically, cigarette brands have prominently sponsored sports events, concerts, and even fashion extravaganzas, aiming to weave smoking into the fabric of popular culture. The 1980s marked significant efforts by tobacco companies, such as Philip Morris and RJ Reynolds, in placing their products in movies and on TV. These companies engaged aggressive product placement agencies to promote tobacco in positive contexts in Hollywood. Efforts extended to providing free cigarettes to actors and encouraging professional photographers to capture images of actors smoking (Mekemson & Glantz, 2002).

Despite restrictive regulations in many nations, the industry adeptly exploits loopholes and shifts to platforms like social media. Exposure to tobacco-related content on platforms such as Twitter, Facebook, Instagram, and YouTube can influence adolescents and young adults, fostering brand awareness, amplifying product allure, and altering susceptibility to tobacco use (Abrams et al., 2023). Research consistently reveals the industry's exploitation of social media to promote tobacco content, and studies link such exposure to tobacco-centric attitudes and behaviors among teens (Donaldson et al., 2022; WHO, 2020a). Recent research has illuminated a concerning trend: a majority of adolescents engage with multiple social media platforms. Those exposed to tobacco content on more than 2 platforms have been found to exhibit a higher likelihood of lifetime e-cigarette use, lifetime usage of other tobacco products, tobacco consumption in the past 30 days, and other tobacco usage in the same timeframe. Moreover, these individuals show an increased predisposition towards tobacco use compared to non-users. Given these insights, it's imperative for regulators to consider introducing legislation to restrict tobacco-related content on social media platforms. Moreover, these platforms might consider implementing safety measures to protect adolescents from such exposure (Donaldson et al., 2022).

Historically, the industry manipulated nicotine content for enhanced addictiveness, marketed flavored cigarettes to appeal to the youth, and sponsored entertainment events for product promotion. In recent times, these tactics have been refashioned with the use of social media influencers, branding that evokes youth-friendly flavors, and by advocating that their products align with a "proportionate level of harm." This underscores the industry's continual adaptability in its marketing endeavors to remain appealing to consumers (WHO, 2019d).

In Southeast Asia, tobacco corporations dominated the market by using social responsibility initiatives to favorably market themselves. These businesses presented tobacco as an opportunity for growth in an effort to dissuade governments from enacting tobacco control laws. However, in the face of resistance, businesses resorted to smuggling and legal action. These businesses are currently concentrating their efforts on Africa and other low-income nations (Amul et al., 2021).

### Monitoring the Tobacco Industry

The monitoring process of the tobacco industry comprises 2 crucial components: surveillance and regulation (WHO, 2020b). In terms of regulation, the WHO assists in setting standards for the content, emissions, packaging, and labeling of tobacco products through its established networks. Two main networks are the

WHO Tobacco Product Regulation Study Group (TobReg) and the WHO Tobacco Laboratory Network (TobLabNet) (WHO, 2020b). Tobacco product regulation study group (TobReg) was established in 2003 to provide the WHO with evidence-based and robust recommendations concerning tobacco product regulation. Meanwhile, TobLabNet, a global tobacco testing laboratory network established by the WHO Tobacco-Free Initiative (TFI) in 2005, focuses on advancing the testing of tobacco products based on TobReg's guidance (WHO, 2020b). The WHO's FCTC also contains measures regulating tobacco products and their descriptions and contents, with recent extensions to regulate emerging products like e-cigarettes. Another key aspect of monitoring the tobacco industry is overseeing its actions. World Health Organisation tracks the industry's interference in global tobacco control policies and documents its strategies aimed at weakening these controls (WHO, 2020b). The WHO diligently observes the industry's efforts to undermine tobacco control policies on a global scale and reports on these activities, including campaigns intended to weaken global tobacco control. The tobacco industry has developed various intervention forms to obstruct or weaken potent tobacco control policies, such as manipulating political processes, challenging proven science, and threatening governments with litigation (WHO, 2012). The preamble of the WHO FCTC highlights the need to be vigilant against the industry's attempts to thwart tobacco control efforts. All parties of the WHO FCTC have agreed on ways to halt the interventions of the tobacco industry and have accepted the principles in the guidelines (WHO, 2012). It emphasizes that there's a conflict of interest between the tobacco industry and public health policies. Measures, such as raising awareness about tobacco products, regulating interactions with the industry, and ensuring transparency, are paramount for countering the industry's interventions. Only through these measures can the industry be controlled and success against the tobacco epidemic be achieved.

In response to increasing restrictions on tobacco advertising, the tobacco industry has pivoted toward packaging design as a critical marketing tool (İlhan & Kara, 2021; TobaccoPlayBook, 2016). The packaging, including its graphic elements, colors, size, texture, and additional materials like foil and inner frames, is strategically designed to appeal especially to target demographics like women and youth (Kotnowski & Hammond, 2013; Wakefield et al., 2002). The WHO acknowledges the need for mechanisms addressing the long-term socio-economic impacts of these marketing strategies. Its FCTC provides clarity on the packaging and labeling of tobacco products, emphasizing the prohibition of misleading descriptors and the necessity of prominent health warnings. The FCTC also recommends plain packaging to reduce product appeal, hinder its use as a promotional tool, and enhance the visibility of health warnings (WHO, 2016). Although most smokers are unaware of the full health consequences, pictorial warnings, especially in low and middle-income countries, serve as an effective means of conveying these risks (Siahpush et al., 2006; TobaccoPlayBook, 2016). Australia was the first to respond to WHO's call, adopting plain packaging laws in 2012, with several other countries, including France, the UK, and Ireland, following suit (WHO, 2016). Türkiye, endorsing the FCTC's directive, implemented plain packaging in 2018, marking a significant step in tobacco control (WHO, 2019c).

## Conclusion

Effective tobacco control is inherently at odds with the economic interests of the tobacco industry and affiliated entities. The industry is increasingly deploying diverse strategies to amplify its influence and penetrate global markets. The globalization of tobacco marketing, trade, research, and industry influence presents a significant worldwide threat. The primary goal of tobacco control is to prevent diseases and deaths caused by tobacco. Central to this mission is the prevention of tobacco use and facilitating cessation among users (WHO, 2000, 2012, 2023a). The tobacco industry poses a significant threat to public health, especially with its introduction of new products that might escalate tobacco consumption and related health issues. The rapid introduction of new nicotine-containing products into our lives raises significant concerns, particularly in the context of nicotine addiction. These products not only aim to entice the new generation but also to keep existing smokers within the cycle of nicotine dependence. This is a critical issue, as the industry's strategy focuses on maintaining a consistent user base, regardless of the public health implications. The targeting of young people, especially those who have never smoked, and individuals who have successfully quit smoking, represents a worrying trend. It's imperative for governments and health organizations to intensify tobacco control measures, offer comprehensive smoking cessation support, and rigorously monitor the industry's advertising techniques. Through such efforts, we can mitigate the detrimental impacts of tobacco on society.

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## INVITED REVIEW

# Other Highlights and New Products on the Agenda: E-Cigarettes/Electronic Nicotine Delivery Systems, Electronic Non-Nicotine Delivery Systems, and Heated Tobacco Products

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## Abstract

E-cigarettes have emerged as a prominent product primarily driven by the tobacco industry. Serving as a strategic lifeline for a tobacco industry facing constrained opportunities, e-cigarettes present a concerning landscape, especially in relation to youth and public health. These devices, often marketed with an age restriction on cigarette sales, inadvertently facilitate the development of nicotine addiction in children and young individuals. They provide a means for perpetuating nicotine dependency among smokers, given the limitations on smoking in public spaces. E-cigarettes are capable of delivering potent nicotine concentrations, contributing to youth addiction and the subsequent adoption of conventional cigarettes and other addictive substances. While some research suggests that transitioning from smoking to e-cigarettes may reduce harm, additional studies are required to establish this conclusively. Notably, the co-use of e-cigarettes and traditional cigarettes poses greater health risks than using either product in isolation. The therapeutic potential of e-cigarettes in smoking cessation is evident when utilized within a structured intervention but not as consumer commodities. It is crucial to acknowledge that e-cigarette technology is continually evolving, making it challenging to assess their long-term health implications accurately. The allure of flavored tobacco products, particularly to the youth, remains a major concern within this landscape.

**Keywords:** E-cigarettes, ENDS, ENNDS, HTPs, vaping

## Definitions

e-cigarettes/electronic nicotine delivery systems (ENDS)/electronic non-nicotine delivery systems (ENNDS): These are electronic devices with batteries that release inhalable vapor used for consuming substances such as nicotine, tetrahydrocannabinol (THC), cannabidiol (CBD), and butane mixed oils (dabs). E-cigarettes typically consist of a battery, liquid cartridge, heating element (atomizer), and mouthpiece, which convert the liquid into an aerosol.

Heated tobacco products (HTPs)/T-vapor: These electronic devices heat tobacco at lower temperatures (up to 350°C) compared to traditional cigarettes, turning nicotine and other chemicals into vapor. Some e-cigarettes also contain tobacco.

Vaping: The act of inhaling aerosol or vapor produced by ENDS, ENNDS, or HTPs.

## Introduction

Electronic nicotine delivery systems (ENDS)/heated tobacco products (HTPs)/e-cigarettes can deliver nicotine levels ranging from 0 to 35 µg in each puff, depending on the type. On average, consuming about 30 puffs from these devices can deliver nicotine equivalent to that obtained from smoking a cigarette. Certain e-cigarettes may provide even higher nicotine concentrations. The amount of nicotine intake depends not only on the nicotine cartridge's content but also on device features and user behavior. E-cigarettes can lead users to consume more nicotine compared to traditional cigarettes (Ramóa et al., 2016). The lethal dose of nicotine

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ranges from 10 to 60 mg, and some e-cigarettes contain nicotine concentrations of up to 100 mg/mL. Salivary cotinine levels in e-cigarette users can be as high as 322 ng/mL, whereas it is 113 ng/mL in smokers and only 2.4 ng/mL in non-smokers (Etter & Bullen, 2011; Etter et al., 2000; Cameron et al., 2014).

ENDS contain various bioactive chemicals apart from nicotine and can even be nicotine free. Even without additives, ENDS/electronic non-nicotine delivery systems (ENNDS) produce aerosols containing glycols, aldehydes, volatile organic compounds, polycyclic aromatic hydrocarbons, tobacco-specific nitrosamines, metals, silicate particles, and other elements. Toxic substances such as dicarbonyls (glyoxal, methylglyoxal, diacetyl) and hydroxycarbonyls (acetol) contribute to significant health issues. While the levels of these toxins are lower than in cigarette smoke, they can vary widely between brands and sometimes exceed tobacco smoke levels (WHO, 2016; Visser et al., 2015). Metals like lead, chromium, nickel, and formaldehyde have been found in ENDS aerosols in concentrations equal to or higher than in conventional cigarettes (Visser et al., 2015. Goniewicz et al., 2013).

The liquid inside these products' cartridges, besides nicotine, contains propylene glycol, ethanol, water, tobacco flower, and various essences and chemicals depending on the type. They can include thousands of different flavors and fragrances, such as mint, fruit flavors, chocolate, solvents, volatiles, and similar chemicals. Some products may even contain cannabis, marijuana, or hemp extracts. The appeal of flavors, especially fruit and toffee-like ones, can attract children and teenagers and influence their preferences (Ambrose et al., 2015; Vasiljevic et al., 2016). Nearly 8000 different flavors have been reported in e-cigarette liquids.

### **e-Cigarette, Electronic Nicotine Delivery System, Electronic Non-nicotine Delivery System, Heated Tobacco Product Market**

Initially, ENDS/ENNDS were marketed by companies independent of traditional multinational tobacco companies. Today, products like ENDS/ENNDS and HTPs are primarily marketed by tobacco companies (Etter et al. 2000). Regulatory approvals in the United States and the European Union are expected to increase the dominance of multinational tobacco companies in the market by raising the cost of bringing new devices to market. This situation poses a significant threat to tobacco control efforts. There are concerns that the entry of multinational tobacco companies into the ENDS/ENNDS market serves strategic objectives (WHO, 2016): Minimizing the threat to tobacco sales by promoting ENDS as a complement to tobacco or by controlling technological innovations to enhance its effectiveness as a smoking cessation aid. Encouraging adults to continue smoking and enticing children to initiate smoking through ENDS/ENNDS advertising. Advocating for ENDS/ENNDS to engage and influence policymakers, scientists, and tobacco control advocates by highlighting potential smoking cessation benefits, gaining credibility through corporate social responsibility initiatives, and undermining the WHO Framework Convention on Tobacco Control.

It is claimed in marketing that e-cigarettes do not contain harmful substances generated during tobacco combustion and provide

a safe alternative to cigarettes without causing tobacco-related diseases. The tobacco industry's history of false health claims, such as asserting in the 1960s that cigarettes were not harmful to health (Grana et al., 2014), raises skepticism about these claims. For example, in a 1954 full-page newspaper advertisement known as the "Frank Statement," 14 tobacco companies stated, "We believe the products we make are not injurious to health ... We always have and always will cooperate closely with those whose task it is to safeguard the public health" (<https://www.tobacco-freekids.org/research/factsheets/pdf/0268.pdf>). James Bowling, the vice president of Philip Morris, said in 1972, "if our product is harmful, we'll stop making it" ([http://www.sourcewatch.org/index.php/James\\_Chandler\\_Bowling](http://www.sourcewatch.org/index.php/James_Chandler_Bowling)). Such statements were made even though the same industry later admitted that cigarettes were harmful. Reflecting on this history, one might think, "How many times have we heard this tale before?" It is suggested that the industry is repeating the same tactics while expecting different outcomes (Braillon, 2016). In reality, e-cigarettes serve as a strategic tool for the industry to perpetuate nicotine addiction (Crotty et al., 2015). Furthermore, they can act as a gateway for young individuals who cannot purchase cigarettes to develop nicotine addiction early in life (McCarthy, 2015; Klein, 2015; Fillon, 2016). By normalizing smoking in society, e-cigarettes serve as a barrier against anti-smoking efforts (Auf et al., 2016). Susan Cameron, CEO of Reynolds American, even stated that "e-cigarettes and other non-combustible products will make the tobacco industry more socially acceptable" (<http://fortune.com/2014/08/08/reynolds-american-ceo-talks-tobaccos-future/>).

Over the past decade, cigarette sales have declined in developed countries. New products like ENDS/ENNDS and HTPs exemplify the tobacco industry's search for alternative products to cigarettes as it faces increasing constraints due to tobacco control measures worldwide. The demand for these products is rapidly rising. In a market research study from 2014, 466 brands and 7764 different products were identified (Zhu et al., 2014). The global ENDS/ENNDS market reached \$10 billion in 2015 and is expected to reach \$27 billion by 2022 (WHO, 2016). According to Euromonitor's 2017 data, total HTP sales in 2016 amounted to \$2.1 billion and were projected to reach \$17.9 billion by 2021 (Euromonitor International, 2017; 2018).

The marketing messages surrounding e-cigarettes often emphasize their potential benefits, such as helping users quit smoking, reducing harm, enabling use in social settings, and offering a wide array of appealing flavors. These messages are designed to attract consumers with promises of a safer alternative to traditional cigarettes and a customized vaping experience (Lyu et al., 2022).

### **E-cigarette Use Among Youth**

The prevalence of e-cigarette use among high school students in the United States has undergone a significant surge. Between 2011 and 2015, there was a tenfold increase in e-cigarette usage among this demographic. E-cigarette adoption is particularly pronounced among young individuals, encompassing both those who already smoke and those who have never engaged in smoking before (Singh et al., 2016; Bunnell et al., 2015; Bostean et al., 2015; Wills et al., 2015).

## Özlü. Other Highlights and New Products on the Agenda: e-cigarettes, ENDS, ENNDS, and HTPs

According to data from the National Youth Tobacco Survey in the United States, the rate of high school students using e-cigarettes, which stood at 20.8% in 2018, escalated to 27.5% in 2019. Notably, a staggering 97% of young users opt for flavored e-cigarette products. A comprehensive review by the World Health Organization (WHO) examining ENDS/ENNDS use among individuals aged 20 and under reveals intriguing trends. Among non-smokers, the prevalence of ENDS/ENNDS use hovers around 2%, but this figure dramatically rises to 13% and 19% in countries such as the United States (specifically, Florida) and Poland, respectively. Meanwhile, current usage rates among smokers reach approximately 17%. The use of ENDS/ENNDS is notably more pronounced in Florida (44.8% for ages 11 – 14 and 51.7% for ages 15 – 18) and Poland (57.4%). Worryingly, in the span of just 3 years, both Florida and Poland witnessed a staggering five- and eight-fold increase, respectively, in ENDS/ENNDS use among young non-smokers (WHO, 2016).

The initial costs associated with refillable ENNDS devices and disposable ENDS/ENNDS products are typically higher than traditional cigarettes. There exists a notable inverse correlation between ENDS/ENNDS sales and cigarette prices. When cigarette prices are elevated, it often leads to an upsurge in ENDS/ENNDS sales (Huang et al., 2014). High cigarette prices seem to drive an increased inclination toward adopting e-cigarettes and similar products.

### Emerging Concerns and Criticisms

Recent scientific literature has raised several noteworthy concerns and criticisms regarding products like ENDS/ENNDS and HTPs. In essence, these are novel products that both foster nicotine addiction and perpetuate existing nicotine dependencies. They represent a means of cultivating nicotine addiction while sidestepping restrictions on tobacco sales to minors. Furthermore, they can act as a transitional step towards tobacco usage and even other addictive substances, such as cannabis. Despite smoking bans in social settings, they sustain addiction by satisfying the need for nicotine, thereby undermining anti-tobacco efforts within society (Schraufnagel, 2015; Leventhal et al., 2015; Giroud et al., 2015).

A substantial debate surrounds the question of whether the increasing use of ENDS/ENNDS among non-smokers serves as a precursor to smoking. Longitudinal studies currently available indicate that the utilization of ENDS/ENNDS by young individuals who have never smoked before at least doubles the likelihood of them initiating smoking (WHO, 2016; Gornall, 2015; Forrester, 2015; Ordonez et al., 2015; Chatham-Stephens et al., 2014; Primack et al., 2015; Leventhal et al., 2015).

A meta-analysis, for instance, reveals that individuals aged 14 to 30 who use e-cigarettes are more prone to initiate smoking compared to their non-e-cigarette using counterparts (Soneji et al., 2017). Additionally, multiple studies corroborate this finding (East et al., 2018; O'Brien, 2021).

E-cigarette use has also been linked to heightened consumption of marijuana, stimulants, and poly-substances (Bentivegna et al., 2019). In a cohort study involving 9,828 adolescents, the rate of e-cigarette use in the first year following initiation was associated with a twofold increase in cannabis initiation (Sun et al.,

2022). Another study involving 20,675 students found that e-cigarette users were three times more likely to use cannabis compared to their peers (Trivers et al., 2018). In a separate study, this ratio was nearly four times higher (Fadus et al., 2019).

### Health Implications

The long-term safety of these products remains shrouded in uncertainty, with questions lingering about the extent and nature of user exposure. Although the levels of carcinogenic and toxic substances in these products are lower than in traditional cigarettes (Grana, R., 2014), their consumption varies widely among individuals and product types. Furthermore, concurrent use with conventional cigarettes can amplify the risks associated with nicotine. Similar to smoking, passive effects from these products are conceivable, and in some instances, tobacco can be added to certain products (Gornall, 2015).

E-cigarettes are by no means benign and have been associated with an escalating number of poisoning cases in tandem with their market growth (Forrester, 2015; Ordonez et al., 2015). The Centers for Disease Control and Prevention (CDC) reported a noteworthy shift in poisoning cases, with incidents related to e-cigarettes surging from 0.3% to 41% of total cases between 2010 and 2014. It is noteworthy that while 94.9% of tobacco-related poisonings involve children aged 0 – 5, only 51.1% of e-cigarette poisonings fall within this age group, with 42% affecting individuals over 20 years old. The occurrence of adverse events related to e-cigarettes significantly outpaced those associated with traditional cigarettes (57.8% vs. 36%;  $P < 0.001$ ) (Chatham-Stephens et al., 2014). Notably, some e-cigarettes contain nicotine concentrations as high as 100 mg/mL, while the lethal dose of nicotine is estimated to be 10 – 60 mg. Salivary cotinine levels in e-cigarette users were measured at 322 ng/mL, significantly exceeding the levels in smokers (113 ng/mL) and non-smokers (2.4 ng/mL) (Etter & Bullen, 2011). Data from the CDC reveals that among 238 cases of acute harm related to e-cigarettes, 53% were attributed to traumatic incidents, such as e-cigarette explosions or burns, while 24% were respiratory events, and 12% involved poisoning (Tzortzi et al., 2020).

Aside from their acute toxicity and potent addictive qualities, nicotine may exert adverse effects on cardiovascular health, particularly when used during pregnancy. Although not inherently carcinogenic, nicotine can act as a “tumor promoter” and appears to play a role in neurodegeneration. Exposure to nicotine during fetal development and adolescence can lead to long-term consequences for brain development, potentially resulting in learning disabilities and anxiety disorders. Sufficient evidence warrants warnings against the use of ENDS and nicotine by children, adolescents, pregnant women, and women of reproductive age (WHO 2016, Kutlu & Gould, 2015; Yuan et al., 2015; Hall et al., 2015).

Propylene glycol, used as a base in e-liquids, can irritate the lungs and other organs. E-cigarettes produce significantly finer particles compared to traditional cigarettes, potentially leading to higher lung deposition (WHO 2016).

The health impacts of flavorings used in e-liquids remain inadequately researched. Heated and inhaled flavors like popcorn and cinnamon are particularly concerning, as flavorings can act as irritants, potentially causing airway inflammation and cytotoxic

effects (WHO 2016, Kreiss et al., 2022; Behar et al., 2014; Tierney et al., 2015; Lerner et al., 2015; Cervellati et al., 2014).

Literature reviews have linked e-cigarette use to harmful immunological effects, including the formation of pro-inflammatory cytokines and oxidative stress, which may raise the risk of immunological and infectious lung diseases, such as asthma and chronic obstructive pulmonary disease (COPD) (Seok GH, et al. 2023).

E-cigarette use has been correlated with an elevated risk of respiratory diseases, such as COPD, emphysema, chronic bronchitis, and asthma, independent of smoking (Xie et al., 2020). In fact, e-cigarette users were found to have a 2.1-fold higher likelihood of obstructive pulmonary dysfunction (Joshi et al., 2021). CT studies have provided evidence of impaired lung gas exchange associated with e-cigarette use (Javelle, 2020). In one study, e-cigarette users were associated with higher rates of coronary heart disease, arrhythmias, chest pain, and cardiovascular symptoms (Espinoza-Derout, J., et.al, 2022)

Among adolescents, e-cigarette use has been associated with depression, suicidal ideation, and suicide attempts, with significantly higher rates of suicide attempts among e-cigarette users compared to non-users (Espinoza-Derout et al., 2022).

In summary, ENDS/ENNDS are far from harmless, and their long-term use is anticipated to heighten the risk of chronic obstructive pulmonary disease, lung cancer, and potentially cardiovascular disease, along with several other conditions typically linked to smoking (WHO 2016; Britton et al., 2016).

### Immediate Physiological Impact

E-cigarettes induce acute physiological responses in users. Following use, they elicit a rise in diastolic blood pressure, an increase in heart rate, and a reduction in exhaled nitric oxide. Furthermore, studies have demonstrated that e-cigarette usage leads to elevated respiratory impedance, which reflects peripheral airway resistance and contributes to increased overall airway resistance (Orellana-Barrios et al., 2015).

Extensive research has probed the effects of e-cigarettes on lung function. Findings indicate that these devices exhibit cytotoxicity towards respiratory tract epithelial cells, resulting in decreased cell viability and heightened airway inflammation. Additionally, e-cigarette use has been associated with an increased susceptibility to respiratory infections and an exacerbation of the virulence of *Staphylococcus aureus*. Furthermore, cytotoxicity has been observed in airway fibroblasts, causing alterations in their morphology. In response to e-cigarette use, the airways exhibit elevated inflammatory cell counts, greater cytokine release, and increased susceptibility to infections. Moreover, endothelial cells experience diminished viability and electrical resistance (Rowell & Tarran, 2015).

Research has shown that within just 5 min of e-cigarette use by healthy smokers, airway resistance, impedance, and oxidative stress all surge (Tarran et al., 2012).

Studies conducted on rat cardiac myoblast cell cultures have revealed that various sweeteners found in the refill solutions of five different e-cigarette manufacturers exhibit cytotoxic

properties (Farsalinos et al., 2013). Furthermore, clinical trials have confirmed that e-cigarette use results in increased systolic and diastolic blood pressure, as well as a heightened heart rate (Yan & D’Ruiz, 2015).

Experimental models have demonstrated that e-cigarettes have detrimental effects on cell viability, leading to decreased clonogenic survival and increased rates of apoptosis and necrosis (Yu et al. 2016).

It is also well-documented that e-cigarette batteries pose risks, as they have been known to explode, causing severe burns, chemical exposure, and physical trauma (<https://onedio.com/haber/elektronik-sigara-patladi-boynu-kirildi-629697>).

### EVALI (E-cigarette, or Vaping, Product Use-Associated Lung Injury) ([https://www.cdc.gov/tobacco/basic\\_information/e-cigarettes/severe-lung-disease/healthcare-providers/index.html](https://www.cdc.gov/tobacco/basic_information/e-cigarettes/severe-lung-disease/healthcare-providers/index.html))

EVALI is a respiratory illness that manifests acutely or subacutely in individuals using e-cigarettes, sometimes progressing to respiratory failure.

According to the report from the Centers for Disease Control and Prevention (CDC), the first case in the USA was identified on March 31, 2019. By February 18, 2020, a total of 2807 cases of hospitalized individuals with e-cigarette or vaping product use-related lung injury (EVALI) or associated fatalities had been reported across all 50 states, the District of Columbia, and two US territories. Tragically, there were 68 confirmed deaths. The median age of affected patients was 24 years, with an age range spanning from 13 to 85 years. Among the patients who succumbed to the illness, the mean age was 49.5 years, with ages ranging from 15 to 75, and 66% of them were male. Among the 2022 hospitalized patients with available data on substance use, 82% reported using products containing THC, while 33% reported exclusive use of products containing tetrahydrocannabinol (THC). Additionally, 57% of the patients reported using products containing nicotine, with 14% solely using nicotine-containing products.

The available data strongly suggest that products containing THC play a significant role in this epidemic. However, the specific chemical or chemicals responsible for causing EVALI have not yet been definitively identified, and the possibility that products containing nicotine may contribute to this condition has not been ruled out.

The clinical presentation of EVALI typically begins with respiratory symptoms, including cough, chest pain, and shortness of breath, which was experienced by 95% of patients (323/339). Gastrointestinal symptoms often accompany these respiratory issues, with 77% of patients (262/339) reporting abdominal pain, nausea, vomiting, and diarrhea. Interestingly, in some cases, gastrointestinal symptoms precede respiratory symptoms. Moreover, 85% of patients presented with general symptoms such as fever, chills, and weight loss.

Upon examination, tachycardia was observed in 55% of patients (169/310), tachypnea in 45% (77/172), and desaturation (oxygen saturation <95%) in 57% (143/253). Auscultation of the chest usually yielded normal findings.

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Radiological assessments, including chest x-rays, often reveal pulmonary infiltrates. Thoracic CT scans frequently exhibit bilateral ground glass opacities, although radiography can be positive even in cases where no symptoms are evident. However, it is important to note that chest x-ray and CT findings may not always correlate with clinical symptoms. Severe or deteriorating disease can be accompanied by complications such as pneumothorax or pneumomediastinum, as well as conditions like pneumonia or pulmonary embolism.

Thoracic CT scans have reported a range of findings, including consolidation, diffuse ground glass opacities, confluent ground glass opacities, mosaic attenuation, bronchial dilatation, traction bronchiectasis, septal thickenings and fibrosis, peripheral reticulation, and pleural effusion.

Pathologically, EVALI is characterized by airway-focused acute lung injury. Severe bronchiolitis is commonly observed, with marked mucosal edema, alterations in bronchiolar epithelium, and peribronchiolar organization. Accumulation of foamy or vacuum macrophages in the peribronchiolar air spaces, along with pneumocyte vacuolization, is evident. In severe cases, extensive alveolar damage and hyaline membranes are observed (Krishnasamy et al. 2020).

Confirmed cases of EVALI are defined as those involving e-cigarette (vaping) use within 90 days before symptom onset, infiltrates on chest x-ray/CT, an absence of signs of infection (determined through various tests including respiratory viral panels, influenza polymerase chain reaction (PCR), *Streptococcus pneumoniae*, urine antigen tests for *Legionella*, sputum, bronchoalveolar lavage, blood culture, and human immunodeficiency virus testing), and no medical records indicating alternative diagnoses such as cardiac, rheumatological, or neoplastic diseases.

Possible cases of EVALI involve e-cigarette (vaping) use within 90 days before symptom onset, infiltrates on chest x-ray/CT, evidence of infection detected by culture or PCR, although the clinician believes that infection is not the sole cause of the respiratory illness or infection testing has not been performed. Similar to confirmed cases, possible cases have no medical records suggesting alternative diagnoses like cardiac, rheumatological, or neoplastic diseases.

Patients presenting with respiratory distress, reduced pulmonary reserve, oxygen saturation below 95%, or comorbidities should be hospitalized. Patients with milder suspected lung injury may receive outpatient care but should be scheduled for follow-up within 24 – 48 h, ensuring normal oxygen saturation, and provided with adequate care and social support. Corticosteroids can be considered as part of the treatment regimen. Early antibiotic therapy to cover potential causes of advanced pneumonia in the community is strongly recommended, and antiviral treatment should be considered in cases of suspected influenza.

### Impact on Smoking Cessation

The influence of e-cigarettes on smoking cessation is a topic that has generated both supporting and opposing research findings.

Numerous studies examining the effect of e-cigarettes on smoking cessation have primarily focused on short-term follow-ups,

lacking data on sustained long-term quit rates (Yasmeen et al., 2019). Some smoking cessation trials involving e-cigarettes have suggested that these devices do not surpass the effectiveness of nicotine replacement therapy (NRT), and in fact, e-cigarette use is often associated with lower rates of smoking cessation (Grana et al., 2014 Orr et al., 2014). Interestingly, it is worth noting that studies reporting positive outcomes regarding smoking cessation and e-cigarettes are frequently linked, either directly or indirectly, to the support of tobacco companies (Bullen et al., 2013; Kosmider & Anastasi, 2016). This association with commercial and other vested interests in the tobacco and ENDS/ENNDS industry raises concerns. In an analysis of 105 studies examining fluid and emission compositions, it was discovered that 30% of these studies had authors who received funding from the tobacco or ENDS/ENNDS industry (WHO, 2016).

A meta-analysis revealed that e-cigarette use was associated with reduced rates of smoking cessation (28%; odds ratio: 0.72, 95% CI 0.57 – 0.91) in both longitudinal and cross-sectional studies (Xie et al., 2018). Another meta-analysis, with a particular focus on e-cigarettes containing nicotine, suggested that these products were more effective than NRT in facilitating smoking cessation and reduction (Vanderkam et al., 2022).

A Cochrane systematic review encompassing 16,000 smokers found that nicotine-containing e-cigarettes were linked to higher quit rates compared to NRT and non-nicotine e-cigarettes (Hanewinkel, R., et al. 2021). However, it is crucial to note that the use of e-cigarettes did not result in a decrease in nicotine addiction, often leading to dual use. Another systematic review supported the idea that e-cigarettes were more effective for smoking cessation than nicotine replacement therapy and behavior modification treatments (Hanewinkel et al., 2022). Nevertheless, it should be emphasized that the efficacy of e-cigarettes in smoking cessation is contingent on a structured therapeutic protocol and professional counseling (Jeremy et al., 2023; Hajek et al., 2019; Hartmann-Boyce et al., 2021; Wang et al., 2021).

Contrastingly, one meta-analysis did not find a significant increase in smoking cessation among e-cigarette users in observational studies (Wang, R. J., et al. 2021).

Smoking cessation therapy targets nicotine addiction. E-cigarettes do not eliminate nicotine addiction; rather, they perpetuate it. E-cigarettes are intrinsically addictive products and should not be considered therapeutic drugs.

Psychological dependence plays a substantial role in smoking addiction. Behavioral treatment methods are integral to smoking cessation, requiring individuals to change behaviors associated with smoking, which can include disposing of items such as lighters and ashtrays and modifying habits like consuming tea and coffee. However, e-cigarettes perpetuate smoking behavior, reinforcing nicotine addiction.

The scientific evidence on the effectiveness of ENDS/ENNDS in smoking cessation is limited. While some studies suggest that ENDS use may hinder smoking cessation efforts, the quality of evidence is often very low, and the participant pool is frequently limited (McRobbie et al., 2014; GRADE Working Group, 2004; Biener & Hargraves, 2014; Brose et al., 2014).

Nicotine replacement therapy (NRT) is a recognized method for quitting smoking. However, NRT is intended for short-term use, carefully dosed, and administered under medical supervision. It is distinct from smoking and thus helps eliminate behavioral addiction. In contrast, the nicotine content and usage patterns of e-cigarettes are uncertain, and some do not contain nicotine at all. Furthermore, e-cigarettes contain numerous potentially harmful substances. Their use is typically long-term rather than temporary, and their side effects and contraindications are not well defined. E-cigarettes are not medical products designed to aid smoking cessation, and they are not supervised by medical professionals. Resembling cigarettes, e-cigarettes sustain behavioral addiction associated with smoking. Importantly, there is a lack of long-term data demonstrating that the transition from cigarettes to e-cigarettes yields the same benefits as quitting smoking altogether.

It is essential to highlight that e-cigarettes are not among the seven FDA-approved products for tobacco use treatment. The US Preventive Services Task Force has cited insufficient evidence regarding the benefits and risks of e-cigarettes in smoking cessation. The American Thoracic Society (ATS) recommends varenicline, rather than e-cigarettes, as the preferred option for smoking cessation (Kathuria, 2022).

Finally, it is crucial to differentiate between the controlled use of e-cigarettes in experimental studies to support smoking cessation and their real-world use by consumers. Relying on the results of controlled studies to promote widespread use is deceptive.

In conclusion, findings related to the impact of e-cigarettes on smoking cessation are not universally applicable. The diverse array of e-cigarette types, ingredients, doses, and mixtures available on the market precludes the generalization of results obtained from specific e-cigarette brands used in research studies.

Moreover, switching from cigarettes to e-cigarettes did not lead to improvements in lung function among individuals with pre-existing lung conditions (Polosa et al., 2016; Bowler et al., 2017). Longer-term investigations are necessary to determine whether such a transition can yield improvements in lung function, as spirometry changes can typically only be reliably detected after several years of smoking cessation (Woodruff et al., 2016).

### Dual Use

As concerns arose regarding the efficacy of e-cigarettes in helping individuals quit smoking, proponents of these products began advocating for dual use, the simultaneous use of both e-cigarettes and traditional cigarettes – as a strategy to reduce the harm associated with smoking (Polosa et al., 2011). From a business perspective, this notion is understandable, as it allows companies to profit from both products when customers use them concurrently.

A population-based study revealed that the association between e-cigarette use and respiratory symptoms, such as chronic cough, sputum production, or wheezing, was notably stronger among dual users (Hedman et al., 2018). The risk of developing respiratory conditions was found to be higher in individuals using both e-cigarettes and traditional cigarettes compared to those using either product alone (Bhatta & Glantz, 2020). Additionally, dual

users were shown to have greater exposure to toxic substances, including nitrosamines, polycyclic aromatic hydrocarbons, and volatile organic compounds, than exclusive smokers (Glantz et al., 2018). Although some contradictory findings exist (Hartmann-Boyce et al., 2023), current research generally indicates that dual use is as harmful as, or possibly even more harmful than, smoking alone (Pisinger & Rasmussen, 2022).

Furthermore, a study by Leventhal et al. demonstrated that dual use, often recommended to mitigate smoking-related harm, particularly among individuals with psychiatric conditions, is associated with an increase in psychiatric comorbidity (Leventhal et al., 2016).

### Passive Influence

Compared to homes without smokers, households using e-cigarettes have significantly higher airborne nicotine levels. Moreover, cotinine levels in non-smoking individuals residing in these households increase significantly due to passive exposure to e-cigarette aerosols (Leventhal et al., 2016). In homes where e-cigarettes are used, airborne nicotine levels are approximately 5.7 times higher than in homes with traditional cigarette smoking. However, biomarker levels (urine and salivary cotinine) in non-smoker volunteers exposed to e-cigarettes are similar to those exposed to traditional cigarettes. This passive exposure results in non-smokers absorbing nicotine (Ballbè et al., 2014).

Passive exposure to e-cigarettes is not limited to nicotine alone. Studies have detected the presence of toxins such as formaldehyde, acetaldehyde, isoprene, acetic acid, 2-butanodione, acetone, propanol, propylene glycol, diacetyl (from flavorings), nicotine, and traces of apple oil (3-methylbutyl-3-methylbutanoate) in e-cigarette smoking rooms, albeit at lower levels compared to traditional smoking rooms (Flouris et al., 2013). Another study conducted in a cafe where three people used e-cigarettes observed elevated levels of carcinogens, including 1,2-propanediol, glycerin, aluminum, and seven polycyclic aromatic hydrocarbons, in the ambient air (Schripp et al., 2013).

Although there is limited research on this subject, passive aerosol (secondhand) exposure from ENDS/ENNDS users is believed to carry the potential for adverse effects (WHO 2016; Schober et al., 2014; Hess et al., 2016). Environmental aerosol is recognized as a source of air pollution due to fine and ultrafine particles, particulate matter containing 1,2-propanediol, various volatile organic compounds, heavy metals, and nicotine. The CDC warns that exposure to e-cigarettes may lead young people to initiate smoking (source: CDC).

### Public Health Measures

The CDC (U.S. Department of Health and Human Services / Centers for Disease Control and Prevention) asserts that these products are not benign, that young people's initiation of e-cigarettes may lead to future smoking, and that e-cigarette use among young individuals is on the rise.

The World Health Organization (WHO) recommends specific measures to safeguard public health, including preventing non-smokers and youth from initiating ENDS/ENNDS use, particularly focusing on vulnerable populations. These measures also involve minimizing potential health risks for ENDS/ENNDS

**Table 1.**

*Recommendations to Protect Society from the Harmful Effects of e-cigarettes (Grana et al., 2014)*

1. **Age Restrictions Consistent with Cigarette Sales:** The sale of e-cigarettes should be restricted to individuals who are legally allowed to purchase cigarettes. Furthermore, e-cigarette sales should be prohibited in locations where traditional cigarette sales are banned.
2. **Uniform Advertising Restrictions:** Apply advertising restrictions on e-cigarettes at a level equivalent to those imposed on traditional cigarettes. This approach prevents the potential glamorization and normalization of e-cigarette use.
3. **Prevent Dual Use Promotion:** Prohibit marketing and branding practices that encourage simultaneous use of both e-cigarettes and traditional cigarettes. This discourages the practice of dual use, which may exacerbate health risks.
4. **Sugar and Alcohol Flavoring Prohibition:** Ban the use of sugar and alcoholic sweeteners and flavorings in e-cigarette products. Such additives may make these products more appealing, especially to young users.
5. **Evidence-Based Smoking Cessation Claims:** Restrict claims that suggest e-cigarettes are effective tools for smoking cessation, particularly when insufficient scientific evidence supports these assertions. This helps prevent misleading information.
6. **Establish Robust Product Regulations:** Implement comprehensive standards for the regulation and promotion of e-cigarette products. This includes rigorous testing, quality control, and transparent labeling to ensure consumer safety and awareness.

users and protecting non-users from exposure to emissions. Additionally, WHO recommends countering unsubstantiated health claims associated with ENDS/ENNDS and ensuring that tobacco control efforts guard against all commercial and other interests related to ENDS/ENNDS, including those of the tobacco industry (WHO, 2016).

The challenges in controlling the tobacco pandemic necessitate a vigilant and sensitive approach to e-cigarettes from the outset. In this context, Grana et al. (Grana et al., 2014) have outlined measures to protect society from the risks associated with e-cigarettes (Table 1).

In our country, electronic cigarettes are categorized as “tobacco products under the framework of Law No. 4207 on the Prevention and Control of Harmful Effects of Tobacco Products, irrespective of their content. Notably, no electronic cigarettes have received official licensing in our country, rendering their importation illegal.

## Conclusion

E-cigarettes have emerged as a prominent product primarily driven by the tobacco industry. Serving as a strategic lifeline for a tobacco industry facing constrained opportunities, e-cigarettes present a concerning landscape, especially in relation to youth and public health.

These devices, often marketed with an age restriction on cigarette sales, inadvertently facilitate the development of nicotine

addiction in children and young individuals. They provide a means for perpetuating nicotine dependency among smokers, given the limitations on smoking in public spaces. Furthermore, e-cigarettes function as barriers to anti-smoking efforts within society.

The tobacco industry’s promotion of e-cigarettes as smoking cessation tools redirects control efforts toward its own interests. E-cigarettes are capable of delivering potent nicotine concentrations, contributing to youth addiction and the subsequent adoption of conventional cigarettes and other addictive substances. While some research suggests that transitioning from smoking to e-cigarettes may reduce harm, additional studies are required to establish this conclusively.

Notably, the co-use of e-cigarettes and traditional cigarettes poses greater health risks than using either product in isolation. The therapeutic potential of e-cigarettes in smoking cessation is evident when utilized within a structured intervention but not as consumer commodities.

It is crucial to acknowledge that e-cigarette technology is continually evolving, making it challenging to assess their long-term health implications accurately. The allure of flavored tobacco products, particularly to the youth, remains a major concern within this landscape.

The evidence remains resolute: young individuals and those who have never smoked should refrain from initiating e-cigarette use. In the face of these complex dynamics, policymakers and public health authorities must remain vigilant and proactive in their efforts to protect the well-being of society, especially our youth, from the potential risks associated with e-cigarettes.

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## ORIGINAL ARTICLE

# Thirdhand Smoke Beliefs of Parents

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## Main Points

- Most parents do not know the concept of THS.
- Parents' beliefs about THS could play an important role in creating smoke-free homes and smoke-free cars.
- Parents who smoke are less likely to believe in the THS impact on health and its persistence in the environment.

## Abstract

Parents are responsible for protecting their children from the harmful effects of thirdhand smoke (THS). The purpose of this descriptive study was to examine parents' beliefs about third-hand smoke. Data were collected using the "Introductory Information Form" and the "Turkish Version of the Beliefs About Third-Hand Smoke Scale." The sample consisted of 895 parents living in Ankara. Data were analyzed using Mann – Whitney *U* and Kruskal – Wallis-*H* tests. Eighty-two percent of the participants did not know the concept of THS. The mean scale score of the participants was  $4.01 \pm 0.82$ . Scale score means were higher for participants who banned smoking in their homes and cars ( $p < .05$ ). The results show that most parents do not know the concept of THS. Parents' awareness should be increased to protect children from THS exposure.

**Keywords:** Parents, smoke, smoke-free policy

## Introduction

While smoking leads to the loss of lives of millions every year, passive exposure to cigarette smoke is also associated with illnesses and deaths (Tobacco Atlas, 2022). On the one hand, it is true that there is no safe level of exposure to cigarette smoke and, on the other hand, evidence that exposure does not end when the smoke goes out and that the effect continues even in the absence of cigarettes is increasing day by day (U.S. Department of Health and Human Services, 2014). After the cigarette is extinguished and the second-hand smoke disperses, thirdhand smoke (THS) is formed when the smoke residues permeate the surfaces and mix with the air again.

Since THS cannot be completely eliminated by ventilation or wiping and can remain on surfaces for weeks, individuals can be exposed to THS through inhalation, swallowing, and the skin (Becquemin

et al., 2010). Thirdhand smoke particles can accumulate on hands, clothes, hair, carpets, curtains, surfaces, toys, and even the hair and fur of pets (Ferrante et al., 2013). It has also been proven that residual nicotine on surfaces can react with nitrous acid in the environment to form carcinogenic substances that are not found in freshly emitted cigarette smoke (Sleiman et al., 2010). Evidence shows that THS exposure can damage human cells and DNA and is associated with short- and long-term health problems such as asthma and cancer (Hang et al., 2013; 2018).

Although the long-term effects of THS exposure are not yet fully known, it can pose a serious health threat to children at the beginning of their lives. Along with physiological factors such as children's high respiratory rate, underdeveloped immune systems, and low metabolic capacity, the fact that they spend most of their time at home and are in frequent

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contact with surfaces, and are vulnerable increases the risk of THS exposure (Ferrante et al., 2013; Hang et al., 2018; Díez-Izquierdo et al., 2018). Parents' beliefs about THS gain importance so that they can protect their children from this exposure and support them. In previous studies conducted with parents, it was found that parents' beliefs about THS exposure were associated with smoking ban practices in their homes and cars and smoking cessation attempts (Drehmer et al., 2014; Shehab and Ziyab, 2021; Xie et al., 2021). Accordingly, it is important to identify parents' THS beliefs. No study has been found in Türkiye that reveals parents' THS beliefs. Therefore, our study aimed to detect parents' beliefs about thirdhand smoke and related factors.

## Material and Methods

This study was conducted descriptively.

### Sample

One primary school was randomly selected from the list of primary schools in three districts of Ankara, which were chosen considering the difference in socioeconomic status among the central districts. Parents of a total of 2800 students studying in three selected primary schools formed the sample of the research. One of the parents was asked to respond to the surveys sent to the family through the students. The research was completed with 895 parents who responded to the surveys (Table 1).

### Measures

"Introductory Information Form" and "Turkish Version of the Beliefs About Thirdhand Smoke Scale" were used to collect the data for the study.

#### Introductory Information Form

It was created by the researcher, using the literature, in order to question the descriptive characteristics of the parents participating in the study and their knowledge about environmental cigarette smoke. In this form, which consists of a total of 20 questions, introductory characteristics such as the parents' age, gender, marital status, education status, employment status, perceived income level, homeownership status, how many children they have, and the age groups of their children were asked. In addition, individuals' smoking status, smokers' thoughts about quitting smoking, the number of people smoking in their homes, and their knowledge of the concept of thirdhand smoke were questioned.

#### Turkish Version of the Beliefs About Thirdhand Smoke Scale

To measure the participants' beliefs about thirdhand smoke, the scale called "Beliefs About Thirdhand Smoke Scale (BATHS)" developed by Haardörfer et al. in 2017 was used (Haardörfer et al., 2017). The Turkish validity and reliability study of the scale was conducted (Odacı and Kitiş, 2021). The scale consists of 9 items in total. It consists of two factors: "THS Persistence in the Environment" and "THS Impact on Health". Cronbach's alpha value of the scale is 0.83. In the scale scoring using a five-point Likert, it is scored as 5: totally agree, 4: agree, 3: not sure, 2: disagree, 1: totally disagree. The score is obtained by dividing the total score by the number of items. The highest score on the scale is 5 and the lowest score is 1. As the score from the scale approaches 5, it is interpreted as the individual believing in the effects of THS on the environment and health, and as it

approaches 1, it means that the individual does not believe in the effects of THS on the environment and health.

### Collection of Research Data

The research was conducted between December and February of the 2019 – 2020 academic year. In cooperation with teachers at schools, informed consent forms and surveys were sent to parents through students. Parents returned the completed survey form through the student. One single parent from each family participated in the research.

The study was approved by the Gazi University Ethics Commission (Date: April 5, 2019; no. 2019-055) and permission from the Ministry of National Education was obtained for the study. The study was executed in accordance with the Declaration of Helsinki.

### Statistical Methods

Data were analyzed with the IBM SPSS Statistics 17 (SPSS Inc.; Chicago, IL, USA) package program. Frequency tables and descriptive statistics were used to interpret descriptive findings. The distribution property of the data set was evaluated by means of Kolmogorov – Smirnov and Shapiro – Wilk tests. Since it was determined that the data did not comply with normal distribution, non-parametric Mann – Whitney *U* and Kruskal – Wallis-*H* tests were employed. If a significant difference was detected between the groups in the Kruskal – Wallis-*H* test, Post-Hoc (Multiple Comparison) tests were used to determine which groups caused the difference. The relationship between variables was evaluated with the Pearson correlation coefficient. Statistical significance was accepted as  $p < .05$ .

## Results

The average age of the parents participating in the research is 38, with 72.5% of them being mothers and most of them (95.3%) being married. Most of the participating mothers and fathers have a high school education or higher. More than half of the parents (59.9%) had a middle-income level. Parents with two children were in the majority (Table 1).

Among the parents who participated in the study 30.7% were smokers. Among parents who were current smokers, 41.5% smoked an average of 5 – 10 cigarettes per day. Almost 70% of parents reported that they planned to quit smoking now or in the future. More than half of the participants (53.5%) had at least one smoker at home. While 14.2% of parents reported that their children had been exposed to cigarette smoke at home in the last 2 weeks. In addition, 23% of parents reported that their child had been exposed to cigarette smoke outside the home in the last 2 weeks. More than half of parents (57.8%) reported that a strict smoking ban in their homes. Additionally, 75.8% of the car-owning parents stated that there was no smoking in their cars (Table 2). It was observed that most of the parents (82.3%) did not know the concept of THS. When the scale scores were examined, it was seen that the parents had a very good level of belief in THS ( $4.01 \pm 0.82$ ) and THS impact on health ( $4.24 \pm 0.84$ ), and a good level of belief in the THS persistence in the environment ( $3.83 \pm 0.88$ ) (Table 3).

When the relationship between descriptive information and scale scores was examined, it was observed that the scores received from the scale differed according to the educational background of the parents. It was determined that parents with undergraduate or

graduate degrees had higher scale total score ( $p = .011$ ), “Effect of THS on Health” sub-dimension ( $p = .005$ ), and “Persistence of THS in the Environment” sub-dimension ( $p = .002$ ) than others (Table 3).

The total score of the beliefs scale on THS ( $p = .001$ ), the “Effect of THS on Health” sub-dimension ( $p = .015$ ), and the “Persistence of THS in the Environment” sub-dimension ( $p = .001$ ) scores of smoking parents were lower than those of non-smoking parents or parents who quit smoking. It was found that the “Effect of THS on Health” subscale scores of parents who were considering quitting smoking were higher than those of parents who were not considering quitting ( $p = .049$ ) (Table 3).

**Table 1.**  
*Introductory Characteristics of the Parents Participating in the Research*

|                                            | Number | %    |
|--------------------------------------------|--------|------|
| Age                                        |        |      |
| $\bar{x} = 38.05 \pm 5.96$ min-max=25 – 61 |        |      |
| Gender                                     |        |      |
| Female/Mother                              | 649    | 72.5 |
| Male/Father                                | 246    | 27.5 |
| Marital status                             |        |      |
| Single                                     | 42     | 4.7  |
| Married                                    | 853    | 95.3 |
| Education status                           |        |      |
| Illiterate                                 | 3      | 0.3  |
| Did not finish school                      | 2      | 0.2  |
| Primary school graduate                    | 72     | 8    |
| Secondary school graduate                  | 117    | 13.1 |
| High school graduate                       | 288    | 32.2 |
| University graduate                        | 360    | 40.2 |
| With master’s degree/PhD degree            | 53     | 5.9  |
| Employment status                          |        |      |
| Employed                                   | 494    | 55.2 |
| Not working                                | 358    | 40   |
| Retired                                    | 25     | 2.8  |
| Unemployed                                 | 18     | 2    |
| Perceived income status                    |        |      |
| Income less than expenses                  | 191    | 21.3 |
| Income equals expenses                     | 536    | 59.9 |
| Income exceeds expenses                    | 168    | 18.8 |
| Number of children                         |        |      |
| 1                                          | 172    | 19.2 |
| 2                                          | 506    | 56.5 |
| 3                                          | 167    | 18.7 |
| 4 or more                                  | 50     | 5.6  |
| Smoking status                             |        |      |
| Smoking                                    | 275    | 30.7 |
| Quit smoking                               | 142    | 15.9 |
| Never smoked                               | 478    | 53.4 |

The scale total score ( $p = .006$ ), “Effect of THS on Health” sub-dimension ( $p = .009$ ), and “Persistence of THS in the Environment” sub-dimension ( $p = .027$ ) scores of parents who did not allow smoking at home were seen to be higher than others. Similarly, it was observed that parents who did not allow smoking in their cars had higher scale total scores ( $p = .001$ ) and both subscale scores than others ( $p = .001$ ;  $p = .001$ ). In addition, it was found that the scale total score ( $p = .000$ ), “Effect of THS on Health” sub-dimension ( $p = .001$ ), and “Persistence of THS in the Environment” sub-dimension ( $p = .001$ ) scores of parents who knew the concept of THS were higher than those who did not know (Table 3).

## Discussion

Children’s exposure to cigarette smoke is closely related to parental smoking. It was observed that three out of every ten

**Table 2.**  
*Characteristics of the Parents Participating in the Study Regarding Cigarette Smoke Exposure at Home*

| Characteristics                                                        | Number | %    |
|------------------------------------------------------------------------|--------|------|
| Number of people smoking at home                                       |        |      |
| No body                                                                | 416    | 46.5 |
| 1 person                                                               | 328    | 36.6 |
| 2 people                                                               | 146    | 16.3 |
| 3 people or more                                                       | 5      | 0.6  |
| Has anyone smoked at home near the child in the last 2 weeks?          |        |      |
| Yes                                                                    | 127    | 14.2 |
| No                                                                     | 750    | 83.8 |
| Do not know                                                            | 18     | 2    |
| Has anyone smoked near the child outside the home in the last 2 weeks? |        |      |
| Yes                                                                    | 206    | 23   |
| No                                                                     | 584    | 65.3 |
| Do not know                                                            | 105    | 11.7 |
| Are there rules against smoking in your home?                          |        |      |
| Strict rules*                                                          | 517    | 57.8 |
| Partial rules**                                                        | 349    | 39   |
| No rule                                                                | 18     | 2    |
| Do not know                                                            | 11     | 1.2  |
| Are there rules about smoking in your car?***                          |        |      |
| Strict rules                                                           | 533    | 75.8 |
| Partial rules                                                          | 146    | 20.8 |
| No rule                                                                | 7      | 1    |
| Do not know                                                            | 17     | 2.4  |

Note: \*Smoking is prohibited in all parts of the house.

\*\*Smoking is prohibited in certain parts of the house.

\*\*\*78.5% of the participants have a car.

**Table 3.**  
Relationship between BATHS Total and Sub-Dimension Mean Scores and Some Variables

|                                            | BATHS total                                                                                                                                                                              |      |      |           | THS Impact on Health |      |      |          | THS Persistence in the Environment |      |      |          |
|--------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------|------|-----------|----------------------|------|------|----------|------------------------------------|------|------|----------|
|                                            | n                                                                                                                                                                                        | Mean | SD   | Min - Max | n                    | Mean | DS   | Min-Max  | n                                  | Mean | SD   | Min-Max  |
| Education Status                           |                                                                                                                                                                                          |      |      |           |                      |      |      |          |                                    |      |      |          |
| Primary school graduate                    | 77                                                                                                                                                                                       | 4.07 | 1.05 | 1 - 5     | 77                   | 3.62 | 1.01 | 1 - 5    | 77                                 | 3.82 | .96  | 1 - 5    |
| Secondary school graduate                  | 117                                                                                                                                                                                      | 4.04 | 1.03 | 1 - 5     | 117                  | 3.66 | .98  | 1 - 5    | 117                                | 3.83 | .95  | 1 - 5    |
| High school graduate                       | 288                                                                                                                                                                                      | 4.18 | .89  | 1 - 5     | 288                  | 3.76 | .92  | 1 - 5    | 288                                | 3.95 | .86  | 1 - 5    |
| University graduate                        | 360                                                                                                                                                                                      | 4.37 | .69  | 1 - 5     | 360                  | 3.96 | .80  | 1 - 5    | 360                                | 4.14 | .71  | 1 - 5    |
| With Master's /PhD degree                  | 53                                                                                                                                                                                       | 4.40 | .63  | 3 - 5     | 53                   | 4.03 | .78  | 2 - 5    | 53                                 | 4.19 | .67  | 2 - 5    |
| Kruskal Wallis $\chi^2$ ; p; difference    | 13.042; p = .011*<br>Difference; 1-4; 2-4; 3-4; 1-5; 2-5; 3-5<br>14.97; p = .005* Difference; 1-4; 2-4; 3-4; 1-5; 2-5; 3-5<br>16.551; p = .002* Difference; 1-4; 2-4; 3-4; 1-5; 2-5; 3-5 |      |      |           |                      |      |      |          |                                    |      |      |          |
| Smoking status                             |                                                                                                                                                                                          |      |      |           |                      |      |      |          |                                    |      |      |          |
| Current user                               | 275                                                                                                                                                                                      | 3.90 | .78  | 1 - 5     | 275                  | 4.16 | .82  | 1 - 5    | 275                                | 3.70 | .85  | 1 - 5    |
| Ex-user                                    | 142                                                                                                                                                                                      | 4.06 | .74  | 1 - 5     | 142                  | 4.29 | .81  | 1 - 5    | 142                                | 3.87 | .77  | 1 - 5    |
| Life-time nonuser                          | 478                                                                                                                                                                                      | 4.07 | .86  | 1 - 5     | 478                  | 4.28 | .87  | 1 - 5    | 478                                | 3.90 | .94  | 1 - 5    |
| Kruskal Wallis $\chi^2$ ; p; difference    | 13.589; p = .001*; *Difference; 1-2; 1-3<br>8.255; p = .015** Difference; 1-2; 1-3<br>13.385; p = .001* Difference; 1-2; 1-3                                                             |      |      |           |                      |      |      |          |                                    |      |      |          |
| Current or future smoking cessation        |                                                                                                                                                                                          |      |      |           |                      |      |      |          |                                    |      |      |          |
| Consider quitting                          | 184                                                                                                                                                                                      | 3.96 | .76  | 1 - 5     | 184                  | 4.22 | .81  | 1 - 5    | 184                                | 3.77 | .82  | 1 - 5    |
| Do not consider quitting                   | 16                                                                                                                                                                                       | 3.51 | 1.00 | 1 - 5     | 16                   | 3.69 | 1.09 | 1 - 5    | 16                                 | 3.38 | 1.03 | 1 - 5    |
| Undecided                                  | 75                                                                                                                                                                                       | 3.83 | .76  | 2 - 5     | 75                   | 4.12 | .75  | 2 - 5    | 75                                 | 3.60 | .86  | 1.80 - 5 |
| Kruskal Wallis $\chi^2$ ; p; difference    | 5.388; p = .42* Difference; 1-2<br>5.219; p = .049; Difference; 1-2<br>4.078; p = .13                                                                                                    |      |      |           |                      |      |      |          |                                    |      |      |          |
| Smoking rules at home                      |                                                                                                                                                                                          |      |      |           |                      |      |      |          |                                    |      |      |          |
| Strict rules                               | 517                                                                                                                                                                                      | 4.08 | .80  | 1 - 5     | 517                  | 4.31 | .83  | 1 - 5    | 517                                | 3.90 | .87  | 1 - 5    |
| Partial rules                              | 349                                                                                                                                                                                      | 3.94 | .84  | 1 - 5     | 349                  | 4.17 | .87  | 1 - 5    | 349                                | 3.75 | .90  | 1 - 5    |
| No rule                                    | 18                                                                                                                                                                                       | 3.80 | .74  | 2.33 - 5  | 18                   | 4.13 | .67  | 2.50 - 5 | 18                                 | 3.54 | .95  | 1.60 - 5 |
| Do not know                                | 11                                                                                                                                                                                       | 3.71 | 1.04 | 1.78 - 5  | 11                   | 3.82 | .96  | 1.75 - 5 | 11                                 | 3.62 | 1.16 | 1.80 - 5 |
| Kruskal Wallis $\chi^2$ ; p; difference    | 12.464; p = .006*; * Difference; 1-2; 1-3; 1-4<br>11.502; p = .009* Difference; 1-2; 1-3; 1-4<br>9.216; p = .027* Difference; 1-2; 1-3                                                   |      |      |           |                      |      |      |          |                                    |      |      |          |
| Smoking rules in the car                   |                                                                                                                                                                                          |      |      |           |                      |      |      |          |                                    |      |      |          |
| Strict rules                               | 533                                                                                                                                                                                      | 4.12 | .77  | 1 - 5     | 533                  | 4.33 | .78  | 1 - 5    | 533                                | 3.95 | .83  | 1 - 5    |
| Smoking is sometimes allowed in the car    | 70                                                                                                                                                                                       | 3.92 | .76  | 1.89 - 5  | 70                   | 4.16 | .78  | 1 - 5    | 70                                 | 3.72 | .84  | 1.80 - 5 |
| Smoking is allowed if the windows are open | 76                                                                                                                                                                                       | 3.82 | .66  | 2.22 - 5  | 76                   | 4.15 | .68  | 1.75 - 5 | 76                                 | 3.55 | .79  | 1.80 - 5 |
| No rule                                    | 7                                                                                                                                                                                        | 3.13 | 1.69 | 1 - 5     | 7                    | 3.25 | 1.75 | 1 - 5    | 7                                  | 3.03 | 1.71 | 1 - 5    |
| Do not know                                | 17                                                                                                                                                                                       | 3.63 | 1.07 | 1 - 5     | 17                   | 3.82 | 1.16 | 1 - 5    | 17                                 | 3.47 | 1.06 | 1 - 5    |
| Kruskal Wallis $\chi^2$ ; p; difference    | 24.538; p = .001* Difference; 1-3; 1-4; 1-5<br>17.343; p = .001* Difference; 1-4; 2-4; 3-4; 5-4<br>24.538; p = .001* Difference; 1-3; 1-4; 1-5                                           |      |      |           |                      |      |      |          |                                    |      |      |          |
| Knowing the THS Concept before             |                                                                                                                                                                                          |      |      |           |                      |      |      |          |                                    |      |      |          |
| Yes                                        | 158                                                                                                                                                                                      | 4.30 | .61  | 2 - 5     | 158                  | 4.48 | .58  | 2 - 5    | 158                                | 4.16 | .70  | 2 - 5    |
| No                                         | 737                                                                                                                                                                                      | 3.95 | .85  | 1 - 5     | 737                  | 4.19 | .88  | 1 - 5    | 737                                | 3.76 | .91  | 1 - 5    |
| Mann - Whitney U test Z value ;p           | -4.736; p = .000*<br>-3.59; p = .001*<br>-5.125; p = .001*                                                                                                                               |      |      |           |                      |      |      |          |                                    |      |      |          |

Note: \* indicates statistical significance.

parents participating in our study smoked. This rate is similar to the frequency determined in the Global Adult Tobacco Survey in Türkiye (31.6%) (GATS, 2016). The implementation of the indoor smoking ban has created awareness in society to prevent second-hand smoke. However, since homes and cars are private property, rules regarding smoking depend on personal preferences. Smoking bans in these areas where children spend most of their time are of great importance in reducing exposure. Our research results show that at least one family member smokes in more than half of the houses with children. In addition, it has been determined that one in every seven children has been directly exposed to second-hand smoke in the home environment in the last 2 weeks. Direct second-hand smoke exposure can be prevented by not smoking near children. However, THS exposure can occur by ingesting particles that settle on surfaces in the body through various means, even if there is no active burning cigarette in the environment. Since THS particles can remain on surfaces for weeks and cannot be completely removed from the environment by ventilation or wiping, the only way to prevent exposure is to create completely smoke-free environments (Ferrante et al., 2013; Hang et al., 2018; Díez-Izquierdo et al., 2018). Smoking only in some parts of the house, such as the kitchen and balcony, is not sufficient to prevent THS exposure because studies have proven that THS particles can also be carried by hand (Northrup, 2019). Approximately 40% of the parents who participated in our research allow smoking in some parts of their homes, although not everywhere. This rate shows that we need to make efforts to create smoke-free homes.

Our study has revealed that ¼ of the parents allowed smoking in their cars. This is important as it shows that children are exposed to second-hand and thirdhand smoke in areas where they are expected to be safest together with their families. In the studies of Nabi-Burza et al. (2012) and Sendzik et al. (2009), it was reported that half of the parents did not have a smoking ban in their vehicles. Another study conducted in Türkiye found that approximately one-third of smoking parents smoked in their cars, but most of these parents did not allow smoking when there were children in the car (Akçay and Özcebe, 2018). The cigarette smoke in cars can reach dangerous levels even under ventilation conditions (windows open, air conditioner running, etc.). It is envisaged that informing parents about the permanence of THS in the environment may enable them to implement a smoking ban in their cars. What is more, our study showed that parents who implemented a complete smoking ban at home and in the car had higher THS beliefs. This result shows that creating smoke-free homes and cars is possible if parents believe in the health effects of THS and its permanence in the environment.

Parents' smoking at home and in the car paves the way for their guests to smoke as well. In our study, some of the non-smoking families (11%) reported that their children were exposed to second-hand smoke at home in the last 2 weeks. This suggests that in some houses, guests are allowed to smoke even though smoking is not permitted. In two different studies conducted in Türkiye (Dülger, 2017; Topçu et al., 2017), it was reported that more than half of the participants allowed their guests to smoke in their homes. This situation is important in terms of estimating the extent of children's indoor THS exposure and showing the necessity of creating smoke-free homes.

THS is a less well-known condition than second-hand cigarette smoke. In Winickoff et al.'s (2009) study, almost all participants (93%) agreed that second-hand smoke is harmful to children's health, while fewer (61%) agreed that THS exposure is harmful to children's health. Roberts et al. (2017) emphasized that adults' awareness of the dangers posed by tertiary exposure to cigarette smoke is not sufficient. In a study conducted in Spain with parents of children under the age of 3, it was found that approximately seven out of ten parents had not heard of the concept of THS before (Diez-Izquierdo et al., 2018). Studies show that adults have insufficient awareness of THS, but after the concept is explained to them, they believe in the health risks caused by the exposure (Diez-Izquierdo et al., 2018; Escoffery et al., 2013; Rendon et al., 2017). Although most of the participants in our study have not heard of the concept of THS before, the majority believe in the health effects of THS and its permanence in the environment (Table 3). These results suggest that parents are sensitive to children's health and that informative studies about THS can have a significant impact.

It has been shown in the literature that there is a relationship between parents' THS beliefs and their tendency to allow smoking in their vehicles and homes (Drehmer et al., 2012; Drehmer et al., 2014; Baheiraei et al., 2018; Winickoff et al., 2009). In our study, the fact that parents who stated that they implemented a complete smoking ban at home and in their private vehicles had higher beliefs about the effects of cigarette smoke on THS coincides with the literature findings in this direction (Table 3). These findings are important as they show that if parents gain knowledge and belief about the effects of THS, especially on children, their efforts to create a smoke-free environment will increase. Therefore, it can be said that while combating smoking, the negative effects of THS exposure should also be included in addition to second-hand cigarette smoke exposure.

When looking at the factors affecting THS belief, the literature shows that those with higher education levels have higher THS awareness (Baheiraei et al., 2018; Díez-Izquierdo et al., 2018; Johansson et al., 2004). In our study, the fact that the belief in THS is higher in parents with higher education levels indicates the necessity of educational activities focusing on parents to protect children from THS and the importance of prioritizing informing parents with low education levels.

It is noteworthy that those who are considering quitting smoking have higher THS health impact subscale scores in this study. Health belief is an important determinant of people's health behavior. It is known that health beliefs (perceived susceptibility, perceived seriousness, perceived benefit, perceived obstacle, and perceived self-efficacy) are related to smoking cessation (Pribadi and Devy, 2020; Dillard, McCaul, and Klein, 2006; Costello et al., 2012). It is also emphasized that educational interventions about THS have a positive effect on individuals changing their smoking policies, reducing the number of cigarettes smoked, and quitting smoking (Drehmer et al., 2014; Patel et al., 2012). Increasing awareness of THS in parents may not only reduce children's exposure but also motivate them to quit smoking.

#### Limitations and Directions/Suggestions for Future Research

Since the non-probability sampling method was used in this research, the results can only be generalized to the research

population. Another limitation is that not all parents in the schools could be reached.

In conclusion, this study reveals that most parents do not know the concept of THS. It has been found that parents who have a smoking ban at home and in the car are more likely to believe in the health effects and environmental permanence of THS. Therefore, educational activities should be organized for parents so that they can protect their children from THS exposure. Parents who smoke are an important target group for education due to their low THS beliefs.

**Data Availability Statement:** The data that support the findings of this study are available on request from the corresponding author.

**Ethics Committee Approval:** This study was approved by the Ethics Committee of Gazi University (Approval No: 2019-055; Date: April 5, 2019).

**Informed Consent:** Written informed consent was obtained from the patients/patient who agreed to take part in the study.

**Peer-review:** Externally peer-reviewed.

**Author Contributions:** Concept – N.O., Y.K.; Design – N.O., Y.K.; Supervision – N.O., Y.K.; Resources – N.O., Y.K.; Materials – N.O., Y.K.; Data Collection and/or Processing – N.O., Y.K.; Analysis and/or Interpretation – N.O., Y.K.; Literature Search – N.O., Y.K.; Writing – N.O., Y.K.; Critical Review – N.O., Y.K.

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## ORIGINAL ARTICLE

# Effects of Smoking and Smoking Cues on Prospective Memory\*

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## Main Points

- Smoking had a negative effect on prospective memory.
- The Turkish version of Virtual Week is a reliable measurement tool for evaluating prospective memory performance in young adults and smokers.
- Among smokers, smoking-related cues had only a minor impact on their prospective memory performance.
- This research contributes to our understanding of cognitive processes of smoking behavior.

## Abstract

This study aimed to investigate the effects of smoking and smoking-related cues on prospective memory (PM). A total of 120 participants, 60 smokers, and 60 non-smokers, were included in the study. The study utilized a task called “Virtual Week” (VW), which consisted of a training day and three virtual days, encompassing 30 PM tasks. Dependent variables were VW completion duration and correct answers on VW. The study revealed that smokers had a significantly lower rate of correct responses in PM tasks compared to non-smokers. Among smokers, the type of cue (smoking-related or unrelated) had only a slight impact on their PM performance. For smokers, the Spearman-Brown split-half reliability coefficient was found to be .74, and Cronbach’s alpha was .76. In summary, smoking was shown to have a detrimental effect on the ability to remember future tasks, aligning with previous research suggesting that smokers perceive deficits in their PM. However, the study only partially supported the theory of cue reactivity, as the type of cue had only a minor influence on smokers’ PM performance. This research contributes to our understanding of the cognitive consequences of smoking and the role of cues in prospective memory among young individuals.

**Keywords:** Memory, nicotine, prospective memory, smoking, tobacco

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## Introduction

Although there are approximately 4000 chemicals in tobacco smoke, one of the main components is nicotine, which is seen as the primary factor in the formation, development, and maintenance of addiction (Lujic et al., 2005). A better understanding of the effect of smoking on cognitive processes can contribute to developing models for addiction, discovering the role of nicotine addiction in various psychiatric and neurological disorders, developing new treatment methods to prevent addiction, deciding on stages of treatment to be taken during the addiction phase, and

preventing relapse that may occur after treatment (McClernon & Gilbert, 2004).

The difficulty people have in reducing their smoking is not due to the pharmacological effects of nicotine alone (Lujic et al., 2005). Rather, stimuli associated with nicotine may also reveal similar psychological, physiological, and behavioral effects that occur in the presence or absence of nicotine (Carter & Tiffany, 1999). Nicotine-related visual cues (image of a smoking person), information from various sensory channels associated with cigarettes (holding, the sound of the lighter, and the smell), and contextual cues related to cigarettes (drinking coffee,



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drinking alcohol, and driving) act as conditioned stimuli to the smoker and can lead to differentiation on cognitive processes (Carter & Tiffany, 1999). Thus, other methods of delivery used in nicotine replacement treatment, such as nicotine gum, patches, and spray, are not very successful in the termination of smoking (Stanley & Massey, 2016). One of the reasons for the failure of cue exposure treatment is that the behavior extinguished by classical conditioning in the clinical environment is acquired because of context-specific conditioning which refers to associations formed between stimuli and responses that are influenced by the context in which the learning occurs (Heald et al., 2023). Cue reactivity is particularly relevant in the context of addiction, where cues associated with substance use can provoke cravings, and drug-seeking, and potentially lead to relapse (Carter & Tiffany, 1999). Cue reactivity is inferred from the differences between smoking-related cues and neutral control cues when taking behavioral cognitive measurements.

Cue reactivity studies also address memory, expectations, and attention processes (Franken, 2003). Smokers' smoking level, abstinence level, arousal level, and task characteristics, such as cognitive and attentional load, have been manipulated in various studies (Heishman et al., 2010; Pakyürek & Şenyüz, 2019). In general, smokers forget their intention of quitting smoking when they encounter smoking-related cues. At this point, prospective memory (PM) which is the ability to remember future tasks, is thought to be one of the possible mechanisms to explain this retrieval memory error (Brandon et al., 2004). According to McDaniel and Einstein (2007), remembering the planned action is achieved through automatic or controlled processes depending on the nature of the task or the relevant cue. Which method will be active may vary depending on the strength between the task and the cue (Einstein et al., 2005). Einstein et al. (2005) stated that there were two types of cues: focal and non-focal. While focal cues are located within the ongoing task, nonfocal cues are located outside the ongoing task. Nonfocal cues are generally time-based internal cues that require strategic monitoring to retrieve the planned action and require the use of prefrontal resources. Focal cues spontaneously restore the PM task during the ongoing task, and this process is associated with the hippocampus (Burgess et al. 2011).

Levent and Davelaar (2022) showed that drug users perform worse than non-drug users on PM tasks. Tasks with alcohol, cannabis, ecstasy, and methamphetamine have high ecological validity through behavioral measurement but it is not clear whether smoking has the same negative effect on PM (Platt et al., 2019). Rendell and Henry (2009) used a computerized Virtual Week (VW), which is a task that has relatively high ecological validity and measures both time-based and event-based PM tasks. Therefore novelty of the present study is that smokers' PM performance under the smoking cue condition. This study investigated PM and smoking cues via Turkish Virtual Week (Pakyürek & Cangöz-Tavat, 2023). Smoking status, smoking cues, and focal-ity of cues were independent variables and the dependent variables were VW completion duration and correct answers on VW.

#### Aim of the Study

The main purpose of this study is to examine how smoking and smoking cues affect performance in terms of PM. The secondary aim of this study is to adapt computerized VW (Rendell &

Henry, 2009), which is considered a PM task, to Turkish culture, as well as to test its functioning on a young smoking sample. The hypotheses are:

1. Smokers have lower performance on the PM task than non-smokers.
2. Smokers who are exposed to smoking-related cues have lower performance on the PM task compared to the groups exposed to non-smoking-related cues and not given any cues.
3. Smokers complete the VW faster than non-smokers.
4. VW is a reliable tool in terms of measuring differences in PM performance in smoking.

#### Material Methods

The study included 120 volunteers ( $M = 21.51$ ,  $SD = 2.85$ ), 60 smokers (women = 30, men = 30) and 60 non-smokers (women = 30, men = 30). Although a total of 159 people participated in the study, the data of 39 people were not included in the analysis for various reasons (high Beck Depression Inventory [BDI] score, change in the amount or status of smoking, technical problems). According to the G\*Power analysis, it was sufficient to collect data from 111 participants with a power of 80% and a margin of error of 0.05. The mean and standard deviation of the participants' BDI and Fagerström Test for Nicotine Dependence (FTND) scores are given in Table 1. Ethics Commission Approval was received from the Aydın Adnan Menderes University Ethics Commission (Approval no: 35853172/433-664 Date: 11.03.2016). Written informed consent was obtained from the participants.

#### Materials

##### Fagerström Test for Nicotine Dependence

The FTND is a six-question test that was developed to determine the level of addiction that occurs because of smoking; it was initially developed by Fagerström in 1978, and it was later updated and finalized (Heatherton et al., 1991). The lowest score that can be obtained from this test is 0, whereas the highest score is 10. Cronbach's alpha coefficient of the scale was 0.56 and it was found to be moderately reliable. (Uysal et al., 2004).

##### Beck Depression Inventory

The BDI is a 21-item scale that measures depression symptoms through self-assessment. Each item is assigned a score between 0 and 3 points, and a high score on the scale is an indicator of high depressive symptoms. The Turkish adaptation of the original scale was established by Hisli (1989). To control for the

**Table 1.**

*Mean and Standard Deviation of Participants' Age, Beck Depression Inventory (BDI) and Fagerström Test for Nicotine Dependence (FTND) Scores*

|                    | FTND        | BDI          | Age          |
|--------------------|-------------|--------------|--------------|
| <i>Smokers</i>     |             |              |              |
| $\bar{X}$ (SS)     | 3.25 (2.03) | 11.08 (4.51) | 21.03 (2.25) |
| <i>Non-Smokers</i> | –           |              |              |
| $\bar{X}$ (SS)     |             | 8.20 (4.80)  | 21.98 (3.30) |
| <i>Total</i>       | –           |              |              |
| $\bar{X}$ (SS)     |             | 9.64 (4.86)  | 21.51 (2.85) |

confounding effect of depression, which has the potential to affect the memory performance of participants, the cut-off point for the BDI was determined as 17 or above.

### Virtual Week Task

Virtual week consists of two types of tasks: regular tasks routinely performed every day and irregular tasks conducted only for that day and that hour (Rendell & Henry, 2009). Regular event tasks such as taking medication at breakfast and dinner, regular time tasks taking asthma medication at 11:00 am and 9:00 pm, and time check tasks performing lung function tests at 2 minutes and 4 minutes after the virtual day starts. Irregular tasks are specific to each day.

Some cards provide event-related cues, while others provide time-related cues. Time check tasks that must be done after a certain time has passed.

When the main image of VW in Figure 1 is displayed, the participant has to click on the starting card. A virtual dice is thrown over the main game image illustrated in Figure 1 (by clicking on the dice image) and the game is continued by moving to the left on the squares. In the lower right corner, there is a box "Event Card" in green. When the letter "E", which symbolizes the green event card, is reached or passed over, an event card is drawn and a question with three options is answered on the card about an activity of the day. After reading the event card and choosing the most likely action to take in daily life, the participant rolls the virtual dice again and continues to progress throughout the day. Virtual days start at 7.00 in the morning and end at 22.30. Two squares progress in VW is equal to a virtual time-lapse of 15 minutes. Regardless of the tasks, there is a real-time digital stopwatch on the main screen, and PM tasks are given according to this stopwatch (e.g., having a lung function test when the stopwatch shows the 2nd and 4th minutes after the virtual day starts). The execution of the PM task is provided by clicking the purple-colored "Perform Task" box at the top right of the screen. Participants select tasks given at the beginning, and during the day, when the time comes, by pressing the Execute Task button and choosing from a list of the true PM tasks and distracting options.

Since the tasks in VW were created according to Western culture, some tasks and options were changed according to Turkish culture, and the task was updated (Pakyürek & Cangöz-Tavat, 2023). For example, Australian dishes such as porridge and cereal were replaced with local dishes such as gözleme and kebab. While making updates, the structure and length of the original sentences were adhered to.

### Smoking-Related Cue Tasks

Cigarette-related and unrelated cue tasks were inspired by the studies of Özdemir (2018) and Shadel et al. (2001). While Özdemir (2018) made the change in cue tasks through video images, Shadel et al. (2001) had the participants apply it directly. In this study, the changes made by Özdemir (2018) through watching the video footage were carried out by having the participants directly apply them. The objects used for the smoking-related act are a bowl, three cigarettes, a lighter, and an ashtray. The objects to be used in the action not related to smoking are a bowl, three pencils, a sharpener, and a pencil case. In the no-action control condition, the participants waited silently for the duration of the smoking-related or unrelated cue.

### Research Design

2 (Smoking Status: Smoker-Non-Smoker)  $\times$  3 (Cue Type: Smoking-Related Cue-No Smoking-Related Cue- No Cue) factorial ANOVA was used for this quasi-experimental study. Smoking and cue type were manipulated between groups. Time check tasks were analyzed separately due to the real-time tasks. In addition, Cronbach's Alpha and Spearman-Brown split-half reliability coefficients of the Turkish-adapted VW were calculated based on PM tasks and smoking.

### Procedure

The virtual week started with the first of the virtual days after the practice day was completed. The participants were randomly assigned to the cue-type conditions at the beginning of the virtual days. In the smoking-related action, before starting the first virtual day, they were asked to open the lid of the bowl in front of them and they were told to take out one of the three cigarettes in the bowl and the ashtray. They were then told to leave the ashtray and the cigarette in their hands on the left side of

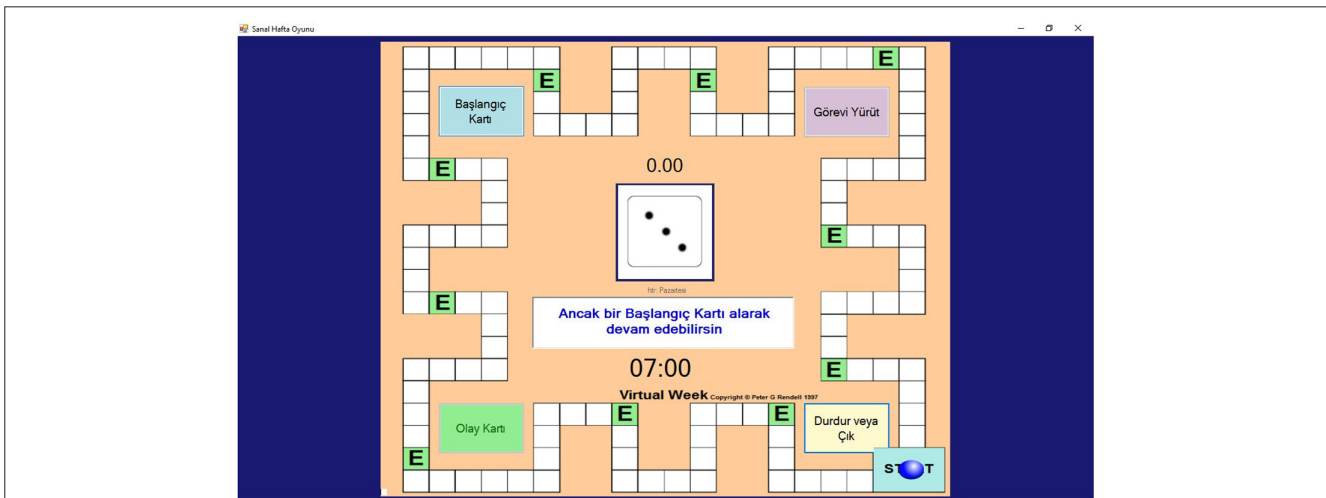


Figure 1. Main Screen of Virtual Week.

the screen. After closing the lid of the bowl and leaving it on the left side of the screen, the first virtual day started. Before starting the second virtual day, they were asked to reopen the lid of the bowl and take out one of the two cigarettes and the lighter in it. They were told to leave the cigarette and lighter on the left side of the screen next to the ashtray and close the lid of the bowl. Before starting the last virtual day, they were asked to open the lid of the bowl again and take out the last cigarette in it. They were asked to light the cigarette with the lighter next to the screen and extinguish it in the ashtray without taking a cigarette puff. In the non-cigarette-related action condition, all the procedures are the same as the cigarette-related action condition with one exception that participants hold a pencil, not a cigarette. In the no-action control condition, the participants were asked to wait silently for the duration of the action-related cues when starting the day. A recognition task was applied for the manipulation check at the end of each virtual day which involved a matching task given during the virtual days. If the participants were unsuccessful on the recognition task, it may indicate a problem in the encoding of information rather than a prospective memory error. VW includes a total of 10 p.m. tasks, including four regular (two event-based, two time-based), four irregular (two event-based, two time-based), and two-time check tasks. A total of 30 PM tasks are used throughout the main task. The dependent variables were time to execute duration and correct answers on VW.

### Statistical Analysis

The findings were analyzed using the licensed version 23.0 of the Statistical Package for Social Sciences (IBM SPSS Corp.; Armonk, NY, USA). First of all, data cleaning procedures were performed to test the suitability of the data for statistical analyses; then, descriptives of demographic information, the Fagerstrom Nicotine Dependence Test (FBNT), Beck Depression Inventory (BDI) were analyzed. Finally, inferential/parametric analyses were conducted to test the hypotheses. In this context, Cronbach's alpha and Spearman-Brown two-half reliability coefficients were calculated to test the reliability of the VW, which was adapted to the Turkish culture. Two separate 2 (Smoking Status: Smoker-Non-smoker)  $\times$  3 (Cue Type: Cue Related to Smoking-Cue Unrelated to Smoking- No Cue) factorial ANOVAs were conducted for the time to complete VW and the time check task.

### Results

As a result of one-way ANOVA of smokers, FNBT scores ( $F_{(2,57)} = .248$ ;  $p = .78$ ), duration of smoking ( $F_{(2,57)} = .154$ ;  $p = .86$ ), and the number of daily cigarettes ( $F_{(2,57)} = .597$ ;  $p = .55$ ) do not show a significant difference according to the cue conditions. Smokers scored higher on BDI than non-smokers, but all participants had lower scores than the cut-off point 17, which is considered an indicator of depression.

According to the correct answers on the PM task, 2 (Smoking Status: Smoker-Non-Smoker)  $\times$  3 (Smoking Cue Type: Smoking-Related Cue, No-Smoking Cue, No Cue) ANOVA result, with the main effect of cue status ( $F_{(2,114)} = 1.11$ ,  $p = .33$ ), smoking\*type of cue ( $F_{(2,114)} = .47$ ,  $p = .63$ ) interaction effects were not statistically significant, while smoking ( $F_{(1,114)} = 4.91$ ,  $p = .03$ ,  $\eta_p^2 = .04$ ), with the main effect were found to be statistically significant. The mean and standard deviation scores are given in Table 2.

**Table 2.**  
Mean and Standard Deviation of Correct Answers on PM and Time Check Tasks

| Smoking Status<br>( <i>N</i> = 120) | Cue Type                      | Tasks                               |                                     |
|-------------------------------------|-------------------------------|-------------------------------------|-------------------------------------|
|                                     |                               | PM Tasks                            | Time Check Task                     |
|                                     |                               | Correct Answers<br>$\bar{X} \pm SS$ | Correct Answers<br>$\bar{X} \pm SS$ |
| Smokers <i>n</i> = 60               | Smoking Related <i>n</i> = 20 | 0.65 $\pm$ 0.21                     | 0.59 $\pm$ 0.17                     |
|                                     | Unrelated Cue <i>n</i> = 20   | 0.69 $\pm$ 0.22                     | 0.62 $\pm$ 0.19                     |
|                                     | No Cue <i>n</i> = 20          | 0.74 $\pm$ 0.20                     | 0.64 $\pm$ 0.19                     |
| Non Smokers <i>n</i> = 60           | Smoking Related <i>n</i> = 20 | 0.75 $\pm$ 0.19                     | 0.74 $\pm$ 0.19                     |
|                                     | Unrelated Cue <i>n</i> = 20   | 0.76 $\pm$ 0.19                     | 0.76 $\pm$ 0.19                     |
|                                     | No Cue <i>n</i> = 20          | 0.77 $\pm$ 0.18                     | 0.75 $\pm$ 0.18                     |

Note: PM Task, prospective memory task.

### The Main Effect of Smoking Status

When the correct answers on PM tasks are examined according to smoking, there is a significant difference between smokers ( $M = .70$ ,  $SE = .03$ ) and non-smokers ( $M = .76$ ,  $SE = .03$ ). see Figure 2.

### Smoking and Cue Type Interaction

Post hoc comparisons based on smoking status showed a marginally significant difference between smokers in the smoking-related cue condition ( $M = .65$ ,  $SE = .05$ ) and non-smokers ( $M = .75$ ,  $SE = .05$ ) ( $p = .06$ ) see Figure 3.

### Time Check Task

Non-smokers ( $M = .75$ ,  $SE = .04$ ) were more successful on time check tasks with a significant difference compared to smokers ( $M = .62$ ,  $SE = .04$ ). see Figure 4.

The interaction effect of smoking  $\times$  cue type ( $F_{(2,114)} = .10$ ,  $p = .90$ ) was not significant.

### Time to Execute Duration

Although smokers ( $M = 1220.2$ ,  $SE = 24.86$ ) completed their PM tasks faster than non-smokers ( $M = 1287.1$ ,  $SE = 24.86$ ), the difference between them was found to be marginally significant ( $p = .06$ ). see Figure 5. The interaction effect of smoking\*cue type ( $F_{(2,114)} = .16$ ,  $p = .85$ ) was not found significant.

### Reliability

Cronbach's Alpha and Spearman-Brown two-half reliability coefficients were calculated to test the reliability of the VW used for the measurement of PM. Accordingly, the Cronbach's Alpha value of VW was 0.75 in all tasks; The Spearman-Brown two-half reliability coefficient was found to be 0.72. When examined in terms of only smokers, the Cronbach's Alpha value was 0.76 in all smokers; The Spearman-Brown split-half reliability coefficient was 0.74, while the Cronbach's Alpha value was 0.67 in

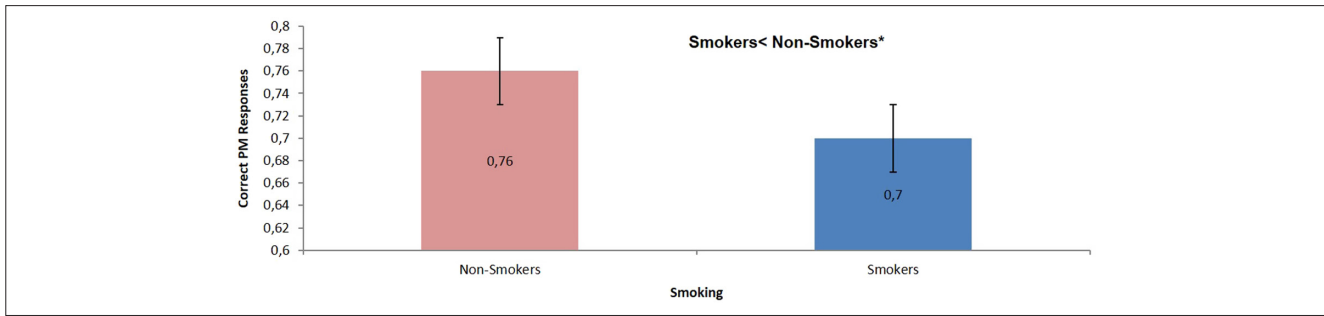


Figure 2. Correct PM Responses According to Smoking.

non-smokers; Spearman Brown's two-half reliability coefficient was found to be 0.65.

## Discussion

### Smoking and Smoking Cues

Smokers' correct answers on PM were found to be significantly lower than non-smokers. The first hypothesis was supported. It has been shown that PM performance decreases in other substance users such as alcohol use (Leitz et al., 2009), opiates (Terrett et al., 2014), ecstasy (Rendell et al., 2007), and methamphetamine (Rendell et al., 2009). Similarly, there was a decrease in PM performance in clinical groups, such as schizophrenia patients (Henry et al., 2007), Parkinson's patients (Foster et al.,

2013), and patients with stroke (Kim et al., 2009). Although the smokers were young ( $M = 21.03$ ,  $SD = 2.25$ ) and did not have a long history of addiction ( $M = 4.10$ ,  $SD = 2.46$ ), smoking had a negative impact on VW performance. Smokers were more unsuccessful than non-smokers in terms of correct answers in complex PM tasks that also require the use of retrospective memory resources.

In cognitive models explaining cue reactivity, it is suggested that smoking-related cues will activate smoking-related experiences in short-term memory and create a cognitive load, resulting in a deterioration in cognitive performance (Cox et al., 2006). In addition, Carter and Tiffany (1999) emphasize the importance of automatic and non-automatic processes in their cognitive model. Repetitive substance use turns into an automatic behavior such as writing. Thus, cognition related to substance use begins to occur automatically, mostly without requiring effort and awareness. When access to substances is limited, in addition to the automatically activated schema for substance use, the conscious process that uses limited non-automatic resources comes into play in parallel (Carter & Tiffany, 1999).

Since searching requires effort and the cue has a disruptive effect on tasks with high cognitive load, it can be expected to deteriorate the relatively difficult PM performance (Brandon et al., 2004; Einstein et al., 2005). Although there was no significant difference related to the cue in the current study, we found a marginally significant difference between smokers ( $M = .65$ ,  $SE = .05$ ) and non-smokers ( $M = .75$ ,  $SE = .05$ ) in terms of PM performance in the smoking-related cue condition. The second hypothesis was partially supported. This finding suggests that smoking-related cues may be more effective in highly dependent smokers.

Smokers' correct answers on time check tasks were found to be significantly lower than non-smokers. Time elapsed in time check tasks is real-time independent of VW compared to elapsed time

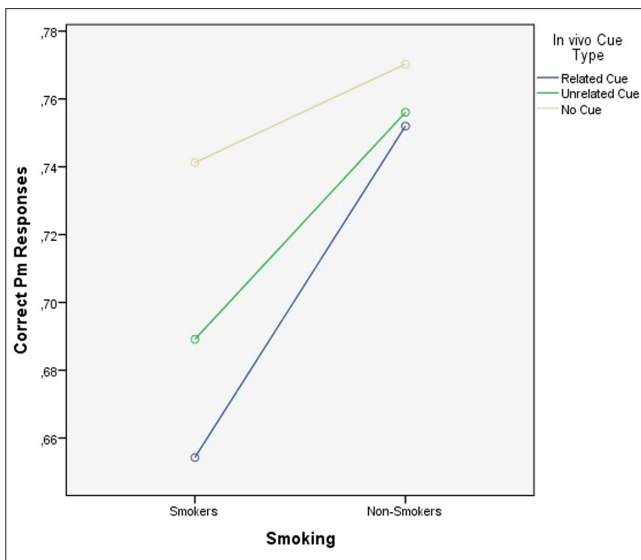


Figure 3. Correct PM Responses According to Cue Type and Smoking.

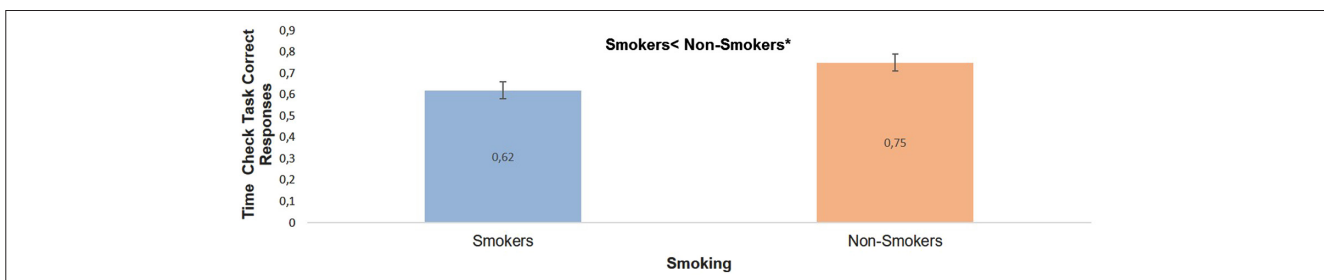


Figure 4. Time Check Correct Responses According to Smoking.

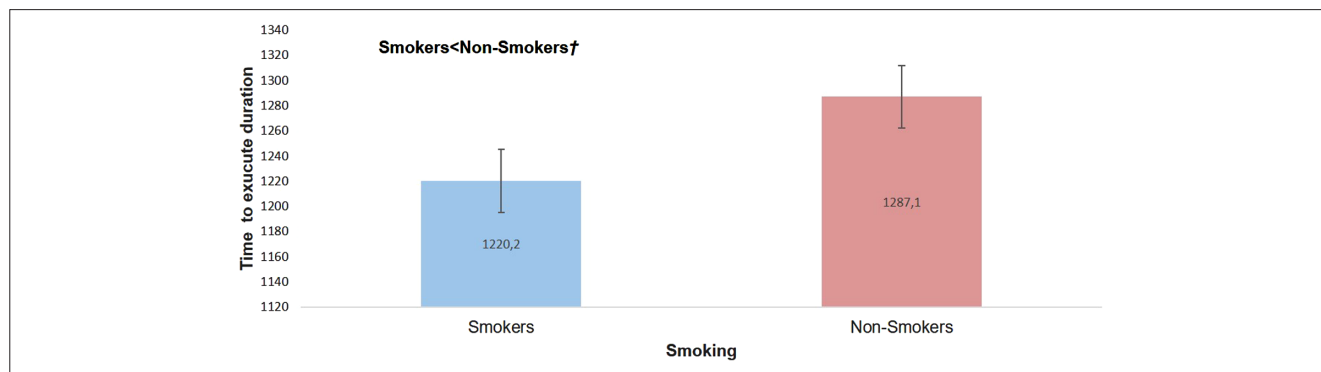


Figure 5. Time to Execute Duration According to Smoking.

in time-based tasks. Time check tasks were also analyzed (Mioni et al., 2015) because they were affected by time-related reasoning and time estimation ability (Einstein et al., 2005). The time check task was more difficult as it was done only in a certain time period and did not contain environmental cues compared to event-related tasks. Smokers are more unsuccessful in the task of time check, which is a difficult task compared to non-smokers. It has been suggested that nicotine negatively affects the time estimation ability by differentiating the perception of time in smokers (Klein et al., 2002).

#### Task Completion Duration

Smokers completed the VW approximately 1 minute and 10 seconds faster than nonsmokers. This difference was found marginally significant. The third hypothesis was partially supported. Overall, although smokers completed the VW faster, they were less accurate than nonsmokers. Smokers respond more quickly than nonsmokers (Heishman et al., 2010; Pakyürek & Şenyüz, 2019), and personality measures reveal that they tend to be more impulsive than nonsmokers (Geist & Herrmann, 1990). Impulsive individuals fail to inhibit and/or suppress their response to rewarding stimuli (Geist & Hermann, 1990). The fact that smokers are more impulsive may be one of the reasons why they complete the VW more quickly. Thus, it may be that smokers spend more effort using the cognitive strategies they have developed and prefer to complete the task faster at the expense of making more mistakes. In addition, smokers' number of cigarettes smoked per day ( $M = 12.62$ ,  $SD = 5.21$ ) may influence their level of abstinence. Because smokers know that they will experience the negative effects of nicotine withdrawal after a certain time period, they may learn to finish the task before withdrawal begins.

Based on cognitive models explaining cue reactivity (Cox et al., 2006) participants in the smoking-related cue condition were expected to complete the VW faster than in the non-smoking cue and no cue conditions. However, in the current study, the lack of a significant difference in the time it took to complete the VW compared to the cue type may be due to the short duration of the cue-type effect and the fact that the participants were young and had just developed an addiction.

#### Reliability

In reliability studies on VW, Rose et al. (2010) found that the Spearman-Brown split-half reliability coefficient was .71 for the healthy young group and .93 for the healthy elderly group. The Spearman – Brown split-half reliability coefficient was found to

be .74 for schizophrenia patients (Henry et al., 2007) and .85 for long-term opiate users (Terrett et al., 2014). The internal consistency coefficient (Cronbach's alpha) of VW was found to be .89 in individuals with brain injury (Mioni et al., 2013) and .89 in patients with Parkinson's disease (Foster et al., 2013). The internal consistency coefficient (Cronbach's alpha) was .64 for the Italian version of the VW, which was adapted for cultures whose native language was not English; it was found to be .92 for the elderly group (Mioni et al., 2015). The internal consistency coefficient (Cronbach's alpha) of the VW applied to healthy young and old people in Poland was found to be .61 and .87, respectively, while Spearman Brown's two-half reliability coefficient was found to be .75 for young people and .95 for the elderly (Niedźwieńska et al., 2016). Lastly, Spearman Brown's two-half reliability coefficient was found to be .85 for young people and .95 for the elderly in the French version of VW (Blondelle et al., 2024). Virtual week has been adapted to Turkish culture and shown to be reliable (Spearman-Brown: .82). The fourth hypothesis was supported but the reliability was relatively lower compared to Western countries. Smoking status and cue manipulation might be the reason for lower reliability but it is still at an acceptable level.

#### Limitations and Future Directions

Smoking had a negative effect on PM, but smoking-related cues did not create a sufficiently disruptive effect in terms of correct responses or task completion duration in the PM task. Using the level of abstinence as an independent variable and looking at the difference in VW performance between light smokers and heavy smokers could also provide useful information. It is known that participants who smoke are more impulsive. For this reason, using impulsivity levels as covariables can contribute to the data analysis.

In the smoking-related cue, and unrelated cue conditions, participants held a cigarette or pen as an in vivo cue before and after the task and performed a specific action with them. Because these cues were performed independently of the VW, the incorporated effect of smoking-related cues attached to tasks such as "buy a cigarette on the way home" in the VW may provide useful information. In addition, presenting cigarette-related cues daily in a laboratory environment where smoking is prohibited may have reduced the effectiveness of contextual cues.

In general, smoking can negatively affect the PM process. In addition, smokers who want to quit smoking may benefit from avoiding smoking cues. Lastly, we show that the Turkish version

of the VW is a reliable measurement tool for evaluating PM performance in young adults and smokers.

**Data Availability Statement:** The data that support the findings of this study are available on request from the corresponding author.

**Ethics Committee Approval:** This study was approved by the Ethics Committee of Aydın Adnan Menderes University (Approval No: 35853172/433-664; Date: 11.03.2016).

**Informed Consent:** Written informed consent was obtained from the participants who agreed to take part in the study.

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## ORIGINAL ARTICLE

# Perceptions of Benefits and Harms of Electronic Cigarettes among Young Adults: A Qualitative Study

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## Main Points

- Young adults perceive electronic cigarettes as beneficial in terms of reducing or quitting traditional cigarette use, providing enjoyment, being less harmful, offering ease of use, and being more cost-effective.
- Young adults believe electronic cigarettes are harmful due to the continuation of nicotine cravings, potential health risks, mechanical issues, and cost considerations.
- The majority of young adults prefer using electronic cigarettes because of their enjoyable nature, potential to reduce or quit traditional cigarette use, or perceived lower harm compared to traditional cigarettes.
- Psychiatric nurses should plan and implement educational programs related to addiction to foster societal awareness on the subject.

## Abstract

In the global context, understanding the increasingly prevalent use of electronic cigarettes among young adults is crucial, particularly in the fight against addiction. This qualitative study, utilizing phenomenological analysis, explored the perceptions of the benefits and harms associated with electronic cigarette use among young adults. The sample comprised 20 young adults selected through the snowball sampling technique, one of the purposive sampling techniques. The participants voluntarily agreed to take part in the study and met the established inclusion criteria for face-to-face interviews, which were conducted using a semi-structured interview form developed by the researchers. The data underwent content analysis. The findings revealed that young adults' perceptions of the benefits of electronic cigarettes fell into five categories, while perceptions of harms were grouped into four categories. The study concluded that young adults often perceive electronic cigarettes as a means to reduce or quit traditional smoking, as pleasurable, or as less harmful compared to traditional cigarettes. It is recommended that future research includes larger samples and employs both quantitative and qualitative approaches to further investigate the experience of using electronic cigarettes. Additionally, counseling services related to addiction, especially provided by psychiatric nurses, are recommended to raise societal awareness.

**Keywords:** Electronic cigarette, qualitative study, young adults

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## Introduction

The electronic cigarette (e-cigarette), defined as a nicotine source designed in the form of a pen or accessory, resembling the appearance of traditional cigarettes and facilitating the continuation of smoking behavior, is increasingly becoming a public health concern among young adults (Gades

et al, 2022; Gupte et al, 2022; Harton et al, 2023). According to the Tobacco and Nicotine Survey conducted in Canada between December 2020 and January 2021, 15% of young people aged 20-24 reported using e-cigarettes in the previous month, and 48% reported having used e-cigarettes at least once. Similarly, in the United States, there has been

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an increase in e-cigarette use among young adults aged 18-29 in recent years (Pew Research Center, 2019). Fu et al (2018) reported in a large population study conducted in 6 European countries that 32% of young people think positively about e-cigarettes, and 81% had used e-cigarettes at least once. In our country, no community-based prevalence study has been found to determine the use of e-cigarettes. However, in a study conducted by Ogan et al (2019) with medical faculty students, it was stated that 43.7% of the participants used e-cigarettes.

A study on the subject has found that e-cigarettes can arouse the curiosity of young adults due to various flavor aromas such as mint, vanilla, chocolate, and scent-enhancing properties, leading them to prefer e-cigarette use (Huma et al, 2022). Kechter et al (2023) state that e-cigarette use among young adults is increasing day by day for weight control purposes. Furthermore, the marketing of e-cigarettes as an aid to quit traditional smoking also contributes to the preference for e-cigarette use among young adults (Ogan et al, 2019). A review of the literature reveals that the belief in e-cigarettes being less harmful than traditional cigarettes, the perception that they reduce stress, and the opportunity to use them in prohibited places make e-cigarettes appealing to young individuals (Bennett et al, 2023; Fadus et al, 2019). Additionally, WHO (2023) called for urgent action to control e-cigarette use. This observation underscores the severity and significance of the issue.

It is asserted that e-cigarettes are used by current smokers, those who have quit smoking, or those considering quitting, and that they can facilitate addiction (Jackler & Ramamurthi, 2019). The literature also emphasizes the relationship between e-cigarette consumption and substance use (Harton et al, 2023; Staff et al, 2020). Globally, delving into the reasons for e-cigarette use among young adults, as well as their attitudes and perceptions towards e-cigarettes, becomes crucial in the fight against addiction. Similarly, it is anticipated that the findings of this study will guide all healthcare professionals in planning and implementing effective interventions for e-cigarette addiction across primary, secondary, and tertiary prevention levels. Additionally, a review of the national literature indicates limited studies on the subject, highlighting the necessity for current research in the existing literature (Atlam et al, 2020; Mutlu et al, 2023; Özpulat & Öztaş, 2020; Sayılı et al, 2020). To contribute to the national literature and gain an in-depth understanding of why risky behaviors such as e-cigarette use are exhibited by young adults, it is believed that examining the perceptions of the benefits and harms associated with e-cigarettes would be beneficial. In this context, this study aims to determine young adults' perceptions of the benefits and harms of e-cigarettes using qualitative research methods.

## Material and Methods

### Study Type, Participants and Settings

In this study, a phenomenological design, one of the qualitative research methods, was employed with the aim of uncovering young adults' perceptions of the benefits and harms associated with e-cigarettes and their experiences in-depth (Kümbetoğlu, 2008). Phenomenological research is approached in 2 distinct forms: descriptive phenomenology and interpretative phenomenology. Given that the primary objective in descriptive phenomenology is to depict individuals' perceptions and experiences, this

approach was adopted for the study (Ersoy, 2016). Within the framework of qualitative research traditions, the purposive sampling method known as snowball sampling was utilized in this research. To initiate snowball sampling, the researchers established a connection with a young adult who used e-cigarettes within their social network (e.g., neighbor, friend). Subsequently, with the assistance of the initial participant, contact was established with other users. This facilitated the expansion of the sample in a cascading manner, commonly referred to as the snowball effect (Yıldırım & Şimşek, 2016).

In qualitative research, there are no strict rules or specific numbers regarding the pre-determination of sample size, but it is recommended to select participants until saturation and redundancy levels are reached based on the expressions of the participants in the study (Liehr et al, 2005). Therefore, the sample size calculation was not conducted in this study. The point of "saturation" was considered to be reached when no new information regarding a benefit or harm related to e-cigarette use could be obtained from the participants. Consequently, the study was concluded with a total of 20 young adults. There were no participants who refused to participate or dropped out during the study. The study included young adults aged 18-35 who had been using e-cigarettes for at least 6 months and were willing to share their experiences by participating in the study. Many different age ranges are defined for the young adulthood period in the literature. Havighurst limited this period to 18-35 years (Zastrow & Kirst-Ashman, 2015), and in this study, the age range determined by Havighurst was taken as the basis.

### Data Collection Tools

The researchers used a Personal Information Form and a Semi-Structured Interview Form, prepared within the literature framework (Huma et al, 2022; Simmons et al, 2016; Simpson et al, 2021), to collect data aiming to determine participants' socio-demographic and e-cigarette usage characteristics. The Personal Information Form included variables such as age, gender, marital status, education level, smoking status, duration of e-cigarette use, and contemplation of quitting e-cigarettes. Specific data for the study were collected through individual interviews using the Semi-Structured Interview Form. All individual interviews were conducted by the researcher(s) in collaboration with young adults with experience in e-cigarette use. Prior to the data collection phase, a pilot study was conducted with 2 participants. These participants confirmed that there were no expressions in the semi-structured interview form that were not understood, and therefore, no changes were made to the expressions in the form.

### Data Collection

The data were collected between April 25, 2023, and June 25, 2023, through face-to-face interviews in a quiet and peaceful environment with the participants. During the interviews, no one other than the participant and the researcher was present in the room. Before starting the interview, the participant was informed about the purpose of the study, and written informed consent was obtained. Once the participant approved, the interview commenced. The Personal Information Form and Semi-Structured Interview Form were given to the participants by the researchers, and they were asked to answer the questions both in writing and verbally. To focus the participant and researcher on the relevant topic, the interview began by

exploring the participant's initial experiences with e-cigarettes. Following the framework of relevant literature (Pokhrel et al, 2015; Simmons et al, 2016; Simpson et al, 2021), participants were expected to express their thoughts on the benefits of young adults' e-cigarette use (initial impressions, positive aspects they liked, and positive thoughts about usage) and their perceptions of harms (negative thoughts and aspects that might lead to quitting). Additionally, participants were asked to share their thoughts and experiences regarding reasons for using e-cigarettes and their thoughts on using them alongside traditional cigarettes. Throughout the interview, the researchers remained flexible, maintained an open approach, and minimized subjectivity. The data collection process lasted an average of 30 minutes. Interviews with participants who allowed recording were recorded using an audio recording device. Participants were informed that survey forms could be provided for them to offer comments or edits, but there was no further interview between participants and researchers.

### Data Analysis

The socio-demographic and e-cigarette usage characteristics of young adults were evaluated using the IBM SPSS Statistics 24 (IBM SPSS Corp.; Armonk, NY, USA) software package and expressed in numbers and percentages. The analysis of study-specific data was conducted based on the principles of content analysis. The aim of content analysis is to reach concepts that can explain the collected data and relationships between these concepts (Baltacı, 2019). In this process, concepts and themes related to the studied subject are identified, similar data is systematically collected, organized, and interpreted (Elo et al, 2014). In this study, open coding was initially performed. Both researchers separately read the semi-structured interview forms, took notes on participants' perceptions of the benefits and harms of e-cigarettes, and created maximum concept categories. Quotations were coded for gender, age, and marital status (e.g., M-1, 25, Single; F-4, 19, Single). Additionally, the study was reported following the Consolidated Criteria for Reporting Qualitative Research (COREQ) guidelines commonly used for reporting qualitative research.

### Trustworthiness

Guba and Lincoln (1982) emphasized the importance of credibility rather than validity and reliability in qualitative research and identified 4 criteria considered as the gold standard. These criteria include credibility, dependability, confirmability, and transferability (Guba & Lincoln, 1982). To ensure the credibility of the study, at the end of data collection, researchers summarized the data to determine if it accurately reflected participants' thoughts. Additionally, participants were asked if they wanted to add any perceptions or experiences to confirm their understanding. To enhance the dependability and confirmability of the study, the data, confirmed by participants, were individually reviewed by the researchers using the triangulation method. To ensure transferability, purposive sampling was employed, and detailed inclusion criteria and study group information were provided. After completing the study, an independent expert reviewed the data collected from the study design to the analysis of data and the writing of results. This evaluation aimed to assess the processes and provide feedback to the researchers (Yıldırım & Şimşek, 2016).

### Ethical Considerations

Before starting the study, ethical approval was obtained from the Ethics Committee for Non-Drug and Non-Medical Device Research of a KTO Karatay University (Approval No: 030 Date: 2023). Informed consent was obtained from young adults who voluntarily agreed to participate in the research and who had used e-cigarettes at the beginning of the study through the Informed Consent Form. Participants were provided with information about the purpose of the research and how the data obtained from the study would be used, following the principles of the Helsinki Declaration. The principles of "Respect for Human Dignity," indicating that participants are free to participate in the research, "Respect for Autonomy," emphasizing autonomy throughout the study, and "Privacy and Protection of Confidentiality," assuring that responses on survey forms would remain confidential, were adhered to.

### Results

When the sociodemographic and e-cigarette usage characteristics of the young adults who agreed to participate in the study were examined, it was found that their mean age was  $22.30 \pm 3.45$ , and the average duration of e-cigarette use was  $20.15 \pm 19.33$  months. It was observed that 60% of the young adults were male, 90% were single, and 85% had a university degree or higher. Additionally, 65% of the young adults used both e-cigarettes and traditional cigarettes, and 80% expressed no intention of quitting e-cigarette use (Table 1).

**Table 1.**  
*Sociodemographic Characteristics of the Participants*

| Variable                            | Mean $\pm$ SD     |      |
|-------------------------------------|-------------------|------|
| Age                                 | $22.30 \pm 3.45$  |      |
| E-cigarette usage time (months)     | $20.15 \pm 19.33$ |      |
|                                     | N                 | %    |
| Gender                              |                   |      |
| Male                                | 12                | 60.0 |
| Female                              | 8                 | 40.0 |
| Marital status                      |                   |      |
| Married                             | 2                 | 10.0 |
| Single                              | 18                | 90.0 |
| Education status                    |                   |      |
| High school                         | 3                 | 15.0 |
| University and above                | 17                | 85.0 |
| Smoking                             |                   |      |
| Yes                                 | 13                | 65.0 |
| No                                  | 7                 | 35.0 |
| Thoughts to quit using e-cigarettes |                   |      |
| Yes                                 | 4                 | 20.0 |
| No                                  | 16                | 80.0 |

### **Young Adults' Perceptions of Benefits of E-Cigarette**

The perceived benefits of e-cigarette use among young adults who have experienced e-cigarette usage were examined under 5 main categories and 8 subcategories (Table 2).

#### **Category 1: Reduction/Cessation of Traditional Cigarette Use**

When this category is explored, it is observed that 35% of the young adults in the study perceive e-cigarettes as beneficial for reducing or quitting traditional cigarette use, and their expressions align with this perception (Table 2). The common feature in participants' statements is the initiation of e-cigarette use with the intention of reducing traditional cigarette use or quitting traditional cigarettes altogether.

#### **Category 2: Pleasurable Experience**

According to the participants in the study, e-cigarette use is perceived as a pleasurable and enjoyable process. The Pleasurable Experience category is discussed in 3 subcategories: Pleasant Smell/Taste, Dense Vapor, and Variety of Flavors (Table 2).

##### **Sub-Category 1: Pleasant Smell/Taste**

It is observed that young adults perceive e-cigarettes as beneficial due to their pleasant smell or taste. Eight percent of young adults with e-cigarette experience emphasize their liking for the smell and taste of e-cigarette liquid flavors (Table 2).

##### **Sub-Category 2: Dense Vapor**

It is understood from the expressions of the participants that they perceive e-cigarettes as beneficial due to the pleasure derived from dense vapor. 30% of the participants expressed enjoyment in the appearance of dense vapor produced after e-cigarette use (Table 2).

##### **Sub-Category 3: Variety of Flavors**

It is observed that 15% of young adults in the study prefer e-cigarettes due to various aroma options (Table 2). They stated that they use e-cigarettes based on their desired tastes and aromas, enjoying the freedom of choice in this regard.

#### **Category 3: Less Harmful**

Some participants reported that e-cigarettes are less harmful compared to traditional cigarettes. This category is discussed in 2 subcategories: less unpleasant smell/taste and lower risk of addiction (Table 2).

##### **Sub-Category 1: Less Unpleasant Smell/Taste**

It is observed that 55% of young adults perceive e-cigarettes as beneficial due to the fact that they leave a less unpleasant taste or odor compared to traditional cigarettes, and they share their experiences based on this perception (Table 2). They express a preference for e-cigarettes over traditional cigarettes because they find them more appealing in terms of smell and taste, stating that using e-cigarettes makes them feel cleaner compared to traditional cigarettes.

##### **Sub-Category 2: Lower Risk of Addiction**

Fifty percent of the participants in the study perceive e-cigarettes as beneficial due to a lower risk of addiction compared to traditional cigarettes (Table 2). They stated that e-cigarette use is less likely to lead to addiction compared to traditional cigarettes,

emphasizing its lower harm. Therefore, they prefer e-cigarette use over traditional cigarettes.

#### **Category 4: Ease of Use**

E-cigarette use is perceived as beneficial by young adults in the study due to the ease of use. This category is discussed in 3 subcategories: Indoor Usage Convenience, Extended Usage Opportunity, and Portability (Table 2).

##### **Sub-Category 1: Indoor Usage Convenience**

The participants were found to perceive e-cigarettes as beneficial because they can comfortably use them in any environment, regardless of being indoors or outdoors. Twenty percent of the participants stated that they cannot use traditional cigarettes indoors, whereas they can use e-cigarettes indoors. Therefore, they prefer e-cigarette use over traditional cigarettes (Table 2).

##### **Sub-Category 2: Extended Usage Opportunity**

It was observed that 5% of the participants perceive e-cigarettes as beneficial because they can be used for an extended period (Table 2). The participants reported that e-cigarettes can be charged at any desired time, allowing for prolonged usage.

##### **Sub-Category 3: Portability**

Twenty percent of young adults perceive e-cigarettes as beneficial due to their portability (Table 2). They stated that e-cigarettes can be easily used on the go, emphasizing the simplicity of carrying them.

#### **Category 5: More Economical**

It was observed that 25% of the participants perceive e-cigarettes as beneficial because they consider them more cost-effective and affordable than traditional cigarettes (Table 2).

### **Perceptions of Harm Related to E-Cigarettes Among Young Adults**

The perceptions of harm related to e-cigarette use among young adults who have experienced using e-cigarettes were examined, encompassing 4 main categories and 5 subcategories (Table 3).

#### **Category 1: Persistence of Nicotine Cravings**

It is observed that 15% of young adults perceive e-cigarettes as harmful due to the persistence of nicotine cravings despite using e-cigarettes (Table 3). A common feature in the expressions generated by the participants is the acknowledgment that substances in e-cigarettes are insufficient in satisfying nicotine needs compared to traditional cigarettes, leading to the continued desire for traditional cigarette use.

#### **Category 2: Harmful to Health**

The participants stated that e-cigarette use is harmful to health. The category of harm to health is divided into 2 subcategories: health problems and addiction risk (Table 3).

##### **Sub-Category 1: Health Problems**

Some participants perceive e-cigarettes as harmful due to their potential to cause various physiological health problems. Forty percent of the participants expressed occasional discomfort while using or after using e-cigarettes (Table 3). Even if they have not personally experienced such issues, some participants mentioned hearing from their social circles or online sources that e-cigarette use can be detrimental to the lungs.

**Table 2.***Perceptions of the Benefits Associated with E-Cigarette Use among Young Adults*

| Categories                                       | Sub-Categories              | Quotes                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | Number of Participants | %  |
|--------------------------------------------------|-----------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------|----|
| Reduction/cessation of traditional cigarette use |                             | <p>"I use both traditional cigarettes and e-cigarettes. After starting to use e-cigarettes, my consumption of traditional cigarettes decreased. Before using e-cigarettes, I used to smoke 20 traditional cigarettes a day, but after using e-cigarettes, I started smoking only 10 traditional cigarettes a day." (M-6, 23, Single).</p> <p>"I find using e-cigarettes reasonable because it reduces traditional cigarette consumption." (M-17, 27, Married).</p>                                                                                                                                                                                                     | 7                      | 35 |
| Pleasurable experience                           | Pleasant smell/taste        | <p>"The delightful aroma of e-cigarettes is one of the favorable aspects that contribute to my positive perception of using them." (M-1, 19, Single). "I don't smoke traditional cigarettes. I use e-cigarettes because the aroma is much more pleasant and tasty." (M-5, 20, Single).</p> <p>"I enjoy using e-cigarettes because the aroma and taste make me feel good." (M-13, 21, Single).</p>                                                                                                                                                                                                                                                                      | 16                     | 80 |
|                                                  | Dense vapor                 | <p>"I enjoy using e-cigarettes because of their high smoke performance." (M-10, 20, Single).</p> <p>"I find the formation of visuals resembling hookah smoke while using e-cigarettes very enjoyable." (M-2, 20, Single).</p>                                                                                                                                                                                                                                                                                                                                                                                                                                          | 6                      | 30 |
|                                                  | Variety of flavors          | <p>"I appreciate the flavored nature of e-cigarettes. For example, I sometimes use chocolate-flavored, sometimes menthol-flavored e-cigarettes." (M-18, 25, Single).</p> <p>"When using e-cigarettes, you can buy the liquid of the flavor you want and experience the taste of the desired aroma." (M-4, 20, Single).</p>                                                                                                                                                                                                                                                                                                                                             | 3                      | 15 |
| Less harmful                                     | Less unpleasant smell/taste | <p>"When using traditional cigarettes, there is an unpleasant odor on us. However, with e-cigarettes, there is no lingering bad smell. After starting e-cigarette use, the smell of traditional cigarettes seemed very heavy a week later." (M-5, 20, Single).</p> <p>"I prefer e-cigarettes because they do not leave a bad smell and taste in the mouth like traditional cigarettes." (M-10, 20, Single).</p> <p>"I believe that e-cigarettes do not have negative effects such as body odor, bad breath, and teeth yellowing, which are present in traditional cigarettes." (M-15, 21, Single).</p>                                                                 | 11                     | 55 |
|                                                  | Lower risk of addiction     | <p>"I enjoy using e-cigarettes because they are free from many foreign substances found in traditional cigarettes. For example, you can add the desired amount of nicotine to the liquid tank of the e-cigarette. Since you can adjust the amount of nicotine you will receive, I don't think e-cigarette use will result in addiction." (M-16, 31, Married).</p> <p>"I think e-cigarettes are always one step ahead in terms of addiction compared to traditional cigarettes." (M-10, 20, Single).</p> <p>"In my opinion, the nicotine content in e-cigarettes is lower than that in traditional cigarettes, so the addiction rate is lower." (M-11, 22, Single).</p> | 10                     | 50 |
| Ease of use                                      | Indoor usage convenience    | <p>"My initial impression of e-cigarettes was the convenience of being able to use them in any setting, whether open or closed." (M-2, 20, Single).</p> <p>"Even if the nicotine content in the liquid tank of e-cigarettes increases, you can still use e-cigarettes in enclosed spaces." (M-16, 31, Married).</p>                                                                                                                                                                                                                                                                                                                                                    | 4                      | 20 |
|                                                  | Extended usage opportunity  | <p>"After charging the e-cigarette once, I can use it for a long time." (M-9, 23, Single).</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | 1                      | 5  |
|                                                  | Portability                 | <p>"Because I consume e-cigarettes, I don't have the trouble of carrying a lighter, like people who smoke traditional cigarettes." (M-2, 20, Single).</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | 4                      | 20 |
| More economical                                  |                             | <p>"E-cigarettes are less expensive than traditional cigarettes." (M-4, 20, Single).</p> <p>"I prefer e-cigarettes because they are economical. For example, while allocating a budget of around 600-700 TL from my monthly income for traditional cigarettes, I allocate a budget of around 300-400 TL from my monthly income for e-cigarettes." (M-12, 21, Single).</p>                                                                                                                                                                                                                                                                                              | 5                      | 25 |

**Table 3.**  
*Perceptions of the Harms Associated with E-Cigarette Use Among Young Adults*

| Categories                       | Sub-Categories                    | Quotes                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | Number of Participants (f) | %  |
|----------------------------------|-----------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------|----|
| Persistence of nicotine cravings |                                   | <p>"I believe that while e-cigarettes may reduce traditional cigarette usage, they never reduce the desire to smoke traditional cigarettes because the nicotine content in e-cigarettes is very low." (F-9, 23, Single).</p> <p>"I also consume traditional cigarettes because the nicotine level in e-cigarettes is low." (M-11, 22, Single).</p>                                                                                                                                                                                  | 3                          | 15 |
| Harmful to health                | Health problems                   | <p>"There are claims that e-cigarettes cause water accumulation in the lungs. If I decide to quit using e-cigarettes one day, it would be due to this reason." (M-14, 21, Single).</p> <p>"I am aware that my chronic asthma has worsened after using e-cigarettes. I don't think e-cigarettes are innocent." (M-16, 31, Married).</p> <p>"I read in an article that e-cigarettes, while providing flavor through aromas, cause the inhaled air to adhere more to the lungs. Menthol flavor is one example." (F-8, 22, Single).</p> | 8                          | 40 |
|                                  | Addiction risk                    | <p>"I believe that e-cigarettes can lead to addiction at least as much as traditional cigarettes." (F-12, 21, Single).</p> <p>"As someone who doesn't use traditional cigarettes, I consume e-cigarettes frequently. I'm not surprised by this because I know that e-cigarettes, like traditional cigarettes, can lead to addiction." (M-10, 20, Single).</p>                                                                                                                                                                       | 2                          | 10 |
| Mechanical problems              | Quick depletion of battery/liquid | <p>"Due to frequent use, the battery of e-cigarettes can run out quickly, and the liquid tank can deteriorate, requiring replacement afterward." (M-16, 31, Married).</p> <p>"E-cigarette aroma liquids sometimes leak. In such cases, both the liquid runs out quickly, and it leaves a bad feeling in our hands." (M-11, 22, Single).</p>                                                                                                                                                                                         | 4                          | 20 |
|                                  | Risk of explosion                 | <p>"Since e-cigarettes operate with a battery, there is always a risk of explosion. I had seen this incident in a video shared on the internet, and it was really terrifying." (M-3, 21, Single).</p> <p>"Sometimes, the use of e-cigarettes can be bothersome due to the risk of explosion." (M-4, 20, Single).</p>                                                                                                                                                                                                                | 2                          | 10 |
|                                  | Lack of portability               | <p>"If you want to use e-cigarettes with different flavored aromas, you have to carry a bag with various liquids." (M-5, 20, Single).</p>                                                                                                                                                                                                                                                                                                                                                                                           | 1                          | 5  |
| Cost                             |                                   | <p>"I'm not currently considering quitting e-cigarettes, but if I ever do, it will definitely be because of financial reasons. The prices of e-cigarettes are unbelievably increasing day by day." (F-6, 23, Single).</p> <p>"I am currently using both regular cigarettes and e-cigarettes. Using both at the same time can be financially challenging for me." (M-18, 25, Single).</p>                                                                                                                                            | 7                          | 35 |

#### Sub-Category 2: Addiction Risk

Ten percent of young adults with experience in e-cigarette use perceive it as harmful due to the high potential for addiction when using e-cigarettes. Some participants reported that the amount and frequency of e-cigarette use increase impulsivity in individuals day by day, indicating that e-cigarette use carries a risk of addiction (Table 3).

#### Category 3: Mechanical Problems

The participants perceive e-cigarette use as harmful due to mechanical problems. The mechanical problems include quick depletion of battery/liquid, risk of explosion, and lack of portability (Table 3).

#### Sub-Category 1: Quick Depletion of Battery/Liquid

About 20% of participants perceive e-cigarettes as detrimental because the battery or flavor-giving liquid quickly runs out. The young adults in the study expressed encountering mechanical problems such as leakage of flavor liquids or rapid depletion of the battery while using e-cigarettes (Table 3).

#### Sub-Category 2: Risk of Explosion

Ten percent of the participants perceive e-cigarettes as harmful due to the risk of explosion related to charging, the battery, or the device (Table 3). The participants expressed fear of the device exploding in their hands during e-cigarette use.

### Sub-Category 3: Lack of Portability

The participants consider e-cigarettes harmful due to their lack of portability. Five percent of the participants stated that e-cigarettes need to be carried with their unique accessories, which can be inconvenient (Table 3).

### Category 4: Cost

A total of 35% of the participants reported that e-cigarette use is more expensive and costly compared to traditional cigarettes, leading to the perception of harm. The participants stated that e-cigarette use can become economically burdensome, potentially turning into an expensive habit. They further stated that continuous spending may be necessary to enhance the product's effectiveness (Table 3).

## Discussion

In this study aimed at determining the perceived benefits and risks of electronic cigarette (e-cigarette) use among young adults through qualitative research methods, the benefit perceptions of young adults with e-cigarette usage experience were assessed in 5 main categories, while the risk perceptions were evaluated in four main categories. The discussion part of the study focused on young adults' perceptions of the benefits and harms of e-cigarettes.

In this study, the participants believed that e-cigarette use could lead to a reduction or cessation of traditional cigarette smoking. They perceived e-cigarettes as enjoyable, less harmful compared to traditional cigarettes, easy to use, and more economical. The literature also emphasizes the growing prevalence of e-cigarette use among young adults for reducing or quitting traditional cigarette smoking or perceiving e-cigarettes as beneficial compared to traditional cigarettes (Atlam et al, 2020; Dayi et al, 2019; Sayılı et al, 2020). Similarly, a study conducted in the United Kingdom found that e-cigarette use was preferred to reduce traditional cigarette smoking (ASH, 2019). The participants evaluated e-cigarettes as more enjoyable than traditional cigarettes due to pleasant flavors/tastes, dense vapor, and a variety of aromas, aligning with existing literature (Huma, 2022; Landry et al, 2019). According to a systematic review, diverse flavor options attract e-cigarette users (Gades et al, 2022). Pokhrel et al (2015) reported that e-cigarettes are used as an enjoyable tool due to their unique features, such as producing large clouds of vapor. In this study, young adults perceived e-cigarettes as less harmful than traditional cigarettes due to the lower risk of bad odor and addiction. A study among teenagers reported that e-cigarettes were used based on perceptions of not containing tobacco, being less harmful than traditional cigarettes, and causing less addiction (Park et al, 2019). A quantitative study with university students in Türkiye reported that 21.6% of participants found e-cigarettes less harmful (Mutlu et al, 2023). Landry et al (2019) stated that the perceived addiction risk is lower among e-cigarette users. Similarly, a study conducted in India by Gupte et al (2022) found that teenagers determine a product's harmfulness based on the presence of tobacco, perceiving products without tobacco as beneficial. In this study, young adults considered e-cigarettes as less harmful and socially acceptable, depending on aroma and nicotine content. Participants perceived e-cigarettes as advantageous due to ease of carrying, long-term use, and the ability to use them even in enclosed spaces compared to traditional cigarettes. The

review of the literature indicates that being able to use e-cigarettes in places where traditional cigarette smoking is prohibited makes e-cigarettes more appealing (Bennett et al, 2023; Fadus et al, 2019; Simpson et al, 2021). Lastly, participants stated that they find e-cigarettes more economical than traditional cigarettes. Especially in the context of addiction prevention efforts in our country, it is believed that the increase in traditional cigarette prices and the availability of e-cigarettes at more affordable prices through illegal means contribute to this finding.

Young adults in this study perceive e-cigarettes as harmful due to the continuation of nicotine cravings, health risks, mechanical problems, and cost. They stated that despite using e-cigarettes, they cannot attain the nicotine levels present in traditional cigarettes, leading to persistent cravings. This situation may contribute to dual use among young adults (Atlam et al, 2020; Öznur Muz et al, 2022). Jackler and Ramamurthi (2019) also note that traditional cigarette users engage in e-cigarette use, increasing dependency. Additionally, the participants emphasized potential health problems and addiction risks associated with e-cigarette use. It can be said that the increasing efforts to clarify uncertainties related to e-cigarette use, the publication of informative content through the press and media, and the easy access of young adults to the results of these studies and relevant publications contribute to the increasing awareness of health risks and addiction potential associated with e-cigarette use. In this study, some participants mentioned encountering mechanical problems more frequently compared to traditional cigarettes due to e-cigarette issues such as quick depletion of the battery/liquid, explosion risk, and lack of portability. This observation aligns with the literature (Pokhrel et al, 2015; Simmons et al, 2016). Finally, some participants state that the cost of e-cigarettes is higher than that of traditional cigarettes. This finding regarding the cost of e-cigarettes may be attributed to curiosity about different flavor options, leading to experimentation, and the frequency of replacing e-cigarette devices. Similarly, Pokhrel et al (2015) reported in their study that participants considered e-cigarette use an expensive habit, expressing complaints about spending money on purchasing or replacing e-cigarette products and accessories, driven by the desire to try new flavors.

The study suggests that young adults' perceptions of the benefits and harms of e-cigarettes may have multiple dimensions. The current findings indicate that young adults often perceive e-cigarettes as a means to reduce or quit traditional smoking, as pleasurable, or as less harmful compared to traditional cigarettes. This may be related to a lack of information, misunderstandings, and peer influence. Therefore, based on the study results, it is recommended to plan addiction-related education and counseling programs specifically for individuals at risk of e-cigarette use. Additionally, it is suggested to implement informative and awareness-raising programs about e-cigarettes and their potential adverse health effects, starting from younger age groups and continuing into young adulthood. These programs should utilize press and media outlets to create public awareness, organize social events and seminars, and facilitate discussions on the perceived benefits and harms of e-cigarettes in small group settings.

### Limitations and Suggestions for Future Research

This study has certain limitations. One limitation is that the research results may not be generalizable, as is typical in other

qualitative studies, and are limited to the young adults reached through snowball sampling. Additionally, in this study, young adults were defined as those between 18 and 35 years old, representing a broad age range. Therefore, it is considered that focusing on individuals aged 18 to 25 in future studies may lead to different results. In addition, children and adolescents aged 12 to 18 are also among the groups at risk for e-cigarette use. Therefore, it is crucial to conduct studies focusing on these age groups. Qualitative studies targeting different age groups are expected to be effective in planning targeted interventions for at-risk populations. It was observed that the majority of young adults interviewed in the study used both traditional cigarettes and e-cigarettes. Hence, it is recommended that future studies, particularly those addressing the risk of e-cigarette use, should be conducted with young adults who do not smoke traditional cigarettes. Furthermore, conducting focus group interviews could be more advantageous for peer interaction, resource and time efficiency, and obtaining comprehensive data in future research. Despite these limitations, the results provide a context for understanding the decision-making process related to e-cigarette use and guiding future research. Conducting comprehensive studies in different populations is also recommended. Descriptive and exploratory studies in terms of e-cigarette use and experimental designs, especially in at-risk groups such as young adults, are suggested to contribute to the national literature by identifying groups at risk for e-cigarette use. Furthermore, it is recommended to conduct large-scale, population-based studies to assess individuals' motivations and expectations concerning e-cigarette use. Qualitative research should also be undertaken to identify the cultural and traditional attitudes that shape public perceptions of the benefits and harms of tobacco use, including e-cigarettes.

**Data Availability Statement:** The data that support the findings of this study are available on request from the corresponding author.

**Ethics Committee Approval:** This study was approved by the Ethics Committee of Non-Drug and Non-Medical Device Research of KTO Karatay University (Approval No: 030 Date: 2023).

**Informed Consent:** Informed consent was obtained from the participants who agreed to take part in the study.

**Peer-review:** Externally peer reviewed.

**Author Contributions:** Concept – A.K.U., E.Ü.; Design – A.K.U., E.Ü.; Supervision – A.K.U.; Resources – A.K.U.; Materials – A.K.U., E.Ü.; Data Collection and/or Processing – A.K.U., E.Ü.; Analysis and/or Interpretation – A.K.U., E.Ü.; Literature Search – A.K.U., E.Ü.; Writing – A.K.U., E.Ü.; Critical Review – A.K.U., E.Ü.

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## ORIGINAL ARTICLE

# Public Perception of Government Intervention: Development and Validation of the Effects of the Nanny State on Smoking (ENSS) Scale

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## Main Points

- The opinions of individuals directly affected by the policy in a particular area are essential for evaluating the policy and the steps to be taken in the future.
- This study presents a novel scale for evaluating smokers' acceptability of tobacco control policies.
- In its final form, the scale includes all the preventive policies implemented to reduce cigarette consumption today.
- The statements in the scale will enable both the assessment of how the policies implemented in the current situation impact the affected population and to understand the views on practices that can be expanded.

## Abstract

This study aimed to develop a unique, valid, and reliable scale to measure smokers' acceptability of tobacco control policies. Based on the "nanny state" conceptual framework, a draft scale was developed through a systematic scale development process. In the research, the factors obtained from the literature and the items included were examined in consultation with experts, content validity was tested, and reliability analyses were conducted. The data for this study were collected from smokers aged 18 years and older in Türkiye. The draft scale was first administered to 405 smokers; exploratory factor analysis was conducted to determine the underlying factor structure of the scale and a 7-factor form with 30 items was obtained. The updated scale included 7 dimensions: Price, Plain Package, Non-Smoking Area, Media, Disturb, Nanny State's Problems and Costs, and Public Perception. It was applied to 617 people who did not reply to the draft scale, and a confirmatory factor analysis was performed. As a result of the confirmatory factor analysis, the goodness of fit values of the scale were within acceptable limits. A scale was obtained to measure how those directly affected by the policy view the policies with the dimensions.

**Keywords:** Health policy, nanny state, scale development, smoking, tobacco Control Policy

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## Introduction

Around 1.3 billion people worldwide smoke, with more than 80% living in low- and middle-income countries (LMICs). Tobacco kills more than 8 million people every year. More than 7 million of these deaths are directly attributable to tobacco use, and about 1.2 million are due to secondhand smoke exposure by non-smokers (World Health Organization, 2022). Tobacco use is an important modifiable risk factor contributing to disability and premature

deaths (Reitsma et al., 2021). The total economic cost of smoking (including health expenditures and productivity losses) is approximately \$1.4 – 1.8 trillion, equivalent to 1.8% of the global annual gross domestic product (World Health Organization, 2021). In addition, the World Health Organization (WHO) report emphasizes that 22 billion tons of water are used in tobacco production worldwide, 2 million tons of packaging waste are generated, and trees cut for tobacco production account for 5% of global deforestation (World Health Organization, 2022).

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World Health Organization (WHO) emphasizes the primary role of governments in addressing lifestyle-related preventable risk factors (tobacco use, unhealthy diet, and harmful alcohol use) in a multi-sectoral manner (World Health Organization, 2003). Governments are responsible for protecting and promoting the population's health and addressing the injustices of health inequalities in society (Coggon, 2018).

Public health interventions by the government are regularly accused of paternalism, as it is emphasized that the government tends to use its power to force individuals to change their behavior (Bellefleur & Keeling, 2018). According to Dworkin (2014), paternalism is the intervention of a state or individual against another person's will, defended or motivated by the claim that the intervened person will be better off or protected from harm. Grill (2013) characterized the normative essence of paternalism as the conflict between respect for freedom and autonomy on the one hand and the protection and promotion of welfare on the other. Paternalism is criticized not because it improves well-being but because it violates freedom or autonomy to achieve it (Bellefleur & Keeling, 2020).

The nanny state broadly describes a paternal state that intervenes unnecessarily and excessively in personal choices (Coggon, 2018; Jochelson, 2006). The nanny state is an essential concept in public health regulation (Fitzpatrick, 2004). It is used to criticize state practices that regulate and control the consumption of unhealthy foods and products such as tobacco and alcohol. The nanny state broadly describes a paternal state that intervenes unnecessarily and excessively in personal choices (Coggon, 2018; Jochelson, 2006). The idea of a nanny state carries connotations of an infantile political vision of a government that treats adults as children in reasoning situations. However, in practice, any measure to protect and promote health, whether or not it is "nannying" in this sense, is accused of being a nanny state (Coggon, 2018). While there is considerable debate about whether government intervention constitutes nanny statism, the role of government in preventive health is not indisputable (Hoek, 2015). Le Grand and New (2015) emphasized the need to carefully analyze what nannying involves and state paternalism. Nanny state policies can create a range of problems and costs. Increased cigarette taxes raise the cost of living and harm people experiencing poverty (who smoke more). Higher prices increase corruption. Over-regulation creates excessive bureaucracy and drains limited resources (Snowdown, 2022).

Evidence shows that tobacco control policies positively change individual preferences and have important implications for better health outcomes (Jochelson, 2006). For example, health warnings on cigarette packages provide information about the risks and encourage reducing cigarette consumption and quitting (Ngo et al., 2018). Similarly, bans and regulations on tobacco advertising, promotion, and sponsorship reduce tobacco sales and consumption worldwide (Blecher, 2008). Well-designed mass media anti-tobacco campaigns can reduce tobacco use, increase quit attempts, reduce youth initiation rates, and reduce secondhand smoke exposure (Durkin et al., 2012). Smokers exposed to mass media campaigns are more likely to quit smoking than those who are not (Naidoo, 2004). Research in low, middle, and high-income countries shows that

taxation policy is remarkably effective in reducing tobacco demand (Jha & Chaloupka, 2000). Public attitudes change over time and are often influenced by the enactment of laws, as shown in many studies by the increased acceptability of smoking restrictions after the introduction of bans on smoking in public places (Pursell et al., 2007).

The biggest obstacle to implementing preventative policies is the low level of public acceptance (Diepeveen et al., 2013; Reynolds et al., 2020a). Few studies have been published on public attitudes toward preventive health policies and interventions (Diepeveen et al., 2013). Studies have also investigated how it characterizes public views on government interventions in preventing non-communicable diseases (Grunseit et al., 2019; Jain et al., 2021). Bellefleur and Keeling (2020) conclude their study with a question: "*How is the population affected by this policy, and how does it see these benefits and the possible negative effects of the policy?*" If the policy interferes with the freedom of certain persons, they need to be involved in developing the policy or intervention. Many OECD countries conduct perception surveys to assess or inform the design of regulatory policies. These can be used to understand what is behind the results of surveys, to identify what is acceptable to consumers, and to identify priority areas for future reforms (OECD, 2012).

Understanding the perceptions of individuals targeted by tobacco policies can provide the basis for future policy development and implementation (Diepeveen et al., 2013). This research aimed to develop a unique, valid, and reliable scale to measure the acceptability of tobacco control policies implemented to reduce smoking. Similar scales have been developed (Velicer et al., 1994) but do not include public perceptions and the problems and costs of the practices. This can contribute to developing and assessing tobacco control policies in Türkiye and other LMICs.

## Material and Methods

### Scale Design

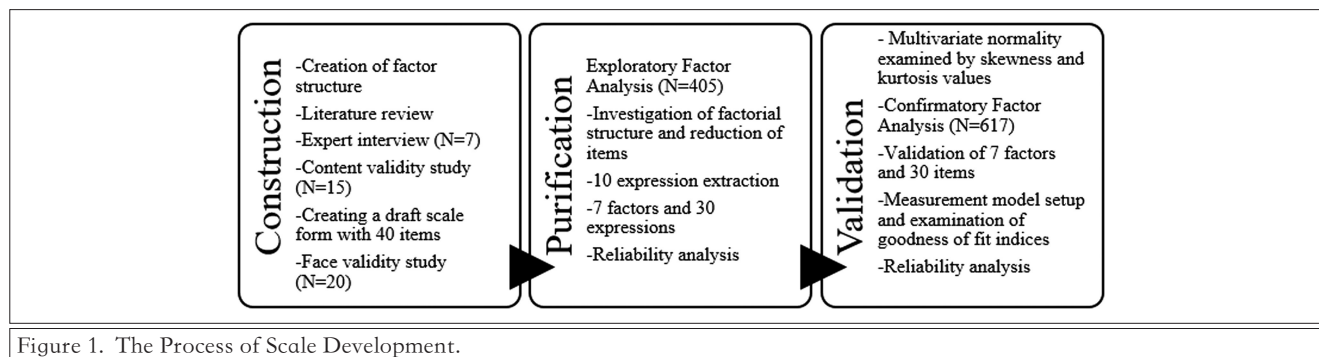
The scale development followed a systematic approach of three stages (Figure 1).

### Stage One: Construction

The first stage involved creating an item pool based on the published literature, including similar scales and interviews with seven experts working in the field. The draft scale's content and face validity were also tested at this stage. For content validity, Lawshe's (1975) technique was used, and the experts were asked to choose one of the options: "Appropriate," "Appropriate but should be corrected," and "Should be removed." In addition to the rating in the Lawshe technique (1975), the researchers asked the experts to write their opinions for each item: "If your answer should be corrected, what is your suggestion about how it should be corrected?" If your answer should be removed, "If your answer should be removed, why?". At the end of the stage, the draft scale form was administered to 20 smokers as a pre-test application to understand whether it was comprehensible.

### Stage Two: Scale Purification

The second stage was to investigate and examine the factorial structure of the ENSS and reduce the number of scale items (40). The questionnaire was administered to 405 smokers over 18 and



used to investigate the factorial validity of the scale. A 5-point Likert-type scale (1: Strongly disagree, 5: Strongly agree) was used in the study. The scale also included 15 questions on demographic characteristics and smoking behavior (Table 1).

### Stage Three: Scale Validation

The data was obtained from 405 participants regarding the draft scale form and exploratory factor analysis (EFA). The last stage includes the final 7-factor and 30-expression scale form and the confirmatory factor analysis (CFA) results with the data obtained from 617 participants.

### Participants and Data Collection

The Social and Human Sciences Ethics Committee of Süleyman Demirel University (Approval No: 127/6, Date: 25.10.2022). University approved the research with a decision numbered 127/6. The study's universe consists of smokers over 18 in Türkiye. The convenience sampling method selected the participants from among smokers over 18. The data of this study (stage two and stage three) were collected between 25.10 and 26.12.2022. Informed consent was obtained from all participants.

Different participants were involved at each stage. Stage one included face-to-face interviews with 7 experts to create the dimensions and items. The draft scale formed after the interviews was presented to 15 experts. The experts were Public Health, Healthcare Management, Sociology, Public Policy, and scale development academics. Their opinions were obtained through an expert opinion form. The draft scale form was administered to 20 smokers as a pre-test application. Stage two and Stage three contained data collected online via Google Forms from 405 and 617 respondents, respectively.

## Results

### Stage One: Construction

Firstly, a pool of 42 items was formed based on the published literature and interviews with 7 experts. In determining the possible factors, the policies in practice and discussed in the literature, the concepts in the nanny state debate, and individuals' perspectives on the duties of the state and the policies it implements were considered. Each factor and item was analyzed and reviewed by experts in scale development, and a draft scale was created. The draft scale was first presented to 15 experts. After the content validity evaluation, necessary corrections were made to the scale; 2 items were removed because they had a CVI score lower than 0.50, and a draft scale with 40 items was formed. The draft scale

form was administered to 20 smokers as a pre-test application and was found to be comprehensible.

### Stage Two: Scale Purification

In stage two, to investigate and examine the factorial structure and validity of the ENSS and reduce the number of scale items (40), the questionnaire was administered to 405 smokers over 18. Then, EFA was conducted using factor analysis with the Direct Oblimin method to extract the factors. Here, items with factor loadings  $>0.40$  were considered, and factors with eigenvalues  $>1$  were selected (Gorsuch, 1983). In addition, the Kaiser – Meyer – Olkin (KMO) sampling adequacy measure was used to indicate the factorability of the data (Tabachnick & Fidell, 2007). The stage obtained a KMO value of 0.894, indicating the adequacy of the sample for factor analysis (Kaiser, 1974). Bartlett's test of sphericity was also significant ( $X^2 = 7892.567$ ,  $df = 435$ ,  $p = .000$ ). The research revealed a 7-factor structure and reduced the scale to 30 items. The naming of the factors followed these. The sub-dimensions were named (1) Price, (2) Plain Package, (3) Non-Smoking Area, (4) Media, (5) Disturb, (6) Nanny State's Problems and Costs, and (7) Public Perception. The scale explained 70.693% of the total variance. As a result of the reliability analysis, it was seen that both the whole scale (0.905) and the 7 factors separately had sufficient internal reliability (.682 – .932) (Table 2).

### Stage Three: Scale Validation

After removing the factors from the EFA, stage three was applied to confirm the underlying factor structure of the ENSS. The 7-factor, 30-item scale derived from the EFA was administered to 617 smokers over 18. Confirmatory factor analysis (CFA) was conducted to determine the goodness-of-fit index between the currently factorial structured model. Within the scope of CFA, the recommended chi-square ( $X^2$ ) ratio degrees of freedom ( $df$ ), Adjusted Goodness of Fit Index (AGFI), Comparative Fit Index (CFI), Normed Fit Index (NFI), Tucker-Lewis index (TLI), Root Mean Square Error of Approximation (RMSEA), Standardized Root Mean Square Residual (SRMR) fit index values were used to reveal the model fit (Hooper et al., 2008). The measurement model provided a good fit with  $X^2/df = 3.517$ , AGFI = .874, CFI = .928, NFI = .903, TLI = .917, RMSEA = .064 and SRMR = .0763 (Jackson et al., 2009). All the fit indices required to obtain a good model fit exceeded the threshold value, thus demonstrating the general acceptability of the measurement model. Confirmatory factor analysis (CFA) explained 73.667% of the total variance. As a result of the reliability analysis, it was seen that both the whole scale (.895) and the 7 factors separately had sufficient internal reliability (.765 – .941) (Table 2). The item-total correlation was

**Table 1.**  
*Demographic Profile of the Study Participants.*

| Demographics                                                        | Categories                           | Stage Two |      | Stage Three |      | Demographics                                                           | Categories                                       | Stage Two |      | Stage Three |      |
|---------------------------------------------------------------------|--------------------------------------|-----------|------|-------------|------|------------------------------------------------------------------------|--------------------------------------------------|-----------|------|-------------|------|
|                                                                     |                                      | N         | %    | N           | %    |                                                                        |                                                  | N         | %    | N           | %    |
| Gender                                                              | Female                               | 151       | 37.3 | 244         | 39.5 | Do you plan to quit smoking?                                           | I plan to quit in 1 month                        | 50        | 12.3 | 78          | 12.6 |
|                                                                     | Male                                 | 254       | 62.7 | 373         | 60.5 |                                                                        | I plan to quit in 6 months                       | 43        | 10.6 | 51          | 8.3  |
| Age                                                                 | 18 – 25                              | 140       | 34.6 | 310         | 50.2 |                                                                        | I plan to quit in 1 year                         | 101       | 24.9 | 161         | 26.1 |
|                                                                     | 26 – 35                              | 108       | 26.7 | 110         | 17.8 | Why do you plan to quit smoking?*                                      | I do not plan to quit                            | 211       | 52.1 | 327         | 53   |
|                                                                     | 36 – 45                              | 99        | 24.4 | 132         | 21.4 |                                                                        | Religious reasons                                | 17        | 4.2  | 22          | 3.6  |
|                                                                     | 46 – 55                              | 49        | 12.1 | 53          | 8.6  |                                                                        | Social reasons                                   | 34        | 8.4  | 44          | 7.1  |
|                                                                     | 56+                                  | 9         | 2.2  | 12          | 1.9  |                                                                        | Economic reasons                                 | 89        | 22   | 142         | 23   |
|                                                                     |                                      |           |      |             |      |                                                                        | Health reasons                                   | 170       | 42   | 259         | 42   |
| Education level                                                     | Primary education                    | 13        | 3.2  | 12          | 1.9  | To what extent do you know the harmful health effects of smoking?      | Family reasons                                   | 53        | 13.1 | 52          | 8.4  |
|                                                                     | High school                          | 25        | 6.2  | 63          | 10.2 |                                                                        | Other reasons                                    | 53        | 13.1 | 68          | 11   |
|                                                                     |                                      |           |      |             |      |                                                                        | I do not plan to quit                            | 179       | 44.2 | 269         | 43.6 |
|                                                                     | Bachelor                             | 242       | 59.8 | 421         | 68.2 |                                                                        | I do not know at all                             | 7         | 1.7  | 10          | 1.6  |
|                                                                     | Master degree                        | 71        | 17.5 | 67          | 10.9 |                                                                        | I know a little                                  | 19        | 4.7  | 20          | 3.2  |
|                                                                     | Doctoral degree                      | 54        | 13.3 | 54          | 8.8  |                                                                        | I know                                           | 61        | 15.1 | 109         | 17.7 |
| Average Monthly Income Level <sup>+</sup>                           | Under 5500₺                          | 158       | 39.0 | 295         | 47.8 | Do you have any health problems that require regular check-ups?*       | I know well                                      | 89        | 22.0 | 145         | 23.5 |
|                                                                     | 5501 – 10,000₺                       | 76        | 18.8 | 124         | 20.1 |                                                                        | I know very well                                 | 229       | 56.5 | 333         | 54   |
|                                                                     | 10.001 – 15,000₺                     | 86        | 21.2 | 97          | 15.7 |                                                                        | Cancer                                           | 5         | 1.2  | 10          | 1.6  |
|                                                                     | Over 15,000₺                         | 85        | 21.0 | 101         | 16.4 |                                                                        | Heart disease                                    | 8         | 2    | 2           | 3.6  |
| How many years have you been smoking?                               | Under 5 years                        | 109       | 26.9 | 214         | 34.7 |                                                                        | Respiratory system diseases (COPD, Asthma, etc.) | 28        | 6.9  | 40          | 6.5  |
|                                                                     | 6 – 15 years                         | 152       | 37.5 | 232         | 37.6 |                                                                        | Diabetes                                         | 15        | 3.7  | 21          | 3.4  |
|                                                                     | 16 – 25 years                        | 94        | 23.2 | 119         | 19.3 |                                                                        | Hypertension                                     | 15        | 3.7  | 22          | 3.6  |
|                                                                     | Over 26 years                        | 50        | 12.3 | 52          | 8.4  |                                                                        | Kidney disease                                   | 5         | 1.2  | 8           | 1.3  |
| How many cigarettes do you smoke on average per day?                | 1 – 10                               | 146       | 36.0 | 237         | 38.4 |                                                                        | Liver disease                                    | 4         | 1    | 8           | 1.3  |
|                                                                     | 11 – 20                              | 185       | 45.7 | 268         | 43.4 |                                                                        | Other                                            | 22        | 5.4  | 41          | 6.6  |
|                                                                     | 21 – 30                              | 48        | 11.9 | 70          | 11.3 |                                                                        | I have no health problems                        | 325       | 80.2 | 485         | 78.6 |
|                                                                     | Over 31                              | 26        | 6.4  | 42          | 6.7  |                                                                        | Fatigue                                          | 266       | 65.7 | 387         | 62.7 |
| How long after waking up do you usually smoke your first cigarette? | Within 5 minutes                     | 80        | 19.8 | 135         | 21.9 | Which of the following problems do you experience in your daily life?* | Insomnia                                         | 191       | 47.2 | 292         | 47.3 |
|                                                                     | 6 – 30 minutes                       | 111       | 27.4 | 172         | 27.9 |                                                                        | Spiritual tension                                | 163       | 40.2 | 248         | 40.2 |
|                                                                     | 31 – 60 minutes                      | 84        | 20.7 | 116         | 18.8 |                                                                        | Forgetfulness                                    | 136       | 33.6 | 206         | 33.4 |
|                                                                     | More than 60 minutes                 | 130       | 32.1 | 194         | 31.4 |                                                                        | Stress                                           | 240       | 59.3 | 363         | 58.8 |
| Have you changed your cigarette brand in the last year?             | I changed due to personal preference | 68        | 16.8 | 123         | 19.9 |                                                                        | Decreased reflexes                               | 51        | 12.6 | 62          | 10   |
|                                                                     | I changed because of the price       | 119       | 29.4 | 177         | 28.7 |                                                                        | Shortness of breath                              | 100       | 24.7 | 152         | 24.6 |
|                                                                     | Did not change                       | 218       | 53.8 | 317         | 51.4 |                                                                        | Difficulty climbing stairs                       | 153       | 37.8 | 215         | 34.8 |
| Do you want to quit smoking?                                        | Yes                                  | 218       | 53.8 | 324         | 52.5 |                                                                        | None of them                                     | 13        | 3.2  | 23          | 3.7  |
|                                                                     | No                                   | 187       | 46.2 | 293         | 47.5 |                                                                        |                                                  |           |      |             |      |
| Have you tried to quit smoking in the last year?                    | Yes                                  | 156       | 38.5 | 251         | 40.7 |                                                                        |                                                  |           |      |             |      |
|                                                                     | No                                   | 249       | 61.5 | 366         | 59.3 |                                                                        |                                                  |           |      |             |      |

\*This is a multi-response variable. <sup>+</sup>The minimum wage in Türkiye is 5500 Turkish Liras.

**Table 2.**  
*Results of Exploratory Factor Analysis and Confirmatory Factor Analysis.*

| Dimensions                       | Items                                                                                                                                                                                   | Factor Loading |      | % of variance<br>(EFA - CFA) | $\alpha$<br>(EFA - CFA) | AVE<br>- CR |
|----------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------|------|------------------------------|-------------------------|-------------|
|                                  |                                                                                                                                                                                         | EFA            | CFA  |                              |                         |             |
| Price                            | Future increases in cigarette prices will cause me to smoke less.                                                                                                                       | .906           | .907 | 5.764/ 6.326                 | .897/ .900              | .74/ .90    |
|                                  | Current cigarette prices make me smoke less.                                                                                                                                            | .898           | .865 |                              |                         |             |
|                                  | Rising cigarette prices make it more likely that I will quit smoking.                                                                                                                   | .826           | .813 |                              |                         |             |
| Plain package                    | The current warnings on cigarette packs (pictures and text) make me smoke less.                                                                                                         | .876           | .853 | 3.747/ 3.658                 | .853/ .835              | .62/ .86    |
|                                  | Current warnings on cigarette packs (pictures and text) make it more likely that I will quit smoking.                                                                                   | .863           | .875 |                              |                         |             |
|                                  | In the future, more warnings (pictures, text, etc.) on cigarette packs will make me smoke less.                                                                                         | .846           | .873 |                              |                         |             |
|                                  | I support the government putting warning labels (pictures and text) on cigarette packs to reduce smoking.                                                                               | .558           | .475 |                              |                         |             |
| Non-smoking area                 | Smoking bans in certain areas (e.g., public organizations and enclosed spaces) make me smoke less.                                                                                      | .770           | .830 | 6.759/ 3.795                 | .849/ .889              | .62/ .83    |
|                                  | If smoking is banned in new areas (bus stops, playgrounds, etc.) in the future, I will smoke less.                                                                                      | .705           | .835 |                              |                         |             |
|                                  | I support the government banning smoking in certain areas to reduce smoking.                                                                                                            | .616           | .690 |                              |                         |             |
| Media                            | In the future, the ban on cigarette adverts and increased censorship of images (on platforms such as Netflix, Disney Plus, etc.) will cause me to smoke less.                           | .880           | .947 | 31.345/ 30.131               | .932/ .941              | .71/ .94    |
|                                  | The ban on cigarette advertisements and the censorship of images (billboards, television, clothes, etc.) cause me to smoke less.                                                        | .849           | .801 |                              |                         |             |
|                                  | Increasing the ban on cigarette advertisements and displays (billboards, television, clothing, platforms, etc.) raises my likelihood of quitting smoking.                               | .773           | .929 |                              |                         |             |
|                                  | Exposure to advertisements (public service announcements) about the harms of smoking (on TV, social media, etc.) causes me to smoke less.                                               | .721           | .832 |                              |                         |             |
|                                  | Increasing the number of advertisements (public service announcements) about the harms of smoking would increase the likelihood of quitting smoking.                                    | .693           | .717 |                              |                         |             |
|                                  | In the future, encountering more advertisements (public spots) about the harms of smoking (on TV, social media, etc.) will cause me to smoke less.                                      | .689           | .828 |                              |                         |             |
| Disturb                          | It bothers me to encounter services for cessation of smoking.                                                                                                                           | .785           | .791 | 4.416/ 7.852                 | .682/ .765              | .57/ .84    |
|                                  | It bothers me that cigarette advertisements and images are prohibited.                                                                                                                  | .747           | .782 |                              |                         |             |
|                                  | It bothers me to see advertisements (public service announcements) about the harms of smoking.                                                                                          | .672           | .860 |                              |                         |             |
|                                  | It bothers me that the places where I can smoke are decreasing day by day.                                                                                                              | .547           | .554 |                              |                         |             |
| Nanny state's problems and costs | The government's continuous increase in the tax on cigarettes led me to use smuggled chewing tobacco, smuggled cigarillos (cigars weighing no more than 3 grams), smuggled cigars, etc. | .933           | .921 | 13.829/ 15.391               | .854/ .877              | .62/ .89    |
|                                  | The government's continuous increase in cigarette tax leads me to use electronic cigarettes.                                                                                            | .855           | .824 |                              |                         |             |
|                                  | The government's continuous increase in the tax on cigarettes leads me to use smuggled tobacco.                                                                                         | .840           | .848 |                              |                         |             |
|                                  | I think that the policies implemented by the government to reduce the use of cigarettes by society increase smuggling and illegality.                                                   | .547           | .650 |                              |                         |             |
|                                  | The government's tobacco control policies, such as tax increases and smoking bans, interfere with my freedom.                                                                           | .427           | .643 |                              |                         |             |
| Public perception                | The primary purpose of tobacco control policies, such as tax increases and smoking bans, is to support the healthy life of individuals.                                                 | .816           | .817 | 4.833/ 6.515                 | .820/ .850              | .57/ .87    |
|                                  | Tobacco control policies, such as tax increases and smoking bans are justified and correct interventions.                                                                               | .740           | .781 |                              |                         |             |
|                                  | If I want to quit smoking, I think the government will support me sufficiently.                                                                                                         | .680           | .777 |                              |                         |             |
|                                  | The government should enact laws to prevent damage to citizens' health.                                                                                                                 | .625           | .674 |                              |                         |             |
|                                  | The government has an essential role in protecting the health of its citizens.                                                                                                          | .522           | .734 |                              |                         |             |

Note(s): EFA, Exploratory factor analysis; CFA, Confirmatory factor analysis;  $\alpha$ , Cronbach alpha; AVE, Average Variance Extracted; CR, Composite Reliability.

analyzed, and it was seen that the relationship between the items and the scale total was positive. When the method of dividing the test into 2 halves was used for the reliability analysis of the scale, the items were divided into 2 halves as odd and even, and it was seen that the reliability of the 2 halves was very high with a rate of .953. Finally, to measure the reliability of the scale, the lower 27% and upper 27% group averages were examined, and it was seen that there was a significant difference between the 2 groups ( $p < .000$ ). Convergent and divergent analyses were performed for similarity and discriminant validity of the factors, and Average Variance Extracted (AVE) and Composite Reliability (CR) values are shown in Table 2. Confirmatory factor analysis was performed using AMOS (Version 25.0), and other analyses were performed using SPSS v.23.0 (IBM SPSS Corp.; Armonk, NY, USA)).

The confirmatory factor analysis diagram is shown in Figure 2.

As seen in Table 1, most of the participants included in the study (stage two and stage three) were male participants in both stages. In both stages, it was observed that a significant portion of the participants were 35 years of age and below. It was

also observed that the education level of the participants was a bachelor's degree and above. Most participants had been smoking for 6 – 15 years, and the average rate of those who said they smoke 11 – 20 cigarettes daily was higher. It was observed that most participants wanted to quit smoking and had not tried to quit smoking in the last year. Most of those who wanted to quit smoking wanted to quit for health reasons. In support of this, it was observed that most participants were well aware of the adverse effects of smoking on health. Most of the participants stated that they experienced fatigue, stress, and insomnia in daily life. The participant characteristics are similar to the statistical data on smokers in Türkiye. It is known that men and individuals over 35 years of age are more likely to smoke in Türkiye (Turkish Statistical Institute, 2023).

## Discussion

The current study aimed to develop a scale to assess the acceptability of government interventions to reduce smoking. The final scale consists of 7 dimensions and 30 items as follows: (1) Price (3 items), (2) Plain Package (4 items), (3) Non-Smoking Area (3 items), (4) Media (6 items), (5) Disturb (4 items), (6) Nanny

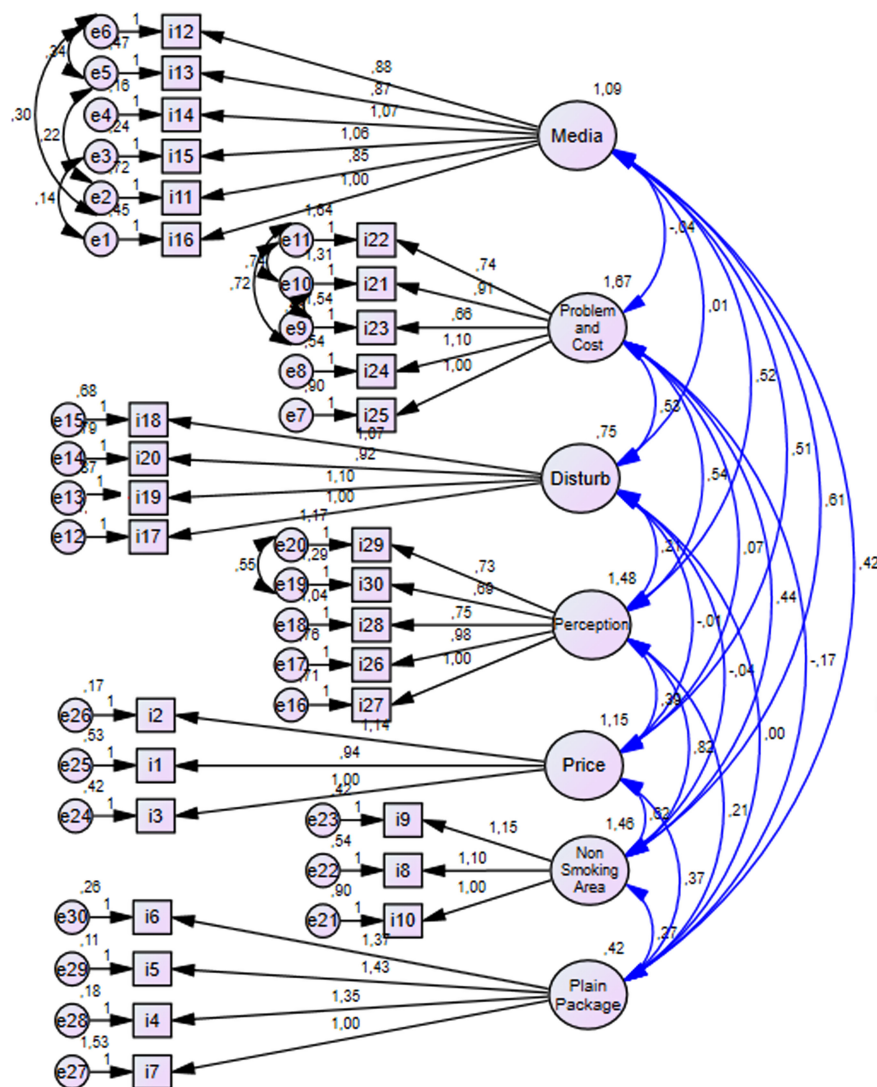


Figure 2. Confirmatory Factor Analysis Diagram.

## Cansever. Public Perception of Government Intervention

State's Problems and Costs (5 items), (7) Public Perception (5 items). The reliability analysis showed that the whole scale and the seven factors had sufficient internal reliability. The demographic characteristics of the people who participated in the study and the demographic characteristics of smokers in Türkiye are compatible. The majority of the participants in the study were males and individuals over 35 years of age, and the highest number of smokers in Türkiye is gathered in these 2 groups. This increases the reliability of the results obtained from the scale.

The views of individuals directly affected by the policy in a particular field are very important for evaluating that policy and the future steps to take. Low public support for government interventions in health policy can hinder implementation. Data collected over time are needed to demonstrate any long-term impact on public health (Howell, 2005). It will also be helpful to present the data obtained. For example, Reynolds et al. (2020b) analyzed data from 6498 abstracts and found that communicating evidence of a policy's effectiveness increases support.

The views of those affected by policies and how they perceive the implementation have been overlooked in the policy-making process (Grunseit et al., 2019; Jain et al., 2021). The developed scale includes the standard procedures of the countries and the practices holistically supported by WHO. The items in the scale will enable both the assessment of how the policies implemented in the current situation impact the affected population and to understand the views on practices that can be expanded in the future. In this context, it can potentially guide the policies that can be put forward.

The 5 dimensions in the scale (Price, Plain Package, Non-Smoking Area, Media, and Public Perception) enable measuring how the practices are generally perceived. As seen in the scale, the practices affect smoking to a greater or lesser extent. These 5 dimensions play a critical role in seeing how the feedback is received from the practices put forward to reduce cigarette use. In addition, 2 dimensions (Disturb, Nanny State's Problems, and Costs) are included in the scale to see the positive and negative reactions to state interventions. The first of these dimensions helps reveal which interventions disturbed smokers more. The Nanny State's Problems and Costs dimension provides insight into the adverse reactions to state interventions associated with the nanny state, which is the core of the scale. Since state interventions in the field can lead to many negative consequences, this dimension is essential in the scale. Understanding the results obtained from the scale will provide in-depth information and thus provide valuable opportunities to improve the relevant policies and the welfare of individuals.

It is crucial to obtain society's views on government interventions and use them in the relevant field (Bellefleur & Keeling, 2020). This study addresses the lack of literature on the perspectives of individuals affected by the policies to reduce smoking that all countries have implemented for many years. The number of countries in the world with at least 2 Monitor, Protect, Offer, Warn, Enforce, Raise taxes (MPOWER) policies in place was 98 in 2020, and the number of people living in these countries was approximately 4.4 billion. It is seen that the MPOWER policy will become more widespread with each passing year, and governments will expand their measures (World Health Organization, 2021).

## Limitations and Directions/Suggestions for Future Research

There are some limitations to be acknowledged. Firstly, the scale does not capture the perspectives of all stakeholders in the policy-making process regarding government interventions to reduce smoking. Since the data for the scale were collected from a sample taken from only one country, the results cannot be generalized to other settings. Further studies are needed to validate the current structure of the scale in other countries. The current study offers interesting and different sub-area initiatives to measure the attitudes of individuals directly affected by state interventions. This is the first study in Türkiye that aimed to see the effects of the policies implemented by countries to reduce smoking among smokers.

There is plenty of scope for further research. Firstly, the ENSS measure focused only on those directly affected by the policy (only the restriction of those over 18 years of age was applied). Future research may subject this study to specific segments and inter-regional comparisons. The results may be affected by particular conditions such as gender, income, and age. They may also enable the comparison of regions with different practices within a country. In addition, the differences between countries can also be the subject of future studies by collecting data from countries where the same/similar policies are adopted.

**Data Availability Statement:** The data that support the findings of this study are available on request from the corresponding author.

**Ethics Committee Approval:** This study was approved by the Ethics Committee of Süleyman Demirel University (Approval No: 127/6, Date: 25.10.2022).

**Informed Consent:** Informed consent was obtained from the participants who agreed to take part in the study.

**Peer-review:** Externally peer reviewed.

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## CASE-BASED REVIEW

# Dual Palatal Perforation as a Consequence of Chronic Cocaine Abuse: A Case Report with Literature Review

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## Main Points

- A rare occurrence of palatal perforation can be a direct consequence as an infrequent complication associated with chronic cocaine abuse that is snorted through the nasal cavity.
- Cocaine powder when lodged within the nasal epithelium can result in oronasal communication, which would subsequently lead food and drink to reflux and cause nasal speech.
- To detect palatal bone erosion and perforation of the soft or hard palate, evaluation of the clinical and radiological examination is required.

## Abstract

Palatal perforation can be either congenital or acquired, both of which may be related to a disease. However, a rare occurrence of palatal perforation can be a direct consequence as an infrequent complication associated with chronic cocaine abuse that is snorted through the nasal cavity. Cocaine powder when lodged within the nasal epithelium can result in oronasal communication, which would subsequently lead food and drink to reflux and cause nasal speech. This article presents a rare and a unique case of a 41 years' adult male patient with two palatal perforations in the hard palate induced by chronic cocaine abuse for last 6 years. The patient had developed serious and annoying dysfunction in swallowing and phonation. The patient was advised to discontinue use of cocaine before starting the definitive prosthetic treatment. A brief review of the literature is also presented that focuses on the etiopathogenesis, differential diagnosis, and treatment to shed light on its oronasal effects.

**Keywords:** Cocaine, oronasal communication, palatal perforation, rhinitis, snorting, euphoria

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## Introduction

The drug cocaine (benzoyl methylecgonine) is primarily synthesized/derived from the leaves of the *Erythroxylum coca* plant (Turner et al., 1981). Indian origins of South America have consumed the leaves of this plant for thousands of years to experience its addictive euphoria. Cocaine is mostly administered by snorting it through the nose. A little while after inhalation, a euphoric “high” feeling starts to

develop and lasts for 20 – 90 minutes (Brand et al., 2008). The urge to get a quick euphoric high makes the intranasal route one of the primary methods of administering cocaine, over other methods (Maloney, 2011). The nose, as a result, is often frequently exposed to the destructive effects of cocaine powder with untoward effects of it on the nasal passage becoming persistent (Seyer et al., 2002). The growing usage of cocaine intranasally has been linked to a variety of medical problems. Due to the

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effects of both the active ingredient and adulterants, cocaine inhaled directly causes local vasoconstriction and irritation in the nasal mucosa (Rilo et al., 2015). The effects of repeated snorting include ischemia, inflammation, necrosis (micro and macro), and eventually chronic infection, which results in perforation.<sup>8</sup> The most frequent side effect of snorting cocaine is nasal septum perforations, which affect roughly 5% of users (Di Cosola et al., 2007). It has been well-documented that cocaine addiction can lead to epistaxis, chronic rhinitis, hyposmia, palate perforation, midface damage, reduced mucociliary transport, and nasal infection, excruciating facial discomfort and cosmetic nasal abnormalities (Cohen et al., 2008; Silvestre et al., 2010; Trimarchi et al., 2013). A very rare consequence is cocaine-induced palatal perforation, and very few cases have been reported in the literature. For this complication to be diagnosed, a thorough clinical history is necessary, including any prior cocaine addiction, which most people tend not to reveal. To detect palatal bone erosion and perforation of the soft or hard palate, evaluation of the clinical and radiological studies is also required (Di Cosola et al., 2007).

There is a difference in opinion regarding the management in such cases. Lack of motivation from the patient's side for quitting the habit prompts medical professionals to take a more conservative approach to therapy, sometimes hesitating to recommend surgery. Different surgical options and a variety of palate reconstruction techniques have been documented. Local flaps, regional flaps, and free flaps are some of them. The use of palatal obturators enhances patient quality of life by preventing embarrassing situations such as the ingress of liquids and solids into the maxillary sinuses or a nasal tone (Di Cosola et al., 2007; Goodger 2005). Most cases involving cocaine abuse and palatal perforation have been reported as solitary perforations. We present a patient who had developed dual palatine perforation with an intervening mucosal separation due to cocaine addiction and discuss this condition in the light of reported literature.

### Case Presentation

A 41-year adult male patient reported to the Department of Oral Medicine, Subharti Dental College, Meerut, with the chief complaint of improper masticatory and speech functions as a result of a perforation in the roof of the mouth. The complaints included liquids passing from the oral cavity into the nasal cavities, purulent discharge from the nose, nasal regurgitation of food for the past 6 months, hypernasal speech, and a diminished sense of taste. Social/personal history revealed a smoker for 15 years, alcoholic, and a 6-year history of cocaine use, snorting cocaine at least two to three times a day. Medical history did not reveal any significant abnormality while the drug history was related to chronic cocaine consumption. Extraoral examination revealed normal parameters for face, temporomandibular joint, and lymph nodes. Functional examination revealed hypernasal voice with no evidence of saddle-nose deformity. On intraoral examination, two palatal perforations with a large perforation measuring 2 cm × 2 cm situated posteriorly and a small anterior perforation measuring 0.5 cm × 0.5 cm with intervening mucosal separation devoid of bone support were observed (Figure 1). The patients' oral hygiene was poor and presented with a Kennedy class 3 modification one partial edentulous arch with one of the arches having a temporary partial denture (Figure 1). The patient

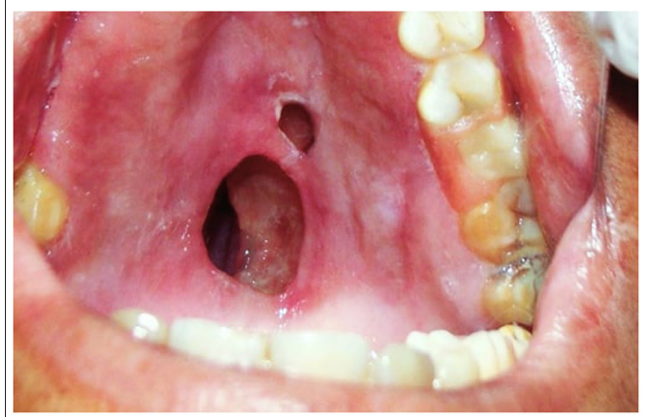


Figure 1. Dual perforation of the hard palate with two perforations (large and small) separated by unsupported mucosal tissue.

provided informed consent. Biopsies from the edge of the septal perforation and palatal perforation showed only acute and chronic inflammation with necrosis but no evidence of vasculitis to rule out malignancy (Figure 2). Routine laboratory tests were within normal ranges, and venereal disease research laboratory and rheumatoid factor tests were negative. Cocaine-induced palatal perforation diagnosis was made based on the patient's clinical examination and social history, with the biopsy taken to rule out dysplastic changes. The patient was advised for a palatal obturator and later surgical repair when his cocaine addiction ceases. The patient failed to return for an appointment.

### Discussion

This article in the form of a case report presents dual perforation of hard palate associated with cocaine abuse. The unique feature being two distinct different sized perforations with a thin unsupported mucosal barrier. Cocaine is derived in the usable powder form from the coca plant (*Erythroxylum coca*), and contains benzoyl methylecgonine, a relatively new narcotic among the psychoactive compounds utilized by humans over time (Muakad, 2012).

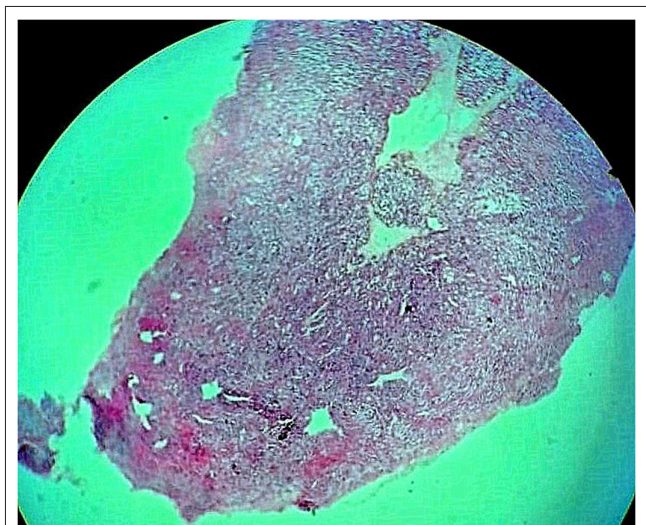


Figure 2. Histopathology of biopsy showing chronic inflammatory cell infiltration mainly lymphocytes.

Cocaine is currently categorized as a psychoactive drug that belongs to stimulants that change brain function and make the central nervous system more active (Blanksma & Brand, 2005). Cocaine can be consumed in a variety of ways, with intranasal administration being one of the more common methods. For a short time after inhaling it, euphoria sets in, lasting for more than an hour depending upon the body metabolism (Maloney, 2011). Mucosal membrane absorption of cocaine results in systemic effects (Silvestre et al., 2010). Clinical effects of the drug include tachycardia, mydriasis, and hyperthermia (Vasica & Tennant, 2002). Intranasal inhalation can result in nasal and oral mucosal irritation and dryness. Damage to the nasal septum and lateral walls of nasal passages has also been reported (Yewell et al., 2002), and less frequently, midline perforation leading to an oronasal fistula or perforation (Rachapalli & Kiely, 2008).

### Demography and Clinical Presentation

Silvestre et al., (2010) in their systematic review on palatal perforation among cocaine abusers documented 36 cases of palatine perforation in cocaine users, with females accounting for slightly more than half of all cases (58.33%) and the average age of the patients was close to 40 years, and the majority of them were young adults with a history of cocaine addiction (Silvestre et al., 2010). The manifestation of chronic cocaine abuse varies as reported in the literature. More than 20 reports presented with cocaine-induced midline destructive lesions (septal perforation, turbinate necrosis, hard/soft palate necrosis, and sinus destruction) (Faelens et al., 2021). Reports in the range of 5 – 20 have observed oral ulcers also in the form of oral sores, pemphigus-like lesions, pinna/facial/nasal necrosis, and subcutaneous emphysema (Faelens et al., 2021). Rare or uncommon manifestations reported in the literature include hearing loss, invasive fungal sinusitis, Pott's puffy tumor, and sudden airway obstruction (Faelens et al., 2021). Seven cases of nasolacrimal duct obstruction associated with cocaine usage intranasally have been reported in a case study (Alexandrakis et al., 1999). In such cases, the symptoms vary accordingly and may present as a lack of sensitivity to sensation, anosmia, pain in the nasal passages, headaches, and halitosis (Silvestre et al., 2010).

Patients who have specifically cocaine-induced palatal perforations typically have nonspecific signs and symptoms that are similar to those of other systemic illnesses such as infections,

neoplasms, autoimmune, or granulomatous diseases (Trimarchi et al., 2013). Chronic nasal blockage, hyposmia, epistaxis, and excruciating facial discomfort are typically the predominant complaints (Trimarchi et al., 2013). Cocaine has a strong vasoconstrictor effect, it is likely that using it would cause ischemia of the oral cavity's soft and hard tissues, which will then result in their necrosis (Bains & Hosseini-Ardehali, 2005). This destructive process can result in perforations or ulcers on the hard and soft palate, leading to oronasal communication and a nasal voice as a consequence, difficulties with eating and drinking, and even nasal regurgitation (Chaparro-González et al., 2018). Oral symptoms generally include a higher predisposition to periodontal disease, primarily gingivitis, damage to oral tissues, the presence of caries, destructive lesions of the facial midline, xerostomia, and ageusia (Melo et al., 2022). Other independent oral symptoms include dental erosions, hyposalivation, temporomandibular disorders, bruxism,<sup>24</sup> and thermal burns in the oral and pharyngeal cavity (smoking of cocaine). Mouth ulcers, pemphigus-like lesions, laryngeal edema, or rhinitis have been reported to be the less common symptoms (Singh et al., 2017).

### Pathogenesis and Differential Diagnosis

Cocaine's local vasoconstrictive effects cause ischemic necrosis of tissue, which eventually results in nasal or palate perforation (Deutsch & Millard, 1989). Both direct injury to the cocaine-anesthetized mucosa and irritation from the drug's impurities have also been proposed as potential causative causes in cocaine-associated lesions (Cottrell et al., 1999). Local inflammation might result in crusting, bacterial, or fungal colonization, mucociliary activity stasis, which may lead to necrosis and ulceration (Cottrell et al., 1999). Vasoconstriction can also be due to central nervous system effects if the drug is taken in moderate-to-large doses. Midline destructive lesions can result from a variety of conditions other than cocaine usage, including infections, neoplasms, systemic disorders, and chemical exposure (Table 1). In order to exclude traumatic causes such as surgery, trauma due to accidents, or self-inflicted lesions, the patient's history should be carefully examined (Wiesner et al., 2004). Midline destructive lesions due to infections like leprosy, tertiary syphilis, mucormycosis in immunocompromised patients, and tuberculosis are also ruled out on the basis of history and other systemic symptoms associated with such diseases (Kuriloff & Kimmelman, 1989). The diagnosis of bacterial or fungal nasal perforations is typically

**Table 1.**  
*Differential Diagnosis of Midline Palatal Perforations*

| Infections                     | Traumatic        | Neoplastic                    | Autoimmune     | Reactive        |
|--------------------------------|------------------|-------------------------------|----------------|-----------------|
| Tertiary syphilis              | Mechanical,      | Melanoma                      | Lupus          | Necrotizing     |
| Tuberculosis                   | Chemical (legal/ | Minor salivary gland          | Sarcoidosis    | sialometaplasia |
| Leprosy                        | illicit drugs)   | Malignancy                    | Crohn disease  |                 |
| Candidiasis                    | Electrical       | Midline destructive Granuloma | Wegener        |                 |
| Diphtheria                     | Thermal          | Metastatic carcinoma antral   | granulomatosis |                 |
| Rhinoscleroma                  | Trauma           | malignancies                  |                |                 |
| Leishmaniasis                  | Surgery          | Cysts and tumors of the       |                |                 |
| Mucormycosis                   | Radiation        | oronasopalatal complex        |                |                 |
| Actinomycosis                  |                  |                               |                |                 |
| Histoplasmosis                 |                  |                               |                |                 |
| Blastomycosis, Coccidiomycosis |                  |                               |                |                 |

Adapted from Cottrell et al., 1999

simple and relies on examination and laboratory investigations. Numerous immune system conditions, such as systemic lupus erythematosus (Reiter & Myers, 1980), sarcoidosis, rheumatoid arthritis, polyarteritis nodosa, mid-facial granuloma syndrome, and granulomatosis with polyangiitis (GPA) (Trimarchi et al., 2013), can result in midline destructive lesions.

### Investigations

When a patient exhibits nonspecific signs and symptoms which resemble those of other systemic disorders, a positive test for cocaine metabolites in the urine, blood, or hair might be a helpful hint and raise suspicion of cocaine-induced palatal perforation (Trimarchi et al., 2013). Indirect immunofluorescence microscopy reveals anti-neutrophil cytoplasmic antibodies frequently in cocaine-induced palatal perforation lesions. These antibodies particularly and principally react with human neutrophil elastase, also known as human leukocyte elastase, when evaluated using antigen-specific solid assays, and they exhibit a perinuclear staining pattern (Peikert et al., 2008). Multiple biopsy specimens taken from the outer margins of the lesion should be sent for histopathological investigation (Trimarchi et al., 2013). Peripheral tissue rather than the necrotic center of the disease should be always taken. There are no disease-specific histological characteristics of cocaine-induced palatal perforation lesions, as many of these features are also common to GPA. Hence GPA constitutes cocaine palatal lesion's primary histopathological differential diagnosis. The cocaine-induced palatal perforations share the following histological manifestations: leukocytoclastic vasculitis, mixed inflammatory infiltrates, microabscesses in vascular walls, perivenulitis, and vascular microthrombotic alterations (Trimarchi et al., 2001). The diagnosis of Cocaine-induced palatal perforation (CIPP) cannot be made with certainty by radiographic assessment of patients with CIPP. In severe cases, a computed tomography scan can reveal the extent of bone and cartilage damage as well as the centrifugal advance of the deterioration. Magnetic resonance imaging (MRI) with contrast medium provides more information in cocaine-induced palatal perforation lesions (Trimarchi et al., 2001 & Trimarchi et al., 2006). On MRI, affected nasal and paranasal mucosa might be seen as hypo intense areas on T2 and exhibit reduced or irregular enhancement (Trimarchi et al., 2003). Mapping the sites of soft tissue erosion with MRI is also helpful. Although none of the radiological findings presented are disease-specific, they do provide additional information that aids in defining the local extent of cocaine-induced palatal lesions and possible options for treatment (Trimarchi et al., 2013 & Trimarchi et al., 2003).

### Management

Because complete abstinence from the substance is required before beginning therapy, it is necessary for the treatment to involve psychiatric assistance (Monasterio & Morovic, 2003). The majority of cocaine-related septal perforations are small, asymptomatic, and require no treatment (Cottrell et al., 1999). Treatment options for palatal perforations are numerous. Before beginning any reconstructive surgery, some surgeons suggest a drug-free period of at least a year that is confirmed by serum and urine toxicology testing (Di Cosola et al., 2007 & Rampi et al., 2021). Aleatory urine tests for metabolites may be advised to monitor the patient's progress because cocaine is excreted in the urine for 48 – 72 hours after consumption (Berman et al., 2016).

Margin biopsies have also been suggested as a way to identify ongoing cocaine addiction signs like vasoactive effects, vasculitis, infarcted regions, and polymorphonuclear cell infiltrates (Silvestre et al., 2010). It is recommended to use a multidisciplinary and conservative management approach, which includes analgesics, antibiotic therapy, surgical debridement, saline solution lavage, and even the implantation of an obturator during the recovery phase (Rampi et al., 2021 & Villa, 1999). A removable palatal obturator is used in traditional management as a conservative approach. This incorporates a prosthetic sealing of the defect, which helps people deal with social problems and enhances quality of life by preventing solids and liquids from being regurgitated to the nose while swallowing and by reducing nasal speech. It is also the preferred course of treatment for people who reject surgical intervention or who are unable to give up the habit. Additionally, it can be periodically relined to enhance fitting in unstable-in-time defects (Barrientos et al., 2021). Any maxillary defect in the form of cleft that has an oronasal communication is comfortably restored with a tooth-supported modified partial denture with an obturator to close the opening. Existing teeth act as abutment and help to retain and support the obturator in place as a definitive treatment (Mattoo et al., 2014). Poor oral hygiene maintenance in young cocaine abusers can render them to an early stage of complete edentulousness. One drawback in such cases will be that edentulous patients will experience fitting and retention issues, and large obturators can recede sensory feedback from the covered mucosa, impairing speech, mastication, and deglutition (Di Cosola et al., 2007). Furthermore, an obturator cannot be worn continuously and may not be able to stop liquid and air leaks in all patients (Nord et al., 2012). There are numerous surgical methods that have been described. Only small perforations can be covered with local flaps. These include pediculated mucoperiosteal flaps, direct suture, cleft palate procedures, reverse mucosal flaps, and palatal flaps. Palatal tissue is directly influenced by factors like the underlying bone structure and perforation size. A small amount of tissue is provided by local flaps (Nord et al., 2012). For small to medium problems, regional flaps such as the tongue, buccinator, buccal fat pad, or temporal muscle flaps can be used ((Barrientos et al., 2021; Nord et al., 2012; Cintra et al., 2008). Regional pedicled flaps have limitations but are dependable. The temporalis muscle flap requires a maxillary tunnel and can affect aesthetic appearance, dorsal pedicled tongue flap requires three weeks of intermaxillary fixation, then a second stage of surgery to separate the flap from the tongue (Nord et al., 2012 & Jackson et al., 2009). Finally, distant flaps, and more frequently a radial forearm free flap, can be employed to repair the defect. These flaps can cover large areas, but they need a skin graft to cover the donor site, where any resulting cosmetic defects are crucial (Nord et al., 2012). In situations when there is insufficient blood supply to the oronasal mucosa, Pelo et al. developed a novel and efficient strategy for repairing small- and medium-sized oronasal connections. They discussed how to correct small- and medium-sized oronasal connections using the Le Fort I osteotomy surgical technique and a bilateral Bichat's fat pad flap. This procedure is simple to carry out and has little effect on the patient's aesthetic appearance (Pelo et al., 2008).

The general dentist should be alert for noticing palatal perforations and ascertain the etiology of these lesions. The clinicians

should always inquire about cocaine use in the patient history. Reconstructive surgery and a prosthesis obturator are the two treatment options for a cocaine-induced palate perforation. The management of these perforations is by a multidisciplinary team which includes a psychiatrist, medical physician, oral pathologists, maxillofacial surgeons, maxillofacial prosthodontists, speech therapists, and a psychologist.

**Data Availability Statement:** The data that support the findings of this study are available on request from the corresponding author.

**Informed Consent:** Informed consent was obtained from the patient who agreed to take part in the study.

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## ORIGINAL ARTICLE

# Seropositivity Rates of Anti-HCV, HbsAg, Anti-HIV, and the Relationship between Sociodemographic and Clinical Variables in Individuals Hospitalized with a Diagnosis of Opioid Use Disorder

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## Main Points

- Anti-HCV seropositivity was found in 8.2% of the sample.
- Anti-HCV seropositivity was significantly related to the age at first substance use, age at first opioid use, history of intravenous drug use, and city of residence.
- It is crucial to conduct viral serological screenings in individuals diagnosed with OUD, especially those with a history of intravenous drug use.

## Abstract

Viral hepatitis and human immunodeficiency virus (HIV)/acquired immune deficiency syndrome (AIDS) are significant public health problems. Globally, there are an estimated 1.34 million deaths annually due to viral hepatitis and 1.33 million due to HIV/AIDS. Viruses transmitted through blood, including human immunodeficiency virus (HIV), hepatitis C virus (HCV), and hepatitis B virus (HBV), are highly prevalent among intravenous drug using (IDU) individuals. This study aimed to investigate the seropositivity rates of antibody to HCV (anti-HCV), HBsAg, and antibody to HIV (anti-HIV), along with sociodemographic and clinical characteristics, in patients diagnosed with opioid use disorder undergoing inpatient detoxification treatment at the Alcohol and Drug Addiction Treatment Center (ADATC). The patients diagnosed with Opioid Use Disorder and treated in Inpatient unit between January 1, 2016, and January 1, 2018, were retrospectively reviewed. In the serological analysis results, anti-HCV positivity was found in 50 (8.2%) patients, and HBsAg positivity was detected in seven (1.1%) patients, with no cases of anti-HIV positivity observed. Regarding anti-HCV positivity, statistically significant differences were found among subgroups related to the age at first substance use, age at first opioid use, history of intravenous drug use, and city of residence. However, no statistically significant differences were observed among subgroups related to age, gender, marital status, education level, employment status, legal history, and additional substance use history.

**Keywords:** Hepatitis B, hepatitis C, HIV, opioid

## Introduction

Viral hepatitis and human immunodeficiency virus (HIV)/acquired immune deficiency syndrome (AIDS) are significant public health problems. Globally, there are an estimated 1.34 million deaths annually due to viral hepatitis and 1.33 million due to HIV/AIDS (Dalal et al., 2011; UNAIDS,

2023). Hepatitis B virus (HBV), hepatitis C virus (HCV), and human immunodeficiency virus (HIV) are known to share similar transmission routes, including intravenous drug use (IDU), blood transfusion, sexual contact, and perinatal exposure. Therefore, co-infection with HIV, HBV, and/or HCV is frequently encountered (McGovern, 2007; Rotman & Liang, 2009). Globally, an estimated 15.6

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million individuals are reported to engage in intravenous drug use (Degenhardt et al., 2017). Viruses transmitted through blood, including HIV, HCV, and HBV, are highly prevalent among intravenous drug-using (IDU) individuals (Degenhardt et al., 2017). Substance contamination as well as the sharing of tools such as syringes, spoons, and cotton during drug preparation and administration are significant factors facilitating the spread of infections among IDU individuals (Ceylan et al., 2022).

Opioid use disorder (OUD) is a psychiatric disorder that is increasingly prevalent not only globally but also in our country. In the European Union, it has been reported that 36% of all treatment admissions related to substance use are attributed to opioid use, with heroin being a widely used substance among opioids (EMCDDA, 2019). It has been observed that individuals who start using heroin generally begin by snorting, and later, approximately 75% of users continue to use it intravenously (Gandhi et al., 2006). In Türkiye, it was reported that around 21.3% of patients receiving inpatient treatment in 2018 used substances intravenously, and these individuals had a higher prevalence of HBV, HCV, and HIV seropositivity compared to the general population (Gıynaş Ayhan & Yıldızgören, 2021).

Targets have been developed for reducing HIV and viral hepatitis infections, and the scope of substance dependence treatment is listed as one of the United Nations' sustainable development goals (UNAIDS, 2017; WHO, 2016). Experiences of homelessness, arrest, incarceration, and involvement in sex work increase the risk of exposure to HIV, HCV, and HBV among IDU individuals, posing a heightened risk of negative impacts on their physical and mental health (Eckhardt et al., 2017; Genberg et al., 2015; Larney et al., 2013; Wood et al., 2017). Age, gender, and the types of drugs used intravenously are associated with the risk of viral transmission through blood among IDU individuals, necessitating diverse treatment and harm reduction methods (Kaye & Darke, 2000; Kozlov et al., 2006; Springer et al., 2015; Zule & Desmond, 1999). Determining the size, demographic characteristics, and levels of exposure to risky behaviors and environments within the IDU population is crucial for effective health policy planning (Altice et al., 2016).

This study aimed to investigate the seropositivity rates of antibody to hepatitis C virus (anti-HCV), hepatitis B surface antigen (HBsAg), and antibody to human immunodeficiency virus (anti-HIV), along with sociodemographic and clinical characteristics, in patients diagnosed with OUD undergoing inpatient detoxification treatment at the Alcohol and Drug Addiction Treatment Center (ADATC). The hypothesis of this study is that there are differences between anti-HCV positive and anti-HCV negative groups of OUD diagnosed patients in sociodemographic and clinical characteristics.

## Material and Methods

### Study Design and Data Collection

Data for all patients hospitalized for OUD at the ADATC inpatient unit of Ankara Numune Training and Research Hospital between January 1, 2016, and January 1, 2018, were retrospectively reviewed. Patients for whom serological analysis results could not be obtained for various reasons (such as those discharged without blood tests) were excluded from the study. All

patients who were hospitalized with a diagnosis of opioid use disorder on the specified dates and whose serological analysis results, sociodemographic data, and clinical data were accessible were included in the study; psychiatric comorbidities were not excluded. Through a retrospective screening of patient records and the hospital software system, sociodemographic information (gender, age, marital status, education level, employment status, city of residence), legal history, history of intravenous drug use, additional substance use, age at first substance use, age at first opioid use, and serological test results for anti-HCV, HBsAg, and anti-HIV using the enzyme immunoassay method (Abbott) were collected. Ethical approval for the study was obtained Clinical Research Ethics Committee of Health Sciences University Dr. Abdurrahman Yurtaslan Oncology Training and Research Hospital, with approval number 2020-03/577, dated March 18, 2020.

### Statistical Analysis

The statistical analysis was conducted using the SPSS v.22 (IBM SPSS Corp.; Armonk, NY, USA) program. The normal distribution suitability of the data was examined using the one-sample Kolmogorov – Smirnov test. The Mann – Whitney *U*-test was employed for comparing data that did not conform to a normal distribution between groups. In all tests, a significance level of  $p < .05$  was considered statistically significant.

## Results

Data for all patients hospitalized for OUD at the ADATC inpatient unit between January 1, 2016, and January 1, 2018, were reviewed. A total of 612 patients were included in the study,

**Table 1.**  
*Sociodemographic Data and Clinical Characteristics*

|                                     |                   | N(%) / Mean $\pm$ s.s. |
|-------------------------------------|-------------------|------------------------|
| Age                                 |                   | 24.29 $\pm$ 4.714      |
| Gender                              | Female            | 42 (6.9%)              |
|                                     | Male              | 570 (93.1%)            |
| Marital status                      | Married           | 125 (20.4%)            |
|                                     | Not married       | 487 (79.6%)            |
| Education (years)                   |                   | 9.03 $\pm$ 2.060       |
| Employment status                   | Employed          | 263 (43%)              |
|                                     | Unemployed        | 349 (57%)              |
| Place of residence                  | The city of ADATC | 564 (92.2%)            |
|                                     | Other cities      | 48 (7.8%)              |
| Age at first substance use (years)  |                   | 16.71 $\pm$ 4.248      |
| Age at first opioid use (years)     |                   | 19.63 $\pm$ 4.538      |
| History of intravenous drug use     | Yes               | 255 (41.7%)            |
|                                     | No                | 357 (58.3%)            |
| History of additional substance use | Yes               | 532 (86.9%)            |
|                                     | No                | 80 (13.1%)             |
| Legal incident history              | Yes               | 348 (56.9%)            |
|                                     | No                | 264 (43.1%)            |

**Table 2.**  
*Serology Test Results*

|          | Serology Result | N (%)       |
|----------|-----------------|-------------|
| Anti-HCV | Positive        | 50 (8.2%)   |
|          | Negative        | 572 (91.8%) |
| HBsAg    | Positive        | 7 (1.1%)    |
|          | Negative        | 605 (98.9%) |
| Anti-HIV | Positive        | 0 (0%)      |
|          | Negative        | 612 (100%)  |

HBsAg, hepatitis B surface antigen; anti-HCV, antibody to HCV ; anti-HIV, antibody to HIV.

consisting of 570 (93.1%) males and 42 (6.9%) females. The average age of the patients was 24.29 ( $\pm 4.714$ ). While 564 (92.2%) patients lived in the city of ADATC, 48 (7.8%) patients lived in other cities. Among the patients, 125 (20.4%) were married, and 487 (79.6%) were not married. In terms of employment status, 263 (43%) patients were employed, and 349 (57%) patients were unemployed. The mean age at first substance use was 16.71 ( $\pm 4.248$ ), and the mean age at first opioid use was 19.63 ( $\pm 4.538$ ). Additional substance use history was present in 532 (86.9%) patients, while 80 (13.1%) had no additional substance use history. A legal history was reported in 348 (56.9%) patients, while 264 (43.1%) had no legal history. A history of intravenous drug use was reported in 255 (41.7%) patients, while 357 (58.3%) had no history of intravenous drug use (Table 1). In the serological analysis results, anti-HCV positivity was found in 50 (8.2%) patients, and HBsAg positivity was detected in seven (1.1%) patients, with

**Table 3.**  
*Comparison of Anti-HCV Serology Results With Sociodemographic and Clinical Data*

|                            |                   | Anti-HCV (+) (n-%) | Anti-HCV (–) (n-%) | P     |
|----------------------------|-------------------|--------------------|--------------------|-------|
| Age at first substance use | <15               | 22 (44%)           | 192 (34.2%)        | <.05  |
|                            | 15 – 18           | 20 (40%)           | 170 (30.2%)        |       |
|                            | 18 – 21           | 5 (10%)            | 103 (18.3%)        |       |
|                            | 21 – 24           | 3 (6%)             | 46 (8.2%)          |       |
|                            | >24               | 0 (0%)             | 51 (9.1%)          |       |
| Age at first opioid use    | <15               | 4 (8%)             | 53 (9.4%)          | <.05  |
|                            | 15 – 18           | 24 (48%)           | 155 (27.6%)        |       |
|                            | 18 – 21           | 11 (22%)           | 141 (25.1%)        |       |
|                            | 21 – 24           | 7 (14%)            | 105 (18.7%)        |       |
|                            | >24               | 4 (8%)             | 108 (19.2%)        |       |
| Intravenous drug use       | Yes               | 49 (98%)           | 206 (36.7%)        | <.05  |
|                            | No                | 1 (2%)             | 356 (63.3%)        |       |
| Place of residence         | The city of ADATC | 37 (74%)           | 527 (93.8%)        | <.001 |
|                            | Other cities      | 13 (26%)           | 35 (6.2%)          |       |

anti-HCV, anti-HCV antibody to HCV.

\*Mann – Whitney U-test.

no cases of anti-HIV positivity observed (Table 2). Regarding anti-HCV positivity, statistically significant differences were found among subgroups related to the age at first substance use, age at first opioid use, history of intravenous drug use, and city of residence. However, no statistically significant differences were observed among subgroups related to age, gender, marital status, education level, employment status, legal history, and additional substance use history (Table 3).

## Discussion

It is reported that approximately 60% of newly detected HCV infections worldwide are observed in the group with substance use, primarily among intravenous drug users (Alter, 2007; Amon et al., 2008). Different studies conducted in Türkiye reveal varying rates of anti-HCV seropositivity. In a retrospective study with patients diagnosed with OUD, the reported anti-HCV seropositivity was 5.1%; while in a study specifically screening individuals using intravenous drugs, the reported rate was 44.9% (Sezak et al., 2012; Tan et al., 2003). In another study conducted abroad, where HCV RNA levels were measured in individuals with anti-HCV seropositivity, a 17.5% HCV infection rate was reported (Berbesi-Fernández et al., 2017). A meta-analysis conducted by Shayan et al. in three developing countries Iran, Afghanistan, and Pakistan, reported an HCV prevalence of 48.3% among IDU patients (Shayan et al., 2021). A review by Degenhardt et al. reported a global anti-HCV seropositivity rate of 52.5% among IDU patients although there were regional variations (Degenhardt et al., 2023). In our study, the rate of anti-HCV seropositivity among patients diagnosed with OUD and receiving inpatient treatment, either through intravenous or other routes, was 8.2%, while among those with intravenous drug use, the anti-HCV seropositivity rate was 19.2%. Differences in the reported rates of anti-HCV seropositivity in the literature have been attributed to variations in intravenous drug use rates, including histories of needle sharing, geographic differences, and other disparities in sample selection. It is believed that the rates observed in our study may be influenced by the inclusion of patients admitted to a single center for inpatient treatment. Additionally, the inability to include data from patients who sought inpatient treatment but were discharged without even undergoing serological analyses may have contributed to these rates.

As a result of peer pressure, the desire for risk-taking, and the pursuit of excitement, young adults are known to have a higher likelihood of initiating and continuing opioid use (Griffin, 2010). When looking at the age groups of anti-HCV positive individuals in our study, it was found that 80% of these individuals were in the age range of 15–21. Risky behaviors such as intravenous drug use, needle sharing, and unprotected sexual intercourse are significant risk factors for the transmission of viral hepatitis. Considering the incomplete development of the prefrontal cortex, which plays a crucial role in impulse control, in individuals within the specified age group, and the negative impact of substance use on this development, the observed age distribution within this range is an expected result.

The widespread use of hepatitis B vaccination in infants has significantly reduced the incidence of new chronic HBV infections. Between the pre-vaccination period (which may vary from the early 1980s to the early 2000s based on the introduction

year into regional vaccination schedules) and 2015, the rate of chronic infections among children under 5 years old has decreased from 4.7% to 1.3%. The remaining infections typically occur through mother-to-child transmission during birth or contact with other infected young children (World Health Organization, 2017). Hepatitis B vaccination was included in the immunization schedule in Türkiye in 1998. In a review that examined 129 studies evaluating seroprevalence in the general population in Türkiye between 1999 and 2009, the overall prevalence of HBsAg positivity was reported to be 4.57% (Toy et al., 2011). A study conducted in Elazığ in 2015 among individuals with substance use reported an HBsAg positivity rate of 2.6% (Karabulut et al., 2015). Another study conducted in our country in 2019, including cases referred to the probation polyclinic, reported an HBsAg positivity rate of 2.2% (Zeytinöğlu et al., 2019). In our study, which included inpatient individuals diagnosed with OUD, the HBsAg seropositivity rate was found to be 1.1%. Generally, in samples predominantly consisting of a younger age group, the rates of HBsAg positivity tend to decrease due to the impact of vaccination, and the frequency in cases with substance use appears to be similar to the general population. The lower HBsAg seropositivity rate in our study compared to other research may be related to a higher vaccination rate in this group, given the difference in the average age between our sample and other studies.

Approximately 39 million individuals worldwide are living with HIV, and intravenous drug use ranks among the primary risk factors for this infection (HIV and AIDS, n.d.). It is reported that around 10% of HIV infections occur through needle sharing during intravenous drug use (Aceijas et al., 2004). The prevalence of HIV in individuals who use intravenous drugs in Iran, Afghanistan, and Pakistan is reported to be 9.1%. In Türkiye, as of December 31, 2018, there were 19,748 reported cases of HIV(+) individuals and 1772 AIDS cases confirmed by a positive confirmation test since 1985. Among these cases, 49.4% were reported to be transmitted sexually, and 1.3% were due to intravenous drug use (Türkiye Halk Sağlığı Genel Müdürlüğü, 2018). Another study conducted in Istanbul among individuals with intravenous opioid use reported a rate of 4.7% (Tan et al., 2003). In another study conducted in Elazığ, the reported rate was 0% (Karabulut et al., 2015) and in a research conducted in Izmir, which included individuals with various substance use disorders using intravenous and other routes, the reported rate of anti-HIV positivity was 0.2% (Zeytinöğlu et al., 2019). When reviewing the literature, considering the variations in anti-HIV positivity rates among samples that include individuals using intravenous or other routes for substance use across countries and regions, it is not surprising that our study yielded diverse results.

The comparison between anti-HCV positive and anti-HCV negative groups, based on a large sample size of inpatients diagnosed with opioid use disorder, along with clinical features such as legal history, age of first opioid use, and age of first substance use, distinguishes this study from other research.

#### Limitations and Directions/Suggestions for Future Research

Since our study was conducted through a retrospective data review method, partial access to the patients' clinical data was

obtained, and not all variables could be examined. Additionally, being a cross-sectional study makes it impossible to establish a cause-and-effect relationship. Nevertheless, considering the sample size, the study provides reliable information regarding the rates of anti-HCV, HBsAg, and anti-HIV in patients diagnosed with OUD in the city where the study was conducted, even though all variables could not be thoroughly examined.

In light of the results of this study, it is crucial to conduct viral serological screenings, especially in individuals diagnosed with OUD, particularly those with a history of intravenous drug use. Collaborating with infectious disease clinics and ensuring follow-up and treatment for individuals where necessary is highly important for public health protection. Given the current treatment methods for HCV infection, which can provide a cure, preventing the spread and complications of this infection, screening individuals diagnosed with substance use disorders, especially those with a history of intravenous drug use, is of great importance.

**Data Availability Statement:** The data that support the findings of this study are available on request from the corresponding author.

**Ethics Committee Approval:** This study was approved by the Ethics Committee of Health Sciences University Dr. Abdurrahman Yurtaslan Oncology Training and Research Hospital (approval number: 2020-03/577; date: March 18, 2020).

**Informed Consent:** N/A.

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## Paltun. HBV, HCV and HIV Seropositivity in Opioid Use Disorder Patients

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## ORIGINAL ARTICLE

# Evaluation of the Attitudes and Depression Levels of Families Who Apply to AMATEM Due to Substance Use Disorder Toward the Addicted Member

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## Main Points

- Family members of individuals with substance use disorders have a considerable risk of depression.
- Problems occur in family relationships in families with substance use disorders.
- The level of depression in family members of individuals with substance use disorders is related to problems in family relationships.
- It is necessary to develop family-based programs and implement psychosocial interventions for families in the treatment of substance use disorders.

## Abstract

The aim of this cross-sectional study is to determine the depression levels of family members of individuals with substance use disorders and their attitudes toward the addicted member, and to examine the relationship between them. The sample of the research consists of 106 family members of individuals with substance use disorder who applied to Manisa Amatem between 21 March 2022 and 20 September 2022 and agreed to participate in the research. Sociodemographic questionnaire, Family Addiction Profile Index Scale (BAPI-A) and Beck Depression Scale were used as data collection tools in the study. It was found that 47% of the family members of individuals with substance use disorder had moderate depression symptoms and 20% of them had mild depression symptoms. It was determined that as the participants' depression levels increased, problems in family relationships, problems in parenting skills, and problems in attitude toward the addicted member also increased. It has been found the depression level was higher in women, the parenting skills of the mothers were more inadequate. This research is important as it shows that substance addicted individuals need psychotherapeutic intervention, rehabilitation programs, psychoeducation, and psychosocial support regarding the addiction process, tailored to the needs of their family members.

**Keywords:** attitude, depression, family relations, substance use disorder

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## Introduction

Substance use disorder is becoming more common all over the world day by day and is considered

a social problem because it is related to health, social, and economic areas. In the 2022 World Drug Report published by the United Nations Office on Drug Crime (UNODC), it is stated that the rate of

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substance use in 2010 increased by 22% to 274 million in 2019, and this rate is estimated to increase to 299 million in 2030 (UNODC 2022). Substance use rates are also a problem in Turkey; the number of outpatient treatment applications in 2021 is 247,390 and the number of applications to inpatient treatment centers is 15,497 (Türkiye National Drug Report, 2022).

Substance use has a multidimensional structure that cannot be explained only by individual factors and should be addressed with biopsychosocial factors (Skewes & Gonzalez, 2013). From this perspective, the family can be a risk factor in the process of starting to use substances and becoming addicted and can also be a social support mechanism in the process of receiving treatment and post-treatment adaptation (Harrison & Asche, 2001). Therefore, the family's relationship with substance addiction is two-way.

The inability of an individual with a substance use disorder to fulfill their responsibilities within the family, spending too much time on substance-related issues, and experiencing financial losses may cause the roles within the family to change and the functionality of the family to deteriorate (Petin, 2014). Studies show that having a substance user in the family increases the stress and depression levels of other family members (Ekinçi et al., 2016; Yüncü et al., 2009; Şenormancı et al., 2019). Therefore, substance use disorder is also a family disease (Ögel, 2010). Preserving family functionality and support mechanisms and maintaining healthy communication within the family are crucial factors in the successful completion of the treatment process and the subsequent social adaptation process (Küçükşen et al., 2016). In this context, evaluating the situation of the family in interventions related to substance addiction is especially important to increase the success of treatment. Starting from this point, the aim of this study is to determine the depression levels and attitudes of families of individuals with substance use disorders toward the addicted member and to evaluate the relationship between them. In the research, the answers to questions such as, "What are the participants' depression levels?" "What are the participants' family relationships like?" and "Is there a relationship between the participants' depression levels and their family relationships?" were sought.

## Material and Methods

This cross-sectional study examines the depression levels of family members of individuals with substance use disorders and the relationship between family members. Manisa Celal Bayar University Faculty of Medicine Health Sciences Ethics Committee dated 05 February 2020 and numbered 204784860-050.04.04, it was decided that the research was ethically appropriate. Due to COVID-19 pandemic conditions, data could be collected between 21 March 2022 and 20 September 2022.

### Sample

The required sample size for the research was determined using power analysis. Using the G\*Power program, the sample size was calculated as a minimum of 102 people in a two-way single group when power = 0.85,  $\alpha$  = 0.05, d (effect size) = 0.3. The sample consists of all family members of individuals with substance use disorder who applied to Manisa Amatam between 21 March 2022 and 20 September 2022 and agreed to participate in the research without selecting any sampling method. Data were collected by

conducting one-on-one interviews with 106 first-degree family members who voluntarily agreed to participate in the research. The interviews were conducted after providing the necessary information about the research and obtaining informed consent.

### Data Collection Tools

Data were collected through a questionnaire containing sociodemographic and substance use disorder-related characteristics created by scanning the literature, and a survey form containing the Family Addiction Profile Index Scale and the Beck Depression Scale.

#### Questionnaire containing sociodemographic and substance use disorder characteristics

A 19-question form was given to the participants, which included variables such as gender, age, education level, gender of the substance addict, how many times s/he had applied for treatment before, living with the substance addict, and having previously attended a training program on substance addiction.

#### Family addiction profile index scale (BAPI-A)

The scale was developed by Ögel et al. (2017) and was created as a 3-point Likert-type (Agree – Partly/Sometimes – Disagree) scale consisting of 10 questions for the purpose of evaluating intra-family relationships in families with individuals with substance use disorders. The sub-factors of the scale are family members' rulemaking, responsibility-giving, conflict resolution skills, family ties, and the family's attitude toward the addict. Family members' rulemaking, responsibility-giving, and conflict-resolution skills can be gathered under a single factor titled "parenting skills." Increasing scores on the scale and sub-factors indicate that problems in family relationships are increasing. Although the Cronbach alpha coefficient of the scale is 0.82, the Cronbach alpha coefficient in this study was found to be 0.77.

#### Beck Depression Scale

The scale developed by Beck et al. (1961) aims to measure depression symptoms. The Cronbach alpha value of the scale, whose Turkish validity and reliability study was conducted by Hisli (1989), was found to be 0.80. The scale, consisting of 21 questions, is in a four-point Likert format, and the questions are evaluated between 0 and 3 points to obtain a minimum of 0 and a maximum of 63 points. According to the scale, 0 – 9 points indicate normal (no signs of depression), 10 – 18 points indicate mild depression, 19 – 29 points indicate moderate depression, and 30 – 63 points indicate severe depression. The Cronbach's alpha coefficient of the scale in this study was found to be 0.87.

#### Analysis of data

Data were evaluated using descriptive statistics (number, percentage, mean, standard deviation, etc.), kurtosis and skewness values in normality analyses, chi-square test, Mann – Whitney *U*-test, Kruskal – Wallis *H*-test and Spearman correlation test. To detect variables that differed as a result of the Kruskal – Wallis *H*-test, the Mann – Whitney *U*-test was applied in pairwise combinations and evaluated by applying Bonferroni correction. The statistical significance level was set at 0.05.

## Results

It was observed that 57.5% of the sample group of the research ( $n$  = 106) was female. The majority consisted of individuals

**Table 1.**  
*Sociodemographic Characteristics of Participants (N = 106)*

| Variables                                                                     | N                 | %    |
|-------------------------------------------------------------------------------|-------------------|------|
| Gender                                                                        |                   |      |
| Female                                                                        | 61                | 57.5 |
| Male                                                                          | 45                | 42.5 |
| Age                                                                           |                   |      |
| 18 – 31 years old                                                             | 12                | 11.3 |
| 32 – 45 years old                                                             | 29                | 27.4 |
| 46 – 59 years old                                                             | 54                | 51   |
| 60 – 72 years old                                                             | 11                | 10.4 |
| Mean $\pm$ SD                                                                 | 46.77 $\pm$ 11.63 |      |
| Median (min-max)                                                              | 48 (18 – 72)      |      |
| Educational Status                                                            |                   |      |
| Illiterate/literate                                                           | 10                | 9.4  |
| Primary school                                                                | 65                | 61.3 |
| High school                                                                   | 26                | 24.5 |
| University                                                                    | 5                 | 4.7  |
| Marital status                                                                |                   |      |
| Single                                                                        | 9                 | 8.5  |
| Married                                                                       | 80                | 75.5 |
| Divorce/Living apart from spouse/<br>Spouse died                              | 17                | 16   |
| Degree of closeness to a family member with a substance use disorder          |                   |      |
| Mother                                                                        | 37                | 35   |
| Father                                                                        | 36                | 34   |
| Sibling                                                                       | 14                | 13   |
| Spouse                                                                        | 19                | 18   |
| Employment Status for the last 6 months                                       |                   |      |
| Employee                                                                      | 50                | 47.2 |
| Nonemployed                                                                   | 42                | 39.6 |
| Retired                                                                       | 14                | 13.2 |
| Monthly income assessment                                                     |                   |      |
| Low                                                                           | 67                | 63.2 |
| Medium                                                                        | 30                | 28.3 |
| Well                                                                          | 9                 | 8.5  |
| Living with family member with a substance use disorder for the last 6 months |                   |      |
| Yes                                                                           | 68                | 64.2 |
| No                                                                            | 38                | 35.8 |
| Having received training from an expert on substance use disorder             |                   |      |
| Yes                                                                           | 21                | 20   |
| No                                                                            | 85                | 80   |
| Thinking that substance use disorder is a treatable disease                   |                   |      |
| Yes                                                                           | 97                | 91.5 |
| No                                                                            | 9                 | 8.5  |

Note: SD = Standard deviation; min = Minimum; max = Maximum.

between the ages of 46 – 59, with the youngest being 18 years old and the oldest being 72 years old, with a rate of 51%, and the highest rate, 61.3%, were primary school graduates. Thirty-five percentage of the participants are the mothers of the individual with a substance use disorder, 34% of them are the fathers, and 64.2% of the participants live with their family member who is addicted to substance use. Eighty percentage of the sample group has not previously attended any training program on substance use disorder, and 91.5% think that substance addiction is a treatable disease (Table 1).

Considering the characteristics of the participants' family members with substance use disorder, it has been seen that 92.5% were male and 35% had applied to any institution for treatment once before, 36% had applied to an institution for treatment two times before, and 27% had applied to an institution for treatment three or more times before.

When the participants' BAPI-A mean scores were examined, it was seen that families with addicted members received  $8.73 \pm 2.73$  points from the parenting skills subdimension,  $1.61 \pm 1.23$  from the family ties subdimension,  $2.5 \pm 1.18$  points from the attitude toward the addict subdimension, and  $12.88 \pm 3.89$  from the total scale score. Considering the cut-off points of the scale, within the scope of this research, it was determined that family members had inadequate parenting skills, attitudes toward the addicted individual were inadequate, and there were problems in family relations in general. When the Beck Depression Scale values were examined, it was seen that the mean score was  $20.13 \pm 9.92$  and 47% ( $n = 50$ ) of the participants had moderate depression (Table 2).

It was found that the median scores on the BAPI-A Scale were higher for participants who did not think addiction was a

**Table 2.**  
*Distribution of Participants' Scores Obtained From BAPI-A and Beck Depression Scale (N = 106)*

| Scales                | Subdimensions                      | Mean $\pm$ SD    | Min-Max Value |
|-----------------------|------------------------------------|------------------|---------------|
| BAPI-A Scale          | Parenting skills                   | $8.73 \pm 2.73$  | 0 – 12        |
|                       | Family ties                        | $1.61 \pm 1.23$  | 0 – 4         |
|                       | Attitudes toward the addicted      | $2.53 \pm 1.18$  | 0 – 4         |
|                       | BAPI-A Total                       | $12.88 \pm 3.89$ | 2 – 20        |
| Beck Depression Scale | Depression Total                   | $20.13 \pm 9.92$ | 3 – 56        |
|                       |                                    | Sayı             | %             |
|                       | No risk of depression (0 – 9 puan) | 16               | 15            |
|                       | Mild depression (10 – 16 puan)     | 21               | 20            |
|                       | Moderate depression (17 – 29 puan) | 50               | 47            |
|                       | Severe depression (30 – 63 puan)   | 19               | 18            |

Note: BAPI-A = Family Addiction Profile Index Scale; SD = Standard deviation; min = Minimum; max = Maximum.

treatable disease, and these participants had more problems in their family relationships ( $U = 262$ ;  $p < .05$ ; Table 3).

It was observed that there was a statistically significant association between the degree of closeness to the individual with a substance use disorder and the parenting skills subdimension, and that mothers' parenting skills are poorer than those of fathers, spouses, and siblings ( $\chi^2 = 9.124$ ;  $p < .05$ ). However, it was observed that the participants in the group who were illiterate,

and primary school graduates had more problems in family ties compared to the participants who were secondary school and university graduates ( $\chi^2 = 8.597$ ;  $p < .05$ ; Table 3).

A statistically significant association was detected between the family structure and the attitude toward the addict subdimension of the BAPI-A Scale, and it was found that participants with nuclear families had less adequate attitudes toward dependent members compared to participants with single-parent families ( $U$

**Table 3.**

*Relationship of BAPI-A Scale and its Subdimensions With Some Sociodemographic Variables*

| Variables                                                            | BAPI-A Total Median (min-max) | Parenting Skills Subdimension | Family Ties Subdimension | Attitudes Toward the Addicted Subdimension |
|----------------------------------------------------------------------|-------------------------------|-------------------------------|--------------------------|--------------------------------------------|
| Gender                                                               |                               |                               |                          |                                            |
| Female                                                               | 14 (6 – 18)                   | 10 (2 – 12)                   | 2 (0 – 4)                | 2 (0 – 4)                                  |
| Male                                                                 | 13 (2 – 20)                   | 9 (0 – 12)                    | 1 (0 – 4)                | 3 (0 – 4)                                  |
| $U$                                                                  | 1263                          | 1250                          | 1342.5                   | 1317.5                                     |
| $p$                                                                  | .482                          | .429                          | .843                     | .716                                       |
| Thinking that substance use disorder is a treatable disease          |                               |                               |                          |                                            |
| Yes                                                                  | 13 (2 – 20)                   | 9 (0 – 12)                    | 1 (0 – 4)                | 3 (0 – 4)                                  |
| No                                                                   | 16 (10 – 18)                  | 11 (7 – 12)                   | 3 (0 – 4)                | 2 (1 – 4)                                  |
| $U$                                                                  | 262                           | 290.5                         | 261                      | 419.5                                      |
| $p$                                                                  | .047*                         | .95                           | .40                      | .842                                       |
| Degree of closeness to a family member with a substance use disorder |                               |                               |                          |                                            |
| Mother                                                               | 15 (6 – 18)                   | 10 (2 – 12)                   | 2 (0 – 4)                | 2 (0 – 4)                                  |
| Father                                                               | 14 (3 – 20)                   | 9 (3 – 12)                    | 1 (0 – 4)                | 3 (0 – 4)                                  |
| Sibling                                                              | 11 (7 – 16)                   | 7 (4 – 10)                    | 1 (0 – 3)                | 3 (1 – 4)                                  |
| Spouse                                                               | 13 (2 – 17)                   | 8 (0 – 12)                    | 1 (0 – 4)                | 3 (0 – 4)                                  |
| $\chi^2$                                                             | 5.522                         | 9.124                         | 2.853                    | 2.423                                      |
| $p$                                                                  | .137                          | .028*                         | .415                     | .489                                       |
| Educational Status                                                   |                               |                               |                          |                                            |
| Illiterate / Literate                                                | 15 (11 – 17)                  | 10 (9 – 12)                   | 2 (1 – 4)                | 3,5 (0 – 4)                                |
| Primary school                                                       | 14 (2 – 20)                   | 9 (0 – 12)                    | 2 (0 – 4)                | 2 (0 – 4)                                  |
| High school                                                          | 12 (6 – 17)                   | 8 (2 – 12)                    | 1 (0 – 4)                | 3 (1 – 4)                                  |
| University                                                           | 11 (7 – 16)                   | 7 (6 – 11)                    | 1 (0 – 3)                | 2 (1 – 4)                                  |
| $\chi^2$                                                             | 7.688                         | 6.479                         | 8.579                    | 2.031                                      |
| $p$                                                                  | .053                          | .090                          | .035*                    | .566                                       |
| Family Structure                                                     |                               |                               |                          |                                            |
| Elementary family                                                    | 14 (2 – 20)                   | 9 (0 – 12)                    | 1 (0 – 4)                | 3 (0 – 4)                                  |
| Single parent family                                                 | 14,5 (3 – 18)                 | 9,5 (3 – 12)                  | 2 (0 – 4)                | 2 (0 – 4)                                  |
| $U$                                                                  | 812                           | 779,5                         | 673                      | 519                                        |
| $p$                                                                  | .391                          | .295                          | .252                     | .004*                                      |
| Use of tobacco product                                               |                               |                               |                          |                                            |
| Yes                                                                  | 13 (2 – 20)                   | 9 (0 – 12)                    | 1 (0 – 4)                | 2 (0 – 4)                                  |
| No                                                                   | 14 (6 – 20)                   | 9 (3 – 12)                    | 2 (0 – 4)                | 3 (0 – 4)                                  |
| $U$                                                                  | 1139                          | 1269.5                        | 1159.5                   | 1057.5                                     |
| $p$                                                                  | .134                          | .506                          | .160                     | .037*                                      |

Note: \*  $p < .05$ ; BAPI-A = Family Addiction Profile Index Scale; min = Minimum; max = Maximum;  $U$  = Mann – Whitney  $U$ -test;  $\chi^2$  = Kruskal – Wallis test.

**Table 4.***Relationship Between Beck Depression Scale and Some Sociodemographic Variables*

| Variables                                                                     |                                              | Degree of Depression  |      |          |      |          |      |          |      | $\chi^2$ | <i>p</i>         |
|-------------------------------------------------------------------------------|----------------------------------------------|-----------------------|------|----------|------|----------|------|----------|------|----------|------------------|
|                                                                               |                                              | No Risk of Depression |      | Mild     |      | Moderate |      | Severe   |      |          |                  |
|                                                                               |                                              | <i>n</i>              | %    | <i>n</i> | %    | <i>n</i> | %    | <i>n</i> | %    |          |                  |
| Gender                                                                        | Female                                       | 3                     | 5.0  | 6        | 9.8  | 37       | 60.7 | 15       | 24.6 | 26.177   | <i>p</i> < .001* |
|                                                                               | Male                                         | 13                    | 29.0 | 15       | 33.3 | 13       | 28.9 | 4        | 8.9  |          |                  |
| Marital status                                                                | Single                                       | 4                     | 44.0 | 2        | 22.2 | 2        | 22.2 | 1        | 11.0 | 12.016   | .035*            |
|                                                                               | Married                                      | 10                    | 12.5 | 17       | 21.3 | 42       | 52.5 | 11       | 13.8 |          |                  |
|                                                                               | Divorce/Living apart from spouse/Spouse died | 2                     | 11.8 | 2        | 11.8 | 6        | 35.3 | 7        | 41.2 |          |                  |
| Degree of closeness to a family member with a substance use disorder          | Mother                                       | 0                     | 0.0  | 1        | 2.7  | 23       | 62.2 | 13       | 35.1 | 46.202   | <i>p</i> < .001* |
|                                                                               | Father                                       | 7                     | 19.4 | 13       | 36.1 | 12       | 33.3 | 4        | 11.1 |          |                  |
|                                                                               | Sibling                                      | 8                     | 57.1 | 3        | 21.4 | 3        | 21.4 | 0        | 0.0  |          |                  |
|                                                                               | Spouse                                       | 1                     | 5.3  | 4        | 21.1 | 12       | 63.2 | 2        | 10.5 |          |                  |
| Living with family member with a substance use disorder for the last 6 months | Yes                                          | 7                     | 10.3 | 11       | 16.2 | 35       | 51.5 | 15       | 22.1 | 6.713    | .082             |
|                                                                               | No                                           | 9                     | 23.7 | 10       | 26.3 | 15       | 39.5 | 4        | 10.5 |          |                  |
| Having received training from an expert on substance use disorder             | Yes                                          | 2                     | 9.5  | 5        | 23.8 | 10       | 47.6 | 4        | 19.0 | .807     | .874             |
|                                                                               | No                                           | 14                    | 16.5 | 16       | 18.8 | 40       | 47.1 | 15       | 17.6 |          |                  |

Note:  $\chi^2$  = Chi-square test statistics; \* *p* < .05.

Note:  $\chi^2$  = Chi-square test statistics; \* *p* < .05.

= 519; *p* < .05). However, participants who do not use tobacco products have poorer attitudes toward the addicted member of the family compared to participants who do (*U* = 1057, *p* < .05; Table 3).

No statistically significant association was found between the participants' BAPI-A Scale scores and whether they were male or female, married, single, or divorced, number of times the relative of a substance addict applied to treatment, whether they lived in the same house with the addict, and whether they had received training on substance addiction (*p* > .05). While 5% of female participants and 29% of male participants with family members with substance addiction did not have depression, 60.7% of females and 28.9% of males were found to have moderate depression. It was determined that this difference between gender and depression levels was statistically significant, and the depression level was higher in women. Depression levels of the participants according to their marital status are also statistically significant. While 44% of single people do not have depression, 52.5% of married people have moderate depression, and 41.2% of divorced/separated/spouse-deceased people have severe depression (Table 4).

A statistically significant association was detected between the degree of closeness to the individual with a substance use disorder and the depression levels of the participants. While 57.1% of siblings do not have depression, moderate depression is present in 62.2% in mothers, 33.3% of fathers, and 63.2% of spouses. It is seen that depression rates are especially higher in mothers and spouses (Table 4).

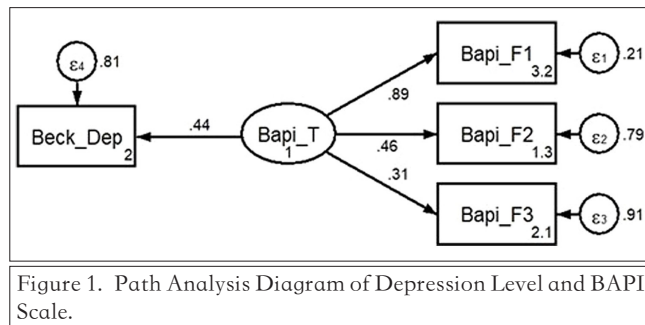
No statistically significant association was detected between the participants' depression levels and whether they lived with a family member with a substance use disorder or received education on substance addiction (*p* > .05).

A weakly positive statistically significant association was detected between the participants' Beck Depression Scale mean scores, BAPI-A Scale score mean, parenting skills subscale mean score, and attitude toward addict subscale mean score. Accordingly, as the participants' depression levels increase, problems in family relationships, problems in parenting skills, and problems in attitude toward the addicted member also increase (Table 5).

**Table 5.***Relationships Between Beck Depression Scale and BAPI-A and its Subdimensions*

|                       |          | BAPI-A Scale                  |                          |                                            |              |
|-----------------------|----------|-------------------------------|--------------------------|--------------------------------------------|--------------|
|                       |          | Parenting Skills Subdimension | Family Ties Subdimension | Attitudes Toward the Addicted Subdimension | BAPI-A Total |
| Beck Depression Scale | <i>r</i> | .375                          | .130                     | .281                                       | .395         |
|                       | <i>p</i> | <.001*                        | .185                     | .003*                                      | <.001*       |

Note: BAPI-A = Family Addiction Profile Index Scale; \*Spearman correlation test *p* < .05.



The effect of participants' family relationships on their depression levels was examined using structural equation modeling. It is seen that the model meets the required goodness of fit values ( $\chi^2 = 6.953$ ,  $SD = 2$ ,  $\chi^2/SD = 3.47$ ,  $RMSEA = 0.153$  ( $LO = 0.040$ ,  $HI = 0.284$ ),  $CFI = 0.893$ ,  $SRMR = 0.057$ ,  $TLI = 0.680$ ). The standardized prediction results of the model are shown in Figure 1. It has been found that problems in family relationships have a positive effect on the level of depression and directly affect it ( $\beta = 0.44$ ,  $p = .011$ ). Family relationships explain a total of 20% of the variation in depression level ( $R^2 = 0.20$ ).

## Discussion

In this study, which was conducted to determine the depression levels of families of individuals with substance use disorders and their attitudes toward the addicted member, it was found that 47% of the participants had moderate depression symptoms and 20% had mild depression symptoms. In addition, it was determined that family members' attitudes and parenting skills toward the addicted individual were inadequate and that there were problems in family relationships. In the correlation analyses, although at a weak level, it is seen that as the participants' depression levels increase, problems in family relationships, problems in parenting skills, and problems in attitude toward the addicted member also increase. It has been found that problems in family relationships have a positive effect on the level of depression and directly affect it. Family relationships explain a total of 20% of the variation in depression level.

Although it is seen in the literature that research focuses on the family functionality of families with substance use disorders, both studies conducted with family members (Bortolon et al., 2016) and studies conducted with addicted individuals (Hidalgo Carmona et al., 2008; Öngel Atar et al., 2016; Küçükşen et al., 2016) there appear to be problems in family functionality. Studies show that there are symptoms of depression in family members of individuals with substance use disorders (Şenormancı et al., 2019; Ekinici et al., 2016; Ólafsdóttir et al., 2019; Madiga & Mokwena, 2022).

In our research, it is seen that the depression levels of female participants are higher than those of male participants. There are studies in the literature that support this finding (World Health Organization, 2017; Kendler et al., 2001). However, it should be noted that there are also studies that do not agree with this finding (Ólafsdóttir et al., 2019; Madiga & Mokwena, 2022). It is thought that the cultural structure, family structure, and

intra-family relations of families with an addicted member may affect the depression levels of male and female members of that family in different ways.

There was no relationship between participants living with a family member with a substance use disorder and their depression levels. This finding differs from the literature (Benishek et al., 2011; Lander et al., 2013; Madiga & Mokwena, 2022). Family structure, distribution of roles within the family, and cultural factors may determine the relationship between living with a person with a substance use disorder and depression levels. It is thought that detailed research is needed on this subject.

In our research, it was found that mothers' parenting skills were poorer than those of other family members. Studies emphasize that mothers with substance-addicted children can take on the responsibilities of their children and that the substance user may have difficulty realizing the consequences of his own addiction; therefore, this is not a correct parental attitude (Bortolon et al., 2016; Nalbantoğlu & Tuncay, 2023; Denning, 2010). In addition, parental rejection is one of the frequently encountered problems in the mothers and fathers of individuals with substance use disorders (Pomini et al., 2014; Bircan et al., 2019; Yüncü et al., 2015).

Family ties were found to be insufficient for participants who were primary school graduates and those with lower education levels. There are results in different studies that family functions are perceived as healthier as the education levels of mothers and fathers increase (Küçükşen et al., 2016).

In our study, it was found that participants with nuclear families had less adequate attitudes towards dependent members compared to participants with single-parent families. It was not possible to compare this finding one-on-one, but in Karataş's (2020) study on family functions in families with substance use disorders, it was stated that the family functionality of nuclear families is healthier than single-parent families. Attitudes towards addicted members change according to family type, which may be related to changing family roles and changing family structures during the substance use process. In this context, there is a need for studies examining how the effects of substance use on the family vary according to family type. In addition, empowering families to gain knowledge about addiction and the treatment process by attending addiction training will also change their attitudes towards the addicted individual. However, another factor that positively affects the attitude toward the addicted family member was found to be tobacco product use. This finding can be explained by the fact that people who have similar experiences with substance use and understand the natural structure of addiction can empathize more easily and therefore develop less negative thoughts and behaviors about addicted individuals (Toronto Drug Strategy Implementation Panel, 2010).

Although it is seen that research on the subject focuses on how individuals with substance use disorders perceive their depression levels and family functionality (Karataş, 2020; Öngel Atar et al., 2016; Hidalgo Carmona et al., 2008; Küçükşen et al., 2016; Bidokhti et al., 2006; Selegheim et al., 2011), there is limited

information about the depression levels of family members in this process, families' attitudes toward the addicted member, parenting skills, and how they perceive intra-family relationships. Therefore, it is thought that the findings of this study will bring a new perspective to the literature and family-based studies to be applied in the treatment of substance use disorders.

In conclusion, our research findings show that depression symptoms are high in family members of individuals with substance use disorders, family members' attitudes and parenting skills toward the addicted member are inadequate, and there are problems in family relationships. Addiction is a family disease, and it is very important to include the family system in the treatment process. Therefore, conducting research on the functions and characteristics of family systems involved in substance addiction will help strengthen family behaviors and create family-based interventions. Our study findings show that substance-addicted individuals need psychotherapeutic intervention, rehabilitation programs, psychoeducation, and psychosocial support regarding the addiction process, tailored to the needs of their family members.

#### Limitations and Directions/Suggestions for Future Research

In this study, we consider it a limitation that no structured clinical interviews were conducted at the stage of clinical diagnosis, except for the scales used during interviews with individuals. The fact that the family members of addicts who use any illegal substance instead of a specific illegal substance are included in the research is also a limitation of this study. The advantage of the study is that the research took place in a regional psychiatric hospital where many patients from the Aegean region, the Mediterranean, and the Marmara region were admitted. It is thought that similar studies to be conducted in this area with larger samples and with the participation of different cultures will be useful in determining the areas of psychological and social support needed by family members and in creating the content of the interventions to be applied according to these areas.

**Data Availability Statement:** The data that support the findings of this study are available on request from the corresponding author.

**Ethics Committee Approval:** This study was approved by the Ethics Committee of Manisa Celal Bayar University Faculty of Medicine Health Sciences (approval number: 204784860-050.04.04; date: 05 February 2020).

**Informed Consent:** Informed consent was obtained from the patients who agreed to take part in the study.

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## ORIGINAL ARTICLE

# The Venomous High: A Systematic Review of Published Cases on Deliberate Snake Envenomation for Recreational Purposes

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## Main Points

- Though rare compared to typical recreational drugs, snake venom use is a concerning phenomenon.
- The systematic review identified 10 articles describing 14 exclusive case reports of individuals using snake venom for recreational use.
- All cases were adult males from India, belonging to different socioeconomic strata and educational backgrounds.
- The phenomenon might be underreported since this practice was facilitated by social and commercial networks. Also, almost all the cases were discovered accidentally by the treating team while being treated for something else.

## Abstract

This study investigates the phenomenon of deliberate snake envenomation for recreational purposes, a practice that appears to be an underreported and potentially growing issue. We conducted a systematic review of the literature, including original papers, case reports, case series, and letters to the editor on PubMed and Scopus databases using the search terms (((Addiction) OR (Recreational Use)) OR (Deliberate Envenomation)) AND (Snake)). Investigators systematically evaluated all cases, and information was extracted using a structured proforma. A total of 14 reports from 10 articles were reviewed. All patients were adult males (age =  $29.5 \pm 10.13$  years) from India, with the majority having a history of substance use disorder. Envenomation was typically sought for psychoactive effects, including stress relief, inducing euphoria, and enhanced sleep. Patients claimed to use cobras and rat snakes, though species were usually uncertain. Premorbid personality traits such as disinhibition, high impulsivity, and sensation-seeking were common among the patients. The practice was prevalent across different socioeconomic strata, facilitated by commercial sources and social networks. Less is known about the actual prevalence, yet results establish recreational snake envenomation as a covert social health issue. Future focused research is needed to establish epidemiology, and consequently the prevention and management of the practice.

**Keywords:** Illicit Drugs, psychedelic, snake bite envenomation, illicit substance use, substance use disorder, Human-Wildlife Conflict

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## Introduction

India accounts for almost half of the total number of annual snakebite deaths globally. Estimates suggest an average of 58,000 such deaths per year

over the last two decades in the country (Suraweera et al., 2020) as compared to the estimated 80,000 to 138,000 global deaths (World Health Organization, 2021). Notwithstanding this staggering mortality rate, along with an even higher incidence of

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amputations and permanent disabilities among the survivors (Suraweera et al., 2020; World Health Organization, 2021), many individuals ironically indulge in deliberate snake envenomation for recreational purposes in various forms (Das et al., 2017).

Yet, in this context, snakes present an even more compelling subject of study. First, their potential lethality and status as one of the most fear-inducing animals underscore their significance. Second, snakes, in general, serve as potent stimuli eliciting both fear and disgust in most individuals. While it is only in recent years that the psychoactive use of animals has caught the interest of researchers and media, the use of naturally occurring substances—present in plants and/or animals—is not at all a novel phenomenon. Humans have been engaging in exploiting, cultivating, and modifying such mind-altering substances for millennia, be it for recreational, religious, or psychedelic purposes (Orsolini et al., 2018). Such animals, which can potentially alter an individual's consciousness, are called psychoactive fauna and individuals who deliberately engage in this behavior are called psychonauts (Blom, 2010). There exist various such faunae, including certain types of fish, toads, lizards, Red Harvester ants, Sonoran Desert toads, etc. (Godara et al., 2022; Orsolini et al., 2018; Stringham et al., 2023). This fear and disgust are suggested to have deep biological predispositions (Rádlová et al., 2020). In the Indian context, the use is particularly interesting, given the religious reverence of snakes in many cultures, including the Hindu culture (Allocco, 2013; Jadav et al., 2022; Kakunje et al., 2019; Stanley, 2008).

A simple Google search of “snake bites addiction” or “snake addiction” yields enough news reports indicating that snake venom use is not entirely uncommon (Kanwar, 2018; Mitra, 2024; Sharma, 2017; “Teenager Addicted to Snake Venom Arrested in Kerala,” 2014), even if the incidence might be on the fringes compared to conventional psychoactive substances. Moreover, though it is a considerably novel phenomenon, “snake bites” are not the only method, and using snakes to alter consciousness is not altogether new. For instance, the use and production of snake wine is quite common in many parts of the world. In fact, snake wine is legally available in many Southeast Asian countries such as Vietnam (Somaweera & Somaweera, 2010). Moreover, while not for recreational purposes, snakes have been used for medicinal purposes as per Ayurveda, as well as in South America (Jadav et al., 2022).

Compared to the fairly substantial amount of anecdotal evidence, there are just a handful of scientific reports of deliberate snake envenomation, and the topic has precluded large-scale cross-sectional or cohort studies. Hence, to understand the current evidence, we aimed to identify, synthesize, and critically review all the published scientific literature in the area.

## Material and Methods

We carried out a systematic review to identify the empirical literature and explore the characteristics of snake envenomation or snake use for recreational purposes.

### Search Strategy

The systematic literature review approach was used to identify and select the published reports on the topic. The preliminary

search was conducted using the electronic databases PubMed and Scopus for case reports of deliberate snake envenomation. We employed the terms (((Addiction) OR (Recreational Use)) OR (Deliberate Envenomation)) AND (Snake)). The search was supplemented by manually checking sources from the bibliographies of published reports. The final search was performed in May 2024.

### Data Abstraction

We obtained full texts of the identified literature. The studies were included if (i) they reported primary data, (ii) were published as case series, case reports, journal articles, and letters to editors, (iii) were published in a peer-reviewed academic journal, (iv) their full text was available, and (v) were in the English language. No limitations were placed on the year of publication. We excluded the studies (i) which did not report on original cases, (ii) reported on findings of accidental snake envenomation, and (iii) were published as non-scientific literature such as newspaper articles or blog posts. Both authors (KG and AJR) used a priori criteria to independently screen and review each report. Disagreements were resolved by consensus between all authors. The relevant data was entered into an Excel spreadsheet.

### Statistical Analysis

The data were analyzed qualitatively and quantitatively using descriptive statistics as applicable, using IBM SPSS version 23 (IBM SPSS Corp.; Armonk, NY, USA).

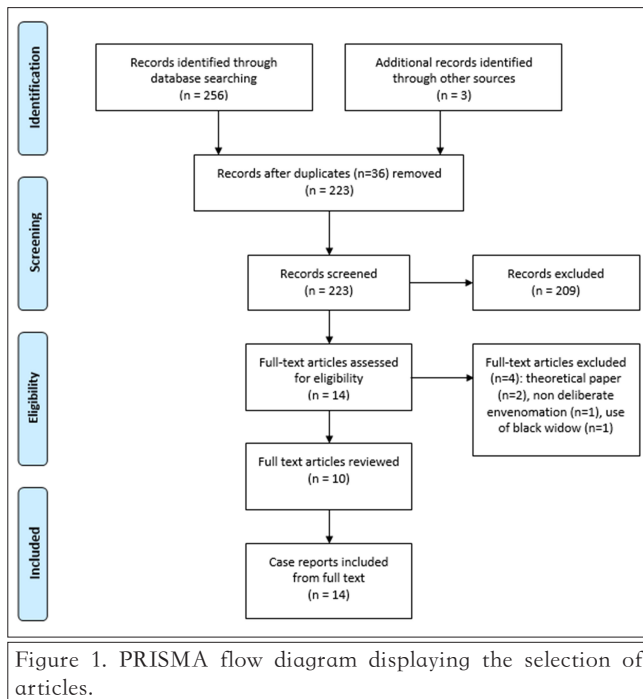
## Results

### Included Studies

As depicted in Figure 1, the initial search identified 256 studies from both databases, with three reports added through cross-referencing and snowballing. After removing the duplicates ( $n = 36$ ), title screening was administered for 223 articles. Gradually, 14 articles were thoroughly read, and four articles were excluded since they did not have primary data or focused on non-deliberate snake envenomation. One article focused on the deliberate envenomation of the black widow (spider). We excluded a Korean report on coagulopathy post-consuming snake wine. The alcohol content is quite high in snake wines, which is expected to denature the proteins in snake venom, and subsequently, this denaturation destroys the biological activity of these proteins. This one case is quite rare and most importantly it pertains to accidental envenomation. Therefore, consuming snake wine is different from “snake bites” or deliberate snake envenomation. Finally, ten articles describing 14 exclusive reports were utilized for the qualitative synthesis. Though we did not aim to set any time limit, all reports were from and/or after 2013, except one which is from 1990.

### Sociodemographic Details

All patients were adult males ( $n = 14$ , age = 29.5, SD = 10.13), hailing from India (Table 1). Deliberate snake envenomation was almost exclusively found accidentally, except in two reports (Ram, 2022; Talwar et al., 2021). Most of the patients had been admitted seeking treatment for substance use disorder (Katshu et al., 2011; Krishnamurthy & Braganza, 2013; Mehra et al., 2018;



Nath & Patra, 2018; Pradhan, 1990; Shukla et al., 2017; Umate et al., 2015), one case had been brought to seek treatment for using snake bites (Ram, 2022), while one had been brought to the emergency department due to ingestion of snake venom and alcohol (Talwar et al., 2021).

#### Details of the Snake Used: Type and Access

As seen in Table 1, the type of snake/s had been identified in only five of the reports, namely krait, cobra, rat snake (*Jerothana* or *pothu*, and small Indian cobra (*Naja Naja*) (Katshu et al., 2011; Pradhan, 1990; Senthilkumaran et al., 2013; Shukla et al., 2017). Otherwise, the descriptions provided are vague, such as “baby snakes” or “green snakes that live in trees” (Krishnamurthy & Braganza, 2013; Pradhan, 1990). Besides, only in the case reported by Shukla et al. (2017) is the snake’s species ascertained by an expert, i.e., a forest ranger. Interestingly, in this report, the patient stated to have been indulging in cobra bites, whereas the species of the snake turned out to be a rat snake (Shukla et al., 2017).

Barring one case in which the patient was himself a snake charmer and had complete access to the snakes (Talwar et al., 2021), all patients had obtained snakes from commercial sources including “snake dens” (Katshu et al., 2011; Pradhan, 1990; Senthilkumaran et al., 2013) and rave parties (Umate et al., 2015). In one case, the patient was taken to a hotel room for a snake bite (Krishnamurthy & Braganza, 2013). Only a few reports mentioned the cost of snake bites: while the case published in the early ’90s reported the price incurred to be INR 50/ bite<sup>1</sup> (Pradhan, 1990), the more recent reports vary from each other extensively: Rs. 250<sup>2</sup> to Rs. 2500/snake bite (Nath & Patra, 2018; Umate et al., 2015).

1 0.60 USD as per conversion in August 2024

2 2.98 USD as per conversion in August 2024

#### Snake Envenomation: Effects and Reasons for Preference

Table 2 presents the clinical features of all cases. Most patients reported that snake envenomation led to good sleep (Krishnamurthy & Braganza, 2013; Mehra et al., 2018; Pradhan, 1990; Ram, 2022; Senthilkumaran et al., 2013; Shukla et al., 2017; Umate et al., 2015), blurred vision (Katshu et al., 2011; Krishnamurthy & Braganza, 2013), stress relief (Senthilkumaran et al., 2013), the experience of “high,” euphoria, happiness, and well-being (Katshu et al., 2011; Mehra et al., 2018; Nath & Patra, 2018; Senthilkumaran et al., 2013; Shukla et al., 2017; Umate et al., 2015); and lethargy (Katshu et al., 2011; Krishnamurthy & Braganza, 2013). Only one patient presented with withdrawal symptoms during admission (Pradhan, 1990). Two patients reported an increased sexual drive and heightened arousal post-envenomation (Senthilkumaran et al., 2013; Umate et al., 2015).

The reasons for preference were the sensation of high for a longer duration ranging from 2 – 3 days to 3 – 4 weeks (Mehra et al., 2018; Shukla et al., 2017; Talwar et al., 2021), reduction in consumption of alcohol and other substances (Talwar et al., 2021), reduced desire to use other substances (Ram, 2022), and no local tissue injury, muscle paresis, diplopia, or gangrene at the bite site (Katshu et al., 2011; Ram, 2022). They also reported a lack of hangover, headaches, tremors (Katshu et al., 2011; Senthilkumaran et al., 2013), craving (Krishnamurthy & Braganza, 2013), and withdrawal symptoms (Pradhan, 1990; Senthilkumaran et al., 2013; Umate et al., 2015). In one case, the patient reported reduced cravings for other substances which diminished 3 – 4 weeks after the snake bite, which led to subsequent bites (Mehra et al., 2018).

#### Premorbid Personality

Observations about pre-morbid personality were made in four case studies.

#### Disinhibition

Disinhibition was a common trait found among individuals who engaged in snake envenomation, wherein one patient was found to engage in socially disapproved activities (Katshu et al., 2011) and was even undergoing criminal investigation for robbery (Katshu et al., 2011). Other disinhibition tendencies were reflected, such as use of multiple substances, frequent lying, stealing, abusive and assaultive behavior, and suspicious dealings involving money and drugs (Krishnamurthy & Braganza, 2013). In another case, a history of physical assault, bullying, expulsion from school, and manipulative tendencies was reported. Herein, the patient was engaged in organizing rave parties as well (Ram, 2022). In the case report by Nath & Patra (2018), the primary reason for the admission of the patient was abusive behavior in the orthopedic ward, where he was admitted due to sustaining an injury when he jumped from a rooftop. Additionally, history taken from family members suggests truancy during school, stealing money from home, and “engaging in gang activities” (Nath & Patra, 2018).

#### High Impulsivity and Sensation Seeking

Shukla (2017) reported that the patient had high impulsive and sensation-seeking tendencies (Shukla et al., 2017). Nath and Patra (2018) conducted psychometric tests wherein the individual had high impulsivity and sensation-seeking scores on impulsive

**Table 1.***Sociodemographic and Snakes' Specific Details*

| Author (Year)                              | Case Number | Sociodemographic Details                                                             | Snake Specification and Acquisition Process                                                                                                                                                                          |
|--------------------------------------------|-------------|--------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Pradhan (1990)<br>Case I                   | 1           | 35-year-old, male, married,<br>Lower SES, works in a<br>gambling den                 | Type of snake: Cobra/green-colored snake found in trees<br>Source: (an unmentioned) ethnic group in the Southern part of Mumbai (Maharashtra) that only deals with individuals known to them; INR 50/bite            |
| Pradhan (1990)<br>Case II                  | 2           | 33-year-old, male, married                                                           | Type of snake: Not given; various types of snakes were available, they were categorized by potential intoxication level: mild, moderate, and severe.<br>Source: Snake dens situated in South Mumbai, Kolkata and Goa |
| Katshu et al.<br>(2011) Case I             | 3           | 52-year-old, male, married                                                           | Type of snake: Not known<br>Source: Nomadic snake charmers, suggested by friends                                                                                                                                     |
| Katshu et al.<br>(2011) Case II            | 4           | 44-year-old, male, married                                                           | Type of snake: Small Indian Cobra (Naja Naja)<br>Source: Some sort of snake den where the patient had slept overnight in an urban slum area                                                                          |
| Krishnamurthy<br>and Braganza<br>(2013)    | 5           | 18-year-old, male                                                                    | Type of snake: Not known (according to the patient, the snakes used were newborn and very small).<br>Source: Professional network in this business (as the suppliers used to take him to a hotel room)               |
| Senthilkumaran<br>et al. (2013)<br>Case I  | 6           | 25-year-old, male, software<br>engineer                                              | Type of snake: Not specified<br>Source: Snake dens                                                                                                                                                                   |
| Senthilkumaran<br>et al. (2013)<br>Case II | 7           | 23-year-old, male, software<br>engineer                                              | Type of snake: Not specified<br>Source: Snake dens                                                                                                                                                                   |
| Umate et al.<br>(2015) Case I              | 8           | 22-year-old, male,<br>educated up to 8th grade,<br>ward boy at a private<br>hospital | Type of snake: Not known (green colored)<br>Source: INR 2500 /bite                                                                                                                                                   |
| Umate et al.<br>(2015) Case II             | 9           | 22-year-old male, educated<br>up to 10th grade                                       | Type of snake: Not known<br>Source: Rave parties                                                                                                                                                                     |
| Shukla et al.<br>(2017)                    | 10          | 21-year-old, male                                                                    | Type of snake: Rat Snake, also known as <i>Jerothana</i> or <i>Pothu</i> (according to the patient it was a Cobra)<br>Source: Snake charmer                                                                          |
| Nath and Patra<br>(2018)                   | 11          | 38-year-old, male                                                                    | Type of snake: Not known<br>Source: Snake charmer Rs 250/bite                                                                                                                                                        |
| Mehra, Basu,<br>and Grover<br>(2018)       | 12          | 33-year-old, male                                                                    | Type of snake: Cobra (the patient was not sure)<br>Source: Snake charmer, introduced by friends                                                                                                                      |
| Talwar et al.<br>(2021)                    | 13          | 28-year-old male, snake<br>charmer                                                   | Type of snake: Not known<br>Source: The patient was himself a snake charmer, hence the occupational accessibility                                                                                                    |
| Ram (2022)                                 | 14          | 19-year-old, educated up<br>to 10th grade, upper SES                                 | Type of snake: Not known<br>Source: Through friends/peer                                                                                                                                                             |

Note: SES, socioeconomic status.

and sensation seeking (Nath & Patra, 2018). Similarly, another participant “constantly desired to remain high and experiment with various local drugs” (Ram, 2022).

#### Antisocial Personality Traits

These were reflected by making sexual advances toward his sister-in-law, stealing money, and showing a lack of guilt or remorse for the same (Nath & Patra, 2018).

#### Comorbid Substance Use

All patients had a history of substance use, with a majority presenting with polysubstance use (Katshu et al., 2011; Krishnamurthy & Braganza, 2013; Mehra et al., 2018; Nath & Patra, 2018; Pradhan, 1990; Ram, 2022; Shukla et al., 2017; Umate et al., 2015).

Six cases have been mentioned specifically abusing different substances in a dependent pattern (Katshu et al., 2011;

**Table 2.**  
*Describing Clinical and Presentation Variables*

| Author (Year)                        | Clinical History                                                                                                                                                                                                                                                                                                               | History of Initiation                                                                                       | Snake Envenomation History                                                                                                                                                                                                                                                                                                                              | Reported Effects and Symptomology                                                                                                                                                                                                                                                                  |
|--------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Pradhan (1990)<br>Case I             | <b>Reason for admission:</b> Heroin withdrawal<br><b>Comorbid substance:</b> Charas, heroin, mandrax                                                                                                                                                                                                                           | <b>Reason for initiation:</b> Was indulging in other substances when he tried snake bites out of curiosity. | <b>Duration:</b> 14 years (approximately)<br><b>Frequency:</b> Two or three times/week<br><b>Procedure:</b> Not specified<br><b>Site of bite:</b> Great toe, tongue                                                                                                                                                                                     | Sleep of about 18 – 20 hours (which gradually decreased). Presented withdrawal symptoms during his admission.                                                                                                                                                                                      |
| Pradhan (1990)<br>Case II            | <b>Reason for admission:</b> Detoxification for charas and heroin addiction<br><b>Comorbid Substance:</b> Charas, ganja, alcohol                                                                                                                                                                                               | <b>Reason for initiation:</b> To get an “extra kick.”                                                       | <b>Duration:</b> 15 years (approximately), discontinued at some point.<br><b>Frequency:</b> Not specified<br><b>Procedure:</b> The snake’s head was tapped with a blunt object. On tapping, the snake used to bite.<br><b>Site of bite:</b> Not specified                                                                                               | Grandiosity, well-being and happiness post each bite. Mixed symptoms such as either lying down for hours or, on certain occasions, kept “moving in the room.” Did not report any hallucinations or withdrawal symptoms.                                                                            |
| Katshu et al.<br>(2011) Case I       | <b>Reason for admission:</b> Not specified.<br><b>Comorbid substance:</b> H/O polysubstance (alcohol, cannabis, benzodiazepines, and opioids) in dependence pattern over the course of 34 years                                                                                                                                | <b>Reason of initiation:</b> “To experience the kick the other substances now lacked.”                      | <b>Duration:</b> 2 months<br><b>Frequency:</b> Twice in 15 days<br><b>Procedure:</b> Not specified<br><b>Site of bite:</b> Left forearm.                                                                                                                                                                                                                | Dizziness, blurred vision followed by heightened arousal, sense of well-being for a few hours; a more intense state of arousal than pentazocine injections.                                                                                                                                        |
| Katshu et al.<br>(2011) Case II      | <b>Reason of admission:</b> Not specified<br><b>Comorbid substance:</b> H/O polysubstance (alcohol, benzodiazepines, opioids, and nicotine) in dependence pattern over the course of 29 years. Opioid was the predominant substance of choice.                                                                                 | <b>Reason of initiation:</b> Found out about snake bites as a means of getting high.                        | <b>Duration:</b> 1 month<br><b>Frequency:</b> Once so far<br><b>Procedure:</b> Not specified<br><b>Site of Bite:</b> Foot                                                                                                                                                                                                                               | Blackout associated with a sense of well-being, lethargy, and sleepiness. Slept overnight at the same place and awoke the next morning without any residual effect.                                                                                                                                |
| Krishnamurthy and Braganza<br>(2013) | <b>Reason of admission:</b> H/O polysubstance use along with chief complaints of “stealing, assaultive behavior, suspicious behavior regarding drugs, etc”<br><b>Comorbid substance:</b> Alcohol, tobacco, opioid, benzodiazepine, and stimulants<br><b>Diagnosis:</b> Alcohol, tobacco, opioid, and benzodiazepine dependence | <b>Reason of initiation:</b> Not specified                                                                  | <b>Duration:</b> Not specified<br><b>Frequency:</b> Thrice so far<br><b>Procedure:</b> A newborn snake (which was fed white powder) was given to the patient in a small box. The patient would sit upright, protruding his tongue, and another person would hold and incite the snake to bite by tapping it on the head.<br><b>Site of bite:</b> Tongue | Increased well-being, lethargy, occasional blurred vision, restlessness, followed by deep sleep of 30 – 36 hours later. Felt weakness the next day back home. No local inflammation or pain was felt subsequently at the puncture site. The patient did not report any craving for the snake bite. |

(Continued)

Krishnamurthy & Braganza, 2013; Mehra et al., 2018; Nath & Patra, 2018; Umate et al., 2015) and two patients were diagnosed with polysubstance abuse (Nath & Patra, 2018; Shukla et al., 2017). The most commonly reported substance is alcohol. Figure 2 is a word cloud that diagrammatically represents the different substances and their frequency of use; larger text size indicates a

higher frequency of use among patients who indulge in deliberate snake envenomation.

#### Assessment and Management

Pathophysiological assessments including hematological, biochemical (Ram, 2022; Senthilkumaran et al., 2013; Talwar et al., 2021), and urine (Ram, 2022) tests were conducted. Shukla (2017)

**Table 2.**  
Describing Clinical and Presentation Variables (Continued)

| Author (Year)                        | Clinical History                                                                                                                                                                                                                                                                                                                                                     | History of Initiation                                                                                         | Snake Envenomation History                                                                                                                                                                                                                                                                                                           | Reported Effects and Symptomology                                                                                                                           |
|--------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Senthilkumaran et al. (2013) Case I  | <b>Reason for admission:</b> To get tested for HIV infection<br><b>Comorbid substance:</b> Not specified                                                                                                                                                                                                                                                             | <b>Reason for initiation:</b> Due to stress and insomnia, despite apparent optimal knowledge of toxic effects | <b>Duration:</b> 6 months<br><b>Frequency:</b> once every 30 – 45 days<br><b>Procedure:</b> The handler holds the snake near the head and makes the snake inject a minimal bite on the little toe or index finger, followed by a bite on the tongue or lip, if desired<br><b>Site of bite:</b> Little toe, index finger, lip, tongue | Stress relief, experienced euphoria, and reported good sleep. No withdrawal symptoms.                                                                       |
| Senthilkumaran et al. (2013) Case II | <b>Reason for admission:</b> To get tested for HIV infection (suggested by a friend, the primary case).<br><b>Comorbid substance:</b> Not specified                                                                                                                                                                                                                  | <b>Reason for initiation:</b> Not specified                                                                   | <b>Duration:</b> Not specified<br><b>Frequency:</b> Not specified<br><b>Procedure:</b> Same as above<br><b>Site of bite:</b> Same as above                                                                                                                                                                                           | Sleep for 20 – 24 hours with a relaxed mind without any hangover or headache, tremor, or sense of crawling. Increased sexual desire. No withdrawal symptoms |
| Umate et al. (2015) Case I           | <b>Reason for admission:</b> Use of heroin - “brown sugar consumption”<br><b>Comorbid substance:</b> heroin, codeine                                                                                                                                                                                                                                                 | <b>Reason of initiation:</b> Engaged in snake bites after chasing brown sugar “to get high.”                  | <b>Duration:</b> 1 year<br><b>Frequency:</b> Initially once every 2 months, since the last 4 months, 2 times/ week<br><b>Procedure:</b> A sharp tap with a blunt instrument was given on snakehead, on tapping snake used to bite.<br><b>Site of bite:</b> Tongue or toes                                                            | Sleep for 18 – 20 hours (which gradually declined). Dizziness, blurred vision, heightened arousal, and a sense of well-being. No withdrawal symptoms.       |
| Umate et al. (2015) Case II          | <b>Reason for admission:</b> Use of heroin - “brown sugar consumption”<br><b>Comorbid substance:</b> heroin                                                                                                                                                                                                                                                          | <b>Reason of initiation:</b> Introduced while attending a rave party in Mumbai suburbs.                       | <b>Duration:</b> Not specified<br><b>Frequency:</b> Not known, (more than once)<br><b>Procedure:</b> A snake was kept in a box which has a hole, where the person had to place his/her tongue.<br><b>Site of bite:</b> tongue                                                                                                        | Drowsiness and would sleep for 12-14 hours. Did not report any withdrawal symptoms.                                                                         |
| Shukla et al. (2017)                 | <b>Reason for admission:</b> Facial paresis and dimness of vision h/o Multiple substance use for 5 years;<br><b>Comorbid substance use</b> includes intravenous heroin, marijuana, and nicotine. Use of cocaine, “magic mushrooms” “acid blots” and alcohol present (h/o suggestive of dependence).<br><b>Diagnosis:</b> Poly-substance abuse and ADHD, Bells palsy. | <b>Reason of initiation:</b> “For a better high.”                                                             | <b>Duration:</b> Not specified<br><b>Frequency:</b> Not specified<br><b>Procedure:</b> Not specified<br><b>Site of bite:</b> Lips and tongue                                                                                                                                                                                         | Drowsiness, euphoria, and feeling of warmth followed by a deep sleep after the bite, which lasted for 2 – 3 days.                                           |

(Continued)

**Table 2.***Describing Clinical and Presentation Variables (Continued)*

| Author (Year)                  | Clinical History                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | History of Initiation                                                                                                                                | Snake Envenomation History                                                                                                                                                                                                                                                                                                                                                                     | Reported Effects and Symptomology                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
|--------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Nath and Patra (2018)          | <p><b>Reason for admission:</b> Referred by the orthopedics department for exhibiting abusive behavior towards ward staff. Consequently, he was in orthopedics department due to an injury sustained from jumping from the rooftop of his house.</p> <p><b>Comorbid substance:</b> History of multiple substance use (alcohol, cannabis, nicotine, opioid, morphine, promethazine, suggestive of dependence pattern), brown sugar.</p> <p><b>Diagnosis:</b> polysubstance abuse (in dependence) and ADHD with dissocial personality disorder</p> | <p><b>Reason of initiation:</b> Managing cravings for opioids, caused by the unavailability of brown sugar during the 1999 cyclone.</p>              | <p><b>Duration:</b> 17 years (approximately),</p> <p><b>Frequency:</b> Not specified</p> <p><b>Procedure:</b> the charmer administered an unidentified liquid onto the patient's tongue to assess venom tolerance. The patient protruded his tongue while the charmer conducted rituals. The snake swiftly bit the tip of the tongue before retreating.</p> <p><b>Site of bite:</b> Tongue</p> | <p>"Tranquility that would cause numbing of senses" which was different from that of opioids.</p>                                                                                                                                                                                                                                                                                                                                                                                                |
| Mehra, Basu, and Grover (2018) | <p><b>Reason for admission:</b> h/o poly substance use for the past 15 years.</p> <p><b>Comorbid substance:</b> tobacco (dependent pattern), alcohol (dependent pattern), opioid (dependent pattern)</p>                                                                                                                                                                                                                                                                                                                                         | <p><b>Reason of initiation:</b> curiosity and as a cheaper substitute for opioid and alcohol.</p>                                                    | <p><b>Duration:</b> Not known</p> <p><b>Frequency:</b> Every 3 to 4 weeks.</p> <p><b>Procedure:</b> Not specified</p> <p><b>Site of bite:</b> Tongue</p>                                                                                                                                                                                                                                       | <p>Jerky movements, blurred vision, and unresponsiveness. ("blackout" for 1 hour). Heightened arousal and well-being more intense than alcohol or opioid, lasting for 3 – 4 weeks. No cravings for alcohol and opioids. After 3 – 4 weeks, well-being declined, and irritability, lethargy, and drug cravings increased, leading to another snake bite. This cycle repeated every 3 – 4 weeks. Over time, opioid and alcohol use decreased, mostly occurring 1 – 2 weeks after a snake bite.</p> |
| Talwar et al. (2021)           | <p><b>Reason for admission:</b> State of irritability after alcohol consumption with snake venom; h/o alcohol addiction for 15 years and repeated failed attempts to quit.</p> <p><b>Comorbid Substance:</b> Alcohol</p>                                                                                                                                                                                                                                                                                                                         | <p><b>Reason of initiation:</b> As an attempt to reduce alcohol intake</p> <p><b>Precipitating factor:</b> Divorce with wife.</p>                    | <p><b>Duration:</b> 4 months</p> <p><b>Frequency:</b> Not specified</p> <p><b>Procedure:</b> Not specified</p> <p><b>Site of bite:</b> Not specified</p>                                                                                                                                                                                                                                       | <p>Experienced a high for 6 – 7 days, resulting in reduced alcohol consumption. Eventually, started mixing his alcohol with the venom in order to increase the duration of the high effect.</p>                                                                                                                                                                                                                                                                                                  |
| Ram (2022)                     | <p><b>Reason for admission:</b> Treatment for deliberate snake envenomation; brought by parents.</p> <p><b>Comorbid substance:</b> current use of tobacco (cigarettes) for 8 years, alcohol for 6 years; cannabis, opioids, cocaine, LSD, and magic mushrooms for 2 years.</p> <p>h/o migraine; facility history: nicotine dependence in grandfather.</p>                                                                                                                                                                                        | <p><b>Reason of initiation:</b> Out of curiosity, considering snake venom as the "ultimate high-sustaining chemical for a more extended period."</p> | <p><b>Duration:</b> 6 months</p> <p><b>Frequency:</b> Several times since</p> <p><b>Procedure:</b> Injected chemicals (provided by friends, content not known) into the snake. Got bitten after smoking cannabis.</p> <p><b>Site of bite:</b> Tongue</p>                                                                                                                                       | <p>Drowsy, feeling of happiness, joyous mood, reduced desire to sleep; did not feel indulging in any other substance use. There was no muscle paresis, diplopia, or gangrene at the bite site.</p>                                                                                                                                                                                                                                                                                               |

Note: ADHD, attention-deficit hyperactivity disorder; HIV, human immunodeficiency virus; h/o, history; LSD, lysergic acid diethylamide.

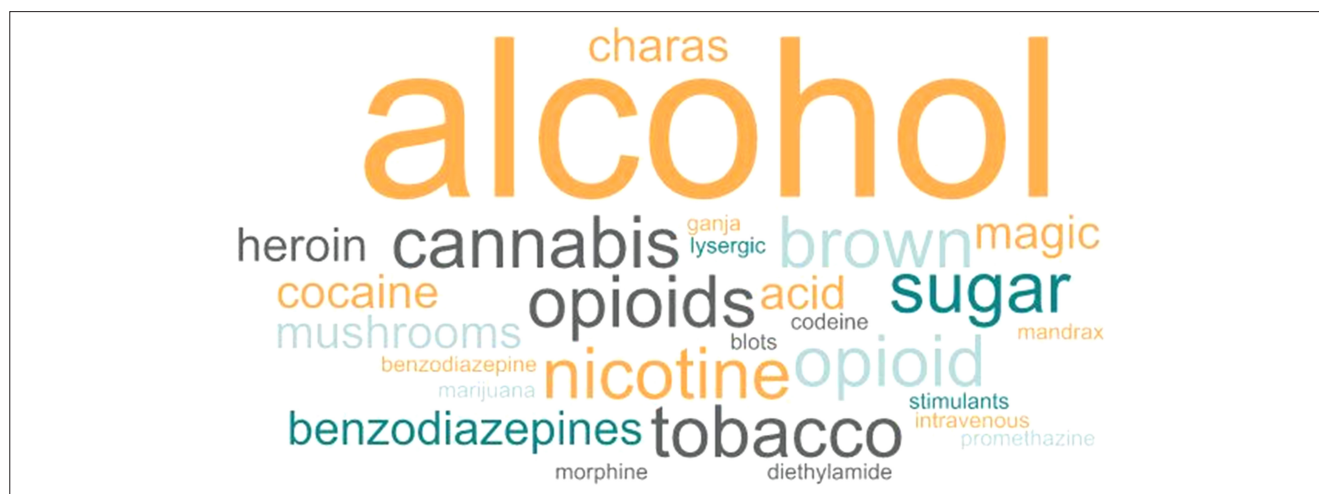


Figure 2. A word cloud diagrammatically representing the different substances and their frequency of use.

conducted serum electrolyte, renal, and liver function tests. It is pertinent to note that all the tests were within normal limits. In addition, neurological tests and magnetic resonance imaging (MRI) scans were also conducted (Shukla et al., 2017). The International Personality Disorder Examination (IPDE) was conducted to gauge personality in one case in which the patient displayed strong impulsive, histrionic, and antisocial tendencies (Ram, 2022). Addiction was assessed using the Clinical Institute Withdrawal Assessment of Alcohol Scale-Revised (Ram, 2022), CAGE, and Alcohol Use Disorder Identification Test (Talwar et al., 2021). Barratt Impulsiveness Scale (BIS) and Sensation Seeking Scale were also used to measure impulsivity and sensation seeking, respectively, and both showed high scores (Nath & Patra, 2018).

Most pharmacotherapy interventions were focused on symptom management, dealing with primary substance addiction, and treating comorbid psychiatric symptoms (Mehra et al., 2018; Nath & Patra, 2018; Ram, 2022; Talwar et al., 2021). Psychotherapeutic interventions included psychoeducation (Mehra et al., 2018; Senthilkumaran et al., 2013), addressing psychosocial factors and personality traits (Nath & Patra, 2018), implementing Motivational Enhancement Therapy (MET) (Mehra et al., 2018; Ram, 2022), Cognitive Behavioral Therapy (CBT) (Ram, 2022; Talwar et al., 2021), and relapse prevention (Mehra et al., 2018).

## Discussion

The study collates published case reports and presents a synthesized picture of deliberate snake envenomation since the first paper was published three decades ago (Pradhan, 1990). Our findings suggest that, despite the lack of reporting, this phenomenon might have a higher prevalence. This is evidenced by various pathways through which it is obtained, such as being often introduced by peers or colleagues (Senthilkumaran et al., 2013) and having been sold through available commercial channels (Krishnamurthy & Braganza, 2013). The commercial sources seem to be organized and structured since reports suggest drug administration systems or routes in place, such as ingestion of a white powder (supposedly drugs), having different rituals (Nath & Patra, 2018), and even systems of arranging hotel rooms for

clients to sleep post the snake bite (Krishnamurthy & Braganza, 2013).

Southern Asia reports a high fatality rate associated with cobra and krait bites. Despite that, most snake venom for recreational use was derived from potentially poisonous snakes. In most cases, the species of the snake was not known to the patients, while others reported that the snake was either a cobra or rat snake. This reflects an underlying need to seek novel, complex experiences, and a willingness to take physical and social risks for the sake of such experiences, or high sensation seeking and novelty seeking. Increased risk-taking and weak behavioral inhibition in the face of potentially aversive outcomes also point toward low harm avoidance. These findings have been further solidified by Nath and Patra (2018), who used psychometric tests such as Barratt's impulsivity scale and sensation-seeking Scale, discovering high levels of both domains in the case they reported (Nath & Patra, 2018). Furthermore, in four cases the researchers identified a common premorbid personality trait of disinhibition among individuals who engage in deliberate snake envenomation (Katshu et al., 2011; Krishnamurthy & Braganza, 2013; Nath & Patra, 2018; Ram, 2022). Behavioral disinhibition is characterized by a pattern of impulsive, antisocial behavior and is associated with an increased propensity to engage in norm violations, sensation-seeking behaviors, and a generalized vulnerability to externalizing tendencies and behaviors such as drug addiction (Iacono et al., 1999; Young et al., 2009). Volition is misdirected or impaired, and individuals may find it difficult to weigh potential consequences (Moeller et al., 2001). In addition to poor risk assessment, they may also prioritize immediate gratification in the form of "long-lasting highs."

The practice of deliberate snake envenomation as a drug was found to be prevalent across all socioeconomic strata, in rave parties, and in snake dens in villages. Though snake venom is a fringe substance compared to conventional psychoactive drugs, the real prevalence is assumed to be far beyond the reported cases. This assumption is based on the premise that in almost all the published cases, this was observed accidentally. Only in two cases were the patients brought in for treatment for deliberate snake envenomation (Ram, 2022; Talwar et al., 2021). In the rest of the cases, the primary purposes for seeking help were

consumption or withdrawal related to other substances, detoxification, getting tested for HIV infection, etc.

The varied price per bite, ranging from Rs 50<sup>3</sup> to 2500<sup>4</sup> can be attributed to the period of the cases reported, i.e., about 25 years. Anecdotal and media reports suggest that a prick can cost anywhere from INR 3000 to 4000 (Ranga, 2011), while a gram of snake bite powder can cost around INR 20,000 to 25,000 (Lenin, 2016; Swati, 2016; *V-Day Drug*, 2012). We speculate that the type and potency of snakes, the mechanisms of demand and supply, and the paying capacity of the customers could be determining factors of such varied and high prices. The spate of new reports of law enforcement seizing snake venom worth millions of Indian rupees (“1kg of Dried “snake venom” seized,” 2021; Lenin, 2016) also highlights the magnitude of wildlife crimes — the illegal business or possession of wildlife for profit, subsistence, personal ownership, cultural or religious beliefs, or as a consequence of human-animal conflict — (McFann & Pires, 2020) that might be occurring, or may even be on the rise. Additionally, a recent review exploring the wildlife trade market on the dark web found that 90% of dark-web wildlife advertisements were for selling recreational drugs (Stringham et al., 2023) which also points out the covert magnitude of this phenomenon.

To the best of our knowledge, this phenomenon has not been explored systematically. Another strength of our study is its focus on psychosocial factors. The study posed a few limitations as well. The systematic review did not explore or include gray literature. The case reports did not follow any prescribed reporting formats; hence, the depth of information elicited differed significantly and there was a lot of missing information. Future researchers can use exploratory research designs in the area to understand the actual prevalence and depth of the problem. Additionally, future research should explore this phenomenon from a criminal, legal, and environmental standpoint.

This study highlights deliberate snake envenomation for recreational purposes. Considering the news reports, accidental discoveries in medical settings, and organized pathways by the patient, it can be speculated that this phenomenon might be far more widespread than it appears on the surface. Snakes are one of the most fatal animals, and even though individuals might not be using truly “venomous” snakes, the practice poses great harm and risks. Craving, sensation-seeking, disinhibition, a desire to achieve a “high” for a longer period, and attempts at reducing the usage of other substances may lead individuals to seek snakes without commercial networks (snake charmers, peddlers, etc.) and might use a fatal snake. Additionally, this phenomenon raises important concerns from the animal protection lens. This study calls for the need for awareness and prevention models not only for mental health professionals and medical professionals but also for wildlife conservationists.

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3 0.60 USD as per conversion in August 2024

4 29.84 USD as per conversion in August 2024

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## REVIEW

# A Review of the Russian Federation's Main Legal Regulations on Drug Abuse and Their Impact on Prevention

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## Main Points

- Over one-fourth of the imprisoned population in the Russian Federation is punished for drug-related crimes.
- In spite of ongoing efforts by the Russian Federation and its severe punishments, the number of drug-related crimes either remains almost the same or shows a slight decrease.
- Severity of punishment alone neither affects drug-related crime rates significantly nor has any sufficient deterrent effect.
- Punishment certainty is more important than severity.

## Abstract

It is demonstrated that policies, operational, and legal responses against drug abuse vary from country to country. In this context, the current and prospective efforts of the Russian Federation to combat drug abuse and its prevention methods need to be closely scrutinized. This is because the Russian Federation is no longer a member of the Council of Europe, and it is now unclear whether the Russian Federation will fulfill its obligations concerning drug abuse and, if so how it will fulfill them. Therefore, in this article, firstly, a brief analysis of the main legal regulations on drug abuse and its prevention methods for drug abuse which are currently applied in the Russian Federation will be provided. Then, in light of some official statistical data provided by the United Nations Office on Drugs and Crime and other sources, it will be discussed whether the existence of heavy fines and severe punishments enforced on perpetrators of drug-related crimes in the Russian Federation so far has had any sufficient deterrent effect. In light of such limited reliable data, it will be argued that the severity of punishments (e.g., receiving a custodial sentence of up to 20 years) alone neither affects drug-related crime rates significantly nor has any sufficient deterrent effect.

**Keywords:** Drug abuse, drug addiction, regulation, the Russian Federation

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## Introduction

It is a historical fact that humans have been using drugs for a long time. Throughout recorded time, almost every society in the world has used one or more drugs to achieve certain desired physical or mental states or to experience relaxation and happiness (Courtwright, 2012; Gahlinger, 2004; Goode, 2012). So, the history of non-therapeutic use of drug dates back to before the rise of the modern state. Since the time of ancient Greek and medieval societies, there have been attempts to restrict the use

of drug to therapeutic purposes. For instance, medieval Muslim societies prohibited the non-therapeutic use of drugs and punished users of hashish as an intoxicant with up to 80 lashes (Aldrich, 2010).

Though every country works hard to solve the problem of drug abuse and minimize its effects on the mental and physical health of people, drug abuse remains one of the global problems of the modern world that needs to be addressed through international efforts. However, it is demonstrated that policies, operational, and legal responses against drug

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abuse vary from country to country, and there are differences in practice. Since each country's characteristics and experience are unique, we need to engage and learn from other countries (Mehroliassani, et.al, 2019; UK, Home Office, 2014).

In this context, the current and prospective efforts of the Russian Federation against drug abuse and its prevention methods need to be closely scrutinized. This is because, in accordance with the Resolution of the European Court of Human Rights of 22 March 2022, the Russian Federation is no longer a member of the Council of Europe and ceased to be a High Contracting Party to the European Convention on Human Rights on 16 September 2022 (Resolution of the European Court of Human Rights). It is now unclear whether the Russian Federation will fulfill its obligations concerning drug abuse and, if so, how it will fulfill them. Therefore, in accordance with the scope and limitation of this journal, in this article, firstly, a brief analysis of the main legal regulations on drug abuse and its prevention methods currently applied in the Russian Federation will be provided. Then, in light of some official statistical data provided by the United Nations Office on Drugs and Crime (UNODC) and other sources, it will be discussed whether the existence of heavy fines and severe punishments enforced on the perpetrators of drug-related crimes in the Russian Federation so far have had any sufficient deterrent

effect. In other words, by considering the case of the Russian Federation, it will be discussed whether the assumption that more severe punishment creates greater deterrence (Bennett et al., 1996; Scheidegger and Rushford, 1999) is supported by official empirical data. In light of such limited reliable data, it will be argued that in the Russian Federation, severity of punishments (e.g., receiving a custodial sentence of up to 20 years) alone neither affects drug-related crime rates significantly nor has any sufficient deterrent effect.

### Main Legal Regulations of the Russian Federation on Drug Abuse and Prevention

Russia, in terms of size, is the largest country in the world with a surface of 17,098,242 km<sup>2</sup>, and according to the population census of 2024, on October 2024, 144.592.798 people are estimated to be residing on Russian territory (Russia, Federal State Statistics Service). As a party to the 3 international drug control conventions, which are namely the Single Convention on Narcotic Drugs of 1961, the Convention on Psychotropic Substances of 1971, United Nations Convention Against Illicit Traffic in Narcotic Drugs and Psychotropic Substances of 1988, the Russian Federation has established a robust policy and legal framework, along with a solid institutional structure, to

**Table 1.**  
*Annual Drug Seizures in Tons by Drug Type*

| Year | Amphetamine-Type Stimulants<br>(Excluding "ecstasy") | Cannabis Herb<br>(Marijuana) | Cannabis Resin<br>(Hashish) | Cocaine-Type |
|------|------------------------------------------------------|------------------------------|-----------------------------|--------------|
| 2017 | 0.30                                                 | 12.35                        | 1.12                        | 0.44         |
| 2018 | 0.14                                                 | 12.89                        | 2.08                        | 0.05         |
| 2019 | 0.04                                                 | 10.10                        | 2.79                        | 0.52         |
| 2020 |                                                      | 9.38                         | 0.93                        | 0.86         |
| 2021 |                                                      | 12.18                        | 2.21                        | 0.87         |
| 2022 |                                                      | 9.21                         | 1.76                        | 0.23         |

Source: <https://dataunodc.un.org/content/country-list>, DataUNODC, Country Profile, the Russian Federation.

**Table 2.**  
*Number of Treatments Provided, by Drug Class*

| Drug Class                                                                    | Drug                                                                          | 2016    | 2017    | 2018    | 2019    | 2021   |
|-------------------------------------------------------------------------------|-------------------------------------------------------------------------------|---------|---------|---------|---------|--------|
| Amphetamine-type stimulants                                                   | Amphetamine-type stimulants                                                   | 14,410  | 16,699  | 17,766  | 18,804  |        |
| Any drug                                                                      | Any drug                                                                      | 496,000 | 459,155 | 423,391 | 401,233 |        |
|                                                                               | Other substances not under int. control                                       |         |         |         | 54,977  |        |
| Cannabis-type drugs                                                           | Cannabis-type drugs                                                           | 28,143  | 27,903  | 27,843  | 28,106  |        |
| Cocaine-type drugs                                                            | Cocaine-type drugs                                                            | 72      | 70      | 73      | 80      |        |
| Opioids, including opiates and synthetic opioids                              | Opioids, including opiates and synthetic opioids                              | 203,621 | 177,711 | 152,471 | 134,247 |        |
| Other drugs/psychoactive substances/ pharmaceutical products not listed above | Other drugs/psychoactive substances/ pharmaceutical products not listed above |         |         |         |         | 63,579 |
| Other miscellaneous                                                           | Multiple drugs                                                                | 46,161  |         | 52,481  |         |        |
| Solvents and inhalants                                                        | Solvents and inhalants                                                        | 22,362  | 7851    |         |         |        |

Source: <https://dataunodc.un.org/dp-drug-use-treatment> DataUNODC, Drug Use- Treatment, the Russian Federation.

effectively manage drug control at national, regional, and international levels. Additionally, the Russian Federation has made significant improvements by enhancing its national anti-drug and anti-crime laws (United Nations Office on Drugs and Crime (UNODC), 2003). Thus, Table 1 shows annual drug seizures by ton, by drug type, by year, and Table 2 shows the number of treatments provided by drug class.

In the Russian Federation, however, laws concerning the protection of citizens from drug abuse and forcing drug addicts to undergo compulsory treatment are derived from Articles 41 and 72 of the Russian Federation Constitution. According to article 41 of the Russian Federation Constitution:

- “1. Everyone shall have the right to health protection and medical care. Medical care in State and municipal health institutions shall be rendered to citizens free of charge at the expense of the appropriate budget, insurance premiums and other proceeds.
2. In the Russian Federation federal programmes for the protection and improvement of the health of the public shall be financed, measures shall be taken to develop State, municipal and private healthcare systems, and activities shall be encouraged which contribute to the improvement of human health, the development of physical education and sport, and ecological, sanitary and epidemiological well-being.
3. The concealment by officials of facts and circumstances, which pose a threat to the life and health of people, shall result in liability according to federal law.” (The Constitution of Russian Federation).

Similarly, article 72 (1/g) of the Constitution of the Russian Federation stipulates that coordination of healthcare issues—such as ensuring accessible and quality medical care, promoting public health, creating conditions for a healthy lifestyle, and fostering a culture of responsible health awareness among citizens, as well as social protection and security—falls under the joint jurisdiction of the Russian Federation and its constituent entities.

In the context of these constitutional bases, the main legal regulations of the Russian Federation on drug abuse and its prevention can be found in Federal Law No. 436 – FZ of 2010, on “Protection of Children from Harmful Information,” Federal Law No. 120-FZ on “the Fundamentals of the System for the Prevention of Child Neglect and Juvenile Delinquency,” Article 69 of the Family Act, article 30 of the Russian Civil Code, and the Criminal Code of the Russian Federation. Details of all these main regulations will be discussed further below.

### **Federal Law No. 436 – FZ of 2010, Protection of Children from Harmful Information**

This federal law aims to protect children from information that is harmful to their health and/or development, including information contained in products. From articles 7 to 10, the law classifies harmful information by taking into account different physical and intellectual development levels of children aged between 6 and 16. According to Article 5 (2) of this federal law, information harmful to the health and/or development of children, and therefore, prohibited for distribution among children, includes information that is

1. “inducing children to commit actions that pose a threat to their life and (or) health, including causing harm to their health, suicide, or the life and (or) health of other persons, or aimed at inducing or otherwise involving children in the commission of such actions;
2. capable of causing children to want to use narcotic drugs, psychotropic and (or) intoxicating substances, tobacco products, nicotine-containing products, alcoholic and alcohol-containing products, to take part in gambling, engage in prostitution, vagrancy or begging.” (Federal Law No. 436 – FZ of 2010, Protection of Children from Harmful Information)

The federal law authorizes the federal executive body, as designated by the Government of the Russian Federation, and makes it responsible for developing and implementing a unified state policy to protect children from harmful information and for producing a list of federal measures aimed at preventing the circulation of such harmful information (Article 4, (1.)).

### **Federal Law No. 120-FZ on the Fundamentals of the System for the Prevention of Child Neglect and Juvenile Delinquency**

There is a great deal of concern about the increase in drug abuse among otherwise law-abiding people, particularly adolescents, in the Russian Federation. Over the years, more and more young people have been becoming victims of drug abuse and related crimes. Addiction, prostitution, and homelessness are frequently brought on by young people’s readiness to take drugs, which is a serious threat to public safety (UNODC Regional Office for Russia and Belarus, 2008). In this particular context, young people’s decision to take drugs for the first time reportedly arises from and is influenced by “curiosity, peer pressure/acceptance, ‘brotherhood,’ poor parental control, and a belief that parents and/or teachers fail to pay them sufficient attention” (UNODC Regional Office for Russia and Belarus, 2008).

In the Russian Federation, Federal Law No. 120-FZ on the Fundamentals of the System for the Prevention of Child Neglect and Juvenile Delinquency aims to address the problem of young drug abusers. Thus, article 5 of Federal Law No. 120 provides that in the Russian Federation, bodies and institutions of the system for the prevention of neglect and juvenile delinquency should carry out individual preventive work in relation to minors who use narcotic drugs or psychotropic substances without a doctor’s prescription or use intoxicating substances, alcoholic, and alcohol-containing products. According to this federal law, relevant bodies and institutions of the system have a duty to open rehabilitation centers that will provide health and social work services for these minors.

### **Article 30 of the Civil Code of the Russian Federation**

In the Russian Federation, the number of drug and alcohol addicts remains high, and the survival capacity of drug and alcohol addicts is very limited. In 2020, 18,013 people overdosed on illicit drugs and 7366 died as a result, which is a 16% increase compared to the number of deaths that occurred in 2019 (Sárosi, 25 February 2022, cited in Hellman, 2022). Due to the high number of drug and alcohol addicts, the Russian Federation applies article 30 of the Civil Code to restrict the active capacity to

protect them. According to article 30 of the Civil Code of the Russian Federation entitled “Restriction of the Citizen’s Active Capacity”

“The active capacity of the citizen, who as a result of his abuse of alcohol or drug addiction has plunged his family into a precarious financial position, may be restricted by the court in conformity with the procedure, laid down by the procedural legislation. He shall be put under the guardianship” (the Civil Code of the Russian Federation).

Since, in Russia, many drug addicts put themselves and their families into financially very tough positions, Russian courts have many cases before them for the appointment of legal guardians or trustees for drug addicts.

#### Article 69 of the Family Code of the Russian Federation

Since children of families that suffer from chronic alcoholism or drug addiction may potentially become addicted as well, the Russian Federation has amended article 69 of the Family Code and made it possible to deprive parents who suffer from chronic alcoholism or drug addiction of their parenthood. According to this article, if one of the parents suffers from chronic alcoholism or drug addiction, the court may deprive him/her of his/her parenthood. Here, for the deprivation of parenthood, courts do not need to follow the procedure cited above and regulated by the Civil Code of the Russian Federation, and the courts can also deprive parenthood even in cases where one of the parents has limited active capacity.

Parents who are deprived of their parenthood lose all rights based on the fact of their kinship with children, including the right to receive maintenance for him/her (article 71 (1) and 87 of the Family Code), and also the right to privileges and state allowances established for citizens with children (Article 71 (1) of the Family Code).

#### Russian Criminal Code

In the Russian Federation, roots of current criminal law provisions on combating drug trafficking go back to 1999 when the Criminal Code was put into force. These provisions were amended in 2012 and 2024. These provisions are now set out in Chapter 25 (from article 228 to 245) of the Russian Criminal Code entitled “Crimes Against Human Health and Public Morality”. Drug trafficking crimes are specifically set out in articles 228, 228.1, 228.2, 228.3, 228.4, 229, 229.1, 230, 231, 232, 233, 234, and 234.1 of the Criminal Code of the Russian Federation. However, the majority of drug crimes regulated in Russia are prosecuted under articles 228 and 228.1 of the Russian Criminal Code. To specify, 95% of all drug crimes registered and prosecuted in Russia in 2013 – 2014 fall into the scope of articles 228 and 228.1 of the Criminal Code (Travova, 2023).

As explained above, in the Russian Federation, legal basis of laws concerning protection of citizens from drug abuse is derived from articles 41 and 72 of the Russian Federation’s Constitution, where right to health is guaranteed. Therefore, the object matter of these crimes is to protect public health. According to Tsepelev et al (2021), the substances and means that are subject to specific regulations are the subjects of these offenses, which are strong and poisonous compounds. A legal

definition of strong and poisonous compounds does not exist. However, the Government of the Russian Federation has approved a list of these substances in Decree No. 964 “On the Approval of Lists of Potent and Poisonous Substances for the Purposes of Article 234 and other Articles of the Criminal Code of the Russian Federation.”

According to the criminal code, the illegal acquisition, storage, transportation, and selling of plants containing narcotics or psychotropic substances are also punishable offenses. The severity of the penalty under these articles, however, depends on the purpose of the perpetrator (drug usage or drug sale) and the weight of the drug seized, which is classified by quantities as “significant,” “large,” or “especially large.”

For the purpose of Articles 228, 228.1 and 229 of the Russian Criminal Code, “large scale” means a quantity of a narcotic drug, psychotropic substance, or its analog exceeding the average one-time consumption dose by 10 or more times, and “especially large scale” by 50 or more times. The quantity of average one-time doses of narcotic drugs and psychotropic substances for the purposes of Article 228, as well as Articles 228.1 and 229 of the Code, shall be endorsed by the Government of the Russian Federation. For the purposes of Articles 228 and 228.1 Table 3 below shows quantity of significant, large, and very large scale doses for narcotic drugs in the Russian Federation.

In accordance with the aforementioned regulations, however, the weight of the composition of the mixture—rather than the weight of the pure narcotic substance—determines the quantity of drugs confiscated. As a result, for instance, 3 g of heroin will be deemed to be found if a police officer finds, or say, 1 g of heroin is combined with 2 g of sugar. Using such a calculation system, as argued by Travova (2023:1146), provides a conducive environment to cheat in the performance evaluation of police officers. As explained, the measurement of the number of confiscated drugs is the main factor while determining criminal responsibility for illegal drug trafficking (Levinson, 2008).

**Table 3.**

*Quantities of drugs (in grams) for purposes of Articles 228 and 228.1 of the Criminal Code of the Russian Federation*

|                        | Significant | Large | Especially Large |
|------------------------|-------------|-------|------------------|
| Marijuana              | 6           | 100   | 100,000          |
| Hashish                | 2           | 25    | 10,000           |
| Hashish oil            | 0.4         | 5     | 1000             |
| Papaver                | 20          | 500   | 100,000          |
| Poppy straw            | 1           | 5     | 500              |
| Methadone              | 0.5         | 2.5   | 1000             |
| Heroin                 | 0.5         | 2.5   | 500              |
| Amphetamine            | 0.2         | 1     | 200              |
| Desomorphine           | 0.05        | 0.25  | 10               |
| Cocaine                | 0.5         | 5     | 1500             |
| Synthetic cannabinoids | 0.05        | 0.25  | 50               |

Source: Travova, 2023: 1165

In this context, article 228 of the Criminal Code of the Russian Federation provides that

1. “Illegal acquisition, storage, transportation, making or processing of narcotic drugs, psychotropic substances or analogues thereof on a large scale without the purpose of sale - shall be punishable by a fine in the amount of up to 40 thousand roubles, or in the amount of the wage or salary, or any other income of the convicted person for a period of up to three months, or by corrective labour for a term of up to two years, or by deprivation of liberty for a term of up to *three years*.”
2. The same deeds committed on an especially large scale - shall be punishable by deprivation of liberty for a term of *three to 10 years* with or without a fine in the amount of up to 500 thousand roubles or in the amount of the wage or salary, or any other income of the convicted person for a period of up to three years.” (The article 228 of the Criminal Code of Russian Federation)

When it comes to illegally producing, selling or sending narcotic drugs, psychotropic substances, or analogues article 228.1 of the Criminal Code provides that:

1. “Illegal making, sale or sending of narcotic drugs, psychotropic substances or analogues thereof - shall be punishable by deprivation of liberty for a term of *four to eight years*.”
2. The same deeds committed:
  - a. by a group of persons in a preliminary conspiracy;
  - b. on a large scale;
  - c. in respect of a known minor by a person who has attained the age of 18 years –

shall be punishable by deprivation of liberty for a term of *five to 12 years* with or without a fine in the amount of up to 500 thousand roubles or in the amount of the wage or salary, or any other income of the convicted person for a period of up to three years.

3. The deeds provided for by Parts One and Two of this Article which are committed:
  - a. by an organized group;
  - b. by a person through his official position;
  - c. in respect of a person known to be under 14 years old;
  - d. on an especially large scale

shall be punishable by deprivation of liberty for a term of *eight to 20 years* with or without a fine in the amount of up to one million roubles or in the amount of the wage or salary, or any other income of the convicted person for a period of up to five years.” (Article 228.1 of the Criminal Code)

## Discussion

It is estimated that over one-fourth of the imprisoned population in the Russian Federation is punished for drug-related

**Table 4.**  
*Persons Held in Prisons, Penal Institutions, or Correctional Institutions for Drug Trafficking and Possession in the Russian Federation*

| The year                 | 2016   | 2017   | 2018   | 2019   | 2020   |
|--------------------------|--------|--------|--------|--------|--------|
| Classification of crime: |        |        |        |        |        |
| Drug possession          | 54,067 | 52,872 | 47,927 | 40,546 | 32,278 |
| Drug trafficking         | 84,087 | 84,287 | 85,182 | 82,592 | 80,036 |

Source: UNODC <https://dataunodc.un.org/dp-prisons-persons-held>

crimes (Hellman, 2022; Knorre, 2020). The limited data and statistics provided by the UNODC suggest similar findings. For instance, in 2017, the number of prisoners serving their sentences for only drug-trafficking and drug possession was over 136,000 which represents almost 23% of the entire Russian prison population (602,176). Table 4 shows the number of prisoners serving their sentences for drug possession and drug trafficking, and Table 5 shows the number of total prison population in the Russian Federation by year.

So, the question that needs to be asked here is why, in spite of ongoing efforts by the Russian Federation and severe punishments enforced on perpetrators of drug-related crimes, the number of drug-related crimes does not decrease dramatically. It either remains almost the same or shows a slight decrease.

Finding a good balance between certainty and severity in punishment is crucial. It is evident from published tests and empirical data that the enforcement of punishments is more decisive than severity. Moreover, available data suggest that low punishment probability makes the sentence or punishment inefficient even though punishment severity is very high (Cremene et al., 2014). Research and empirical data provided by Von Hirsch et al. (1999) provides 4 criteria which seem to be necessary conditions for severe punishment to have a deterrent effect. First of all, potential offenders must think there is a high probability of being detected for criminal sanctions to have any deterrent effect. Secondly, potential offenders should be aware that there is a significant or increased risk of being convicted and receiving a heavy punishment. Thirdly, potential offenders should believe that the penalty will be applied to them if caught, and finally, potential offenders should consider the risk of penalty when deciding whether to violate the rule and commit a crime. Each of these necessary preconditions needs to be considered and met for successful deterrence in the context of drug-related crimes and specifically in the prevention of re-offending by drug addicts.

The general perception about the risk of being caught, and if caught, the perception that a severe punishment is going to be applied without exception is important in order to make severe punishment effective (Cremene et al., 2014). When the risk or

**Table 5.**  
*Total Number of Persons Held in Prisons, Penal Institution or Correctional Institutions in the Russian Federation*

| The year                | 2012    | 2013    | 2014    | 2015    | 2016    | 2017    | 2018    | 2019    | 2020    | 2021    | 2022    |
|-------------------------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|
| Prison population total | 701,909 | 677,827 | 671,649 | 646,085 | 630,155 | 602,176 | 563,166 | 523,928 | 482,851 | 465,896 | 439,453 |

Source: UNODC <https://dataunodc.un.org/dp-prisons-persons-held>

**Table 6.**  
*The Bribery Rate Per 100,000 Population in the Russian Federation and Selected Countries*

| Country                | Category            | 2015  | 2016  | 2017  | 2018  | 2019  | 2020  | 2021  | 2022  |
|------------------------|---------------------|-------|-------|-------|-------|-------|-------|-------|-------|
| Algeria                | Corruption: bribery |       |       |       | 0.21  | 0.23  | 0.23  | 0.22  |       |
| Morocco                | Corruption: bribery |       | 20.36 | 53.61 | 59.15 |       | 64.99 | 43.83 | 54.42 |
| Mexico                 | Corruption: Bribery |       | 1.30  | 0.93  | 2.03  | 2.83  | 2.35  | 2.24  | 1.70  |
| Uruguay                | Corruption: bribery | 0.21  | 0.23  | 0.41  | 0.38  | 0.61  | 0.61  | 0.41  | 0.41  |
| Uzbekistan             | Corruption: bribery | 6.47  | 5.51  | 5.78  | 3.70  | 3.25  | 0.47  | 0.58  |       |
| Azerbaijan             | Corruption: Bribery |       | 0.44  | 0.33  | 0.78  | 0.79  | 1.16  | 1.82  |       |
| Cyprus                 | Corruption: bribery | 2.27  | 3.17  | 2.48  | 1.31  | 1.14  | 0.89  | 0.96  | 1.84  |
| Israel                 | Corruption: Bribery |       |       |       | 1.01  | 1.06  | 1.76  | 0.51  | 0.82  |
| Bulgaria               | Corruption: bribery | 1.15  | 1.82  | 1.94  | 2.35  | 1.84  | 1.69  | 1.47  | 1.55  |
| The Russian Federation | Corruption: bribery | 10.88 | 11.06 | 9.06  | 9.29  | 10.46 | 11.04 |       |       |
| Albania                | Corruption: bribery | 7.42  | 8.89  | 10.31 | 9.52  | 10.61 | 5.62  | 9.21  | 17.38 |
| Greece                 | Corruption: bribery |       |       | 1.11  | 2.17  | 1.80  | 0.61  | 2.42  | 1.26  |
| Italy                  | Corruption: bribery | 0.91  | 0.87  | 0.89  | 0.68  | 0.77  | 0.69  | 0.58  | 0.60  |
| Montenegro             | Corruption: bribery |       | 3.16  | 0.63  | 0.63  | 0.16  | 0.95  | 1.27  | 1.91  |
| Germany                | Corruption: bribery | 10.53 | 7.90  | 4.66  | 4.79  | 4.99  | 5.00  | 6.13  | 5.91  |

Source: UNODC Corruption and economic crime <https://dataunodc.un.org/dp-crime-corruption-offences>

certainty of being caught for a wrongful act is high, socially and morally unacceptable behaviors are less likely to occur. However, offenders generally do not consider, or if consider they underestimate, the risk of being caught. Instead, they think that they will avoid the mistakes that others may make (Redding, 2006:11; Robinson & Darley, 2004). As Von Hirsch et al (1999) argue, potential offenders tend to have much more information about the risk of being caught than the severity of the sentence. According to studies, both the public and those who commit crimes frequently have little knowledge of possible punishments (Redding, 2006, Robinson & Darley, 2004). Furthermore, punishment alludes to an unforeseen circumstance that wrongdoers may disregard. This means that strictly implemented sentencing guidelines, mechanisms, and procedures may be effective if they are combined with a significantly increased probability of conviction (Von Hirsch et al., 1999).

Lastly, Redding (2006) contended that the perceived costs of non-compliance with laws must be greater than the perceived advantages of breaching them in order for criminal penalties to have a deterrent impact. However, it needs to be mentioned that it is particularly challenging to eradicate dishonest behaviors in societies where there is widespread systemic corruption since poor habits are somehow accepted as morally right and even “normal” (Cremene et al., 2014). The bribery rate per 100,000 people in the Russian Federation remains high (see Table 6) and one can easily consider that there are other social and economic factors that weaken the implementation of criminal law provisions. Therefore, the severity of punishment (e.g., receiving a custodial sentence of up to 20 years) alone neither affects drug-related crime rates significantly nor has any sufficient deterrent effect. Severe sentencing policies might possibly have an impact if combined with much higher probabilities of conviction, certainty of apprehension, and implementation of sentence.

## Conclusion

In light of the necessary preconditions explained above, severe punishments or laws cannot act as a deterrent if the targeted population is unaware that laws exist or does not believe that laws or sentences will be implemented. Moreover, as seen in the case of Russia, in societies where the enforcement of the law is prevented through the systematic practice of bribery or corruption, severe punishments will not have a deterrent effect.

Similarly, in societies in which implementation of sentences is interrupted through systematic practice of pardons or amnesties or in which soft or unconditional parole rules exist for offenders, the punishment will not have a deterrent effect, and it will not prevent reoffending. The same conclusion is also correct for culturally motivated crimes. When it comes to culturally motivated crimes such as honor killing, no matter how severe or light, punishment may not well serve as a deterrent (Doğan, 2013, 2020). However, this article has its own limitations in terms of available reliable data and, therefore, it would be implausible to claim that it provides the whole picture of circumstances that explain why the existence of severe punishments enforced on perpetrators of drug-related crimes does not have any sufficient deterrent effect in the Russian Federation. With these caveats, this article contributes to the literature on whether more severe punishment creates greater deterrence in the context of drug abuse and its prevention.

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## ORIGINAL ARTICLE

# Bibliometric Analysis of Postgraduate Theses on Exercise Addiction in Türkiye

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## Main Points

- In recent years, there has been a significant increase in research on exercise addiction in theses and dissertations in Türkiye.
- Theses on exercise addiction in Türkiye cover multidisciplinary, mainly sports sciences and psychology.
- Exercise Addiction Scale-17 and Exercise Addiction Scale-21 stand out as the most commonly used scales in research on exercise addiction.
- Other scales with established validity and reliability in the current literature can also be preferred in research studies.
- In the context of exercise addiction, while master's level theses are commonly prepared, doctoral and medical specialization theses are also crucial for conducting more comprehensive and in-depth research.

## Abstract

The aim of this study is to delineate the common characteristics and research trends of postgraduate theses related to exercise addiction in Türkiye, thereby providing a guiding resource for researchers and practitioners in this field. In this bibliometric analysis, a total of 86 theses were obtained from the Council of Higher Education Thesis Center using the search term exercise addiction." Out of these theses, 84 met the inclusion criteria, providing a comprehensive overview. The majority of these theses were written in Turkish (92.85%), with an average page count of 91.01 pages. The subjects of the theses varied widely, with sports being the most prevalent area of focus (76.19%). Health sciences institutes were the primary contributors to research in this area (44.04%), emphasizing the multidisciplinary nature of the topic. The Exercise Addiction Scale-17 emerged as the most commonly used scale (58.33%), indicating a standardized approach to assessing addiction levels. Participant profiles ranged from regular exercisers to diagnosed patients, highlighting the diverse scope of research. Furthermore, the distribution of theses by publication year showed an increasing trend, with 2022 being the most active year. This comprehensive analysis provides valuable insights for researchers and practitioners, guiding future studies and interventions in this important area of study.

**Keywords:** Addictions to exercise, bibliometrics, dependency, exercise, scales, sports

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## Introduction

With the increasing awareness of healthy living in today's society, there has been a noticeable rise in the tendency to exercise (Martínez - Montoro et al., 2023). Exercise is considered an important component for maintaining and enhancing physical

health and is widely recommended (Lu et al., 2021; Pinckard et al., 2019). However, in some individuals, an excessive passion and addiction towards exercise can develop. This condition is referred to as exercise addiction and has been gaining increasing attention in recent years (Colledge et al., 2020; Weinstein & Szabo, 2023).

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Exercise addiction manifests itself with symptoms such as allocating excessive time and energy to exercise in one's life, experiencing anxiety and restlessness when unable to exercise, and neglecting other activities (Landolfi, 2013; Weinstein & Szabo, 2023). It is known that this condition can negatively impact an individual's physical health and lead to social and psychological problems. Exercise addiction has become an important research topic in sports psychology and mental health fields (Berczik et al., 2012). Therefore, analyses of research on exercise addiction allow us to understand the structure and development of the scientific literature in this area, enabling us to acquire extensive knowledge about exercise addiction.

Bibliometric analysis is the numerical analysis of publications produced by individuals or institutions in a specific field, during a specific period, and in a specific region, along with the relationships between these publications (Cihad et al., 2021; Cinar et al., 2021; Kacmaz et al., 2022). This type of analysis is used to understand the structure, development, and impact of scientific literature and is widely used in areas such as science policy, research evaluation, and knowledge management. Additionally, bibliometric analyses for postgraduate theses include qualitative and quantitative analyses of academic works produced by universities, institutes, or research centers (Cinar et al., 2021). In bibliometric analyses, topics such as the distribution of theses by year, which universities produce more theses, and which departments contribute more theses are examined (Cihad et al., 2021; Cinar et al., 2021). These data can serve as guidance for future research and help identify research trends in a particular field (Cihad et al., 2021).

In light of this information, the aim of this study is to conduct a descriptive analysis of the content of the theses on exercise addiction available in the Council of Higher Education (CoHE) Thesis Center. This analysis will help us understand the current state of academic research conducted in the field of exercise addiction and contribute to enhancing the knowledge base in this area. Additionally, it aims to serve as a guiding resource for future research planned in the field of exercise addiction in the coming years. The results of this study will contribute to the literature on exercise addiction, thus aiding in the advancement of research in this area.

## Material and Methods

This research was designed to conduct a bibliometric analysis of postgraduate theses focusing on exercise addiction in Türkiye. The main page of the "National Thesis Center" website of the Turkish Higher Education Council was searched with the search terms "Exercise Addiction" and "Egzersiz Bağımlılığı" in the "Search Term" section set to "All" (CoHE, 2024). Following the search, access was obtained to all accessible theses, and these theses were examined from a bibliometric perspective.

The inclusion criteria for the study were as follows: the thesis must be available in the CoHE National Thesis Center, it must be a master's, doctoral, or specialization thesis, the publication language must be Turkish or English, and the term "Exercise Addiction" must be present in the thesis title. Exclusion criteria included instances where the term "Exercise Addiction"

appeared in the title but the actual study was not related to this topic.

Researchers utilized a thesis review form developed by them for the examination of the theses. The thesis review form includes the following questions.

1. What is the type of postgraduate thesis?
2. What is the distribution of languages of postgraduate thesis?
3. How does the distribution of postgraduate theses vary by page numbers?
4. What is the distribution of postgraduate theses by subject area?
5. How are postgraduate theses distributed by institute?
6. How is exercise addiction assessed in postgraduate thesis?
7. What is the population of subjects in postgraduate thesis?
8. How do the theses distribute by publication year?
9. What indexes are used in postgraduate thesis?
10. How do the theses distribute by the universities they were conducted at?
11. What are the participant numbers like in postgraduate thesis?

Since the current research does not involve the collection of data from participants, it does not require any Ethics Committee approval or consent.

## Statistical Analysis

Within the scope of the study, each review dimension identified in the thesis review form developed by the researchers was transformed into a spreadsheet using the Microsoft Excel program. Each row contains demographic information related to the theses, including basic information such as thesis title, publication year, author, university name, etc. The obtained numerical data are presented as numbers (n) and percentages (%).

## Results

A search with the keywords "Exercise Addiction" in postgraduate theses yielded 86 theses. Two theses were excluded as they were not relevant to the topic. The study focused on a total of 84 theses, comprising 78 master's theses, 4 doctoral theses, and 2 specialization theses in medicine. Of all the included postgraduate theses, 78 were written in Turkish, while 6 were written in English.

The examined theses varied widely in page numbers, ranging from 45 pages to 217 pages. The average page count of the theses was calculated as 91.01 pages. The average page counts of the theses were found to be as follows: specialization (162 pages), doctoral (133 pages), and master's (87 pages). It was observed that the theses consisted of 3 theses with 50 pages or fewer, 30 theses with 51-75 pages, 23 theses with 76-100 pages, 17 theses with 101-125 pages, 6 theses with 126-150 pages, and 5 theses with 150 pages or more.

Upon examining the subject areas of the theses, it was observed that they mainly focused on sports (64 theses), psychology (12 theses), nutrition and dietetics (5 theses), and psychiatry (3 theses).

When investigating the institutes where the theses were conducted, it was found that 37 theses were from health sciences

institutes, 19 theses were from graduate education institutes, 15 theses were from social sciences institutes, 11 theses were from education sciences institutes, and 2 theses were from medical faculties.

An examination of the scales used in the theses revealed that the Exercise Addiction Scale-17 (EAS-17) (49 theses) was the most preferred scale by researchers. This was followed by the Exercise Addiction Scale-21 (EAS-21) (31 theses), Exercise Addiction Inventory (3 theses), and Exercise Addiction Scale for Youth (1 thesis).

A total of 48 theses were conducted with participants engaged in regular exercise. Sixteen theses were conducted with high school and university students, 13 theses were with licensed athletes, 4 theses were with the general population, and 3 theses were with diagnosed patients.

Upon examining the participant numbers included in the examined theses, it was found that studies were conducted with a minimum of 30 and a maximum of 3747 participants. The average number of participants in the theses was calculated as 414.28 participants. The theses with the highest number of participants were conducted with 3747, 1578, 956, 828, and 795 participants. The theses with the lowest number of participants were conducted with 30, 43, 60, 63, and 69 participants (Table 1).

When examining the distribution of theses on exercise addiction by year, it was determined that the first thesis was conducted in 2005, and the year 2022 (22 theses) was identified as the year with the most intense research activity (Figure 1).

When examining the indexes used in the theses, Exercise (44 theses) was the most commonly used index. This was followed by dependency (40 theses), exercise addiction (30 theses), sports (21 theses), sportsmen (12 theses), university students (10 theses), scales (7 theses), and fitness (7 theses) indexes (Figure 2).

When examining the distribution of postgraduate theses by universities, it was observed that the highest number of theses was prepared at Mersin University (six theses). This was followed by Gazi University with five theses, and Ege University and Üsküdar University with four theses each. Adnan Menderes University, Bayburt University, Gaziantep University, Istanbul Gelişim University, Munzur University, and Selçuk University each had three theses.

## Discussion

Exercise addiction has become an increasingly prominent area of research in recent years. In this study, a bibliometric analysis of postgraduate theses on exercise addiction in Türkiye was conducted, and the findings were examined. These findings illustrate the general profile and trends of academic research on exercise addiction in Türkiye.

Firstly, as a result of the conducted examinations, it was observed that the examined postgraduate theses exist in various types. These theses include master's theses, doctoral theses, and medical specialization theses. Particularly, it was observed that master's theses are more prevalent among other types. Similarly, in studies conducted with a similar search model, it has been

noted that master's studies outnumber doctoral and medical specialization studies (Kacmaz et al., 2022). This indicates a significant interest in academic research on exercise addiction and suggests that more postgraduate-level studies can be expected in this field in the future. The lower number of doctoral and medical specialization theses may suggest that such studies require longer processes and tend to conduct more in-depth research (Cihad et al., 2021; Cinar et al., 2021). The increase in the number

**Table 1.**  
*Distribution of Postgraduate Theses by Variables*

| Variables                          | n  | (%)   |
|------------------------------------|----|-------|
| Thesis Type                        |    |       |
| Master's                           | 78 | 92.85 |
| Doctoral                           | 4  | 4.76  |
| Specialization in Medicine         | 2  | 2.38  |
| Language                           |    |       |
| Turkish                            | 78 | 92.85 |
| English                            | 6  | 7.15  |
| Thesis Page Numbers                |    |       |
| 50 pages and below                 | 3  | 3.57  |
| 51 – 75 pages                      | 30 | 35.71 |
| 76 – 100 pages                     | 23 | 27.38 |
| 101 – 125 pages                    | 17 | 20.23 |
| 126 – 150 pages                    | 6  | 7.14  |
| 151 pages and above                | 5  | 5.95  |
| Subject Areas                      |    |       |
| Sports                             | 64 | 76.19 |
| Psychology                         | 12 | 14.28 |
| Nutrition and Dietetics            | 5  | 5.95  |
| Faculty of Medicine                | 3  | 3.57  |
| Institutes                         |    |       |
| Institute of Health Sciences       | 37 | 44.04 |
| Graduate School of Education       | 19 | 22.62 |
| Institute of Social Sciences       | 15 | 17.85 |
| Institute of Educational Sciences  | 11 | 13.09 |
| Faculty of Medicine                | 2  | 2.38  |
| Scales Used in Theses              |    |       |
| Exercise Addiction Scale-17        | 49 | 58.33 |
| Exercise Addiction Scale-21        | 31 | 36.90 |
| Exercise Addiction Inventory       | 3  | 3.57  |
| Exercise Addiction Scale for Youth | 1  | 1.19  |
| Participant Profile                |    |       |
| Regular Exercisers                 | 48 | 57.14 |
| Students                           | 16 | 19.04 |
| Licensed Athletes                  | 13 | 15.47 |
| General Population                 | 4  | 4.76  |
| Diagnosed Patients                 | 3  | 3.57  |
| Participant Numbers                |    |       |
| 0 – 50                             | 2  | 2.38  |
| 51 – 100                           | 7  | 8.33  |
| 101 – 200                          | 10 | 11.90 |
| 201 – 300                          | 20 | 23.80 |
| 301 – 400                          | 24 | 28.57 |
| 401 – 500                          | 8  | 9.52  |
| 501 – 1000                         | 10 | 11.90 |
| Over 1001                          | 3  | 3.57  |

n, number of participants, %, percentage.

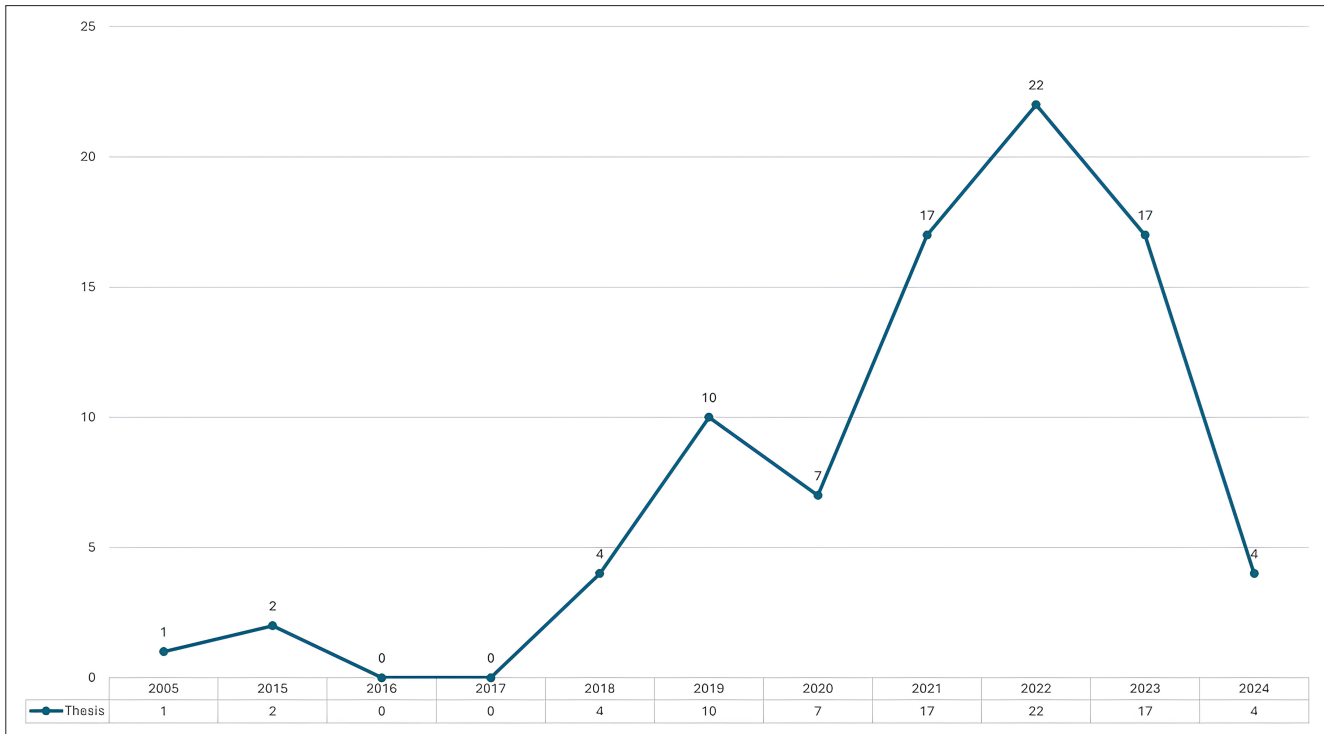


Figure 1. Distribution of postgraduate theses by year.

of such theses may indicate that research on exercise addiction is progressing towards a more comprehensive and in-depth understanding.

As a result of the conducted examination, it is observed that the majority of the examined postgraduate theses are written in Turkish. Several reasons may account for the predominance of Turkish-language theses in the CoHE National Thesis Center.

Firstly, the language of instruction in Turkish higher education institutions is generally Turkish. Therefore, students are expected to write their theses in their native language. Additionally, according to the rules set by the CoHE, it is essential for theses in postgraduate programs with Turkish as the language of instruction to be written in Turkish (CoHE, 2022). However, it has been observed that a few theses are written in English. With the reasoned opinion of the advisor and relevant board decisions,

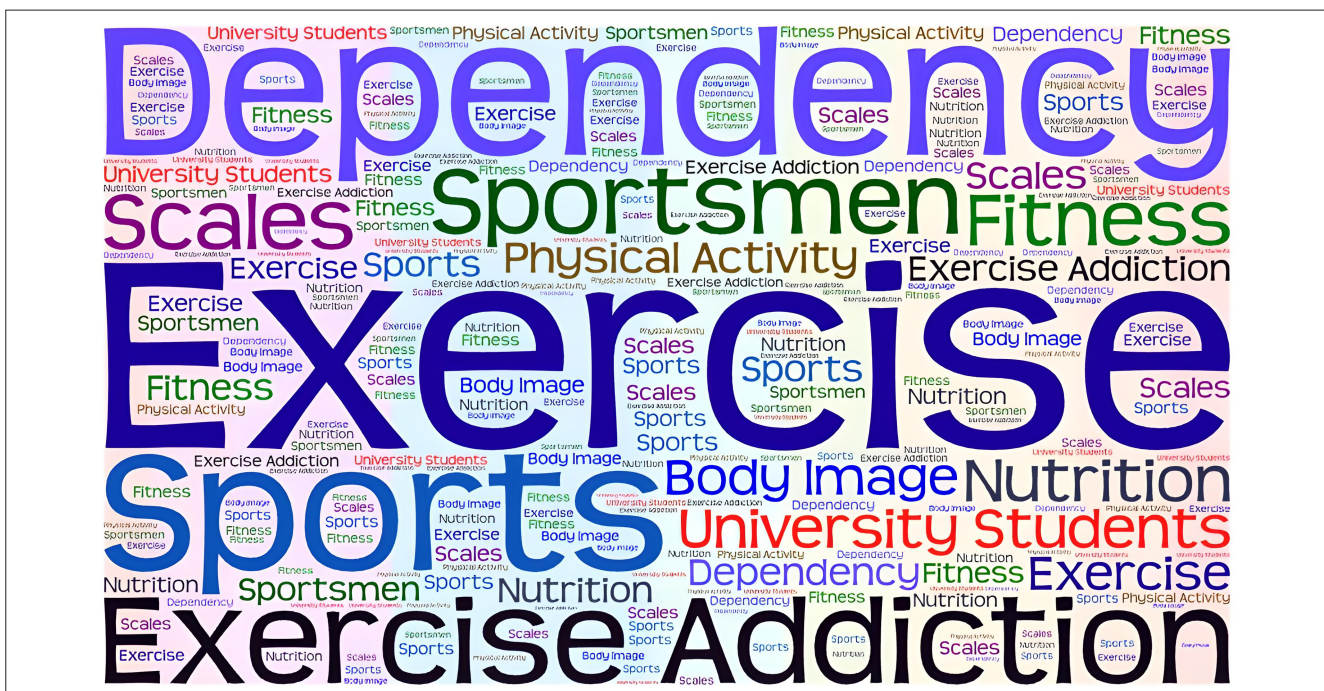


Figure 2. Indexes used in postgraduate theses.

theses can also be written in English, provided that a comprehensive Turkish summary is provided (CoHE, 2022). This linguistic diversity may contribute to the dissemination and development of scientific knowledge in the field of exercise addiction, fostering a more comprehensive understanding.

The findings of this study indicate that postgraduate theses are generally of moderate length, but some are shorter or longer. According to the findings of this study, when examining the page numbers of theses, it is observed that they show a wide range of distribution. Postgraduate theses on exercise addiction generally exhibit a moderate level of scope and detail. Additionally, the average page numbers of medical specialization and doctoral theses were higher compared to master's theses. This suggests that medical specialization and doctoral theses are addressed in more detail (Cihad et al., 2021; Cinar et al., 2021).

The findings of this study indicate that various disciplines contribute to research on exercise addiction. Among the examined theses, the most common subject area is the field of sports sciences. It is observed that the number of theses conducted in the field of sports is significantly higher compared to other subject areas (Di Lodovico et al., 2019). This suggests that research on exercise addiction is often conducted in fields such as sports science, exercise physiology, and sports psychology. Topics such as the effects of sports on health and behavioral characteristics observed in athletes may constitute the focus of exercise addiction research (Godoy-Izquierdo et al., 2023). Additionally, a significant number of theses are found in the field of psychology. The discipline of psychology plays an important role in understanding the psychological factors underlying exercise addiction and in treating this addiction (Colledge et al., 2020). The presence of theses on exercise addiction in other fields such as nutrition and dietetics and psychiatry also indicates that exercise addiction is a multidimensional issue and that various disciplines contribute to research in this area (Strahler et al., 2021; Trott et al., 2020). Bringing together research from different disciplines can contribute to the development of a more comprehensive understanding of exercise addiction and the development of effective intervention strategies. In conclusion, the distribution of postgraduate theses by subject areas indicates that research on exercise addiction is approached with an interdisciplinary perspective and examined from various perspectives (Bruno et al., 2014).

When examining the distribution of postgraduate theses by institute, it is observed that the majority of theses are conducted in the Institute of Health Sciences compared to other institutes. This suggests that exercise addiction is considered an important research area from the perspective of health sciences and that there is a high level of interest among health professionals in this topic. It is believed that research conducted in health sciences institutes can integrate the effects of exercise addiction into clinical and practical applications to a greater extent (Ozdemir & Akpınar Kocakulak, 2023; Yıldız, 2023). On the other hand, the number of theses conducted in the Graduate School of Education and the Institute of Social Sciences is also noteworthy. This indicates that the field of exercise addiction requires a multidisciplinary approach and that educators and social scientists can play an important role in this area (Bruno et al., 2014). Since exercise

addiction has not only physiological effects but also psychological and social dimensions, it is important for different disciplines to come together and work on this topic (Bruno et al., 2014; Hausenblas & Mann, 2018).

When examining the commonly used scales in postgraduate theses, it is observed that the EAS-17 is the most preferred scale. This scale is widely used in research on exercise addiction and is designed to assess individuals' exercise habits and level of addiction (Tekkurşun Demir et al., 2018). The reason for the frequent use of EAS-17 is its brevity and the proven reliability and validity (Tekkurşun Demir et al., 2018). In addition to EAS-17, the EAS-21 also emerges as a commonly preferred scale. Similar to EAS-17, EAS-21 is a scale used to assess the level of exercise addiction but is more comprehensive and includes more subscales (Ikizler & Yeltepe, 2007). This scale is preferred by researchers who want to examine different aspects of exercise addiction in more detail. Additionally, other scales such as the Exercise Addiction Inventory (Terry et al., 2004) and the Exercise Addiction Scale for Youth (Dokuzoğlu et al., 2022) are also present in the theses, but their frequency of use is lower compared to EAS-17 and EAS-21. Moreover, using other scales with established validity and reliability in the literature related to exercise addiction may be beneficial (Aydin et al., 2023). Therefore, scale selection in research on exercise addiction is an important decision, and researchers should choose scales that are suitable for their research purposes and target population.

When examining the distribution of research according to the publication year of the theses, it is observed that there is an increasing trend in research on exercise addiction over time. It was determined that the first thesis was conducted in 2005, with the most intensive research activity occurring in the year 2022 (Yeltepe, 2005). This increase can be associated with the growing recognition of the importance of exercise addiction. The increasing interest in physical activity for maintaining individuals' physical health and concerns that this process may increase the risk of exercise addiction may have encouraged researchers to conduct more studies in this area. Additionally, the increase in research on exercise addiction indicates an increase in systematic research and scientific knowledge in this field (Di Lodovico et al., 2019; Strahler et al., 2021). Acquiring more knowledge about the effects of exercise addiction on physical and psychological health, developing effective intervention strategies in this regard, and raising awareness in the community are important aspects of increasing research on this topic (Landolfi, 2013; Lichtenstein & Hinze, 2020). The increasing number of studies on exercise addiction by publication year emphasizes the necessity for more research in this field and the importance of continuously updating the scientific literature in this area. In this context, the continuation and diversification of research on exercise addiction will contribute to the accumulation of knowledge in this field and the development of more effective intervention methods. In addition, the distribution of theses according to publication years also shows the trend in this regard. Accordingly, we see an increasing trend in exercise addiction, especially between 2016 and 2019 and 2020 and 2022. We think that this may be due to the tendency of researchers to introduce a topic that has not yet been mentioned in the literature or to publish new certain topics in the literature and receive

more citations. As a matter of fact, the trend, which started in 2016, increased as researchers from different departments wrote theses on this subject and reached its maximum in 2022. In this context, it can be said that theses on this subject will decrease after 2022, and the trend will change.

When examining the most frequently used indexes in postgraduate theses, it is observed that research on exercise addiction generally revolves around specific keywords. At the forefront of these indexes are keywords such as “Exercise,” “Addiction,” and “Exercise Addiction.” The majority of research conducted in the field of exercise addiction seems to focus around these keywords in order to identify fundamental concepts and connections. Additionally, specific words such as athletes, university students, and scales are also commonly used. This suggests that researchers tend to associate exercise addiction with specific subgroups or scales and conduct more specific studies in this regard. The frequent use of the exercise addiction scale, in particular, suggests that researchers may have focused their studies on scale-based assessment methods in this field. The intensive use of these indexes indicates a concentration of research on specific concepts and measurement tools in studies related to exercise addiction (Ikizler & Yeltepe, 2007; Tekkurşun Demir et al., 2018).

When examining the distribution of theses across universities, it is observed that research on exercise addiction is conducted in various universities. This distribution reflects the interest of different universities and academic units in the field of exercise addiction. Considering the distribution of postgraduate theses according to universities examined in the study, it is noted that Mersin University hosts the highest number of theses. Other universities such as Gazi University, Ege University, and Uskudar University also have a significant number of theses, indicating substantial research activity in the field of exercise addiction by both academics and these universities (Ayılğan, 2022; Ö. Demir, 2021). These studies conducted at different universities reflect a wide range of research and academic activities in the field of exercise addiction (Cihad et al., 2021; Kacmaz et al., 2022). This demonstrates that research on exercise addiction promotes inter-university collaboration and knowledge sharing.

When examining the findings related to the number of participants in postgraduate theses, a wide range of participant numbers is observed. Studies with a low number of participants generally involve research conducted on a specific group or population. For example, research focusing on specific groups such as licensed athletes or diagnosed patients may have limited participant numbers (Bodur, 2021; Ö. Demir, 2018). While these studies are important for understanding the exercise addiction behaviors or effects within specific subgroups, their generalizability may be limited. On the other hand, studies with a high number of participants typically involve research conducted on the general population or large samples (Ö. Demir, 2021; Kürtül, 2021). Such studies may enhance the generalizability of findings and deepen the overall understanding of exercise addiction.

#### Limitations and Future Directions

A limitation of the study may be that only postgraduate theses conducted in Türkiye were subjected to bibliometric analysis.

This situation may indicate the exclusion of data and findings that could have been obtained from the international literature.

The findings of this study contribute significantly to providing a deeper understanding of exercise addiction and updating clinical practices. Analyzing postgraduate theses related to exercise addiction may enhance awareness among healthcare professionals, educators, and researchers and facilitate the promotion of a multidisciplinary approach. Furthermore, standardizing assessment tools and fostering inter-university collaboration could help make clinical practices in the field of exercise addiction more effective. In this context, academic research on exercise addiction has significant potential to contribute directly or indirectly to clinical practices.

In conclusion, while the current study offers valuable insights into the characteristics and trends of postgraduate research on exercise addiction in Türkiye, it is essential to acknowledge its limitations in revealing temporal trends or changes in research focus. As highlighted, future research endeavors could benefit from incorporating longitudinal analyses to track the evolution of the field over time. By periodically revisiting the bibliometric analysis at intervals, researchers can discern shifts in prevalence rates, emerging patterns in research emphasis, and advancements in assessment tools and methodologies. Such longitudinal investigations would not only enhance our understanding of the dynamic nature of exercise addiction but also enable us to identify evolving areas of interest or potential gaps in knowledge. Ultimately, this approach would facilitate more informed decision-making for future research endeavors and clinical practices.

**Data Availability Statement:** The data that support the findings of this study are available on request from the corresponding author.

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**Informed Consent:** N/A.

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**Author Contributions:** Concept – B.S.U., T.K.; Design – B.S.U., F.B.; Supervision – F.B.; Materials – B.S.U., M.E.; Data Collection and/or Processing – B.S.U., T.K.; Analysis and/or Interpretation – B.S.U., M.E.; Literature Search – B.S.U., T.K.; Writing – B.S.U., M.E.; Critical Review – F.B.

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## ORIGINAL ARTICLE

# Anxiety, Social Media Addiction, and the Effect of These Conditions on Insomnia During the Coronavirus Disease 2019 Period

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## Main Points

- It was observed that 5.1% of the participants had coronavirus disease 2019 (COVID-19) anxiety, 11.4% experienced moderate insomnia, and 3.3% experienced severe insomnia. Family income, anxiety level, and social media addiction were present with insomnia ( $p < .05$ ).
- The social media addiction level of singles, high school graduates, those with fewer than three children, those who drink alcohol, and those who use smartphones more frequently were significant. ( $p < .05$ ).
- The COVID-19 anxiety level of women was significantly higher than men ( $p = .001$ ).
- It is important for individuals with social media addiction not to have technological devices in their sleep environment and, if necessary, to get support from health professionals to reach optimal sleep times.

## Abstract

This study aimed to investigate the effects of anxiety, social media addiction, and these conditions on insomnia among adults aged 18 and above residing in Kahramanmaraş during coronavirus disease 2019. This descriptive, cross-sectional study was conducted in Kahramanmaraş province between September 15 and December 31, 2021. The study included individuals aged 18 and above who agreed to participate ( $n = 394$ ). Participants' sociodemographic characteristics, responses to the coronavirus disease 2019 Anxiety Scale, Social Media Addiction Scale—Adult Form, and Insomnia Severity Index were recorded.

Of the participants, 61.4% were female, with a mean age of  $33.59 \pm 10.86$  years, and 94.2% of the participants reported using at least one social media platform. The most commonly used social media platforms were WhatsApp (94.2%), Instagram (81.2%), and YouTube (66%). The mean anxiety level was  $1.84 \pm 3.17$ , the social media addiction level was  $44.14 \pm 14.24$ , and the insomnia severity index was  $8.75 \pm 5.67$ . It was observed that 5.1% of individuals had coronavirus disease 2019 anxiety, 11.4% had moderate insomnia, and 3.3% had severe insomnia. Significant differences were found in social media addiction levels among unmarried individuals, high school graduates, those with fewer than three children, alcohol consumers, those with longer smartphone usage, and those accessing the Internet at home ( $p < .05$ ). Compared to males, females had significantly higher levels of coronavirus disease 2019 anxiety ( $p = .001$ ).

The present study revealed an association between anxiety, social media addiction, and insomnia during the coronavirus disease 2019 pandemic. Future multicenter and prospective studies should investigate the relationship between social media addiction and anxiety and the impact of these conditions on insomnia to determine the temporal sequence and develop interventions targeting the initial manifestation based on the identified cause-and-effect relationship.

**Keywords:** Anxiety, COVID-19, family medicine, insomnia, social media addiction

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## Introduction

On January 5, 2020, the World Health Organization identified a new coronavirus variant that has not been detected in humans before. This variant rapidly spreads from person to person via droplets and quickly turns into the global coronavirus disease 2019 (COVID-19) pandemic. The accompanying unknowns still threaten people physiologically, psychologically, and socially (Suryasa et al., 2021).

Like other coronavirus outbreaks, the rapid spread of the COVID-19 pandemic and the possibility of severe illness have caused significant anxiety in many of the population. It has been reported that individuals in professions with a higher risk of contracting the disease and their close contacts experience higher anxiety levels (Çiçek & Almalı, 2020; Gao et al., 2020). Satıcı et al. (2021) in their study in Türkiye, showed that fear of COVID-19 increased psychological symptoms such as stress, depression, and anxiety in individuals and decreased life satisfaction.

With the influence of restrictions and bans during the pandemic, people have started to pay more attention to social media to reduce their concerns about coronavirus and meet many psychological needs such as entertainment and social relations. In 2020, during the COVID-19 epidemic, social media users increased fastest in the last three years. During this period, the number of social media users in the world increased by 13% (490 million people) to 4.20 billion. In Türkiye, this number reached 60 million, with an increase of 11% (6 million people) (Bozkurt & Bozkurt, 2022).

The increased time spent on social media affects the duration and structure of sleep, which is a physiological necessity (Taş, 2022; Vahedi & Saiphoo, 2018).

Studies have suggested a significant relationship between social media addiction and sleep disorders, emphasizing that this relationship is bidirectional, with each factor amplifying or reducing the impact of the other (George et al., 2018; Priego-Parra et al., 2020). Furthermore, research indicates that individuals with high social media addiction become more anxious and depressed due to information overload (Çelik & Diker, 2021; Priego-Parra et al., 2020).

This study investigates the effects of COVID-19-related anxiety, social media addiction, and insomnia on individuals aged 18 and above residing in Kahramanmaraş City.

## Material and Methods

This descriptive and cross-sectional study was conducted in province between September 15 and December 31, 2021. The study population consisted of individuals aged 18 and above residing in Kahramanmaraş province who agreed to participate. Written informed consent was obtained from the patients who agreed to take part in the study. Those who did not consent to participate and individuals under 18 were excluded from the study, and no sample calculation was performed. Those who agreed to participate and met the inclusion criteria within the specified period were included in the study. Ethical approval was obtained from the Non-Interventional Clinical Research Ethics Committee of

Kahramanmaraş Sütçü İmam University (date: September 14, 2021, decision number: 05).

The data collection form of the study consisted of a total of 56 questions. The first section of the data collection form included participants' sociodemographic characteristics, while the second section included the Coronavirus Anxiety Scale (CAS), Social Media Addiction Scale—Adult Form (SMAS-AF), and Insomnia Severity Index (ISI). Participants were directed to the survey forms through face-to-face interviews and a link provided via Google Forms, and they were asked to complete the forms. While the survey was distributed via Google Forms to reach more people, it was specifically stated that a person should complete only one survey. The participants' place of residence in that province was determined according to their statements. Forms were sent to people known to reside in the districts, and they were asked to distribute them around. The weighted proportion method was used in this way.

In our study, the SMAS-AF, adapted to the population in Türkiye, was used to measure the level of social media addiction, CAS was used to measure coronavirus anxiety levels, and ISI was used to determine the level of insomnia. CAS, SMAS-AF, and ISI scores were considered dependent variables, while sociodemographic data were independent variables.

Lee developed CAS in 2020 to detect coronavirus anxiety (Lee, 2020). Turkish validity and reliability analysis was conducted by Bicer et al. (2020), and Cronbach's alpha value was reported as 0.832. The scale consists of five questions, each receiving points between 0 and 4. On this scale, where the lowest score can be 0 and the highest score is 20, a score of 9 or above is considered coronavirus anxiety.

Sahin and Yagcı (2017) developed SMAS-AF, consisting of 20 questions with a 5-point Likert type. It corresponds to the following statements: 1: "Not suitable for me at all," 2: "Not suitable for me," 3: "I am undecided," 4: "Suitable for me," 5: "Very suitable for me." While 18 questions on the scale were asked positively, two were asked negatively. The minimum score that can be obtained from the scale is 20, while the maximum score can be 100. Higher scores indicate a higher level of social media addiction. The internal consistency coefficient of the scale was found to be 0.940.

Insomnia Severity Index was developed by Bastien et al. (2001). It consists of seven questions. Each item consists of five options (scored from 0 to 4). The 0–7 point range is "clinically insignificant insomnia," the 8–14 point range is "subthreshold of insomnia," the 15–21 point range is "clinical insomnia (moderately severe)," the 22–28 point range is "clinical insomnia (severe)" means. The Turkish validity and reliability of the scale were conducted by Boysan et al. (2010), and the Cronbach alpha value was calculated as 0.790.

The data analysis for this study was conducted using SPSS 24.0 (IBM SPSS Corp.; Armonk, NY, USA) software package. Categorical variables were presented as numbers and percentages, while continuous numerical variables were presented as means, standard deviations, medians, and minimum and maximum values. The comparison of categorical variables was

performed using Pearson's chi-square test. The normal distribution of numerical data was evaluated using the Shapiro – Wilk test. Independent samples *t*-test was used to compare normally distributed continuous variables between two groups, while the Mann – Whitney *U*-test was used to compare non-normally distributed variables. The Kruskal – Wallis test was employed for comparisons among more than two groups. Bonferroni correction was applied to the *p*-values to determine the groups where significant differences originated. Multivariate linear regression analysis was used for parameters significantly associated with univariate analyses. A *p*-value less than .05 was considered statistically significant.

## Results

A total of 394 individuals participated in this study. Of the participants, 61.4% were female, and the mean age was  $33.59 \pm 10.86$  years (range: 18 – 65). Of the participants, 55.8% were married, 35.8% were employed, 22.8% were students, and 74.4% had a university degree or higher. Also, 31.7% of the participants had an income lower than their expenses, 51.3% had at least one child, and 59.1% lived with four or more people in their households.

One participant reported not owning a smartphone. Of the participants, 72.8% stated that they had been using a smartphone for at least seven years, and 11.4% reported using it for 7 hours or more daily (Table 1), and 84.3% of the participants accessed the Internet from home, and 94.2% indicated using at least one social media platform. The most frequently used social media platforms were WhatsApp (94.2%), Instagram (81.2%), and YouTube (66%).

**Table 1.**  
*Participants' Television and Smartphone Usage Characteristics*

| Variables                       | Count | Percentage |
|---------------------------------|-------|------------|
| TV viewing time (per day)       |       |            |
| <1 hour                         | 172   | 43.7       |
| 1 – 3 hours                     | 73    | 18.5       |
| 4 – 6 hours                     | 13    | 3.3        |
| >7 hours                        | 3     | 0.8        |
| None                            | 133   | 33.8       |
| Presence of a smartphone        |       |            |
| Yes                             | 393   | 99.7       |
| No                              | 1     | 0.3        |
| Duration of smartphone usage    |       |            |
| <1 year                         | 1     | 0.3        |
| 1 – 3 years                     | 10    | 2.5        |
| 4 – 6 years                     | 96    | 24.4       |
| 7 years and above               | 287   | 72.8       |
| Daily smartphone usage duration |       |            |
| <1 hour                         | 28    | 7.1        |
| 1 – 3 hours                     | 169   | 42.9       |
| 4 – 6 hours                     | 152   | 38.6       |
| 7 hours                         | 45    | 11.4       |

The average scores for the participants in the study were  $1.84 \pm 3.17$  for CAS,  $44.14 \pm 14.24$  for SMAS-AF, and  $8.75 \pm 5.67$  for ISI. According to the results, 5.1% of the participants had COVID-19 anxiety, 11.4% experienced moderate-level insomnia, and 3.3% experienced severe-level insomnia.

When comparing participants' SMAS-AF scores with sociodemographic data, it was found that singles had a higher level of social media addiction than married individuals ( $p < .001$ ). Additionally, when comparing participants with different education levels, it was observed that high school graduates had a significantly higher level of social media addiction than primary school graduates ( $p = .033$ ). Furthermore, participants without children had a significantly higher level of social media addiction than those with three or more children ( $p < .001$ ). The distribution of SMAS-AF scores based on participants' psychiatric history, smoking, and alcohol consumption characteristics is presented in Table 2.

When comparing SMAS-AF scores based on participants' television and smartphone usage characteristics, it was found that the duration of TV viewing and owning a smartphone did not

**Table 2.**  
*Distribution of Social Media Addiction Scale—Adult Form Scores According to Participants' Psychiatric History, Smoking, and Alcohol Use Characteristics*

| Variable                                  | Mean $\pm$ SD     | Median (Minimum – Maximum) | <i>p</i> |
|-------------------------------------------|-------------------|----------------------------|----------|
| Psychiatric history                       |                   |                            | .062     |
| No                                        | $43.62 \pm 14.21$ | 42.5 (20 – 94)             |          |
| Yes                                       | $47.17 \pm 14.15$ | 48 (24 – 76)               |          |
| Common anxiety disorder                   |                   |                            | .140     |
| Yes                                       | $49.76 \pm 11.56$ | 51 (31 – 74)               |          |
| Depression                                | $43.93 \pm 17.93$ | 46.5 (24 – 76)             |          |
| Panic attack                              | $43.5 \pm 14.39$  | 42.5 (28 – 68)             |          |
| Obsessive-compulsive disorder             | $51.8 \pm 10.55$  | 54 (34 – 61)               |          |
| Anxiety disorder                          | $59.5 \pm 19.43$  | 66.5 (31 – 74)             |          |
| Bipolar disorder                          | $42 \pm 0.0$      | 42 (42 – 42)               |          |
| Borderline personality disorder           | $49 \pm 0.0$      | 49 (49 – 49)               |          |
| Psychiatric medication (in the past year) |                   |                            | .053     |
| Yes                                       | $48.65 \pm 14.56$ | 48 (24 – 76)               |          |
| No                                        | $43.68 \pm 14.14$ | 43 (20 – 94)               |          |
| Smoking                                   |                   |                            | .782     |
| Quit                                      | $44.9 \pm 14.03$  | 46 (23 – 68)               |          |
| Current smoker                            | $45.14 \pm 15.18$ | 43.5 (22 – 94)             |          |
| Non-smoker                                | $43.71 \pm 13.91$ | 43 (20 – 91)               |          |
| Alcohol                                   |                   |                            | .001     |
| Drinker                                   | $49.06 \pm 13.22$ | 47 (22 – 94)               |          |
| Non-drinker                               | $43.17 \pm 14.25$ | 42 (20 – 94)               |          |

**Table 3.**

*Distribution of Social Media Addiction Scale—Adult Form Scores Based on Participants' Coronavirus Disease 2019 Anxiety and Insomnia Severity*

| Variables                | Mean $\pm$ SD     | Median<br>(Minimum – Maximum) | <i>p</i> |
|--------------------------|-------------------|-------------------------------|----------|
| COVID-19 anxiety         |                   |                               | <.001    |
| Absent                   | 43.36 $\pm$ 13.52 | 43 (20 – 94)                  |          |
| Present                  | 58.85 $\pm$ 19.02 | 54 (37 – 94)                  |          |
| Insomnia severity        |                   |                               | <.001    |
| Clinically insignificant | 40.44 $\pm$ 12.39 | 39 (20 – 91) <sup>a</sup>     |          |
| Subthreshold insomnia    | 45.98 $\pm$ 13.95 | 46 (20 – 78) <sup>b</sup>     |          |
| Moderate insomnia        | 48.78 $\pm$ 14.27 | 50 (22 – 94) <sup>b</sup>     |          |
| Severe insomnia          | 60.23 $\pm$ 22.25 | 53 (24 – 94) <sup>b</sup>     |          |

Note: There is a statistically significant difference between the parameters indicated by different letters.

COVID-19 = Coronavirus disease 2019.

significantly affect the scores. However, as the daily smartphone usage duration increased, social media addiction significantly increased ( $p < .001$ ).

When comparing participants who access the Internet at home versus those who access it at work, it was found that they had a significantly higher level of social media addiction ( $p = .001$ ). Furthermore, when comparing social media users versus non-users, it was observed that they had a significantly higher level of social media addiction ( $p < .001$ ). Among users of WhatsApp, YouTube, Instagram, Twitter, Snapchat, and other social media platforms, social media addiction was significantly higher than those who did not use these platforms ( $p < .05$ ). The distribution of SMAS-AF scores and statistical data based on participants' COVID-19 anxiety and severity of insomnia are provided in Table 3.

When examining the factors influencing COVID-19 anxiety among participants, it was found that females had statistically significantly higher levels of COVID-19 anxiety compared to males ( $p = .001$ ). According to this study, the family's total monthly income, the number of children, and the number of individuals living in the household did not significantly affect COVID-19 anxiety ( $p > .05$ ). Participants' psychiatric history, smoking, and alcohol use characteristics did not show statistically significant differences in COVID-19 anxiety levels ( $p > .05$ ). Individuals' use of social media platforms did not affect COVID-19 anxiety levels. At the same time, participants with severe insomnia had statistically significantly higher levels of COVID-19 anxiety compared to those with clinically insignificant insomnia ( $p = .002$ ).

When examining the factors influencing insomnia severity among participants, no significant changes were observed in ISI scores based on sociodemographic characteristics ( $p > .05$ ). Only participants with lower income than expenses had significantly higher ISI scores than those with higher income ( $p = .001$ ). There was no statistically significant difference in ISI scores based on

**Table 4.**

*Distribution of Insomnia Severity Index Scores Based on Participants' Television, Smartphone, and Social Media Use Characteristics*

| Usage Characteristics             | Mean $\pm$ SD     | Median<br>(Minimum – Maximum) | <i>p</i> |
|-----------------------------------|-------------------|-------------------------------|----------|
| Television viewing time (per day) |                   |                               | .537     |
| <1 hour                           | 8.61 $\pm$ 5.35   | 8 (0 – 28)                    |          |
| 1 – 3 hours                       | 8.74 $\pm$ 5.54   | 9 (0 – 24)                    |          |
| 4 – 6 hours                       | 11.15 $\pm$ 5.65  | 10 (2 – 22)                   |          |
| >7 hours                          | 13.67 $\pm$ 12.42 | 7 (6 – 28)                    |          |
| None                              | 8.58 $\pm$ 5.95   | 8 (0 – 24)                    |          |
| Smartphone usage time             |                   |                               | .938     |
| <1 year                           | 9.0 $\pm$ 0.0     | 9 (9 – 9)                     |          |
| 1 – 3 years                       | 8.1 $\pm$ 5.53    | 7.5 (0 – 20)                  |          |
| 4 – 6 years                       | 8.99 $\pm$ 5.65   | 8.5 (0 – 28)                  |          |
| 7 years and above                 | 8.69 $\pm$ 5.71   | 8 (0 – 28)                    |          |
| Daily smartphone usage time       |                   |                               | .001     |
| <1 hour                           | 7.57 $\pm$ 4.92   | 7.5 (0 – 20) <sup>a</sup>     |          |
| 1 – 3 hours                       | 7.67 $\pm$ 5.26   | 7.0 (0 – 24) <sup>a</sup>     |          |
| 4 – 6 hours                       | 9.37 $\pm$ 5.8    | 9.0 (0 – 28) <sup>ab</sup>    |          |
| >7 hours                          | 11.42 $\pm$ 6.12  | 11.0 (1 – 28) <sup>b</sup>    |          |
| Social media usage                |                   |                               | .035     |
| Non-users                         | 6.3 $\pm$ 4.73    | 6.0 (0 – 17)                  |          |
| Users                             | 8.9 $\pm$ 5.69    | 8.0 (0 – 28)                  |          |

Note: There is a statistically significant difference between the parameters indicated by different letters.

psychiatric history, psychiatric medication use, and smoking status. Still, participants who consumed alcohol had significantly higher ISI scores than non-drinkers ( $p = .035$ ). The distribution of ISI scores based on participants' television, smartphone, and social media use characteristics is provided in Table 4. When comparing individuals with and without COVID-19 anxiety, those with anxiety had significantly higher insomnia severity levels ( $p = .001$ ).

In the multivariate linear regression analysis, incorporating the parameters significantly associated with insomnia severity in the univariate analyses, it was observed that total family income ( $p < .001$ ), COVID-19 anxiety level ( $p = .001$ ), and social media addiction level ( $p < .001$ ) were independently associated with insomnia severity, irrespective of other variables (Table 5). However, the variables that were found to be significant in the univariate analyses, such as alcohol use ( $p = .342$ ), social media usage ( $p = .305$ ), and daily smartphone usage time ( $p = .067$ ), were not found to be associated with insomnia severity in the multivariate analysis.

## Discussion

The effects of the COVID-19 pandemic on mental health and well-being are expected to be profound and enduring. However, it

**Table 5.**  
Independent Risk Factors for Insomnia Severity Index (Multivariate Linear Regression. Backward Step 3)

|                     | Unstandardized $\beta$ | SE    | Standardized $\beta$ | $t$     | $p$   | 95% CI  |         |
|---------------------|------------------------|-------|----------------------|---------|-------|---------|---------|
|                     |                        |       |                      |         |       | Under   | Upper   |
| Still               | 4.726                  | 1.297 |                      | 3.644   | <.001 | 2.176   | 7.276   |
| Family income       | -1.358                 | 0.372 | -0.169               | - 3.653 | <.001 | - 2.089 | - 0.627 |
| CAS total score     | 0.285                  | 0.086 | 0.159                | 3.296   | .001  | 0.115   | 0.454   |
| SMAS-AF total score | 0.099                  | 0.021 | 0.248                | 4.749   | <.001 | 0.058   | 0.140   |

Dependent variable: ISI score.  $R^2 = 0.416$ ;  $F = 20.411$ ;  $p < .001$

Note: CAS = Coronavirus Anxiety Scale; CI = Confidence interval; SE = Standard error; SMAS-AF = Social Media Addiction Scale—Adult Form.

remains uncertain who will be more affected and to what extent these effects will permeate all aspects of mental health. During this period, an increase in anxiety, depression, and sleep disorders has been reported in almost all segments of society, especially among those directly exposed to the virus (O'Connor et al., 2021). Another phenomenon observed concurrently with the increased quarantine measures is the rise in social media usage (Bozkurt & Bozkurt, 2022). This study examines the relationship between anxiety, social media addiction, and insomnia in Kahramanmaraş province during the COVID-19 pandemic, demonstrating that these conditions are interrelated.

Epidemic diseases, especially pandemics such as COVID-19, for which there is no definitive information about their treatment, increase the fear, anxiety, and anxiety levels of societies due to the uncertainty they carry (Doğan & Düzel, 2020).

A study conducted with adult participants in China revealed that frequent use of social media during the COVID-19 pandemic and increased exposure to misinformation negatively affected individuals' mental well-being and increased anxiety and depression levels (Gao et al., 2020). It has been reported that one of the situations that cause the most anxiety for individuals is the possibility of transmitting the disease to other family members or loved ones during a pandemic (Çiçek & Almalı, 2020). Furthermore, the belief that personal protective equipment may not be easily accessible when needed and the negative news shared on the Internet also contribute to increased anxiety levels (Çiçek & Almalı, 2020).

In general, it has been observed that anxiety and depression levels are higher among women during the COVID-19 pandemic (Doğan & Düzel, 2020; Yılmaz et al., 2020; Yıldırım, 2020). Consistent with these findings, our study also found a statistically significant higher level of anxiety among women. A meta-analysis investigating the prevalence of anxiety symptoms in the general population during COVID-19 determined that 31.9% had anxiety symptoms. Our study showed that sleep problems were also observed with increased anxiety levels (Salari et al., 2020). In a recent systematic review and meta-analysis, the frequency of anxiety among COVID-19 cases was reported to be 47%, which was significantly higher compared to the population not affected by COVID-19, and the experience of COVID-19 was found to be associated with anxiety (Deng et al., 2021). Further studies are needed to investigate anxiety levels during different phases of the pandemic and among various segments of the population to better understand the relationship between the pandemic and anxiety levels.

Most studies on sleep disorders in the literature have focused on healthcare workers. These studies have reported a higher prevalence of COVID-19-related sleep disorders compared to the pre-pandemic period (Alimoradi et al., 2021; Jahrami et al., 2021). In all groups included in the studies, sleep problems are positively associated with psychological issues such as depression and anxiety (Alimoradi et al., 2021; Jahrami et al., 2021). Previous studies have reported a wide range of sleeplessness frequencies in the general population. While there are studies that report similar rates to our findings, it is observed that the frequency of sleeplessness varies across different segments of the population. The variability in reported frequencies of sleeplessness among studies may be due to the timing of the studies during different phases of the pandemic, the inclusion of different populations, the use of different scales, or reliance on self-reported sleep disorders.

In this study, another parameter evaluated was individuals' level of social media addiction. According to the findings, unmarried individuals had a significantly higher level of social media addiction than married individuals. Similarly, a study by Yuksel et al. (2020) reported that individuals without a partner had higher levels of social media addiction than those in a relationship. Additionally, in our study, participants with three or more children had a statistically significantly lower level of social media addiction than those without children. Unmarried individuals and those without children may have more time to use social media. Individuals with more children may have less time to browse social media due to their daily responsibilities and different engagements.

In this study, compared to primary school graduates, high school graduates had a significantly higher level of social media addiction. Zhao (2021), evaluated the relationship between social media addiction and educational status and reported a higher prevalence of incomplete education among social media addicts (68% vs. 62%). They also found that social media addiction decreased after graduation. On the other hand, Simsek et al. (2019), compared social media addiction levels among different educational levels and found no significant difference between the groups. They reported that high school and university students had moderate social media addiction.

In contrast to these studies, our study found that a certain increase in educational level (being a high school graduate) was associated with increased social media addiction. However, a higher level of educational attainment was not associated with an increase in social media addiction. A slight increase in educational level

may enhance individuals' social media usage skills, leading high school graduates to prefer social media more. Additionally, considering that being a university graduate contributes to personal development and awareness, it is thought that it may instill the skill of limiting social media usage.

In this study, when compared to non-drinkers, alcohol drinkers had a significantly higher level of social media addiction. Increased social media usage time increases the likelihood and frequency of encountering alcohol-related social media content. Curtis et al. (2018), examined the relationship between increased social media usage, alcohol-related content exposure, and alcohol consumption. They reviewed the results of 19 studies related to this topic. They concluded that exposure to alcohol-related content increases as social media usage time increases, significantly increasing alcohol consumption. They suggested that both phenomena are rooted in attachment and that having a predisposition to addiction-prone personality traits may be associated with both social media and alcohol addiction. Previous studies and the results of our study indicate that an increase in alcohol consumption is positively associated with increased social media usage. The observed relationship in our study may be attributed to individuals' susceptibility to addiction or their higher exposure to alcohol-related content on social media, as suggested in the literature.

This study found that as daily smartphone usage increased, social media addiction increased significantly. Individuals use their smartphones for various purposes, and spending time on social media is one of the primary purposes. Smartphones are the most commonly used devices for accessing social media. In a recent study, Chen et al. (2020), stated that individuals mainly connect to social media through their smartphones and that a significant relationship exists between the increase in smartphone usage time and social media addiction. Similarly, in our study, it can be said that the increase in smartphone usage time is expected to be associated with an increase in the time spent on social media and the frequency of addiction.

In this study, one of the parameters identified as independently affecting insomnia, among other variables, is family income level. It has been found that an increase in income is associated with a decreased risk of insomnia. This relationship has also been demonstrated in various previous studies. In the study by Etindele-Sosso (2020), it was noted that there is a relationship between educational level, occupation, and income level, with individuals with lower educational levels working in jobs with lower wages that are more physically demanding and have longer hours, leading to experiences of insomnia. Efforts to reduce individuals' income concerns and indirectly mitigate the impact on sleep health, an important component of overall health, should include long-term interventions to increase individuals' educational levels and employment opportunities.

Compared to individuals without COVID-19 anxiety, those with COVID-19 anxiety had a statistically significant higher level of social media addiction. This finding is consistent with the results of many previous studies. In a systematic review conducted by Keles et al. (2020), that examined the relationship between social media usage and anxiety levels, they evaluated the results of 13 studies published on this topic. They reported a significant

increase in depression and anxiety levels associated with increased social media usage duration, regardless of the purpose of social media usage. Similarly, Shensa et al. (2018) determined, based on their study conducted on a nationally representative sample in the United States, that there is a relationship between social media usage level and the occurrence of anxiety and depression symptoms. Consistent with previous studies, our study also found a significant relationship between anxiety levels and social media addiction, independent of other variables. Especially during the pandemic, many people follow current information through social media platforms and become aware of various true and false situations. Individuals spend more time on social media and encounter negative news more frequently. Increased exposure to negative news on social media can be interpreted as an expected finding leading to increased anxiety among individuals who encounter such news. Our study did not provide a definitive interpretation as to whether anxiety leads to social media addiction or social media addiction leads to anxiety. Prospective studies conducted in the future can establish a cause-and-effect relationship by demonstrating which condition occurs earlier.

Compared to individuals with clinically insignificant levels of insomnia, participants with severe insomnia had a statistically significant higher level of COVID-19 anxiety. Increased anxiety levels were also identified as an independent risk factor for insomnia. Previous studies have shown a bidirectional relationship between anxiety and insomnia. In a systematic review and meta-analysis conducted by Arenas et al. (2019), it was stated that depression, anxiety, and sleep problems interact with each other, with the presence of one condition triggering another. Frontini et al. (2021) examined anxiety, sleep disorders, and physical activity levels during the pandemic. They demonstrated that these three conditions were interrelated, and individuals were negatively affected by the increase in these conditions during the pandemic. Consistent with these studies, our study found that anxiety levels were associated with insomnia, independent of other variables. Prospective studies can determine whether anxiety or insomnia occurs earlier and help develop possible interventions.

When compared to individuals with clinically insignificant levels of insomnia, those experiencing any level of insomnia were found to have a statistically significant higher level of social media addiction. Similar to anxiety, it was also found that social media addiction is associated with insomnia independent of other variables. During the COVID-19 pandemic, there has been an increase in both the frequency and duration of internet usage. Following school closures and the implementation of lockdown measures, many people turned to social media platforms to distract themselves from their troubles. While this can sometimes be beneficial for individuals, it can also lead to higher levels of social media addiction (Bozkurt & Bozkurt, 2022). Particularly during the pandemic, increased stress and anxiety have driven people to rely more heavily on the Internet for news consumption. However, false information on the Internet and social media has caused individuals to become even more tense and anxious instead of finding relief (Priego-Parra et al., 2020). Based on previous research and the findings of our study, it can be concluded that social media addiction increases the risk of experiencing insomnia.

The COVID-19 pandemic has shown a significant relationship between anxiety, social media addiction, and insomnia. The increased exposure to accurate or false news and comments on social media platforms can contribute to higher anxiety levels, disrupting sleep initiation and maintenance. Moreover, individuals with elevated anxiety levels may use excessive social media as a coping mechanism. Implementing measures to verify the information shared on social media platforms is important, as this can help reduce anxiety levels. Additionally, individuals with social media addiction may allocate more time to social media usage, which can encroach upon their sleep duration, decreasing optimal sleep time. Specifically for individuals with social media addiction, avoiding having access to social media or any electronic devices with screens in their sleep environment is recommended. Seeking support from healthcare professionals can also be beneficial in achieving optimal sleep durations, which are crucial for overall health. Future multicenter and prospective studies can further investigate the relationship between social media addiction, anxiety, and their impact on insomnia. By identifying the temporal sequence of these clinical entities and establishing a cause-and-effect relationship, interventions can be developed targeting the primary factor that emerges.

#### Limitations and Directions/Suggestions for Future Research

This study has some limitations. One limitation is that the participants included in the study were not selected through a specific sampling method, which restricts the representativeness and generalizability of the study to a certain population. While the survey was distributed via Google Forms to reach more people, it was specifically stated that a person should complete only one survey. Still, the possibility of repeated participation could not be completely prevented.

Although our study was conducted during the COVID-19 pandemic, it is essential to consider that the unknown characteristics of the disease and the implementation of social restrictions/lockdowns during the earlier stages of the pandemic may have influenced social media usage, anxiety levels, and insomnia in different ways. Therefore, the results of our study should be interpreted in light of the period in which the study was conducted. Another limitation is that our study did not involve prospective follow-up, which prevents establishing a cause-and-effect relationship or temporal precedence among the observed outcomes. Prospective studies with long-term follow-ups could be valuable in this regard.

**Data Availability Statement:** The data that support the findings of this study are available on request from the corresponding author.

**Ethics Committee Approval:** This study was approved by Ethics committee of Kahramanmaraş Sütçü İmam University (approval number: 05, date: September 2021).

**Informed Consent:** Written informed consent was obtained from the patients who agreed to take part in the study.

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Y.C.M., Z.Y.T.; Analysis and/or Interpretation – R.S.G., C.K., Y.C.M.; Literature Search – R.S.G., Y.C.M., Z.Y.T.; Writing – Y.C.M., R.S.G.; Critical Review – C.K., Z.Y.T.

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## ORIGINAL ARTICLE

# Does Internet Addiction Lead to Academic Procrastination among Pharmacy Students at a University in Türkiye? A Cross-Sectional Study

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## Main Points

- There is a significant correlation between Internet addiction and time management.
- There is a positive and moderately significant relationship between Internet addiction and academic procrastination.
- Internet addiction is a significant predictor of academic procrastination.
- Internet addiction negatively affects academic performance.

## Abstract

Pharmacy students belong to the age group with the highest use of the internet and they are at risk of unregulated and unnecessary internet addiction, which could have a negative impact on their learning behaviors, academic grades, and time management skills. This study aims to assess the time management skills, academic procrastination, and academic performance of pharmacy students in Türkiye and their relationship with internet addiction. A cross-sectional study was conducted among 622 pharmacy students in Türkiye. This study used Young's Internet Addiction Test (IAT) Time Management Inventory (TMI) and Tuckman Procrastination Scale (TPS) to evaluate internet addiction, time management and academic procrastination respectively. According to the results, no significant differences were found in IAT scores based on gender ( $p = .096$ ). The study findings also revealed a significant correlation between pharmacy students' total IAT score and their overall TMI score. In contrast, there is a positive and moderately significant relationship observed between pharmacy students' total IAT and TPS scores. And internet addiction significantly predicted academic procrastination. In light of the findings, the study suggested that academic institutions and relevant authorities need to promote responsible internet usage among pharmacy students to increase their academic performance.

**Keywords:** addiction, pharmacy, procrastination, time management, universities

## Introduction

Science and technology are progressing at a rapid speed in modern life. Advancements in computer and internet technologies are two of the most visible instances of this evolution (Ceyhan, 2008). The Turkish Statistical Institute's 2019 Household Information Technologies Usage Survey indicates that 75.3% of Turkish households utilize the Internet, and this usage is highest among the 16 – 24 age group (90.8%;

Yılmazsoy & Kahraman, 2017). With the advent of 4G technologies and faster internet, pharmacy undergraduate students belonging to the age group of 18 – 24 can stay updated with instant access to global scientific databases and libraries. Moreover, their communication with the world has also increased through better video and audio conferencing apps (Ceyhan, 2008). However, excessive, uncontrolled, and non-purposeful use of these technologies could lead to internet addiction (Ceyhan, 2008).

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Most university students belong to the age group of 18–29 years with the highest use of the internet, and they are at risk of unregulated and unnecessary internet addiction, which could have a negative impact on their learning behaviors and grades (Mohammadi & Torabi, 2018). Studies reveal that the majority of college students in Türkiye have moderate levels of internet addiction (Sansgiry et al., 2006).

Time management involves coordinated task and organization management, and assessing and improving students' skills in allocating time effectively (Grissom et al., 2015). Uncontrolled Internet addiction is a significant factor that affects student's time management skills, which are necessary for effective academic learning (Mohammadi & Torabi, 2018; Öksüz et al., 2018). Students pursuing undergraduate pharmacy education need to allocate ample time for learning and understanding, and Internet addiction could hinder their career goals and negatively impact them as healthcare professionals. Additionally, academic procrastination, despite being often overlooked, can have irreversible consequences. Therefore, it's important that pharmacists, who play a crucial role in healthcare service delivery, effectively and efficiently manage their time (Sansgiry et al., 2006).

Excessive internet use is reportedly occupying various aspects of student life, both socially and academically (Ito et al., 2009). Studies have reported a direct relationship between internet addiction and lower academic achievements, postponement of exams, delay in completing assignments and projects, and not meeting student advisors (Kandemir, 2014; Lay, 1988). Procrastination is a common phenomenon among university students, who often procrastinate in completing academic tasks (Yang et al., 2019). Various studies have examined the relationship between academic procrastination and internet use (Lin et al., 2018; Mohammadi & Torabi, 2018). However, there are limited studies that assess the relationship between time management skills, academic procrastination, and academic performance of pharmacy students with internet addiction. This study aims to assess the relationship between the extent of internet addiction among pharmacy students in Türkiye and academic procrastination and time management skills.

## Material and Methods

### Study Design

This is a cross-sectional, descriptive study conducted between September and October 2023 in the Faculty of Pharmacy at a university in Turkey. In this study, sample size calculations were performed using G-Power (3.1.9.6). The computation was set for analysis of variance (ANOVA) with the expected effect size  $f$  at 0.20, an alpha level of 0.05 (two-tailed), and a power ( $1 - \beta$  error probability) of 0.95. The required sample size was accordingly determined to be 470.

### Instrument Development

The first section of the questionnaire consists of demographic information about the study participants, including their age, gender, purpose and frequency of Internet use, academic performance, and internet usage habits. The second section consists of a combination of three questionnaires, namely Young's Internet Addiction Test, The Time Management Inventory, and the Tuckman Procrastination Scale.

### Young's Internet Addiction Test

The assessment of students' internet addiction levels was conducted using the IAT (Young, 2009). The Turkish version of the IAT, including its validity and reliability, was established through a study conducted by Çakır and Horzum (Balta & Horzum, 2008). This questionnaire comprises 19 items, each rated on a six-point Likert scale, with responses ranging from 0 (does not apply) to 5 (always applies). The total scores range from 0 to 95, with scores between 0 and 30 indicating non-addictive internet usage. Scores falling within the ranges of 31 to 49, 50 to 79, and 80 to 95 correspond to mild, moderate, and severe internet addiction, respectively. The scale comprises three sub-dimensions. The first sub-dimension, titled "Preferring Online Activities Over Daily Life," consists of a total of eight items; the second sub-dimension, "Desire to Increase Online Time," consists of seven items; and the third sub-dimension, "Issues Arising from Online Activities," includes four items. The Cronbach's alpha coefficient of IAT was 0.89.

### Time Management Inventory (TMI)

The TMI was employed to assess the students' time management skills. Originally developed by Britton and Tesser in 1991 (Britton & Tesser, 1991), the Turkish validity and reliability of the TMI were confirmed by Alay and Koçak (Alay & Koçak, 2002). The TMI comprises a total of 27 items distributed across three subscales. The "Time Planning" subscale consists of 16 items that investigate participants' short-term planning regarding time utilization. The "Time Attitudes" subscale includes seven items that assess participants' attitudes towards time management. Lastly, the "Time Wasting" subscale comprises four items that pertain to participants' tendencies to use time inefficiently. The TMI employs a 5-point Likert scale, with response options ranging from "1-never" to "5-always." Total TMI scores range from 27 to 135, with higher scores indicating more proficient time management skills. In the Turkish validity and reliability study of the TMI, Cronbach's alpha coefficient was 0.87. In our study, the Cronbach's alpha coefficient for the TMI was 0.89.

### Tuckman Procrastination Scale (TPS)

The TPS is used to assess procrastination tendencies among college-level students and comprises 16 items with a uni-dimensional structure (Tuckman, 1991). In the translated Turkish version, the scale is composed of 14 items and employs a 5-point Likert-type response format. It was validated by Uzun-Ozer et al. in 2013 (Özer et al., 2013). When aggregating all items, the total scale score can range from a minimum of 14 to a maximum of 70. A higher score indicates a greater tendency towards AP. In our study, the Cronbach's alpha coefficient for the TPS was 0.86.

### Data Collection

Before data collection, study participants were briefed on the study's objectives, voluntary participation, and anonymity and confidentiality of the collected data. Written informed consent was obtained from students who willingly agreed to participate. A total of 642 students participated in the study. Data from twenty participants were excluded from the analysis due to identified errors and deficiencies. Subsequently, the analysis was conducted using data obtained from 622 participants.

### Ethical Consideration

Ethical approval was obtained from the Atatürk University Clinical Research Ethics Board (IRB Approval No: B.30.2.ATA.0.01.00/722).

### Data Analysis

Statistical analyses were performed using the Statistical Package for the Social Sciences SPSS v.26 (IBM SPSS Corp.; Armonk, NY, USA). The normality of the variables was assessed using the Shapiro – Wilk test, and the data were determined to follow a normal distribution. Descriptive statistical methods of frequency, percentage, minimum, maximum, mean, and standard deviation were utilized to characterize the participants' demographics, levels of Internet addiction, academic procrastination, and time management skills. Pearson's correlation analysis and regression analysis were employed to explore the relationships between scale scores. Independent samples t-tests and ANOVA were employed to compare participants' demographics with their levels of Internet addiction, academic procrastination, and time management skills. To identify group differences, the Tukey HSD test was applied. The significance level for the study was set at  $p < .05$ .

### Results

A total of 622 students participated in the study. The demographic characteristics of pharmacy students are presented in Table 1. The pharmacy students, with an average age of 21.32 years, were predominantly female (73%), mostly with an average academic achievement level and average socio-economic status. The majority of students lived in dormitories (66.7%), had personal computers (71.5%), and used the Internet to communicate with friends (78.8%; Table 1).

The overall IAT, TMI, and TPS scores of pharmacy students are presented in Table 2. Pharmacy students achieved an average score of  $31.60 \pm 13.52$  on the IAT, which shows a low level of internet addiction. Furthermore, over 50% of students showed no addiction, followed by mild addiction (38.6%). The results showed an average TMI score of  $84.26 \pm 14.37$  among pharmacy students, which indicates a moderate level of time management skills. Furthermore, pharmacy students received an average score of  $37.43 \pm 9.58$  on the TPS, indicating a slightly above-average level of procrastination (Table 2).

Table 3 shows a negative but significant correlation between student's IAT and TMI scores ( $r = -0.283$ ,  $p < .05$ ), preference for online activities over daily life and TMI score ( $r = -0.268$ ,  $p < .05$ ) and desire to increase online time and TMI total score ( $r = -0.276$ ,  $p < .05$ ). In contrast, a positive and significant relationship was observed between pharmacy students' total IAT and TPS scores ( $r = 0.558$ ,  $p < .05$ ), preference for online activities over daily life and the total TPS score ( $r = 0.514$ ,  $p < .05$ ) and desire to increase online time and total TPS score ( $r = -0.513$ ,  $p < .05$ ; Table 3).

Table 4 presents a comparison of the personal characteristics of pharmacy students with their average IAT scores. A significant difference was observed in the level of Internet addiction concerning students' school grade ( $p < .05$ ), and the time spent on the Internet ( $p < .05$ ). Specifically, pharmacy students in the fifth

**Table 1.**  
*Personal Characteristics of the Pharmacy Students (N = 622)*

| General Characteristics                    | Mean $\pm$ SD    | N (%)      |
|--------------------------------------------|------------------|------------|
| Age                                        | 21.32 $\pm$ 1.99 |            |
| Gender                                     |                  |            |
| Female                                     |                  | 454 (73.0) |
| Male                                       |                  | 168 (27.0) |
| School grade (year)                        |                  |            |
| First grade                                |                  | 112 (18.0) |
| Second grade                               |                  | 128 (20.6) |
| Third grade                                |                  | 118 (19.0) |
| Fourth grade                               |                  | 133 (21.4) |
| Fifth grade                                |                  | 131 (21.1) |
| Academic grade                             |                  |            |
| <2.50                                      |                  | 31 (4.9)   |
| $\geq 2.50$                                |                  | 591 (95.1) |
| Place of residence                         |                  |            |
| Alone at home                              |                  | 63 (10.1)  |
| Dorm                                       |                  | 415 (66.7) |
| At home with the family                    |                  | 144 (23.2) |
| Income status                              |                  |            |
| Low (< 20,000 TL)                          |                  | 82 (13.2)  |
| Below average (20,000 – 30,000 TL)         |                  | 198 (31.8) |
| Average (30,000 – 40,000 TL)               |                  | 263 (42.3) |
| High (> 40,000 TL)                         |                  | 79 (12.7)  |
| Owning a personal computer                 |                  |            |
| Yes                                        |                  | 445 (71.5) |
| No                                         |                  | 177 (28.5) |
| Daily Internet use                         |                  |            |
| 1 – 3 h                                    |                  | 211 (33.9) |
| 3 – 6 h                                    |                  | 318 (51.1) |
| >6 h                                       |                  | 93 (15.0)  |
| Purposes of social networking <sup>a</sup> |                  |            |
| Communicate with friends                   |                  | 490 (78.8) |
| Create a social circle                     |                  | 147 (23.6) |
| Make new friends                           |                  | 64 (10.3)  |
| Share information                          |                  | 348 (55.9) |
| Share video, sound                         |                  | 396 (63.7) |
| Play games and spend time                  |                  | 269 (43.2) |
| Other                                      |                  | 118 (19.0) |

<sup>a</sup>More than one option is marked.

grade who spent more than 6 hours on the Internet exhibited significantly higher levels of Internet addiction ( $33.73 \pm 14.00$ ;  $41.65 \pm 15.09$ , respectively). However, no significant differences were found in IAT scores based on gender ( $p = .096$ ), place of residence ( $p = .062$ ), ownership of a personal computer ( $p = .268$ ), or income

**Table 2.**  
*IAT, TMI and TPS Scores of Pharmacy Students*

|     |                                              | Mean $\pm$ SD<br>N (%) | Low Score | High Score | Score Range |
|-----|----------------------------------------------|------------------------|-----------|------------|-------------|
| IAT | Preferring Online Activities Over Daily Life | 11.85 $\pm$ 6.63       | 3         | 33         | 0 – 40      |
|     | Desire to increase online time               | 13.41 $\pm$ 5.98       | 4         | 32         | 0 – 35      |
|     | Issues arising from online activities        | 5.97 $\pm$ 3.14        | 0         | 18         | 0 – 20      |
|     | IAT total                                    | 31.60 $\pm$ 13.52      | 8         | 73         | 0 – 95      |
|     | No addiction (0–30)                          |                        |           | 317 (50.9) |             |
|     | Mild (31–49)                                 |                        |           | 240 (38.6) |             |
|     | Medium (50–79)                               |                        |           | 65 (10.5)  |             |
| TMI | Time planning                                | 48.91 $\pm$ 11.62      | 17        | 80         | 16 – 80     |
|     | Time attitudes                               | 21.92 $\pm$ 4.01       | 10        | 35         | 7 – 35      |
|     | Time - wasting                               | 13.44 $\pm$ 2.84       | 4         | 20         | 4 – 20      |
|     | TMI total                                    | 84.26 $\pm$ 14.37      | 41        | 122        | 27 – 135    |
| TPS | TPS total                                    | 37.43 $\pm$ 9.58       | 14        | 66         | 14 – 70     |

Note: IAT = Young's Internet Addiction Test; TMI = Time Management Inventory; TPS = Tuckman Procrastination Scale.

status ( $p = .136$ ). However, female students, whose academic grade is below 2.5, those living with their families, and/or belonging to high-income families and/or having personal computers generally have higher IAT scores. Furthermore, a significant difference was identified between the gender of pharmacy students and their tendency to prefer online activities over daily life ( $p = .025$ ). Female students tended to engage in online activities more frequently due to Internet addiction. Additionally, a significant difference was observed between the school grades of pharmacy students and their inclination to prefer online activities over daily life, the desire to increase online time, and issues arising from online activities ( $p < .05$ ). Students in the fifth grade displayed a higher preference for online activities over daily life and a stronger desire to increase online time compared to students in other grades. Another significant difference was found between the time spent by pharmacy students on the Internet and their inclination to prefer online activities over daily life, the desire to increase online time, and issues arising from online activities ( $p < .05$ ). Students who spent 6 hours or more on the Internet showed a

higher tendency toward preferring online activities over daily life, a stronger desire to increase online time, and more issues arising from online activities. Also, a positive and weak but significant correlation was found between pharmacy students' total IAT scores and their age ( $r = 0.089$ ,  $p = .027$ ). Furthermore, there were positive and weak but significant relationships between age and the preference for online activities over daily life and the issues arising from online activities ( $r = 0.084$ ,  $p = .036$ ;  $r = 0.092$ ,  $p = .021$ ), respectively (Table 4).

Table 5 provides a comparison of the personal characteristics of pharmacy students with their TMI and TPS score averages. A significant difference was observed between the gender ( $p = .006$ ), school grade ( $p < .05$ ), and daily internet use ( $p < .05$ ) of pharmacy students and their level of time management skills. Specifically, it was concluded that pharmacy students who used the internet for 1 – 3 hours daily, female students, and 1st-grade students exhibited significantly higher levels of adequate time management skills. However, no significant differences were

**Table 3.**  
*Relationships Between IAT and TMI/its Subscales and TPS*

| IAT and Subscales                            |       | TMI and Subscales |                |                |           | TPS Total |
|----------------------------------------------|-------|-------------------|----------------|----------------|-----------|-----------|
|                                              |       | Time Planning     | Time Attitudes | Time - Wasting | TMI Total |           |
| Preferring Online Activities Over Daily Life | $p$   | .000              | .000           | .000           | .000      | .000      |
|                                              | $r^a$ | –0.164*           | –0.343*        | –0.200*        | –0.268*   | 0.514*    |
| Desire to Increase Online Time               | $p$   | .000              | .000           | .000           | .000      | .000      |
|                                              | $r^a$ | –0.178*           | –0.289*        | –0.260*        | –0.276*   | 0.513*    |
| Issues Arising from Online Activities        | $p$   | .320              | .004           | .000           | .000      | .000      |
|                                              | $r^a$ | –0.40             | –0.115*        | –0.234*        | –0.111*   | 0.290*    |
| IAT total                                    | $p$   | .000              | .000           | .000           | .000      | .000      |
|                                              | $r^a$ | –0.169*           | –0.337*        | –.262*         | –0.283*   | 0.558*    |

Note: IAT = Young's Internet Addiction Test; TMI = Time Management Inventory; TPS = Tuckman Procrastination Scale.

<sup>a</sup>Pearson correlation analysis.

\* $p < .05$ .

**Table 4.***Comparison of the Personal Characteristics of the Students With Their IAT Score Averages*

| General Characteristics    | Preferring Online Activities Over Daily Life<br>Mean $\pm$ SD                                            | Desire to Increase Online Time<br>Mean $\pm$ SD                    | Issues Arising From Online Activities<br>Mean $\pm$ SD                     | IAT Total<br>Mean $\pm$ SD                                                                      |
|----------------------------|----------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------|----------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------|
| Age                        |                                                                                                          |                                                                    |                                                                            |                                                                                                 |
| $r^2$                      | 0.084*                                                                                                   | 0.044                                                              | 0.092*                                                                     | 0.089*                                                                                          |
| $p$                        | .036                                                                                                     | .270                                                               | .021                                                                       | .027                                                                                            |
| Gender                     |                                                                                                          |                                                                    |                                                                            |                                                                                                 |
| Female                     | 12.21 $\pm$ 6.62                                                                                         | 13.62 $\pm$ 6.00                                                   | 5.92 $\pm$ 3.03                                                            | 31.15 $\pm$ 13.60                                                                               |
| Male                       | 10.87 $\pm$ 6.58                                                                                         | 12.83 $\pm$ 5.90                                                   | 6.10 $\pm$ 3.45                                                            | 29.12 $\pm$ 13.25                                                                               |
| $t$ ; $p$                  | 2.246 <sup>a</sup> ; .025*                                                                               | 1.467 <sup>a</sup> ; .143                                          | - 0.615 <sup>a</sup> ; .539                                                | 1.667 <sup>a</sup> ; .096                                                                       |
| School grade               |                                                                                                          |                                                                    |                                                                            |                                                                                                 |
| First grade                | 9.19 $\pm$ 4.97                                                                                          | 11.37 $\pm$ 5.25                                                   | 5.03 $\pm$ 2.92                                                            | 25.06 $\pm$ 10.70                                                                               |
| Second grade               | 11.73 $\pm$ 5.98                                                                                         | 14.02 $\pm$ 5.79                                                   | 6.76 $\pm$ 3.24                                                            | 30.69 $\pm$ 13.07                                                                               |
| Third grade                | 13.25 $\pm$ 7.10                                                                                         | 13.64 $\pm$ 6.39                                                   | 6.42 $\pm$ 3.37                                                            | 32.79 $\pm$ 14.50                                                                               |
| Fourth grade               | 11.48 $\pm$ 7.00                                                                                         | 13.23 $\pm$ 5.67                                                   | 6.14 $\pm$ 3.15                                                            | 30.17 $\pm$ 13.41                                                                               |
| Fifth grade                | 13.34 $\pm$ 6.96                                                                                         | 14.50 $\pm$ 6.31                                                   | 6.40 $\pm$ 2.86                                                            | 33.73 $\pm$ 14.00                                                                               |
| $F$ ; $p$                  | 7.940 <sup>b</sup> ; .000*<br>5 > 1-2-4**<br>4 > 1-3-5**<br>3 > 13 > 1-4**<br>2 > 1-5**<br>1 > 2-3-4-5** | 4.898 <sup>b</sup> ; .001*<br>1 > 21 > 21 > 21 > 21<br>> 2-3-4-5** | 4.058 <sup>b</sup> ; .003*<br>5 > 1**<br>4 > 1**<br>3 > 1**<br>1 > 3-4-5** | 7.566 <sup>b</sup> ; .000*<br>5 > 1 - 4**<br>4 > 1 - 5**<br>3 > 1**<br>2 > 1**<br>1 > 2-3-4-5** |
| Academic grade             |                                                                                                          |                                                                    |                                                                            |                                                                                                 |
| <2.50                      | 13.87 $\pm$ 6.41                                                                                         | 13.32 $\pm$ 4.37                                                   | 5.39 $\pm$ 2.58                                                            | 32.10 $\pm$ 11.87                                                                               |
| $\geq$ 2.50                | 11.74 $\pm$ 6.63                                                                                         | 13.41 $\pm$ 6.06                                                   | 6.00 $\pm$ 3.17                                                            | 30.52 $\pm$ 13.61                                                                               |
| $t$ ; $p$                  | 1.747 <sup>a</sup> ; .081                                                                                | - - 0.079 <sup>a</sup> ; .937                                      | - - 1.056 <sup>a</sup> ; .292                                              | 0.631 <sup>a</sup> ; .0629                                                                      |
| Place of residence         |                                                                                                          |                                                                    |                                                                            |                                                                                                 |
| Alone at home              | 11.90 $\pm$ 6.27                                                                                         | 13.02 $\pm$ 4.97                                                   | 6.76 $\pm$ 3.54                                                            | 31.08 $\pm$ 12.28                                                                               |
| Dorm                       | 11.52 $\pm$ 6.66                                                                                         | 13.08 $\pm$ 6.03                                                   | 5.86 $\pm$ 3.12                                                            | 29.74 $\pm$ 13.59                                                                               |
| At home with the family    | 12.76 $\pm$ 6.65                                                                                         | 14.51 $\pm$ 6.16                                                   | 5.92 $\pm$ 3.01                                                            | 32.89 $\pm$ 13.66                                                                               |
| $F$ ; $p$                  | 1.861 <sup>b</sup> ; .156                                                                                | 3.207 <sup>b</sup> ; .041*<br>3 > 2**                              | 2.267 <sup>b</sup> ; .104                                                  | 2.965 <sup>b</sup> ; .062                                                                       |
| Income status              |                                                                                                          |                                                                    |                                                                            |                                                                                                 |
| Low                        | 12.21 $\pm$ 6.96                                                                                         | 13.22 $\pm$ 5.86                                                   | 5.83 $\pm$ 2.92                                                            | 30.62 $\pm$ 13.44                                                                               |
| Below average              | 11.80 $\pm$ 6.55                                                                                         | 13.42 $\pm$ 6.33                                                   | 5.66 $\pm$ 3.04                                                            | 30.24 $\pm$ 13.67                                                                               |
| Average                    | 11.33 $\pm$ 6.47                                                                                         | 13.17 $\pm$ 5.71                                                   | 5.98 $\pm$ 3.19                                                            | 29.88 $\pm$ 13.32                                                                               |
| High                       | 13.30 $\pm$ 6.89                                                                                         | 14.34 $\pm$ 6.10                                                   | 6.85 $\pm$ 3.33                                                            | 33.89 $\pm$ 13.71                                                                               |
| $F$ ; $p$                  | 1.895 <sup>b</sup> ; .129                                                                                | 0.806 <sup>b</sup> ; .491                                          | 2.792 <sup>b</sup> ; .040*<br>4 > 1 - 2-3**                                | 1.855 <sup>b</sup> ; .136                                                                       |
| Owning a personal computer |                                                                                                          |                                                                    |                                                                            |                                                                                                 |
| Yes                        | 11.94 $\pm$ 6.71                                                                                         | 13.48 $\pm$ 5.99                                                   | 6.19 $\pm$ 3.14                                                            | 30.98 $\pm$ 13.59                                                                               |
| No                         | 11.62 $\pm$ 6.43                                                                                         | 13.21 $\pm$ 5.96                                                   | 5.41 $\pm$ 3.09                                                            | 29.65 $\pm$ 13.35                                                                               |
| $t$ ; $p$                  | 0.536 <sup>a</sup> ; .592                                                                                | 0.501 <sup>a</sup> ; .617                                          | 2.795 <sup>a</sup> ; .005*                                                 | 1.109 <sup>a</sup> ; .268                                                                       |
| Daily Internet use         |                                                                                                          |                                                                    |                                                                            |                                                                                                 |
| 1 - 3 h                    | 9.37 $\pm$ 5.21                                                                                          | 10.42 $\pm$ 4.75                                                   | 5.01 $\pm$ 2.84                                                            | 24.39 $\pm$ 10.39                                                                               |
| 3 - 6 h                    | 12.02 $\pm$ 6.28                                                                                         | 14.01 $\pm$ 5.52                                                   | 6.13 $\pm$ 2.99                                                            | 31.50 $\pm$ 12.59                                                                               |

(Continued)

**Table 4.**
*Comparison of the Personal Characteristics of the Students With Their IAT Score Averages (Continued)*

| General Characteristics | Preferring Online Activities Over Daily Life<br>Mean $\pm$ SD | Desire to Increase Online Time<br>Mean $\pm$ SD | Issues Arising From Online Activities<br>Mean $\pm$ SD | IAT Total<br>Mean $\pm$ SD  |
|-------------------------|---------------------------------------------------------------|-------------------------------------------------|--------------------------------------------------------|-----------------------------|
| >6 h                    | 16.86 $\pm$ 7.68                                              | 18.12 $\pm$ 6.37                                | 7.59 $\pm$ 3.53                                        | 41.65 $\pm$ 15.09           |
| F ; p                   | 47.602 <sup>b</sup> ; .000*                                   | 69.380 <sup>b</sup> ; .000*                     | 24.210 <sup>b</sup> ; .000*                            | 65.109 <sup>b</sup> ; .000* |
|                         | 3 > 1 – 2**                                                   | 3 > 1 – 2**                                     | 3 > 1 – 2**                                            | 3 > 1 – 2**                 |
|                         | 2 > 1 – 3**                                                   | 2 > 1 – 3**                                     | 2 > 1 – 3**                                            | 2 > 1 – 3**                 |

Abbreviation: IAT, Young's internet addiction test.

<sup>a</sup>Independent groups T test.

<sup>b</sup>ANOVA.

<sup>c</sup>Pearson correlation analysis.

\* $p < .05$ .

\*\*LSD test.

found in time management skills based on academic achievement ( $p = .846$ ), place of residence ( $p = .105$ ), ownership of a personal computer ( $p = .764$ ), and income status ( $p = .455$ ). It was determined that pharmacy students with academic achievements of 2.50 and above, those living alone, having higher income status, and owning a personal computer generally demonstrated more effective time management skills. Moreover, a significant difference was identified between the time planning, time attitudes, and time-wasting subscales and the pharmacy students' gender ( $p < .05$ ), school grade ( $p < .05$ ), and daily internet use ( $p < .05$ ). A significant difference was also found between the place of residence ( $p = .024$ ) of pharmacy students and their time-wasting subscale. Students with academic achievements of 2.50 and above exhibited better time planning, more positive time attitudes, and less time-wasting tendencies. Additionally, a positive and weak but significant correlation was found between the total TMI, time attitudes-time wasting subscales scores of pharmacy students and their age ( $r = -0.106$ ,  $p = .008$ ;  $r = -0.108$ ,  $p = .007$ ;  $r = -0.134$ ,  $p = .01$ ). A significant difference was observed in the level of academic procrastination among pharmacy students based on their school grades ( $p < .05$ ), place of residence ( $p = .007$ ), and daily internet use ( $p < .05$ ). It was determined that the academic procrastination level of pharmacy students who used the internet for more than 6 hours daily, those living with their family, and 3rd-grade students was significantly higher. However, no significant differences ( $p > .05$ ) were found in academic procrastination levels based on gender ( $p = .178$ ), academic achievement ( $p = .654$ ), income status ( $p = .873$ ), or ownership of a personal computer ( $p = .122$ ). Nevertheless, it was observed that female pharmacy students, those with academic achievements below 2.50, individuals with below-average income status, and those without personal computers exhibited higher academic procrastination levels. Additionally, no correlation was found between pharmacy students' total TPS score and their age ( $r = 0.054$ ,  $p = .178$ ; Table 5).

In the regression analysis, multicollinearity was not a concern (for all predictors: tolerance values  $> 0.1$  and VIF  $< 5$ ). A forward linear regression with Internet addiction score as the dependent variable showed that higher academic procrastination ( $\beta = .60$ ;  $p < .005$ ) scores were significantly related to Internet addiction. Additionally, 32% variance in Internet addiction is explained by academic procrastination and time management ( $R^2 = 0.32$ ,

$p < .001$ ). A second forward linear regression with academic procrastination score as the dependent variable found that higher Internet addiction ( $\beta = .42$ ;  $p < .001$ ), and lower time management ( $\beta = -.48$ ;  $p < .001$ ) were significantly related to higher academic procrastination. Furthermore, 52% variance in academic procrastination is explained by internet addiction and time management ( $R^2 = 0.52$ ,  $p < .001$ ). A third forward linear regression with time management score as the dependent variable found that lower academic procrastination ( $\beta = -.95$ ;  $p < .001$ ) was significantly related to higher time management. Moreover, 36% variance in time management is explained by academic procrastination and Internet addiction ( $R^2 = 0.36$ ,  $p < .001$ ; Table 6).

## Discussion

The study findings showed that pharmacy students in Türkiye have mild internet addiction. These results showed similarity with pharmacy students in the USA, where university students also showed lower levels of internet addiction, but contrasted with a study conducted in Egypt, where pharmacy students showed a moderate level of internet addiction (Sayed et al., 2022; Younes et al., 2016).

The results of this study highlighted a statistically significant correlation between the total IAT scores of pharmacy students and their age, and these results coincide with the findings of a similar study in Türkiye (Alarçin & Şirin, 2021). However, in a study conducted with university students in Egypt, no correlation was found between internet addiction and the age group of students (Sayed et al., 2022).

The results of this study found that female students in Türkiye exhibited a higher prevalence of internet addiction, which is inconsistent with other documented studies conducted in Türkiye and other parts of the developed world (Upadhayay & Guragain, 2017; Younes et al., 2016). Despite higher internet usage, the findings of this study reported that the time management skills of female pharmacy students were significantly higher than those of male students, which was also supported by previously conducted studies around the world (Gayef et al., 2017; Mishra et al., 2014). The findings of this study reported no significant difference between pharmacy students' grades and time management skills, which is in contrast to another study conducted among nursing students in Türkiye (Altiner Yas et al., 2022).

**Table 5.***Comparison of students' personal characteristics with their TMI and TPS score averages*

| General characteristics    | Time planning<br>Mean $\pm$ SD              | Time attitudes<br>Mean $\pm$ SD             | Time - wasting<br>Mean $\pm$ SD             | TMI total<br>Mean $\pm$ SD                               | TPS total<br>Mean $\pm$ SD                                |
|----------------------------|---------------------------------------------|---------------------------------------------|---------------------------------------------|----------------------------------------------------------|-----------------------------------------------------------|
| Age                        |                                             |                                             |                                             |                                                          |                                                           |
| $r^c$                      | -0.061                                      | - - 0.108*                                  | -0.134*                                     | -0.106*                                                  | 0.054                                                     |
| $p$                        | .126                                        | .007                                        | .001                                        | .008                                                     | .178                                                      |
| Gender                     |                                             |                                             |                                             |                                                          |                                                           |
| Female                     | 49.92 $\pm$ 11.24                           | 21.55 $\pm$ 3.92                            | 13.76 $\pm$ 2.64                            | 85.23 $\pm$ 14.36                                        | 37.77 $\pm$ 9.75                                          |
| Male                       | 46.18 $\pm$ 12.21                           | 22.91 $\pm$ 4.08                            | 12.56 $\pm$ 3.17                            | 81.65 $\pm$ 14.10                                        | 36.49 $\pm$ 9.06                                          |
| $t$ ; $p$                  | 3.596 <sup>a</sup> ; .000*                  | -3.797 <sup>a</sup> ; .000*                 | 4.780 <sup>a</sup> ; .000*                  | 2.776 <sup>a</sup> ; .006*                               | 1.487 <sup>a</sup> ; .138                                 |
| School grade               |                                             |                                             |                                             |                                                          |                                                           |
| First grade                | 52.46 $\pm$ 10.82                           | 23.21 $\pm$ 4.22                            | 14.61 $\pm$ 2.30                            | 90.28 $\pm$ 13.89                                        | 33.97 $\pm$ 8.85                                          |
| Second grade               | 49.02 $\pm$ 11.75                           | 21.97 $\pm$ 4.70                            | 13.26 $\pm$ 2.66                            | 84.25 $\pm$ 14.96                                        | 37.63 $\pm$ 9.51                                          |
| Third grade                | 46.14 $\pm$ 9.89                            | 21.40 $\pm$ 3.40                            | 13.35 $\pm$ 2.81                            | 80.79 $\pm$ 12.37                                        | 39.40 $\pm$ 8.95                                          |
| Fourth grade               | 48.44 $\pm$ 12.25                           | 21.84 $\pm$ 3.86                            | 13.27 $\pm$ 3.02                            | 83.55 $\pm$ 14.66                                        | 36.96 $\pm$ 10.04                                         |
| Fifth grade                | 48.73 $\pm$ 12.31                           | 21.40 $\pm$ 3.51                            | 12.87 $\pm$ 3.03                            | 82.99 $\pm$ 14.25                                        | 38.88 $\pm$ 9.62                                          |
| $F$ ; $p$                  | 4.441 <sup>b</sup> ; .002*<br>1 > 2-3-4-5** | 4.297 <sup>b</sup> ; .002*<br>1 > 2-3-4-5** | 6.557 <sup>b</sup> ; .000*<br>1 > 2-3-4-5** | 7.248 <sup>b</sup> ; .000*<br>1 > 2-3-4-5**              | 5.913 <sup>b</sup> ; .000*<br>1 > 2-3-4-5**<br>3 > 4**    |
| Academic grade             |                                             |                                             |                                             |                                                          |                                                           |
| <2.50                      | 49.06 $\pm$ 10.08                           | 21.77 $\pm$ 3.78                            | 12.94 $\pm$ 2.09                            | 83.77 $\pm$ 12.65                                        | 38.42 $\pm$ 9.38                                          |
| $\geq$ 2.50                | 48.90 $\pm$ 11.70                           | 21.93 $\pm$ 4.02                            | 13.47 $\pm$ 2.87                            | 84.29 $\pm$ 14.46                                        | 37.37 $\pm$ 9.59                                          |
| $t$ ; $p$                  | 0.077 <sup>a</sup> ; .938                   | - - 0.205 <sup>a</sup> ; .838               | - - 1.013 <sup>a</sup> ; .312               | - - 0.194 <sup>a</sup> ; .846                            | 0.592 <sup>a</sup> ; .654                                 |
| Place of residence         |                                             |                                             |                                             |                                                          |                                                           |
| Alone at home              | 49.60 $\pm$ 12.48                           | 22.76 $\pm$ 3.61                            | 12.68 $\pm$ 3.15                            | 85.05 $\pm$ 14.69                                        | 35.94 $\pm$ 10.01                                         |
| Dorm                       | 49.29 $\pm$ 11.32                           | 21.99 $\pm$ 4.07                            | 13.64 $\pm$ 2.74                            | 84.92 $\pm$ 14.11                                        | 36.91 $\pm$ 9.30                                          |
| At home with the family    | 47.50 $\pm$ 12.05                           | 21.33 $\pm$ 3.94                            | 13.20 $\pm$ 2.93                            | 82.03 $\pm$ 14.82                                        | 39.56 $\pm$ 9.92                                          |
| $F$ ; $p$                  | 1.395 <sup>b</sup> ; .249                   | 3.019 <sup>b</sup> ; .050                   | 3.773 <sup>b</sup> ; .024*                  | 2.266 <sup>b</sup> ; .105                                | 5.006 <sup>b</sup> ; .007*<br>3 > 1-2**                   |
| Income status              |                                             |                                             |                                             |                                                          |                                                           |
| Low                        | 50.23 $\pm$ 11.11                           | 21.87 $\pm$ 4.01                            | 13.44 $\pm$ 2.69                            | 85.54 $\pm$ 14.55                                        | 37.41 $\pm$ 9.68                                          |
| Below average              | 48.58 $\pm$ 12.60                           | 21.89 $\pm$ 4.25                            | 13.68 $\pm$ 2.86                            | 84.15 $\pm$ 15.10                                        | 37.83 $\pm$ 9.73                                          |
| Average                    | 48.17 $\pm$ 10.76                           | 21.83 $\pm$ 3.92                            | 13.44 $\pm$ 2.81                            | 83.44 $\pm$ 13.29                                        | 37.08 $\pm$ 9.30                                          |
| High                       | 50.80 $\pm$ 12.21                           | 22.33 $\pm$ 3.70                            | 12.84 $\pm$ 2.99                            | 85.96 $\pm$ 15.72                                        | 37.57 $\pm$ 10.12                                         |
| $F$ ; $p$                  | 1.459 <sup>b</sup> ; .225                   | 0.324 <sup>b</sup> ; .808                   | 1.678 <sup>b</sup> ; .171                   | 0.873 <sup>b</sup> ; .455                                | 0.233 <sup>b</sup> ; .873                                 |
| Owning a personal computer |                                             |                                             |                                             |                                                          |                                                           |
| Yes                        | 49.11 $\pm$ 11.38                           | 21.95 $\pm$ 4.03                            | 13.31 $\pm$ 2.90                            | 84.37 $\pm$ 13.82                                        | 37.05 $\pm$ 9.50                                          |
| No                         | 48.39 $\pm$ 12.23                           | 21.83 $\pm$ 3.96                            | 13.77 $\pm$ 2.66                            | 83.99 $\pm$ 15.70                                        | 38.37 $\pm$ 9.74                                          |
| $t$ ; $p$                  | 0.699 <sup>a</sup> ; .485                   | 0.343 <sup>a</sup> ; .732                   | - - 1.828 <sup>a</sup> ; .068               | 0.301 <sup>a</sup> ; .764                                | - - 1.547 <sup>b</sup> ; .122                             |
| Daily Internet use         |                                             |                                             |                                             |                                                          |                                                           |
| 1 - 3 h                    | 50.56 $\pm$ 11.98                           | 22.48 $\pm$ 3.91                            | 13.87 $\pm$ 2.92                            | 86.91 $\pm$ 14.69                                        | 34.75 $\pm$ 8.68                                          |
| 3 - 6 h                    | 48.51 $\pm$ 11.18                           | 21.94 $\pm$ 3.82                            | 13.42 $\pm$ 2.67                            | 83.86 $\pm$ 13.84                                        | 37.57 $\pm$ 9.37                                          |
| >6 h                       | 46.53 $\pm$ 11.85                           | 20.58 $\pm$ 4.53                            | 12.55 $\pm$ 3.06                            | 79.66 $\pm$ 14.23                                        | 42.99 $\pm$ 9.86                                          |
| $F$ ; $p$                  | 4.319 <sup>b</sup> ; .014*<br>1 > 2 - 3**   | 7.392 <sup>b</sup> ; .001*<br>3 > 1 - 2**   | 7.124 <sup>b</sup> ; .001*<br>3 > 1 - 2**   | 8.683 <sup>b</sup> ; .000*<br>1 > 2 - 3**<br>2 > 1 - 3** | 25.842 <sup>b</sup> ; .000*<br>1 > 2 - 3**<br>2 > 1 - 3** |

Abbreviation: TMI, time management inventory; TPS, Tuckman procrastination scale.

<sup>a</sup>Independent groups T test.<sup>b</sup>ANOVA.\* $p < .05$ .

\*\*LSD test.

**Table 6.**
*Regression Analysis*

| <b>Model 1: Linear Regression Taking the Internet Addiction score as the Dependent Variable</b>       |                      |                                          |                                        |          |                  |            |
|-------------------------------------------------------------------------------------------------------|----------------------|------------------------------------------|----------------------------------------|----------|------------------|------------|
| <b>Variable</b>                                                                                       | <b>R<sup>2</sup></b> | <b>Unstandardized <math>\beta</math></b> | <b>Standardized <math>\beta</math></b> | <b>p</b> | <b>Tolerance</b> | <b>VIF</b> |
| Academic procrastination                                                                              | 0.32                 | .85                                      | .60                                    | <.001    | 0.645            | 1.550      |
| Time management                                                                                       |                      | .08                                      | .07                                    | .06      | 0.645            | 1.550      |
| <b>Model 2: Linear Regression Taking the Academic Procrastination Score as the Dependent Variable</b> |                      |                                          |                                        |          |                  |            |
| <b>Variable</b>                                                                                       | <b>R<sup>2</sup></b> | <b>Unstandardized <math>\beta</math></b> | <b>Standardized <math>\beta</math></b> | <b>p</b> | <b>Tolerance</b> | <b>VIF</b> |
| Internet addiction                                                                                    | 0.52                 | .30                                      | .42                                    | <.001    | 0.920            | 1.087      |
| Time management                                                                                       |                      | -.32                                     | -.48                                   | <.001    | 0.920            | 1.087      |
| <b>Model 3: Linear Regression Taking the Time Management Score as the Dependent Variable</b>          |                      |                                          |                                        |          |                  |            |
| <b>Variable</b>                                                                                       | <b>R<sup>2</sup></b> | <b>Unstandardized <math>\beta</math></b> | <b>Standardized <math>\beta</math></b> | <b>p</b> | <b>Tolerance</b> | <b>VIF</b> |
| Internet addiction                                                                                    | 0.36                 | .08                                      | .07                                    | .06      | 0.689            | 1.452      |
| Academic procrastination                                                                              |                      | -.95                                     | -.64                                   | <.001    | 0.689            | 1.452      |

The results also showed that internet addiction among pharmacy students in Türkiye was not related to their academic performance. Similar results have been reported among students in Egypt (Sayed et al., 2022). However, studies conducted in Slovenia and the USA have shown that internet addiction may affect students' academic performance, as students tend to spend most of their time using the internet (Li et al., 2015; Macur et al., 2016). Studies examining the relationship between university students' academic performance and time management skills have revealed that students who use their time effectively also achieve higher academic grades (Altiner Yas et al., 2022; Siddiqi & Memon, 2016). Our study showed that there was no difference between students' academic performance levels and the time planning, time attitudes, and time-wasting subscales, which is inconsistent with another study conducted among nursing students in Türkiye (Altiner Yas et al., 2022).

The study results also showed that pharmacy students who live with their families use the Internet more frequently. It has been reported that engaging in sports and other healthy social activities can help minimize stress and internet addiction among students and also keep them physically and mentally fit (Upadhayay & Guragain, 2017). Another factor reported in this study was that there was no difference between internet addiction and the income level of students, which is consistent with the findings of another study conducted among Malaysian students (Radeef & Faisal, 2020). Our study showed that pharmacy students who had personal computers had higher levels of internet addiction because they can access the internet in the comfort of their homes, which increases internet utilization and subsequently addiction. Similar findings have been reported by a study conducted among nursing students (Turan et al., 2020).

Excessive Internet usage is a significant indicator of addiction (Griffiths, 2005). The results of this study highlighted a strong correlation between daily Internet usage time and Internet addiction, in line with the results of another study conducted among university students in Türkiye (Savci & Aysan, 2017). However, another study reported that Internet addiction scores did not differ significantly based on the duration of daily Internet use (Eroğlu & Bayraktar, 2017).

Academic procrastination among pharmacy students increases with an increase in Internet addiction, which contradicts previous findings that found no significant relationship between academic procrastination and internet use (Odaci, 2011). Specifically, the preference for online activities over daily life, the desire to increase online time, and issues arising from online activities significantly raise the academic procrastination levels of pharmacy students in Türkiye. Similarly, many studies have confirmed that there is a strong relationship between internet use and procrastination. For example, Davis et al. reported a strong and positive relationship between procrastination and Internet use (Davis, 2001). Similarly, Kandemir showed that there is a strong and positive relationship between academic procrastination and the degree of internet addiction (Kandemir, 2014). In addition, the regression analysis results of our study showed that internet addiction significantly predicted academic procrastination, in line with the results of another study conducted in Thailand (Nadarajan et al., 2023).

The findings of this study also reported that internet addiction negatively affects students' time management skills, which was reported in studies conducted with university students in Türkiye and Pakistan (Altiner Yas et al., 2022; Siddiqi & Memon, 2016). More specifically, the results of this study highlighted that the preference for online activities over daily life, the desire to increase online time, and issues arising from online activities significantly diminish the effective time management skills of pharmacy students.

#### **Limitations and Directions/Suggestions for Future Research**

In our study, internet addiction was found to be a significant predictor of academic procrastination. Some studies emphasize that this relationship could be bidirectional. Therefore, further research is needed. In addition, a significant relationship was found between internet addiction and time management. It is anticipated that intervention studies on time management will be planned and studies on reducing internet addiction will be useful for university students. The study has some limitations. Firstly, the results may not be generalizable to all pharmacy students in Türkiye. Secondly, data collection based on student self-report is considered a limitation, as self-report bias may occur.

This study has provided valuable insights into the relationship between academic procrastination, time management, and internet addiction among pharmacy students in Türkiye. This study revealed that with the increased use of the internet, pharmacy student's time management skills diminish, and academic procrastination increases. Furthermore, it was found that students' internet addiction has a negative impact on their academic grades. In particular, a significantly higher level of internet addiction was found among students spending more than 6 hours on the internet. It was also found that students who used their time management skills effectively achieved better academic grades. In light of these findings, it is suggested that interventions aimed at promoting responsible internet usage and mitigating academic procrastination tendencies should be developed among pharmacy students.

**Data Availability Statement:** The data that support the findings of this study are available on request from the corresponding author.

**Ethics Committee Approval:** This study was approved by the Atatürk University Clinical Research Ethics Board (IRB Approval No: B.30.2.ATA.0.01.00/722).

**Informed Consent:** Written informed consent was obtained from the participants who agreed to take part in the study.

**Peer-review:** Externally peer-reviewed.

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## ORIGINAL ARTICLE

# Examining the Mediation Role of Parental Guilt in the Relationship between Working Mothers' Smartphone Addiction and Their Children's Problematic Technology Use\*

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## Main Points

- As a result of this study, according to the assessments made by working mothers, it was determined that parental guilt had a mediating effect on the relationship between smartphone addiction and problematic technology use in their children.
- It can be thought that mothers feel guilty because of the time they spend with their smartphones and exhibit addictive behaviors, which may lead them to engage in guilt-compensating behaviors that promote a permissive attitude towards their children. Accordingly, the mother who feels guilty may adopt a permissive parental attitude and engage in behaviors that compensate for her guilt.
- A mother who feels guilty, adopts a permissive parental attitude, and engages in behaviors that compensate for her guilt may mediate the development of problematic technology use in her child.

## Abstract

This study aimed to examine the mediation of parental guilt in the relationship between smartphone addiction in working mothers and problematic technology use among their preschool children. A total of 260 working mothers, aged between 22 and 50, with preschool children, participated in the study. The study utilized the "Personal Information Form," "Smartphone Addiction Scale Short Form," "Parental Guilt Scale," and "Problematic Technology Use Scale for Children." SPSS bootstrapping analysis was applied to investigate the mediation of parental guilt in the relationship between mothers' smartphone addiction and their preschool children's problematic technology use. The analysis revealed that parental guilt mediated the relationship between mothers' smartphone addiction and their children's problematic technology use. The findings are discussed considering existing knowledge on smartphone addiction, parental guilt, and problematic technology use in children. In this direction, suggestions are presented with a focus on working mothers to reduce problematic technology use among children.

**Keywords:** Parental guilt, preschool period, problematic technology use, smartphone addiction, working mother

## Introduction

Working mothers are expected to balance work, their spouses, children, and family, in addition to the effort they put in to reach the positions they aim for in their careers (Korkmaz, 2020). When the responsibilities of motherhood and working roles are combined, especially women with young

children face difficulties (Gozubuyuk, 2010). For women who try to balance their roles as worker, wife, and mothers, smartphones have become their helpers in fulfilling their responsibilities. However, digital conveniences are not limited to working life. Although needs are increasingly being met faster and easier through the applications developed, as Erbas (2020) emphasizes, technological addictions

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have become widespread because of being able to access technology as easily as a smartphone.

Today, especially with the diversification of technological devices, the rate of preschool children's access to these devices is rapidly increasing (Topcu, 2018). As a result of the gradual increase in technology use, problematic technology uses, such as technological addictions, have emerged, and technological addictions have started to be taken seriously in early childhood (Erbaş, 2020). In fact, children's predisposition to digital tools has become so high that in many current discussions, children are referred to as the "app generation," the "wireless generation," and the "e-child" (Selwyn & Odabasi, 2022).

Mothers' high use of smartphones and permissive parental attitudes towards their children increase problematic technology use (Kol, 2021). It is expected that the behaviors exhibited by children who are exposed to their parents' attitudes and observe their habits will also follow this trend. Therefore, in studies examining children's problematic use of technology, it is essential to investigate the technology habits and technology addictions of mothers, as they are the individuals with whom the child spends the most time from birth to primary school.

According to Aktas (1994), since mothers work and are busy for most of their days, they often experience feelings of guilt, believing they may be neglecting their children. Moreover, it is known that individuals experiencing guilt tend to adopt compensatory behaviors (Hoffman, 1996). Parents may demonstrate actions such as confessing, apologizing, offering delicious snacks, and giving more hugs to alleviate the guilt they feel (Aarntzen et al., 2019; Tangney, 1990). These compensatory behaviors, developed to alleviate guilt, often lead parents to adopt a permissive attitude. According to Baumrind (1966), parents with permissive attitudes may find it difficult to control their children's behavior because they allow them significant freedom, and children raised in this manner may have the freedom to eat, sleep, and use technology whenever they wish.

In the literature, Yuksel et al. (2020) concluded that parents' supervision of their children's internet use had an impact on the adolescents' addiction to the internet. According to the findings of the study by Buyuksahin Cevik & Celikkaleli (2010), adolescents who believed their parents' attitudes toward them were indifferent had significantly higher internet addiction levels. Although there have been studies on technology use with a focus on parents, studies on working mothers have been found

to be incomplete (Gunuç & Atli, 2018; Isikoglu & Ergenekon, 2021; Oguz & Kutluca, 2020). Especially considering the critical importance of the preschool period for a child's development, it was deemed necessary to examine the use of technology by working mothers and their children due to the increasing educational opportunities for women, changes in cultural structure, and economic concerns. In this context, it is believed that a mother's active use of a smartphone can influence the child. Also, mothers who serve as important role models for young children in technology use (Kurtoglu Erden & Uslupehlivan, 2021) may exhibit permissive attitudes toward technology use to alleviate guilt (Hoffman, 1996), which could be related to the child's problematic technology use. In this regard, it can be inferred that the child may develop problematic technology use because of the mother's increased guilt associated with smartphone use and her compensatory behaviors. This study aims to examine the relationship between working mothers' smartphone addiction, parental guilt, and preschool children's problematic technology use. The research questions are as follows:

- Is there a relationship between problematic technology use in children, smartphone addiction in working mothers, and parental guilt?
- Does parental guilt play a mediating role in the relationship between working mothers' smartphone addiction and their children's problematic technological use?

## Material and Methods

This study was conducted following the relational model. The relational model is employed to address doubts about the relationship between variables through a literature review and to provide justification for the identified relationship (Wood & Brink, 1998). This model is an attempt to determine the variable most highly correlated with the criterion variable (McMillan & Schumacher, 2006). The relationships among these variables, highlighting the mediating role, are illustrated in Figure 1.

### Participants

The research group comprises working mothers with preschool children. In this study, the convenience sampling method, preferred in cases where individuals available at a certain place and time voluntarily participate, was utilized (Martella et al., 2013). This sampling technique involves the selection of participants who are typically situated at a location (such as a school) that is appropriate for the study purpose. Convenience sampling is a cost-effective and time-efficient sampling strategy that is

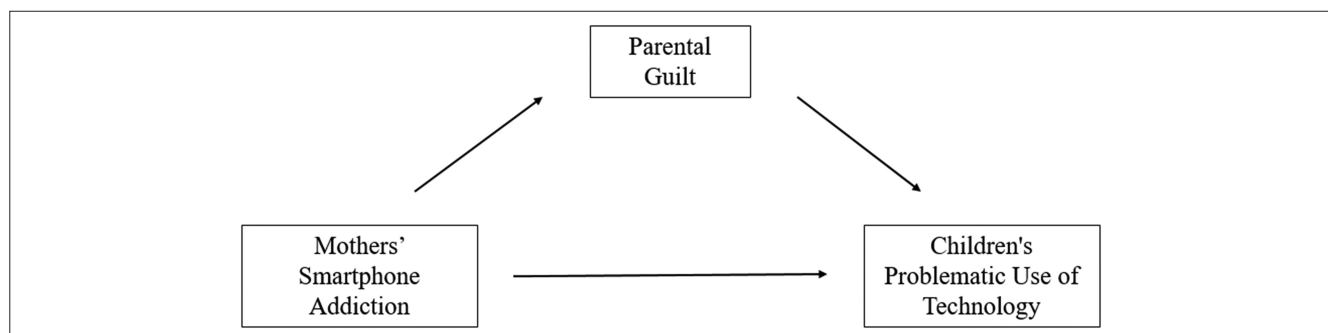


Figure 1. Model for Children's Problematic Use of Technology.

straightforward to use (Stratton, 2021). In this case, the researchers gathered information by contacting working mothers in their social circle who had kids between the ages of 2 and 6. According to the Social Security Institution (2023), individuals who work for an employer, independently on their own behalf, or as public officials with insurance are categorized as employees. Kline (2001) suggested that 200 participants may be sufficient for the analysis, so we reached 260 working mothers in Türkiye, aged between 22 and 50, with preschool-age children. Demographic information about the participants in the research group is provided in Table 1.

As shown in Table 1, the weekly working hours of the mothers were observed as follows: 52 (20%) of them worked less than 20 hours, 109 (41.9%) worked 21 – 40 hours, and 99 (38.1%) worked 41 hours or over. Additionally, 102 (39.2%) mothers work in the public sector, 127 (48.8%) work in the private sector, and 31 (11.9%) own their own businesses.

#### Data Collection and Data Collection Tools

The dataset was created by combining the personal information form with the measurement tools determined within the scope of the research. As a result of the decision of Yıldız Technical University Social and Human Sciences Research Ethics Committee meeting on October 31, 2022, the approval of the

ethics committee of Yıldız Technical University University numbered 20230502065 was obtained. Within the dataset, participants were first provided with information about the research's purpose, the use of the data exclusively for this study, non-disclosure to third parties, guidelines for responding, and information about the researcher, all in the context of informed consent. Forms were distributed through the Google Forms application on an online platform. Data were collected on a voluntary basis from mothers who were requested to complete the form for only one of their children. Data collection took place between December 2022 and February 2023. Further details about the measurement tools are provided below.

#### Problematic Technology Use Scale for Children

The Problematic Technology Use Scale for Children was developed by Konca et al. (2022) for parents with children in the preschool developmental stage. The scale employs a 5-point Likert scale and consists of 26 items. The exploratory factor analysis revealed a 4-factor structure, including continuity of use, resistance to control, impact on development, and deprivation-escape. Subsequently, confirmatory factor analysis confirmed that the goodness-of-fit index values were at an acceptable level. Cronbach's alpha coefficient for the total score of the scale was calculated as .93 (Konca et al., 2022). In this study, Cronbach's alpha coefficient was found to be .93.

#### Smartphone Addiction Scale

The 10-item, 6-point Likert scale-based Smartphone Addiction Scale was created by Kwon et al. (2013) to assess smartphone addiction. In the adaptation study into Turkish conducted by Noyan et al. (2015). The scale includes five factors: daily life functioning, deprivation, virtual environment-oriented relationships, overuse, and tolerance. Confirmatory factor analysis confirmed that the goodness-of-fit index values were at an acceptable level. The Cronbach's alpha coefficient for the total score of the scale items was found to be .86 (Noyan et al., 2015). In this study, the Cronbach's alpha coefficient was determined to be .90.

#### Parental Guilt Scale

Haslam et al. (2020) created the Parental Guilt Scale, which consists of 10 items graded on a 7-point Likert scale, to evaluate the cognitive and emotional aspects of guilt felt in relation to parenting. Reliability and validity studies were conducted by Polat et al. (2022) for the Turkish culture. The scale does not have sub-dimensions. Confirmatory factor analysis confirmed that the goodness-of-fit index values were at an acceptable level. The Cronbach's alpha reliability coefficient for the scale was calculated as .89 (Polat et al., 2022). In this study, Cronbach's alpha coefficient was found to be .90.

#### Data Analysis

Statistical analyses were conducted using the SPSS 23.0 (IBM SPSS Corp.; Armonk, NY, USA) package program and the SPSS PROCESS v.4.2 plug-in. It was observed that the variables in this study were convenient for univariate normality and also Mahalanobis distance values were calculated to assess multivariate normality, and three data points with values less than .001 were identified as outliers and removed. To unveil both direct and indirect effects, a regression-based mediation macro was employed following the recommendations of Preacher & Hayes (2018). Bootstrapping was applied to assess the significance of

**Table 1.**

*Frequency and Percentage Values of Demographic Information of the Participants*

| Participants' Characteristics | f   | %    |
|-------------------------------|-----|------|
| Mother's age                  |     |      |
| Under 35 years old            | 167 | 64.2 |
| 35 years of age or older      | 93  | 35.8 |
| Mother's education level      |     |      |
| High school                   | 32  | 12.3 |
| Undergraduate                 | 154 | 59.2 |
| Graduate                      | 74  | 28.5 |
| Mother's weekly working time  |     |      |
| Less than 20 hours            | 52  | 20   |
| 21 – 40 hours                 | 109 | 41.9 |
| 41 hours or over              | 99  | 38.1 |
| Mother's sector of work       |     |      |
| Public sector                 | 102 | 39.2 |
| Private sector                | 127 | 48.8 |
| Own business                  | 31  | 11.9 |
| Child age                     |     |      |
| Under 35 months               | 83  | 32.4 |
| 36 – 48 months                | 59  | 23   |
| 49 – 60 months                | 57  | 22.3 |
| 61 months or older            | 57  | 22.3 |
| Child gender                  |     |      |
| Girl                          | 128 | 49.2 |
| Boy                           | 132 | 50.8 |

the mediation. When using the bootstrap technique, a 95% CI was established using 5000 samples. Model four was utilized in the analysis, with the model structured as follows: the independent variable, smartphone addiction (X), the mediating variable, parental guilt (Mi) and the dependent variable, children's problematic use of technology (Y). mother's age and the child's gender were included in the analysis as control variables.

## Results

Pearson correlation analysis was conducted to determine the relationship between the child's problematic technology use, the mother's smartphone addiction, and parental guilt variables. The results are presented in Table 2.

As shown in Table 2, there is a significant positive relationship between the child's problematic technology use and the mothers' smartphone addiction ( $r = .25$ ;  $p < .01$ ); the child's problematic technology use and parental guilt ( $r = .30$ ;  $p < .01$ ); and the mothers' smartphone addiction and parental guilt ( $r = .18$ ;  $p < .01$ ). Since a significant positive relationship was observed between these variables, a mediation analysis was conducted. The model used to analyze the mediation of parental guilt in the relationship between the problematic technology use of preschool children with working mothers and the mothers' smartphone addiction is presented in Figure 2.

**Table 2. Pearson**  
*Correlation Analysis Between Problematic Technology Use, Smartphone Addiction, and Parental Guilt*

|                                             | Correlation |       |       |
|---------------------------------------------|-------------|-------|-------|
|                                             | 1           | 2     | 3     |
| 1. Children's problematic use of technology | –           |       |       |
| 2. Mothers' smartphone addiction            | .25**       | –     |       |
| 3. Parental guilt                           | .30**       | .18** | –     |
| Mean                                        | 50.82       | 24.4  | 44.6  |
| SD                                          | 19.14       | 10.68 | 13.75 |

Note: \*\* $p < .01$ .

As can be seen in Figure 2, when examining the direct effects of the model, it was found that mothers' smartphone addiction predicted parental guilt ( $B = .32$ ,  $p < .001$ ), mothers' smartphone addiction predicted children's problematic use of technology ( $B = .52$ ,  $p < .001$ ), and parental guilt predicted children's problematic use of technology ( $B = .37$ ,  $p < .001$ ). Before adding parental guilt as a mediator variable to the model, it was observed that mothers' smartphone addiction directly and significantly predicted children's problematic use of technology ( $B = .52$ ,  $p < .001$ ). When the mediator variable was included in the model, the predictive power slightly decreased ( $B = .39$ ,  $p < .001$ ), but it remained significant. Consequently, these results indicate the presence of an indirect effect in the model, and parental guilt plays a mediating role in the relationship between mothers' smartphone addiction and children's problematic use of technology. To test the significance of this mediation role, bootstrap results for indirect effects are presented in Table 3.

As shown in Table 3, the bootstrapping analysis applied to the model provides bootstrapping coefficients and 95% CIs, indicating upper and lower values. Upon examining Table 3, it becomes evident that mothers' smartphone addiction predicts problematic use in children through parental guilt (bootstrap coefficient = .118, 95% CI = .05, .20).

## Discussion

In this study, it was revealed that parental guilt played a mediating role in the relationship between working mothers' smartphone addiction and problematic technology use in their children. It is known that parents' and children's technology use habits are closely related to each other (Terras & Ramsay, 2016). Especially preschool children are more likely to use technological devices such as tablets and smartphones with their families than they are to use these devices alone (Marsh et al., 2015). In a study conducted by Lauricella et al. (2015), the correlation between parents' time spent with computers, smartphones, tablets, and televisions and children's screen use time confirms that parents' and children's technology use habits are related to each other. Parents' smartphone use is not limited to the time they spend alone and has also become common during the care of their children (McDaniel, 2020). According to Bandura (1978),

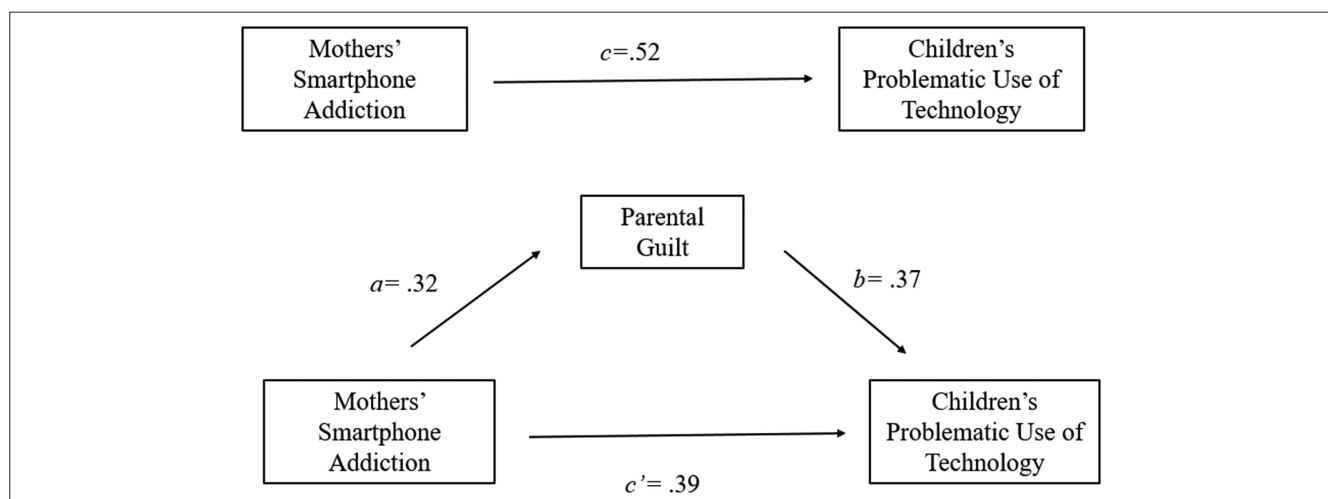


Figure 2. The Mediation Model for Children's Problematic Technology Use.

**Table 3. Path**  
Coefficients and Indirect Effect Results for Mediation Model

| Comments and Indirect Effect Results for Mediation Model |                        |              |      |
|----------------------------------------------------------|------------------------|--------------|------|
|                                                          | Coefficient<br>of Path | 95% CI Level |      |
|                                                          |                        | LLCI         | ULCI |
| Direct effects                                           |                        |              |      |
| MSA→PG                                                   | .393                   | .162         | .482 |
| PG→CPUT                                                  | .368                   | .206         | .539 |
| Indirect effects                                         |                        |              |      |
| MSA→PG→CPUT                                              | .118                   | .050         | .204 |

Note: CPUT = Children's problematic use of technology; LLCI = Lower limit of confidence interval; MSA = Mothers' smartphone addiction; PG = Parental guilt; ULCI = Upper limit of confidence interval.

the foundation of learning consists of observation, modeling, and imitation. Consequently, children acquire a significant portion of the traits that guide their own behavior by observing adults (Aydin, 2016). Especially when considering that children spend the most time with their families during their early years, the role of parents as primary role models becomes evident. Preschool children's development of habits through positive or negative modeling of their parents in terms of technology use plays a crucial role in determining the extent of problematic technology use in children (Akkoyunlu & Tugrul, 2002). Given that children emulate their parents' habits in the use of digital tools, Wong et al. (2020) identified a significant relationship between children's screen time and problematic technology use. The observation and modeling of mothers' behaviors due to their smartphone addiction can determine whether children's technology use becomes problematic or not. According to the study's findings, it can be hypothesized that mothers who perceive themselves as heavy smartphone users are likely to have children who also use technology extensively. This is consistent with the findings of Lermi and Afat (2020), who suggest that a mother who cannot set limits on phone use as a parent may struggle to establish boundaries for her child. It is well documented that technological addictions can develop in children whose parents fail to set limits on technology use. Therefore, it can be argued that a working mother's smartphone addiction may serve as an explanatory factor for a child's problematic technology use.

The increasing participation of women in the workforce has ignited a growing debate regarding the effects of maternal employment on children (Heiland et al., 2017). One of these effects pertains to the ways in which working mothers and their children utilize technology. For instance, Ersoz and Ozmen (2020) noted that the development of internet infrastructure in the business sphere has made it convenient for employees to conduct transactions using smartphones. However, smartphones are not limited to work-related activities, as social media applications have also become widely used. According to a report by Mail Online (2008), people have become so reliant on their cell phones that the mere thought of a low battery or disconnection can lead to increased stress levels. It is well established that the stress experienced by mothers can have an impact on their parenting roles and, subsequently, on their children (Meighan, 2017). In addition to the stress caused by technology addiction, the work and family roles imposed on working mothers also create additional stress factors. For instance, Korkmaz (2020) noted that working mothers must balance their

roles as a spouse, parent, child, and member of the family while also pursuing their career goals. Stress levels, particularly in working mothers, tend to escalate due to the conflict between their work, home, and parental responsibilities (Poduval J & Poduval M, 2009). It is inevitable for parents with elevated stress levels to experience feelings of guilt (Simon, 1995). According to Blatt et al. (1984), guilt is one of the fundamental elements of addiction. Studies conducted in this context have shown a relationship between addiction and guilt (Cam & Ayakdas Dagli, 2017; Kalyoncu et al., 2002). Additionally, guilt has also been associated with excessive smartphone use (Chatterjee & Kar, 2021). In addition to the guilt they experience due to their addiction, individuals also feel guilty for experiencing positive emotions resulting from the benefits gained through smartphone use (Lanette & Mazmanian, 2018). Moreover, the stress and guilt stemming from smartphone addiction play a crucial role in determining their relationship with their children. According to Kol (2021), children of mothers who use smartphones more intensively tend to learn technology at an early age. In this study, parental guilt was found to mediate the relationship between smartphone addiction among working mothers and problematic technology use in their children. As a result of this sense of guilt, individuals engage in compensatory behaviors to prevent the recurrence of similar situations (Ozdemir & Duzguner, 2020). To alleviate guilt, mothers who feel a sense of inadequacy due to their guilt may provide their children with cell phones when they are not present and instruct them to call in cases of need. However, these actions aimed at reducing guilt can inadvertently encourage unsupervised technology use by the child (Seagram & Daniluk, 2002). It can be inferred that mothers experience guilt because of the time they spend with their smartphones and exhibit addictive behaviors. Consequently, they may engage in guilt-compensating behaviors that center on a permissive attitude towards their child. Within a permissive attitude, children have the freedom to go to sleep, eat, and use technology whenever they please due to the lack of clear rules, inadequate supervision, and a high level of tolerance (Baumrind, 1966; Cetinkaya, 2020). In this context, it is conceivable that a guilt-ridden mother may adopt a permissive parental attitude and engage in behaviors aimed at compensating for her guilt.

#### Limitations and Directions/Suggestions for Future Research

The results obtained are very important; however, this study has limitations. The first limitation is that this research was planned to be cross-sectional, so it does not capture the changes experienced by mothers and their children over time. To address this limitation, longitudinal studies that track changes in the levels of problematic technology use in children, smartphone addiction, and parental guilt among working mothers can be planned. The second limitation is that the characteristics of working mothers were not examined in detail in this study, and the characteristics of the mothers reached for the study were limited to those specified in the demographic information. For this reason, future studies can be planned to evaluate the characteristics of mothers, such as their working conditions, where they live (rural or metropolitan), ethnicity, etc. Additionally, future research may explore additional mediating variables, such as parental attitudes, stress, marital satisfaction, and the parent-child relationship, alongside parental guilt in the relationship between problematic technology use in children and smartphone addiction in working mothers. Furthermore, research can extend to include non-working

mothers as participants. In subsequent studies, problematic technology use during primary, secondary, and high school periods can be examined, with a particular focus on working mothers.

As a result of this study, it was determined that parental guilt had a mediating effect on the relationship between smartphone addiction and problematic technology use in their children. In this regard, the concept of digital parenting can be incorporated into psychoeducational programs designed to reduce problematic technology use among children. Furthermore, efforts can be made to ensure that families utilize technology consciously, both for themselves and their children. Specifically, professionals providing counseling to working mothers can address feelings of guilt and the accompanying sense of inadequacy, aiming to develop healthier mother-child relationships by reducing maternal guilt and associated compensatory behaviors. Additionally, experts in the field of addiction can work towards addressing and alleviating guilt as part of addiction treatment for their clients. To promote the appropriate use of technology by children, awareness-raising sessions can be organized for parents, emphasizing conscious technology use for both parents and their children.

**Data Availability Statement:** The data that support the findings of this study are available on request from the corresponding author.

**Ethics Committee Approval:** This study was approved by the Ethics Committee of Yıldız Technical University University (approval number: 20230502065 date: 31.10.2022).

**Informed Consent:** Informed consent was obtained from participants who agreed to take part in the study.

**Peer-review:** Externally peer reviewed.

**Author Contributions:** Concept – F.M.Y., S.M.E.; Design – F.M.Y., S.M.E.; Supervision – S.M.E.; Resource – F.M.Y.; Materials – F.M.Y.; Data Collection and/or Processing – F.M.Y.; Analysis and/or Interpretation – F.M.Y., S.M.E.; Literature Search – F.M.Y.; Writing – F.M.Y., S.M.E.; Critical Review – F.M.Y., S.M.E.

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