Vol 27 - Issue 2 (2026)

Journal of Dependence

AKADEMiSYEN
KiTABEVi

e - ISSN 3108-7973
DOI: 10.51982/bagimli

Journal of Dependence

Publication ethics

The Journal is committed to practice the publication ethics and takes all possible measures against any publication malpractices.

The editorial and publication processes of the journal are shaped in accordance with the guidelines of the International Council of Medical Journal Editors (ICMJE), The World Association of Medical Editors (WAME), The Council of Science Editors (CSE), The Committee on Publication Ethics (COPE), The European Association of Science Editors (EASE), and National Information Standards Organization (NISO). The journal conforms to the Principles of Transparency and Best Practice in Scholarly Publishing (https://doaj.org/bestpractice).

In the event of alleged or suspected research misconduct, e.g., plagiarism, citation manipulation, and data falsification/fabrication, the Editorial Board will follow and act in accordance with COPE guidelines.

Journal of Dependence

Volume 27, Issue 2, 2026

Owner: Akademisyen Publishing

Publisher: Akademisyen Publishing

Managing Editor: Yasin DİLMEN

Address: Halk Sokak 5 / A Yenişehir / Ankara

E-mail: journalofdependenceeditor@gmail.com

Online Publication Date: June 25, 2026

Frequency: Published online four times a year on Mart, June, September and December

Design and Arrangement: Akademisyen Publishing

Typesetting: Akademisyen Publishing

Journal's History (2000-2025)

Journal's Previous Name	Parallel Title	p-ISSN	e-ISSN
Bağımlılık Dergisi	Journal of Dependence	1302-5570	2791-9846

AKADEMISYEN YAYINEVİ

Publisher Contact

Address: Halk Sokak 5 / A
Yenişehir / Ankara

Phone: 0312 431 16 33

E-mail: info@akademisyen.com

Website: akademisyen.com

Journal of Dependence

EDITORIAL TEAM

Journal of Dependence

Journal of Dependence

ABOUT THE JOURNAL

Journal of Dependence is a scientific journal devoted to publishing original research, reviews, case reports, commentaries, and policy in all areas of dependence including behavioral dependence. Welcomed articles range from studies of the chemistry of substances of abuse, their actions at molecular and cellular sites, in vitro and in vivo investigations of their biochemical, pharmacological and behavioral actions, laboratory-based and clinical research in humans, substance abuse treatment and prevention research, and studies using methods from epidemiology, sociology, and economics.

Journal of Dependence which is the scientific publication of the Akademisyen Publishing in Turkey is published four times a year.

Journal of Dependence contains original articles, case reports, editorials, and letters to the editor and review articles in all areas of dependence including behavioral dependence. The publication language of the journal is **English**.

Journal of Dependence is an international peer-reviewed medical journal.

All manuscripts which will be published in the journal must be in accordance with research and publication ethics. All articles are subject to review by the editors and referees. If the article is accepted for publication, it may be subject to editorial revisions to aid clarity and understanding without changing the data presented.

All authors should have contributed to the article directly either academically or scientifically. The authors must assume all the responsibility of their articles.

Assoc. Prof. Dr. Mehmet Emin Demirkol, Çukurova University Faculty of Medicine Department of Psychiatry, Adana, Türkiye must be used for all kinds of correspondence.

Manuscript submission: All manuscripts should be submitted by online system of journal at **https://jod.akademisyen.net/** For consideration, all articles must be submitted online. Articles submitted in other forms will not be considered. All manuscripts submitted to Journal of Dependence are screened by Crosscheck in terms of originality.

E-mail: editor@jod.akademisyen.net

- **e – ISSN: 3108-7973**
- **DOI: 10.51982/bagimli**

Journal of Dependence

CONTENTS

2026- Volume: 27 Issue: 2

Research Article

Journal of Dependence, 2026; 27(2):63-74

JOURNAL OF DEPENDENCE

Research Article

The role of attention-deficit/hyperactivity disorder symptoms in the relationship between digital parenting attitudes and internet gaming disorder symptoms

Ünzile Feyza KARAKOÇ[1] Çaglar Charles Daniel JAICKS[2]

DOI: 10.51982/bagimli.615

Abstract

Objective: This study aimed to examine the relationship between digital parenting attitudes and Internet Gaming Disorder (IGD) symptoms among children and adolescents, and to investigate whether Attention-Deficit/Hyperactivity Disorder (ADHD)–related symptoms play a moderating role in this relationship.

Methods: This cross-sectional study included 193 children and adolescents aged 10–17 years and their parents. Digital parenting attitudes were assessed using the Digital Parenting Attitude Scale, ADHD-related symptoms were measured with the Conners Parent Rating Scale–Revised Short Form, and IGD symptoms were evaluated using the Internet Gaming Disorder Scale–Short Form. Group comparisons were performed using independent samples t-tests and one-way ANOVA.

Results: Male children differed significantly from female children in cognitive problems/inattention ($p=0.002$), hyperactivity symptoms ($p<0.001$), ADHD index scores ($p=0.027$), and IGD severity ($p=0.001$). Frequency of technology use was significantly associated with cognitive problems/inattention ($p=0.048$) and IGD severity ($p<0.001$). IGD symptoms were positively correlated with oppositional behavior ($r=0.28$, $p<0.05$), cognitive problems/inattention ($r=0.42$, $p<0.001$), hyperactivity symptoms ($r=0.33$, $p<0.001$), and ADHD index scores ($r=0.49$, $p<0.001$). Digital parenting attitudes were not significantly associated with IGD severity. Moderation analyses showed that ADHD symptoms ($B=3.3$, $p<0.001$) and hyperactivity symptoms ($B=3.6$, $p<0.001$) were significantly associated with IGD severity, whereas the interaction terms were not statistically significant ($p=0.300$; $p=0.568$).

Conclusion: The findings suggest that ADHD-related symptoms were more closely associated with IGD severity than digital parenting attitudes in this sample. Preventive and intervention strategies should prioritize the identification and management of ADHD-related vulnerabilities within a broader family context rather than focusing solely on digital parenting practices.

Keywords: Digital parenting attitudes; internet gaming disorder; ADHD symptoms; hyperactivity; children and adolescents; digital media use

[1]**Ünzile Feyza Karakoç**
Private Practice in Psychology, Bursa, Türkiye
email: feyzakarakocc@gmail.com
ORCID iD: 0009-0005-2588-3422

[2]**Çağlar Charles Daniel Jaicks**
İstanbul Aydın University, Department of Child and Adolescent Psychiatry, Istanbul, Türkiye
email: caglarjaicks@yahoo.com
ORCID iD: 0000-0003-4428-6912

Received: 2025-12-18
Accepted: 2026-03-04

INTRODUCTION

The rapid expansion of digital technologies has profoundly transformed children's and adolescents' daily lives, particularly in relation to internet use and digital gaming (Paulus et al., 2018; Petrescu et al., 2025). While digital environments offer opportunities for learning, social interaction, and entertainment, excessive or uncontrolled engagement with online games has raised significant mental health concerns. Internet Gaming Disorder (IGD), recognized in the Diagnostic and Statistical Manual of Mental Disorders (DSM-5) as a condition warranting further study, is characterized by persistent and recurrent gaming behavior leading to functional impairment or distress (Borges et al., 2021; Moreno et al., 2022). Adolescents appear to be particularly vulnerable to IGD due to developmental factors such as heightened reward sensitivity, immature self-regulation, and increased autonomy in digital media use.

Parental influence plays a central role in shaping children's digital behaviors, especially during adolescence. In this context, the concept of digital parenting has gained increasing attention in the literature (Liu et al., 2023; Piao et al., 2022). Digital parenting attitudes encompass parental strategies, rules, monitoring practices, and guidance related to children's use of digital technologies. Supportive and guidance-oriented digital parenting has been associated with healthier online behaviors, whereas overly controlling, inconsistent, or permissive digital parenting styles may increase the risk of problematic internet and gaming use (Fidan & Olur, 2023; Ren & Zhu, 2022). Despite growing interest in this area, empirical findings remain mixed, suggesting that the impact of digital parenting attitudes on IGD symptoms may depend on individual child-related factors.

One of the most consistently reported individual risk factors for problematic gaming is Attention-Deficit/Hyperactivity Disorder (ADHD) (Berloffa et al., 2022). ADHD is characterized by persistent patterns of inattention, hyperactivity, and impulsivity, which may predispose individuals to excessive gaming through mechanisms such as impaired self-control, reward-seeking behavior, and difficulties in delaying gratification (Antshel & Barkley, 2020). Previous studies have demonstrated strong associations between ADHD symptoms and increased severity of IGD symptoms (Werling et al., 2022). However, less is known about how ADHD symptoms interact with environmental factors, such as parental digital attitudes, in shaping adolescents' gaming behaviors.

Therefore, the present study aims to examine the relationship between digital parenting attitudes and Internet Gaming Disorder symptoms in a clinically referred sample of children and adolescents with suspected ADHD-related symptoms, and to investigate the moderating role of ADHD symptoms in this relationship. A moderation framework was considered relevant because ADHD-related difficulties such as inattention, impulsivity, and hyperactivity may influence how effectively children and adolescents respond to parental guidance, monitoring, and rule-setting in digital environments. In this sense, ADHD-related symptoms may alter the strength of the association between digital parenting attitudes and IGD symptoms, rather than functioning only as an independent correlate. At the same time, alternative conceptualizations are also plausible, and ADHD-related symptoms may be examined as predictors or parenting-related variables may be examined as mediators in future studies. By exploring whether the association between digital parenting and IGD symptoms varies according to the level of ADHD symptoms, this study seeks to contribute to a more nuanced understanding of the interplay between parental and individual factors in problematic gaming behaviors.

METHODS

Study Design

This study employed a quantitative research approach using a correlational research design to examine the moderating role of ADHD symptoms in

the relationship between digital parenting attitudes and IGD symptoms. Correlational research designs aim to determine the strength, direction, and nature of relationships among two or more variables without experimental manipulation and are widely used in behavioral and social sciences research (Creswell & Creswell, 2017). In this framework, digital parenting attitudes were treated as the independent variable, IGD symptoms as the dependent variable, and ADHD symptoms as the moderator variable.

Ethical permission was obtained from the Istanbul Aydın University, Social and Human Sciences Ethics Committee for this study with date 19/12/2024 and number 2024/13, and Helsinki Declaration rules were followed to conduct this study. The study was conducted in accordance with the ethical principles outlined in the Declaration of Helsinki. Participation was voluntary. Because the study sample consisted of children and adolescents under the age of 18, written informed consent was obtained from their parents or legal guardians prior to participation. Confidentiality and anonymity of participant data were strictly maintained throughout the research process.

Sample

The study sample consisted of children and adolescents aged 10–17 years who were referred to the first author's private practice in psychology in Bursa, Türkiye, with suspected ADHD-related symptoms, and one of their parents. Suspicion of ADHD was determined during the routine clinical referral process at the private practice. The study sample did not include participants with a formally established ADHD diagnosis; rather, inclusion was based on referral due to suspected ADHD-related symptoms and the presence of parent-reported ADHD symptomatology. The study did not rely on a formal diagnostic interview for inclusion; instead, participants were enrolled based on referral for ADHD-related complaints and completion of the study measures. Inclusion criteria were being between 10 and 17 years of age, being referred with suspected ADHD-related symptoms, and having complete parent-reported questionnaire data. Participants with incomplete data were excluded from the final analyses. A convenience sampling method, a non-probability sampling technique, was used due to its practicality, cost-effectiveness, and ease of access to eligible participants (Suen et al., 2014). Sample size estimation was conducted using G*Power version 3.1.9.2, based on the effect size reported in the study by Berloffa et al. (Stefano Berloffa et al., 2022). Assuming a moderate effect size ($f = 0.40$), a significance level of $\alpha = 0.05$, and 95% statistical power, the minimum required sample size was calculated as 70 participants. Participation in the study was entirely voluntary. Prior to data collection, all participants were provided with an informed consent form, which clearly stated that the data would be used solely for research purposes and that participants had the right to withdraw from the study at any time without penalty. Ultimately, data from 193 parents and 193 children/adolescents were included in the final analyses.

Data Collection Instruments

Sociodemographic Information Form

This form was developed by the researcher to obtain demographic information about the participants. It included items related to parental gender, age, educational level, marital status, technological competence, as well as the child's age, gender, and frequency of technology use. Technology use frequency was categorized based on parental reports as follows: 'monthly' (use occurring a few times per month or less), 'weekly' (use occurring several times per week), and 'daily/almost daily' (use occurring every day or nearly every day).

Digital Parenting Attitude Scale

Digital parenting attitudes were assessed using the Digital Parenting Attitude Scale, developed and validated in Turkish by Kaya et al. (2018). The scale consists of 12 items rated on a 5-point Likert scale and includes two subscales: (1) Approval of

Effective Use of Digital Media and (2) Protection from Digital Media Risks. Previous studies using the Turkish version of the scale reported Cronbach's alpha values of 0.77 for the first subscale and 0.72 for the second, indicating acceptable reliability. Total scores range from 12 to 60, with higher scores indicating stronger digital parenting attitudes. In the current sample, Cronbach's alpha coefficients were 0.78 for Approval of Effective Use of Digital Media and 0.75 for Protection from Digital Media Risks.

Conners Parent Rating Scale–Revised Short Form (CPRS-R:S)

ADHD symptoms were measured using the Conners Parent Rating Scale–Revised Short Form, designed to assess behavioral problems in children and adolescents aged 3–17 years. The scale consists of 27 items rated on a 4-point Likert scale and includes the following subscales: Oppositional Behavior, Cognitive Problems/Inattention, Hyperactivity, and ADHD Index. Scores range from 0 to 81, with higher scores indicating greater symptom severity. Turkish validity and reliability studies reported Cronbach's alpha values ranging between 0.73 and 0.86 (Kaner et al., 2013). In the current sample, Cronbach's alpha coefficients were 0.80 for Oppositional Behavior, 0.84 for Cognitive Problems/Inattention, 0.82 for Hyperactivity, and 0.88 for the ADHD Index.

Internet Gaming Disorder Scale–Short Form (IGDS9-SF)

IGD symptoms were assessed using the Internet Gaming Disorder Scale–Short Form, developed by Pontes and Griffiths (2015) based on DSM-5 diagnostic criteria (Pontes et al., 2017). The scale includes 9 items rated on a 5-point Likert scale, covering symptoms such as preoccupation, withdrawal, tolerance, loss of control, and continued use despite negative consequences. Scores range from 9 to 45, with higher scores indicating greater IGD severity. The Turkish adaptation demonstrated good reliability (Cronbach's alpha = 0.75) and test-retest reliability (0.78) (Arıcak et al., 2018). In the current sample, the Cronbach's alpha coefficient for the IGDS9-SF was 0.83.

All measurement instruments in this study were completed by the parents of the children and adolescents (parent-report format), and no self-report measures were administered to the children.

Statistical Analysis

All statistical analyses were performed using IBM SPSS Statistics for Windows, Version 27.0 (IBM Corp., Chicago, IL, USA). Prior to the main analysis, data were screened for missing values and outliers. Descriptive statistics were calculated for all study variables and are presented as mean ± standard deviation. The assumption of normality was assessed using the Kolmogorov–Smirnov test, as well as by examining skewness and kurtosis values. Skewness and kurtosis values within the range of ±2 were considered indicative of an approximately normal distribution. As the data met the assumptions of normality, parametric statistical tests were applied in subsequent analyses. Group comparisons between two independent groups (e.g., child gender and parental marital status) were conducted using independent samples t-tests. Comparisons involving more than two groups (e.g., frequency of children's technology use and child age groups) were performed using one-way analysis of variance (ANOVA). When applicable, statistically significant results were interpreted based on overall p values, as post hoc comparisons were not the primary focus of the study. Associations among digital parenting attitudes, ADHD-related symptom dimensions, and IGD symptoms were examined using Pearson product–moment correlation analysis. Correlation coefficients (r) were interpreted according to conventional effect size guidelines. To examine the moderating role of ADHD-related symptoms in the relationship between digital parenting attitudes and IGD symptoms, moderation analyses were conducted using PROCESS Macro version 4.2 (Model 1). Prior to the moderation analyses, preliminary regression assumptions, including normality, linearity, and the absence of extreme outliers, were evaluated. In addition, main effects of digital parenting attitudes and ADHD-related symptoms on IGD symptom

severity were examined before testing interaction terms. Moderation analyses were then conducted using PROCESS Macro (Model 1), in line with standard regression-based moderation procedures. The same digital parenting variable was used across the moderation models, and the difference between Table 5 and Table 6 in the previous version reflected a labeling inconsistency rather than a difference in model specification. Unstandardized regression coefficients (B), standard errors (SE), *t* values, and *p* values were reported. Model fit was evaluated using the coefficient of determination (R^2) and overall model significance (*F* statistic). No formal correction for multiple comparisons was applied; therefore, the findings from subgroup and correlation analyses should be interpreted as exploratory. Effect sizes were calculated for group comparisons (Cohen's d for t-tests and eta-squared for ANOVA) to aid in the interpretation of the magnitude of the observed differences.

RESULTS

A total of 193 children and adolescents and their parents were included in the study. Of the children/adolescents, 78 (40.4%) were female and 115 (59.6%) were male. The mean age of the children/adolescents was 12.1±1.8 years.

Male children demonstrated significantly lower scores in approval of effective digital media use compared to female children (p=0.006). In contrast, male children exhibited significantly higher levels of cognitive problems/inattention (p=0.002), hyperactivity symptoms (p<0.001), and ADHD index scores (p=0.027). Furthermore, IGD symptom severity was significantly higher among male children compared to females (p=0.001). No significant gender differences were found for protection from digital media risks or oppositional behavior (p>0.05). The observed differences were of small-to-moderate magnitude based on effect size estimates. (Table 1).

Table 1. Gender-Based Differences in Digital Parenting Attitudes, ADHD-Related Symptoms, and Internet Gaming Disorder Severity Among Children

	Female (n=78)	Male (n=115)	p value
Digital Parenting Attitudes	*24.1±3.8*	*22.6±3.7*	**0.006**
Digital Parenting – Protection from Digital Media Risks	*25.8±3.5*	*25.7±2.8*	*0.886*
Oppositional Behavior (CPRS-R:S)	*4.7±2.9*	*5.1±4.0*	*0.420*
Cognitive Problems / Inattention (CPRS-R:S)	*3.2±2.7*	*5.0±4.5*	**0.002**
Hyperactivity (CPRS-R:S)	*1.7±2.1*	*3.8±4.2*	**<0.001**
ADHD Index (CPRS-R:S)	*9.2±5.6*	*11.5±7.9*	**0.027**
IGD symptoms	*16.5±6.2*	*20.3±8.1*	**0.001**

Values are presented as mean±standard deviation. Abbreviations: *CPRS-R:S, Conners Parent Rating Scale–Revised Short Form; ADHD, Attention-Deficit/Hyperactivity Disorder; IGD, Internet Gaming Disorder.*
p<0.05 was considered statistically significant.

Children who used technological devices daily or almost daily showed significantly higher levels of cognitive problems/inattention than those who used them weekly, according to post hoc comparisons (p=0.048). Moreover, IGD symptom severity differed significantly across technology use frequency groups, and post hoc analyses indicated that children in the daily/almost daily use group had significantly higher IGD scores than those in the monthly use group (p<0.001). No significant differences were detected across groups in digital parenting attitudes, hyperactivity symptoms, or ADHD index scores (p>0.05) (Table 2).

Table 2. Differences in Digital Parenting Attitudes, ADHD-Related Symptoms, and Internet Gaming Disorder Severity According to Children's Frequency of Technology Use				
Variable	**Monthly (n=20)**	**Weekly (n=51)**	**Daily / Almost daily (n=122)**	**p value**
Digital Parenting – Approval of Effective Digital Media Use	*21.8±3.4*	*23.6±3.2*	*23.2±4.1*	*0.185*
Digital Parenting – Protection from Digital Media Risks	*26.7±2.4*	*25.9±2.4*	*25.5±3.4*	*0.234*
Oppositional Behavior (CPRS-R:S)	*4.4±4.8*	*4.3±2.7*	*5.3±3.6*	*0.213*
Cognitive Problems / Inattention (CPRS-R:S)	*4.0±4.6*	*3.3±2.7*	*4.8±4.2*	**0.048**
Hyperactivity (CPRS-R:S)	*2.9±4.7*	*2.7±2.8*	*3.0±3.8*	*0.898*
ADHD Index (CPRS-R:S)	*9.2±7.8*	*9.7±6.1*	*11.2±7.4*	*0.291*
IGD symptoms	*14.8±6.2*	*16.5±5.1*	*20.4±8.2*	**<0.001**

Values are presented as mean±standard deviation. Abbreviations: CPRS-R:S, Conners Parent Rating Scale–Revised Short Form; ADHD, Attention-Deficit/Hyperactivity Disorder; IGD, Internet Gaming Disorder. p<0.05 was considered statistically significant.

IGD symptom severity was positively correlated with oppositional behavior ($r = 0.28$, $p < 0.05$), cognitive problems/inattention ($r = 0.42$, $p < 0.001$), hyperactivity symptoms ($r = 0.33$, $p < 0.001$), and ADHD index scores ($r = 0.49$, $p < 0.001$). In addition, protection from digital media risks was positively correlated with oppositional behavior, cognitive problems/inattention, hyperactivity symptoms, and ADHD index scores (all $p < 0.05$). No significant correlation was found between approval of effective digital media use and IGD symptoms ($r = 0.03$, $p > 0.05$) (Table 3).

Table 3. Pearson Correlation Matrix of Digital Parenting Attitudes, ADHD-Related Symptom Dimensions, and Internet Gaming Disorder Symptoms						
Variable	**1**	**2**	**3**	**4**	**5**	**6**
Digital Parenting – Protection from Digital Media Risks	*-0.27**	—				
Oppositional Behavior (CPRS-R:S)	*-0.03*	*0.20**	—			
Cognitive Problems / Inattention (CPRS-R:S)	*-0.19**	*0.20**	*0.57****	—		
Hyperactivity (CPRS-R:S)	*-0.14**	*0.18**	*0.64****	*0.58****	—	
ADHD Index (CPRS-R:S)	*-0.03*	*0.23**	*0.62****	*0.83****	*0.62****	—
IGD symptoms	*0.03*	*0.10*	*0.28**	*0.42****	*0.33****	*0.49****

*Values represent Pearson correlation coefficients (r). Abbreviations: CPRS-R:S, Conners Parent Rating Scale–Revised Short Form; ADHD, Attention-Deficit/Hyperactivity Disorder; IGD, Internet Gaming Disorder. 1: Approval of Effective Use of Digital Media; 2: Protection from Digital Media Risks; 3: Oppositional Behavior; 4: Cognitive Problems/Inattention; 5: Hyperactivity; 6: ADHD Index; 7: Internet Gaming Disorder symptoms. *p < 0.05, **p < 0.01, ***p < 0.001*

Scores for protection from digital media risks were significantly lower in the ≥13 years age group compared to younger age groups ($p<0.001$). No significant age-related differences were observed for digital media approval, ADHD-related symptoms, or IGD symptom severity ($p>0.05$) (Table 4).

Table 4. Comparisons of Digital Parenting Attitudes, ADHD-Related Symptoms, and Internet Gaming Disorder Severity Across Child Age Groups				
Variable	**Age 10 (n=58)**	**Age 11–12 (n=67)**	**Age ≥13 (n=68)**	**p value**
Digital Parenting – Approval of Effective Digital Media Use	*22.8±5.1*	*22.7±2.9*	*24.0±3.2*	*0.107*
Digital Parenting – Protection from Digital Media Risks	*26.6±2.8*	*26.4±2.9*	*24.4±3.1*	**<0.001**
Oppositional Behavior (CPRS-R:S)	*4.4±2.7*	*5.5±4.2*	*4.9±3.6*	*0.210*
Cognitive Problems / Inattention (CPRS-R:S)	*4.2±3.6*	*4.3±4.3*	*4.3±3.5*	*0.986*
Hyperactivity (CPRS-R:S)	*2.5±3.6*	*3.2±4.1*	*3.0±3.7*	*0.595*
ADHD Index (CPRS-R:S)	*9.9±5.8*	*11.5±6.9*	*10.3±6.8*	*0.422*
IGD symptoms	*19.2±9.8*	*22.4±16.8*	*20.3±14.3*	*0.602*

Values are presented as mean±standard deviation. Group comparisons were conducted using one-way analysis of variance (ANOVA). Abbreviations: CPRS-R:S, Conners Parent Rating Scale–Revised Short Form; ADHD, Attention-Deficit/Hyperactivity Disorder; IGD, Internet Gaming Disorder.
p<0.05 was considered statistically significant.

ADHD symptoms were significantly associated with IGD symptom severity (B=3.3, p<0.001). However, the interaction term between digital parenting attitudes and ADHD symptoms was not statistically significant (p=0.300), indicating no significant moderating effect. The overall model explained 21% of the variance in IGD symptoms (R^2=0.21, p<0.001) (Table 5).

Table 5. Moderation Analysis Examining the Role of ADHD Symptoms in the Relationship Between Digital Parenting Attitudes and Internet Gaming Disorder Symptoms				
Predictor	**B**	**SE**	**t**	**p**
Constant	*18.7*	*0.5*	*38.2*	**<0.001**
Digital Parenting Attitudes	*0.4*	*0.5*	*0.9*	*0.370*
ADHD Symptoms	*3.3*	*0.5*	*6.7*	**<0.001**
Digital Parenting × ADHD	*0.5*	*0.5*	*1.0*	*0.300*

Model summary: R^2 = 0.21, F = 17.14, p < 0.001. Unstandardized regression coefficients are reported. Moderation analysis was conducted using PROCESS Macro (Model 1). Abbreviations: ADHD, Attention-Deficit/Hyperactivity Disorder; IGD, Internet Gaming Disorder.

The interaction between digital parenting attitudes and hyperactivity symptoms was not significant (p=0.568), suggesting that hyperactivity did not moderate the relationship between digital parenting attitudes and IGD symptoms. The model accounted for a significant proportion of variance in IGD symptom severity (R^2=0.21, p<0.001) (Table 6).

Children of divorced parents exhibited significantly higher scores in approval of effective digital media use (p=0.003) but significantly lower scores in protection from digital media risks (p<0.001) compared to children of married parents. In addition, IGD symptom severity was significantly lower among children of divorced parents (p=0.002). No significant differences were found for ADHD-related symptom dimensions (p>0.05) (Table 7).

Table 6. Moderation Analysis Examining the Role of Hyperactivity Symptoms in the Relationship Between Digital Parenting Attitudes and Internet Gaming Disorder Symptoms

Predictor	B	SE	t	p
Constant	*18.8*	*0.5*	*38.1*	**<0.001**
Digital Parenting – Approval of Effective Digital Media Use	*0.5*	*0.5*	*1.1*	*0.276*
Hyperactivity Symptoms (CPRS-R:S)	*3.6*	*0.5*	*7.1*	**<0.001**
Digital Parenting × Hyperactivity	*0.4*	*0.7*	*0.6*	*0.568*

Model summary: $R^2 = 0.21$, $F=16.75$, $p < 0.001$. Unstandardized regression coefficients are reported. Moderation analysis was conducted using PROCESS Macro (Model 1). Abbreviations: CPRS-R:S, Conners Parent Rating Scale–Revised Short Form; IGD, Internet Gaming Disorder.

Table 7. Differences in Digital Parenting Attitudes, ADHD-Related Symptoms, and Internet Gaming Disorder Severity According to Parental Marital Status

Variable	Married (n=159)	Divorced (n=34)	p value
Digital Parenting – Approval of Effective Digital Media Use	*22.8±3.8*	*24.9±3.3*	**0.003**
Digital Parenting – Protection from Digital Media Risks	*26.1±3.1*	*23.9±2.5*	**<0.001**
Oppositional Behavior (CPRS-R:S)	*4.8±3.8*	*5.5±2.5*	*0.286*
Cognitive Problems / Inattention (CPRS-R:S)	*4.1±4.0*	*5.0±3.3*	*0.221*
Hyperactivity (CPRS-R:S)	*3.0±3.7*	*2.7±3.6*	*0.666*
ADHD Index (CPRS-R:S)	*10.5±7.4*	*10.9±5.6*	*0.749*
IGD symptoms	*19.3±8.1*	*16.4±3.8*	**0.002**

Values are presented as mean±standard deviation. $p<0.05$ was considered statistically significant. Abbreviations: CPRS-R:S, Conners Parent Rating Scale–Revised Short Form; ADHD, Attention-Deficit/Hyperactivity Disorder; IGD, Internet Gaming Disorder. $p<0.05$ was considered statistically significant.

DISCUSSION

A prominent finding of the present study is the strong association between ADHD-related symptoms — particularly hyperactivity— and the severity of IGD symptoms. This result is highly consistent with clinical and population-based research emphasizing neurodevelopmental vulnerability as a core determinant of problematic gaming. In a clinical sample of children and adolescents diagnosed with ADHD, Berloffa et al. evaluated 102 participants using structured psychiatric interviews alongside DSM-5–based IGD criteria and reported significantly elevated impulsivity and hyperactivity scores among individuals meeting IGD thresholds (Berloffa et al., 2022). Their findings highlighted deficits in inhibitory control and reward processing as key mechanisms underlying excessive gaming in ADHD populations. Similarly, Chung et al. examined 318 adolescents using standardized parenting questionnaires, validated attention problem scales, and the IGD-Short Form, demonstrating that attentional dysregulation exerted a strong direct effect on IGD severity, whereas parenting variables showed comparatively weaker associations (Chung et al., 2023). Importantly, their path analyses indicated that attention-related symptoms explained a substantial proportion of variance in gaming outcomes. Longitudinal

evidence further strengthens this interpretation. In their systematic review of 28 longitudinal studies involving more than 60,000 children and adolescents, Thorell et al. concluded that ADHD symptoms consistently predicted later problematic digital media use, particularly gaming, even after controlling for baseline media exposure (Thorell et al., 2024). The present study is consistent with these findings in showing that hyperactivity symptoms and ADHD-related symptom severity were significantly associated with IGD severity. These findings suggest that individual neurodevelopmental characteristics may be more closely related to IGD symptoms than digital parenting attitudes in this sample.

In contrast to initial expectations, digital parenting attitudes were not significantly associated with IGD symptom severity in the present study. This finding aligns with a growing body of empirical literature suggesting that media-specific parenting practices may have limited direct impact on problematic gaming behaviors. Kabadayı and Eyimaya investigated digital parenting attitudes and digital game addiction among middle school students using a validated Digital Parenting Attitude Scale and a digital game addiction inventory (Kabadayı & Eyimaya, 2025). Despite identifying a high prevalence of risky and addictive gaming behaviors, their regression analyses revealed no significant direct association between digital parenting attitudes and addiction severity. A broader synthesis is provided by Lukavská et al., who conducted a meta-analysis of 40 studies encompassing over 90,000 participants and found that media-specific parenting strategies, such as restrictive and active mediation, were weakly or inconsistently related to problematic internet use and gaming disorder (Lukavská et al., 2022). Their results suggested that the influence of media-specific parenting diminishes with age and may be overshadowed by individual-level risk factors. Similarly, Li et al. analyzed data from more than 2,400 adolescents and reported that general parenting warmth and behavioral control showed only modest associations with gaming outcomes once psychological variables were included in the models (Li et al., 2022). Consistent with these findings, the present study suggests that digital parenting attitudes alone may not be closely associated with IGD severity, particularly in samples characterized by elevated ADHD symptomatology.

Although ADHD and hyperactivity symptoms were robustly associated with IGD severity, they did not moderate the relationship between digital parenting attitudes and IGD symptoms. This pattern is consistent with prior research suggesting that ADHD-related characteristics may be more strongly associated with IGD symptoms than as conditional moderators of parenting-related effects. In their moderation and mediation analyses, Chung et al. demonstrated that attention problems exerted strong direct effects on IGD severity but did not significantly alter the strength of parenting-related associations (Chung et al., 2023). Their findings suggest that attentional dysregulation may be more strongly related to IGD symptoms, potentially leaving limited variance for interaction effects. Moreover, Thorell et al. emphasized that ADHD symptoms represent relatively stable vulnerabilities across developmental contexts, with consistent effects on problematic digital media use regardless of environmental conditions (Thorell et al., 2024). From this perspective, the absence of a moderating effect in the present study may reflect a ceiling phenomenon, whereby the influence of ADHD-related dysregulation on gaming behavior is sufficiently strong to overshadow variations in digital parenting attitudes. Thus, rather than amplifying or buffering parental effects, ADHD symptoms may show a relatively consistent association with IGD symptoms across different parenting contexts.

Several additional findings also merit brief consideration. Male participants showed higher levels of cognitive problems/inattention, hyperactivity symptoms, ADHD index scores, and IGD severity than female participants, which is broadly consistent with previous literature suggesting that boys may be more vulnerable to both ADHD-related symptom expression and problematic gaming behaviors. In addition, more frequent technology

use was associated with higher cognitive problems/inattention and greater IGD severity, supporting the view that more intensive engagement with digital devices may co-occur with greater attentional difficulties and gaming-related problems. Another noteworthy finding was that protection from digital media risks was lower in the older age group, which may reflect reduced parental monitoring or increasing adolescent autonomy with age. Finally, the positive correlations between protection from digital media risks and ADHD-related symptom dimensions may indicate that parents perceive a greater need for protective digital parenting practices when children show more behavioral and attentional difficulties.

Beyond digital parenting attitudes, the broader family environment may be more closely related to IGD symptoms. Gan et al. examined cumulative family risk in a sample of 600 adolescents using validated measures of family structure, conflict, and emotional climate, and demonstrated that cumulative family risk was positively associated with IGD symptoms (Gan et al., 2022). Their mediation analyses further indicated that individual psychological factors partially explained this association. Similarly, Li et al. employed structural equation modeling in a sample of 315 adolescents to investigate parental interpersonal conflict, emotional disengagement, and related behaviors, finding that these parental factors indirectly contributed to internet gaming addiction through adolescent emotional and behavioral pathways (Li et al., 2025). In line with these findings, the present study identified significant differences in IGD severity according to parental marital status, suggesting that family structure and relational dynamics may be more influential than digital parenting attitudes alone. Taken together, these results underscore the importance of considering IGD within a broader family systems framework, where individual vulnerabilities and family-level risk factors interact to shape gaming-related outcomes.

The findings of the present study should be interpreted in light of several limitations. The cross-sectional design limits the ability to draw causal inferences regarding the relationships between digital parenting attitudes, ADHD-related symptoms, and IGD. Although strong associations were observed —particularly for ADHD and hyperactivity symptoms— the temporal direction of these relationships cannot be determined, and reciprocal effects are likely. The reliance on parent-reported measures may have introduced reporting bias and shared method variance, as parents' perceptions of both their children's behaviors and their own digital parenting practices may be influenced by subjective factors. In addition, because multiple key variables were derived from the same informant, the possibility of common method bias cannot be ruled out, and this may have contributed to inflated associations among the study variables. In addition, digital parenting attitudes were assessed using a general framework that may not fully capture specific parenting practices directly related to gaming behaviors, such as active mediation, rule enforcement, or real-time monitoring. The use of convenience sampling within a single sociocultural context may further restrict the generalizability of the findings to other populations with different family structures or cultural norms. Although the study did not include a comparison group without ADHD-related symptoms, the use of a relatively homogeneous sample with elevated ADHD-related characteristics allowed for a more focused examination of the relationships of interest within a clinically relevant group. However, this design limits the ability to determine whether the observed associations are specific to individuals with ADHD-related symptoms. Finally, the analytical models focused primarily on ADHD-related symptoms, while other relevant individual and contextual factors —such as emotional regulation, peer influences, and broader family functioning— were not examined and should be considered in future research. In addition, age was analyzed using categorical groupings rather than as a continuous variable, which may have reduced the sensitivity of the analysis and led to some loss of information. Sociodemographic subgroup analyses were conducted on an exploratory basis using variables considered

clinically and contextually relevant in the present sample. However, age, sex, frequency of technology use, and family structure were not included as covariates in the regression and moderation models. Therefore, potential confounding effects cannot be ruled out, and the reported associations should be interpreted with caution. In addition, because multiple statistical tests were conducted without formal correction for multiple comparisons, the possibility of Type I error should be considered when interpreting the findings.

In conclusion, this study highlights, in a clinically referred sample of children and adolescents with suspected ADHD-related symptoms, the strong association between ADHD-related symptoms—particularly hyperactivity—and IGD severity, while suggesting that digital parenting attitudes alone were not significantly associated with problematic gaming behaviors in this sample. The findings indicate that individual neurodevelopmental vulnerabilities may be more closely associated with IGD symptoms than contextual digital parenting practices, and that ADHD symptoms did not significantly moderate the relationship between digital parenting attitudes and IGD severity. Moreover, differences observed according to family-related characteristics, such as parental marital status, suggest that broader family context and relational dynamics may also be associated with IGD symptoms. Taken together, these results underscore the importance of adopting a multidimensional perspective that integrates individual psychological vulnerabilities and family-level factors when understanding and addressing IGD. Interventions aimed at preventing or reducing problematic gaming behaviors may benefit from prioritizing the assessment and management of ADHD-related symptoms while situating digital parenting practices within a broader family systems framework. Although the present study focused on moderation, alternative models may also be relevant. In particular, future studies may examine whether parenting-related variables function as mediating mechanisms in the association between ADHD-related symptoms and IGD symptoms. The absence of a formal diagnostic assessment for ADHD should be considered when interpreting the findings, as the results reflect ADHD-related symptomatology rather than clinically confirmed ADHD.

REFERENCES

Antshel, K. M., & Barkley, R. (2020). Attention deficit hyperactivity disorder. *Handbook of Clinical Neurology, 174*, 37–45. https://doi.org/10.1016/B978-0-444-64148-9.00003-X

Arıcak, O. T., Dinç, M., Yay, M., & Griffiths, M. D. (2018). Adapting the short form of the internet gaming disorder scale into Turkish: Validity and reliability. *Addicta: The Turkish Journal on Addictions, 5*(4), 615–636. https://doi.org/10.15805/addicta.2018.5.4.0027

Berloffa, S., Salvati, A., D'Acunto, G., Fantozzi, P., Inguaggiato, E., Lenzi, F., Milone, A., Muratori, P., Pfanner, C., Ricci, F., Ruglioni, L., Tacchi, A., Tessa, C., Villafranca, A., & Masi, G. (2022). Internet gaming disorder in children and adolescents with attention deficit hyperactivity disorder. *Children, 9*(3), 428. https://doi.org/10.3390/children9030428

Borges, G., Orozco, R., Benjet, C., Martínez Martínez, K. I., Vargas Contreras, E., Jiménez Pérez, A. L., Peláez Cedrés, A. J., Hernández Uribe, P. C., Covarrubias Díaz Couder, M. A., Gutiérrez-García, R. A., Quevedo Chávez, G. E., Albor, Y., Méndez, E., Medina-Mora, M. E., Mortier, P., & Ayuso-Mateos, J. L. (2021). (Internet) gaming disorder in DSM-5 and ICD-11: A case of the glass half empty or half full. *The Canadian Journal of Psychiatry, 66*(5), 477–484. https://doi.org/10.1177/0706743720948431

Chung, S. A., Bae, S., Kim, H. J., Lee, J. W., Hwang, H., & Han, D. H. (2023). Mediating effects of attention problems on the link between parenting style and internet gaming disorder in adolescents. *Frontiers in Psychiatry, 14*, 1211889. https://doi.org/10.3389/fpsyt.2023.1211889

Creswell, J. W., & Creswell, J. D. (2017). *Research design: Qualitative, quantitative, and mixed methods approaches*. SAGE Publications.

Fidan, N. K., & Olur, B. (2023). Examining the relationship between parents' digital parenting self-efficacy and digital parenting attitudes. *Education and Information Technologies*. https://doi.org/10.1007/s10639-023-11841-2

Gan, X., Xiang, G. X., Li, H., Wang, S. H., Jin, X., & Zhu, C. S. (2022). Cumulative family risk and internet gaming disorder among adolescents: A serial mediating model of personal growth initiative and gratitude. *Frontiers in Public Health, 10*, 819324. https://doi.org/10.3389/fpubh.2022.819324

Kabadayı, H., & Eyimaya, A. Ö. (2025). Examining the effect of digital parenting attitudes on digital game addiction. *Revista da Escola de Enfermagem da USP, 59*, e20250059. https://doi.org/10.1590/1980-220X-REEUSP-2025-0059en

Kaner, S., Büyüköztürk, Ş., & İşeri, E. (2013). Conners parent rating scale-revised short: Turkish standardization study. *Archives of Neuropsychiatry, 50*(2), 100–110. https://doi.org/10.4274/npa.y6219

Kaya, G. İ., Bayraktar, D. M., & Yılmaz, Ö. (2018). Dijital ebeveynlik tutum ölçeği: Geçerlik ve güvenirlik çalışması. *Mehmet Akif Ersoy Üniversitesi Eğitim Fakültesi Dergisi*, 149–173. https://doi.org/10.21764/maeuefd.390626

Li, H., Peng, K., Wu, Y., Wang, L., & Luo, Z. (2025). Investigating parental factors that lead to adolescent internet gaming addiction. *PLOS ONE, 20*(4), e0322117. https://doi.org/10.1371/journal.pone.0322117

Li, Z. K., Shi, L. J., & Cai, X. L. (2022). Smartphone addiction is more harmful to adolescents than internet gaming disorder: Divergence in the impact of parenting styles. *Frontiers in Psychology, 13*, 1044190. https://doi.org/10.3389/fpsyg.2022.1044190

Liu, J., Wu, L., Sun, X., Bai, X., & Duan, C. (2023). Active parental mediation and adolescent problematic internet use: The mediating role of parent-child relationships and hiding online behavior. *Behavioral Sciences, 13*(8), 673. https://doi.org/10.3390/bs13080679

Lukavská, K., Hrabec, O., Lukavský, J., Demetrovics, Z., & Király, O. (2022). The associations of adolescent problematic internet use with parenting: A meta-analysis. *Addictive Behaviors, 135*, 107423. https://doi.org/10.1016/j.addbeh.2022.107423

Moreno, M., Riddle, K., Jenkins, M. C., Singh, A. P., Zhao, Q., & Eickhoff, J. (2022). Measuring problematic internet use, internet gaming disorder, and social media addiction in young adults: Cross-sectional survey study. *JMIR Public Health and Surveillance, 8*(1), e27719. https://doi.org/10.2196/27719

Paulus, F. W., Ohmann, S., von Gontard, A., & Popow, C. (2018). Internet gaming disorder in children and adolescents: A systematic review. *Developmental Medicine & Child Neurology, 60*(7), 645–659. https://doi.org/10.1111/dmcn.13754

Petrescu, T. C., Błachnio, A., & Enea, V. (2025). Internet gaming disorder in children and adolescents: A systematic review of familial protective and risk factors. *Addictive Behaviors, 167*, 108345. https://doi.org/10.1016/j.addbeh.2025.108345

Piao, M. Y., Jeong, E. J., & Kim, J. A. (2022). Mental health of parents and their children: A longitudinal study of the effects of parents' negative affect on adolescents' pathological gaming. *Healthcare, 10*(11), 2233. https://doi.org/10.3390/healthcare10112233

Pontes, H. M., Stavropoulos, V., & Griffiths, M. D. (2017). Measurement invariance of the internet gaming disorder scale-short-form (IGDS9-SF) between the United States of America, India and the United Kingdom. *Psychiatry Research, 257*, 472–478. https://doi.org/10.1016/j.psychres.2017.08.013

Ren, W., & Zhu, X. (2022). Parental mediation and adolescents' internet use: The moderating role of parenting style. *Journal of Youth and Adolescence, 51*(8), 1483–1496. https://doi.org/10.1007/s10964-022-01600-w

Suen, L. J., Huang, H. M., & Lee, H. H. (2014). [A comparison of convenience sampling and purposive sampling]. *Hu Li Za Zhi, 61*(3), 105–111.

Thorell, L. B., Burén, J., Ström, J., Sandberg, D., & Nutley, S. B. (2024). Longitudinal associations between digital media use and ADHD symptoms in children and adolescents: A systematic literature review. *European Child & Adolescent Psychiatry, 33*(8), 2503–2526. https://doi.org/10.1007/s00787-022-02130-3

Werling, A. M., Kuzhippallil, S., Emery, S., Walitza, S., & Drechsler, R. (2022). Problematic use of digital media in children and adolescents with a diagnosis of attention-deficit/hyperactivity disorder compared to controls: A meta-analysis. *Journal of Behavioral Addictions, 11*(2), 305–325. https://doi.org/10.1556/2006.2022.00007

Peer-Review

Double blind peer reviewed

Conflict of Interest

The authors declare that they have no conflict of interests regarding content of this article.

Financial Support

The Authors report no financial support regarding content of this article.

Acknowledgments

This article was prepared by rearranging the master's thesis titled "The moderating role of attention-deficit/hyperactivity symptoms in the relationship between digital parenting attitudes and internet gaming disorder symptoms," completed in 2025 by Ünzile Feyza Karakoç under the supervision of Asst. Prof. Dr. Çağlar Charles Daniel Jaicks.

Ethical Declaration

Ethical permission was obtained from the Istanbul Aydın University, Social and Human Sciences Ethics Committee for this study with date 19/12/2024 and number 2024/13, and Helsinki Declaration rules were followed to conduct this study.

Authorship Contributions

Concept: Ü.F.K.; Design: Ü.F.K.; Supervision: Ç.C.D.J.; Financing and equipment: -; Data collection and entry: Ü.F.K.; Analysis and interpretation: Ü.F.K., Ç.C.D.J.; Literature search: Ü.F.K.; Writing: Ü.F.K.; Critical review: Ç.C.D.J.

Corresponding Author

[1]**Caglar Charles Daniel Jaicks**

Istanbul Aydin University, Department of Child and Adolescent Psychiatry, Istanbul, Türkiye

Email: caglarjaicks@yahoo.com

ORCID iD: https://orcid.org/0000-0003-4428-6912

Journal of Dependence, 2026; 27(2):75-87

JOURNAL OF DEPENDENCE

Research Article

Internet gaming disorder severity and chronotype in relation to bedtime procrastination among adults with ADHD symptoms reporting regular digital game engagement

Beyza ERDOĞAN AKTÜRK[1]

DOI: 10.51982/bagimli.616

Abstract

Objective: This pilot study examined the associations of internet gaming disorder (IGD) severity and chronotype with bedtime procrastination among adults presenting to a psychiatry outpatient clinic with attention-deficit/hyperactivity disorder (ADHD) symptoms. The potential moderating role of chronotype was also explored.

Methods: Eighty-nine adults presenting to a psychiatry outpatient clinic with ADHD symptoms were recruited consecutively. Participants reporting ≥3 hours/week of digital gaming (n = 51) were included in the main analyses. ADHD symptoms were assessed with the Adult ADHD Self-Report Scale (ASRS-v1.1), chronotype with the Morningness–Eveningness Questionnaire (MEQ), bedtime procrastination with the Bedtime Procrastination Scale (BPS), and IGD severity with the Internet Gaming Disorder Scale–Short Form (IGDS9-SF). Spearman correlations and hierarchical regression analyses were conducted.

Results: Greater IGD severity was positively associated with bedtime procrastination (r_s = .413, p = .003), whereas lower MEQ scores (evening chronotype) were associated with higher bedtime procrastination (r_s = −.541, p < .001). In regression analyses, IGD severity accounted for 22.4% of the variance in bedtime procrastination. Adding chronotype significantly increased explained variance (ΔR^2 = .215), with the final model accounting for 44.6% of total variance. The interaction between IGDS9-SF and MEQ was not statistically significant (β = .081, p = .467), and the interaction term accounted for a small proportion of variance.

Conclusion: IGD severity and evening chronotype were independently associated with bedtime procrastination in adults with ADHD symptoms, highlighting the clinical relevance of assessing both gaming behavior and circadian preference in relation to sleep-related behaviors.

Keywords: Internet gaming disorder; chronotype; bedtime procrastination; attention-deficit/hyperactivity disorder; behavioral addiction.

[1]**Beyza Erdoğan Aktürk**

Tarsus State Hospital, Department of Psychiatry, Mersin, Türkiye

Email: beyzaerdogan128@gmail.com

ORCID iD: 0000-0002-5072-9241

Received: 2026-02-12

Accepted: 2026-03-17

INTRODUCTION

Advances in technology, while contributing substantially to numerous domains in contemporary life, have also led to increased digital exposure and the emergence of previously unforeseen conditions such as Internet gaming disorder, nomophobia, and musculoskeletal disorders (Yıldırım & Kişioğlu, 2018; Şenel et al., 2021). Internet gaming disorder, in particular, is a psychiatric condition that significantly impairs functioning in younger populations and imposes a considerable societal burden (Aksu et al., 2022). This disorder is characterized not merely by excessive time spent gaming, but also by loss of impulse control, deterioration in the fulfillment of daily responsibilities, irritability, and aggression, frequently resulting in marked impairment in family, occupational, and social functioning (Güleç, 2020).

Although epidemiological investigations examining Internet gaming disorder within the broader framework of behavioral addictions remain limited, general prevalence rates of approximately 3%—a non-negligible proportion—have been reported (Kim et al., 2022; Stevens et al., 2021). Variability in technology use across different regions of the world, influenced by economic conditions, socio-cultural characteristics, sampling strategies, and methodological differences in analyses, has contributed to heterogeneous prevalence estimates for Internet gaming disorder (Kim et al., 2022; Darvesh et al., 2020). In addition to the scarcity of epidemiological data, causal and etiological investigations of this disorder are also insufficient. While impulsivity, poor social skills, and excessive engagement with online games have been identified as risk-related behaviors, studies examining causality have not yet provided definitive evidence (Scharkow et al., 2014).

When the general structure of addictions is examined, it is commonly observed that various psychiatric symptoms accompany the clinical presentation. Similar to alcohol and substance use disorders, behavioral addictions such as smartphone addiction are frequently associated with disturbances in the sleep–wake cycle and the postponement of daily routines (Geng et al., 2021; Simiyon et al., 2025; Liu, Chen et al., 2025). However, in Internet gaming disorder, clear evidence regarding the presence and severity of these variables—and whether they represent antecedents or consequences—remains lacking. Particularly in individuals with Attention-Deficit/Hyperactivity Disorder (ADHD), a condition characterized by impulsivity, delaying bedtime and engaging in heightened reward-seeking behaviors to activate the reward system may constitute factors with the potential to disrupt both sleep and overall mental health.

The role of chronotype—an indicator of individual differences in circadian preference, commonly described as morningness or eveningness—represents an additional area of debate in the emergence of procrastination behaviors and behavioral addictions. Although evening chronotype has been reported to be more prevalent in alcohol and substance use disorders, it remains unclear whether this association reflects a causal risk factor or a consequence of addiction-related processes (Taylor et al., 2020; Steardo et al., 2025).

While previous studies have separately examined the relationships between Internet gaming disorder, ADHD symptoms, chronotype, and bedtime procrastination, no study has comprehensively evaluated these variables together, particularly with respect to testing the potential moderating role of chronotype (Cabelguen et al., 2021; Hsu et al., 2024; Uygur & Bahar, 2023).

The present study aims to address this gap. Specifically, we sought to investigate the relationships among Internet gaming disorder severity, chronotype, and bedtime procrastination in individuals presenting to a psychiatry outpatient clinic with attention deficit symptoms. Furthermore, we aimed to test the potential moderating role of chronotype in the association between Internet gaming severity and bedtime procrastination. We anticipate that this approach will contribute to a more comprehensive understanding of the multidimensional nature of

sleep postponement and chronobiological variability in the context of Internet gaming disorder.

H1: Greater internet gaming disorder severity is associated with increased bedtime procrastination in adults with ADHD symptoms reporting regular digital game engagement.

H2: An eveningness-oriented chronotype, as indicated by lower MEQ scores, is associated with greater bedtime procrastination in adults with ADHD symptoms reporting regular digital game engagement.

H3: Chronotype moderates the association between internet gaming disorder severity and bedtime procrastination, indicating a significant interaction between IGDS9-SF and MEQ.

METHODS

Participants

Adults aged 18–65 years who presented to the outpatient psychiatry clinic with attention and concentration complaints suggestive of ADHD symptoms were eligible for inclusion. To classify participants according to gaming behavior, all individuals were asked whether they engaged in digital (internet- or screen-based) gaming for more than three hours per week. Participants meeting this operational criterion were categorized as reporting ≥3 hours/week of digital gaming (n = 51), whereas those below this threshold were categorized as reporting <3 hours/week (n = 38). This threshold was defined a priori for descriptive classification purposes only and was not intended to serve as a diagnostic threshold; all inferential analyses concerning gaming severity were conducted using IGDS9-SF total scores as a continuous variable. The criterion was intended to distinguish individuals with regular gaming engagement from those reporting only incidental or lower-frequency game engagement.

This study was designed as a pilot, feasibility-oriented investigation conducted in a real-world outpatient psychiatry setting. Accordingly, the sample size was primarily determined by achievable recruitment within the predefined study period and the aim of obtaining preliminary estimates of effect magnitudes rather than formal hypothesis testing for small effects. A sensitivity power analysis was conducted using G*Power 3.1 (F tests; linear multiple regression: fixed model, R^2 increase) to contextualize the detectable effect size within the available gamer subgroup (n = 51). Assuming a two-tailed $\alpha = .05$, statistical power $(1-\beta) = .80$, one tested predictor (e.g., the addition of a single main effect or interaction term), and three total predictors in the final model, the minimum detectable incremental effect size was approximately $f^2 \approx 0.17$, corresponding to a moderate effect size. Accordingly, findings were interpreted as preliminary estimates of associations, and moderation analyses were considered exploratory.

Participants were excluded if a comprehensive clinical psychiatric evaluation conducted by a board-certified psychiatrist, in accordance with DSM-5 criteria, indicated the presence of major depressive disorder, bipolar disorder, psychotic disorders, or neurological or neurodevelopmental disorders other than ADHD. Individuals with significant communication or language impairments that could compromise the validity of self-report measures were also excluded.

Data Collection

The study protocol was approved by the Toros University Scientific Research and Publication Ethics Committee (approval date: 24 November 2025; approval number: 09/178). All procedures were conducted in accordance with the ethical standards of the institutional research committee and with the principles of the Declaration of Helsinki.

Participants were recruited consecutively from the outpatient psychiatry clinic between 1 December 2025 and 1 February 2026. All participants provided written informed consent prior to participation.

Measures

Adult ADHD Self-Report Scale (ASRS-v1.1)

Attention-deficit/hyperactivity symptoms were assessed using the Adult ADHD Self-Report Scale (ASRS-v1.1), developed by the World Health Organization (Kessler et al., 2005). The scale assesses two symptom dimensions: inattention and hyperactivity/impulsivity. The Turkish version of the ASRS has demonstrated good internal consistency, with a Cronbach's alpha coefficient of approximately 0.88 (Doğan et al., 2009). The ASRS was used to assess symptom severity and was not employed as a diagnostic classification tool.

Morningness–Eveningness Questionnaire (MEQ)

Chronotype was assessed using the Morningness–Eveningness Questionnaire (MEQ), originally developed by Horne and Östberg (1976) to evaluate individual differences in circadian preference. The questionnaire consists of 19 items and classifies individuals along a continuum from definite morning type to definite evening type. The Turkish adaptation conducted demonstrated good internal consistency (Cronbach's α = 0.785–0.812) and high test–retest reliability (r = 0.84) (Pündük et al., 2005). In the present study, MEQ total scores were treated as a continuous variable, with lower scores indicating greater eveningness. Internal consistency in our sample was good (Cronbach's α = .846).

Bedtime Procrastination Scale (BPS)

Bedtime procrastination was assessed using the Bedtime Procrastination Scale (BPS), originally developed by Kroese et al. (2014) to measure the tendency to delay going to bed without external reasons. The scale consists of nine items rated on a five-point Likert scale. The Turkish adaptation study conducted by Yılmaz Dinç et al. (2016) demonstrated acceptable internal consistency (Cronbach's α = .71) and supported the single-factor structure of the scale. In the present study, BPS total scores were analyzed as a continuous variable, with higher scores indicating greater bedtime procrastination. Internal consistency in our sample was excellent (Cronbach's α = .943).

Internet Gaming Disorder Scale–Short Form (IGDS9-SF)

Internet gaming disorder severity was assessed using the Internet Gaming Disorder Scale–Short Form (IGDS9-SF), developed by Pontes and Griffiths (2015) in accordance with the nine DSM-5 criteria for Internet Gaming Disorder. The scale consists of nine items rated on a five-point Likert scale, assessing gaming-related symptoms over the previous 12 months. The Turkish version validated by Evren et al. (2018) demonstrated good internal consistency (Cronbach's α = 0.89) and supported a unidimensional factor structure. In the present study, the IGDS9-SF was administered only to participants reporting ≥3 hours/week of digital gaming, consistent with the study's focus on gaming severity among regular digital game users, and was treated as a continuous variable. Internal consistency in our sample was good (Cronbach's α = .885).

Statistical Analysis

All statistical analyses were conducted using R (version 4.5.2). Descriptive statistics, including means, standard deviations, and frequency distributions, were computed for all study variables. Internal consistency of the scales was evaluated using Cronbach's alpha coefficients. Normality of continuous variables was assessed using the Shapiro–Wilk test. Visual inspection of Q–Q plots was also performed. Group comparisons between individuals who engaged in digital (internet- or screen-based) gaming for ≥3 hours per week and those who engaged in digital gaming for <3 hours per week were performed using independent samples t-tests for normally distributed variables, Mann–Whitney U tests for non-normally distributed variables, and chi-square or Fisher's exact tests for categorical variables. Homogeneity of variances was evaluated using Levene's test.

Analyses involving the BPS and the IGDS9-SF were restricted to participants who engaged in digital gaming for ≥3 hours per week (n = 51). Bivariate associations among study variables within this group were examined using Spearman rank-order correlations due to violations of normality assumptions. To examine associations with bedtime procrastination among participants reporting ≥3 hours/week of digital gaming, hierarchical multiple regression analyses were conducted. In the primary model, IGD severity (IGDS9-SF) was entered in Step 1, chronotype (MEQ) was added in Step 2, and the interaction term (IGDS9-SF × MEQ) was entered in Step 3 to test the potential moderating role of chronotype. In a separate robustness analysis, ADHD symptom severity (ASRS total score) was additionally included as a covariate to evaluate whether observed associations remained after adjustment. All continuous predictors were mean-centered prior to analysis to reduce multicollinearity. Assumptions of linear regression (normality, homoscedasticity, independence of errors, and multicollinearity) were evaluated through inspection of residual plots and variance inflation factor (VIF) values. Statistical significance was set at $p < .05$.

RESULTS

Sample Characteristics

The sample consisted of 89 adults (52 males, 58.4%; 37 females, 41.6%) with a mean age of 32.98 years (SD = 9.84). The majority of participants were university graduates (69.7%), employed (68.5%), and married (52.8%). Among the participants, 51 individuals (57.3%) reported ≥3 hours per week of digital gaming, whereas 38 participants (42.7%) reported <3 hours per week. Sociodemographic characteristics of the sample are presented in **Table 1.**

Table 1. Sociodemographic Characteristics of Participants (n = 89)

Variable	**Mean**	**SD**
Age (years)	32.98	9.84
Variable	**n**	**%**
Sex		
Female	37	41.6
Male	52	58.4
Marital status		
Never married	36	40.4
Married	47	52.8
Divorced/Widowed	6	6.7
Employment status		
Unemployed	14	15.7
Employed	61	68.5
Student	14	15.7
Education level		
Primary school	2	2.2
High school	25	28.1
University or postgraduate	62	69.7
Tobacco use		
No	50	56.2
Yes	39	43.8
Alcohol use		
No	71	79.8
Yes	18	20.2
Drug use		
No	87	97.8
Yes	2	2.2

Note. n = frequency, SD: standard deviation

Scale Properties

All study instruments demonstrated acceptable to excellent internal consistency. Cronbach's alpha coefficients were .905 for the ASRS, .846 for the MEQ, .943 for the BPS, and .885 for the IGDS9-SF. The IGDS9-SF reliability estimate was calculated within the subgroup reporting ≥3 hours/week of digital gaming. Descriptive statistics for all study measures are presented in **Table 2**.

Table 2. Descriptive Statistics and Internal Consistency of Study Measures

Scale	Mean	SD	Min	Max	Cronbach's α
ASRS	32.25	13.61	5	72	.905
MEQ	48.27	10.48	20	77	.846
BPS	25.31	9.93	10	45	.943
IGDS9-SF	16.49	8.66	9	42	.885

Note. ASRS = Adult ADHD Self-Report Scale; MEQ = Morningness–Eveningness Questionnaire; BPS = Bedtime Procrastination Scale; IGDS9-SF = Internet Gaming Disorder Scale–Short Form; SD = standard deviation. Cronbach's α values indicate internal consistency reliability.

Group Comparisons

No significant differences were observed between participants reporting ≥3 hours/week of digital gaming and those reporting <3 hours/week in terms of age (Mann–Whitney U = 1127.5, p = .189), MEQ total scores (t = 1.35, p = .180), or ASRS total scores (t = 0.83, p = .411). However, significant group differences were observed for sex (χ^2 = 4.18, p = .041), with a higher proportion of males in the ≥3 hours/week group (68.6%) compared to the <3 hours/week group (44.7%). Additionally, education level (Fisher's exact test, p = .006) and employment status (Fisher's exact test, p = .024) differed significantly between groups. Detailed comparisons are presented in **Table 3.**

Table 3. Comparison of Sociodemographic and Clinical Characteristics Between Participants Reporting ≥3 Hours/Week and <3 Hours/Week of Digital Gaming

Variable	<3 hours/week (n = 38)	≥3 hours/week (n = 51)	Test statistic	p
Age (years), *Mean (SD)*	34.00 (7.49)	32.22 (11.30)	U = 1127.5	.189
Sex, *n (%)*			χ^2 = 4.18	.041*
Female	21 (55.3%)	16 (31.4%)		
Male	17 (44.7%)	35 (68.6%)		
Marital status, *n (%)*			Fisher's exact	.621
Never married	12 (31.6%)	24 (47.1%)		
Married	24 (63.2%)	23 (45.1%)		
Divorced/Widowed	2 (5.3%)	4 (7.8%)		
Employment status, *n (%)*			Fisher's exact	.024*
Unemployed	3 (7.9%)	11 (21.6%)		
Employed	32 (84.2%)	29 (56.9%)		
Student	3 (7.9%)	11 (21.6%)		
Education level, *n (%)*			Fisher's exact	.006**
Primary school	0 (0.0%)	2 (3.9%)		
High school	5 (13.2%)	20 (39.2%)		
University or postgraduate	33 (86.8%)	29 (56.9%)		
MEQ total score, *Mean (SD)*	50.00 (12.30)	46.98 (8.79)	t = 1.35	.180
ASRS total score, *Mean (SD)*	33.63 (14.50)	31.22 (12.90)	t = 0.83	.411

Note. Values are presented as n (%) unless otherwise indicated.
MEQ = Morningness–Eveningness Questionnaire; ASRS = Adult ADHD Self-Report Scale.
**p < .05, **p < .01.*

Correlations

Among participants reporting ≥3 hours/week of digital gaming (n = 51), chronotype (MEQ) was negatively associated with bedtime procrastination (BPS) (r_s = −.541, p < .001), whereas IGD severity was positively associated with bedtime procrastination (r_s = .413, p = .003). ADHD symptom severity (ASRS total score) was also positively correlated with bedtime procrastination (r_s = .501, p < .001). The correlation between chronotype and IGD severity was not statistically significant (r_s = −.054, p = .705). Detailed correlation coefficients are presented in **Table 4** and illustrated in **Figures 1** and **2**.

Table 4. Spearman Correlations Among Study Variables in the ≥3 Hours/Week Digital Gaming Subgroup (n = 51)

Variable	1	2	3	4
1. MEQ	1.000			
2. BPS	-.541**	1.000		
3. IGDS9-SF	-.054	.413**	1.000	
4. ASRS	-.200	.501**	.402**	1.000

*Note. Spearman's rank-order correlation coefficients are reported. MEQ = Morningness–Eveningness Questionnaire; BPS = Bedtime Procrastination Scale; IGDS9-SF = Internet Gaming Disorder Scale–Short Form. Lower MEQ scores indicate greater eveningness.**p < .01.*

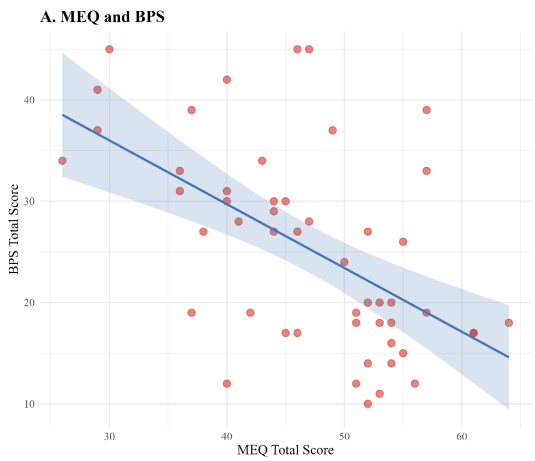

Figure 1: Association between chronotype (MEQ total score) and bedtime procrastination (BPS total score). Lower MEQ scores (evening preference) were associated with higher bedtime procrastination (Spearman r = –.541, p < .001).

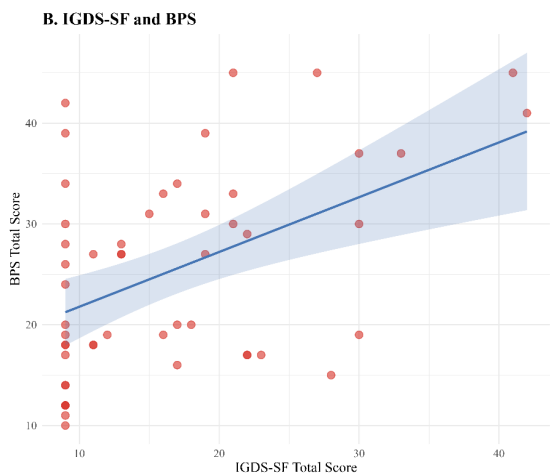

Figure 2: Bivariate association between IGD severity (IGDS9-SF total score) and bedtime procrastination (BPS total score). A moderate positive correlation was observed (Spearman r = .413, p = .003).

Hierarchical Regression Analysis

A three-step hierarchical multiple regression analysis was conducted among participants reporting ≥3 hours/week of digital gaming (n = 51). In Step 1, internet gaming disorder severity (IGDS9-SF) accounted for 22.4% of the variance in bedtime procrastination (F(1, 49) = 14.18, p < .001; β = .474). In Step 2, chronotype (MEQ) was added, resulting in a significant increase in explained variance (ΔR^2 = .215, F change = 18.43, p < .001). In this model, both IGDS9-SF (β = .368, p = .002) and MEQ (β = −.475, p < .001) were independently associated with bedtime procrastination. In Step 3, the interaction term (IGDS9-SF × MEQ) was included to examine the moderating role of chronotype. The interaction was not statistically significant (β = .081, p = .467), and the increase in explained variance was minimal (ΔR^2 = .006). The final model accounted for 44.6% of the variance in bedtime procrastination. Results from the final hierarchical model are presented in **Table 5** and illustrated in **Figure 3**.

In an additional regression analysis including ADHD symptom severity (ASRS score) as a covariate, the overall model remained statistically significant (R^2 = .499, p < .001). In this ADHD-adjusted model, chronotype (β = −.411, p < .001) and ASRS total score (β = .305, p = .022) were independently associated with bedtime

Table 5. Hierarchical Regression Analysis Predicting Bedtime Procrastination in Participants Reporting ≥3 Hours/Week of Digital Gaming (n = 51)							
Variable	**B**	**SE**	**β**	**t**	**p**	**R2**	**Delta R2**
Step 1						.224	
IGDS9-SF	0.543	0.144	.474	3.765	<.001		
Step 2						.440	.215***
IGDS9-SF	0.422	0.127	.368	3.320	.002		
MEQ	-0.537	0.125	-.475	-4.292	<.001		
Step 3						.446	.006
IGDS9-SF	0.469	0.143	.409	3.283	.002		
MEQ	-0.560	0.130	-.496	-4.321	<.001		
IGDS9-SF x MEQ	0.009	0.012	.081	0.733	.467		

*Note. IGDS9-SF = Internet Gaming Disorder Scale–Short Form; MEQ = Morningness–Eveningness Questionnaire. B = unstandardized coefficient; SE = standard error; β = standardized coefficient. R^2 represents the proportion of variance in bedtime procrastination explained by the model. ΔR^2 indicates the increase in explained variance relative to the previous step. ***p < .001, **p < .01.*

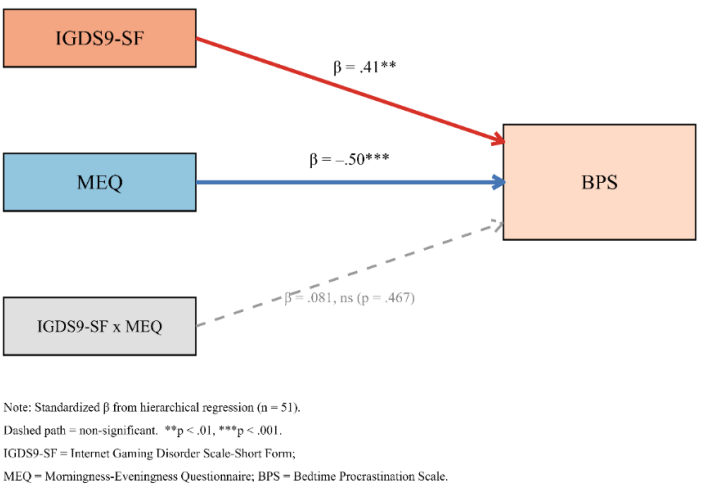

Figure 3. Hierarchical Regression Model Examining Associations of IGD Severity and Chronotype With Bedtime Procrastination in the ≥3 Hours/Week Gaming Subgroup (n = 51)

procrastination, whereas the association between IGDS9-SF and bedtime procrastination was attenuated and no longer statistically significant (β = .211, p = .098). These results are presented in **Table 6**.

DISCUSSION

To our knowledge, this pilot study is among the first to examine the relationships among digital gaming disorder severity, bedtime procrastination, and chronotype in individuals presenting to a psychiatry outpatient clinic with ADHD symptoms. Our primary findings indicate that, among individuals with ADHD symptoms, greater digital gaming disorder severity and an evening chronotype were significantly associated with higher levels of bedtime procrastination. In hierarchical regression analyses, both variables showed independent associations in the primary model; however, the association between gaming severity and bedtime procrastination weakened after adjustment for ADHD symptom severity.

The observed association between digital gaming disorder severity and bedtime procrastination is consistent with previous research linking behavioral addictions to sleep disturbances (Yeh et al., 2017). For example, a meta-analysis reported that internet addiction is significantly associated with overall sleep problems and reduced sleep duration (Alimoradi et al., 2019). Kristensen et al. (2021) found significant effects of problematic gaming on reduced sleep duration, poorer sleep quality, and increased daytime sleepiness. Similarly, individuals with smartphone addiction have been shown to exhibit poorer sleep quality as well as increased behavioral difficulties (Soni et al., 2017). In the present study, although this association was observed in bivariate and primary regression analyses, it weakened after adjustment for ADHD symptom severity. The contribution of the present study lies in examining these relationships within a clinical subgroup characterized by ADHD symptoms and in jointly addressing chronotype, gaming severity, and bedtime procrastination—an integration that has received limited attention in previous research.

LeBourgeois et al. (2017) suggest that digital media may affect sleep through mechanisms such as disruption of circadian rhythms due to device-emitted light, distortion of time perception, and psychological arousal caused by digital content. Exposure to digital gaming during evening hours may disrupt sleep onset by increasing cortical arousal and activating reward-related neural systems (Kristensen et al., 2021). In the present study, IGDS9-SF scores alone explained 22.4% of the variance in bedtime procrastination in the primary regression model. This finding suggests that gaming severity may be meaningfully associated with sleep-related behavioral tendencies in individuals with ADHD symptoms; however, part of this association may reflect variance shared with ADHD symptom severity. In the context of ADHD, impulsivity and deficits in self-regulation may increase sleep-related problems either through an elevated risk of gaming addiction severity (Yen et al., 2017) or through direct behavioral disruptions such as delaying bedtime. Impairments in inhibitory control mechanisms may render individuals more vulnerable to problematic gaming behaviors and accompanying sleep-related difficulties compared with the general population (Aydin et al., 2024).

Chronotype is well known to be an important factor influencing sleep-related variables such as sleep duration, sleep quality, and sleep onset timing (Juda et al., 2013). In our study, evening chronotype was significantly associated with higher bedtime procrastination ($r_s = -.541$, $p < .001$). Moreover, this association remained significant even after controlling for ADHD symptoms. This finding is

Table 6. ASRS-Adjusted Regression Model Examining Associations with Bedtime Procrastination (Robustness Analysis) (n = 51)

Variable	B	SE	Beta	t	p	R2	Delta R2
Step 1						.440	
IGDS9-SF (centered)	0.422	0.127	.368	3.320	.002		
MEQ (centered)	-0.537	0.125	-.476	-4.292	< .001		
Step 2						.499	.059*
IGDS9-SF (centered)	0.242	0.143	.211	1.689	.098		
MEQ (centered)	-0.464	0.123	-.411	-3.760	< .001		
ASRS total	0.234	0.099	.305	2.368	.022		

*Note. IGDS9-SF = Internet Gaming Disorder Scale–Short Form; MEQ = Morningness–Eveningness Questionnaire; ASRS = Adult ADHD Self-Report Scale. B = unstandardized coefficient; SE = standard error; β = standardized coefficient. R^2 represents the proportion of variance in bedtime procrastination explained by the model. ΔR^2 indicates the increase in explained variance after the inclusion of ADHD symptom severity. *p < .05, ***p < .001.*

consistent with previous research showing that individuals with an evening chronotype are more prone to delaying bedtime (Carciofo & Cheung, 2025; Kühnel et al., 2018). It is also consistent with theoretical models suggesting that bedtime procrastination may reflect a mismatch between biological circadian preferences and environmental or social demands (Díaz-Morales et al., 2008). These findings highlight the potential importance of considering circadian preference in clinical assessments of sleep-related behaviors. Previous literature has suggested interventions targeting sleep hygiene and circadian regulation to address delayed sleep patterns (e.g., chronotherapy and behavioral sleep interventions) (Lack & Wright, 2007; Culnan et al., 2019); however, these strategies were not directly examined in the present study.

When digital gaming disorder severity and chronotype were examined together, they explained 44.6% of the variance in bedtime procrastination in the primary regression model, reflecting a notable proportion of explained variance within the limits of the sample size. However, the interaction effect between IGDS9-SF and MEQ was not statistically significant ($\beta = .081$, $p = .467$), indicating that, in this sample, chronotype did not moderate the effect of gaming severity on bedtime procrastination. Instead, digital gaming disorder severity and chronotype showed additive associations with bedtime procrastination. Notably, when ADHD symptom severity was also included in the model, the association between gaming severity and bedtime procrastination weakened and was no longer statistically significant; in contrast, chronotype and ADHD symptoms remained independently associated with bedtime procrastination. Our findings show similarities with some studies in the literature. Liau et al. (2015) demonstrated that higher impulsivity is associated with lower self-regulation, which in turn is associated with higher pathological gaming (dual-system model). Lin et al. (2023) showed that ADHD exacerbates insomnia among individuals with IGD. This pattern suggests that part of the association between gaming severity and bedtime procrastination may reflect shared variance linked to self-regulation difficulties associated with ADHD (Liu, Qiao, et al., 2025). From a clinical perspective, these findings suggest that gaming behavior, circadian preference, and ADHD symptom severity may represent interrelated but partially overlapping factors in understanding bedtime procrastination among individuals with ADHD symptoms.

No significant differences were observed in chronotype or ADHD symptom severity between participants reporting ≥3 hours of digital gaming per week and those reporting <3 hours. However, significant differences emerged in terms of gender distribution, education level, and employment status. The higher proportion of males in the ≥3 hours/week group is consistent with previous evidence indicating greater participation of males in digital gaming (Dong & Potenza, 2022). The lower education level and higher unemployment rates observed in this group may reflect broader sociodemographic characteristics associated with more frequent gaming; however, the cross-sectional design does not allow causal interpretations. In addition, characteristics such as impulsivity and inhibitory control difficulties—which have been reported to vary by gender—may also partially contribute to these differences (Dong & Potenza, 2022).

In summary, H1 was partially supported (the IGD–bedtime procrastination association was significant in the primary model but attenuated after adjustment for ADHD symptoms), H2 was fully supported, and H3 was not supported.

In conclusion, the findings suggest that bedtime procrastination in adults with ADHD symptoms reflects a multidimensional pattern involving gaming severity, circadian preference, and underlying ADHD symptomatology. Although digital gaming disorder severity was associated with delayed bedtime, this association weakened after adjustment for ADHD symptom severity, indicating a partial overlap between these constructs. Evening chronotype, however, remained consistently associated with

bedtime procrastination. These findings support a comprehensive clinical assessment approach that includes the evaluation of gaming behavior, circadian preference, and ADHD-related self-regulation difficulties in individuals presenting with delayed sleep patterns. Longitudinal and multimethod studies are needed to clarify the temporal direction of these relationships and to better elucidate the underlying mechanisms.

Limitations

The cross-sectional design, relatively small sample size, and single-center recruitment limit the generalizability of the findings. Given the pilot and feasibility-oriented nature of the study, results—particularly the non-significant interaction term—should be interpreted as preliminary. Sensitivity power analysis indicated detectability only for moderate incremental effects; as interaction effects in field research are typically small, the present sample was likely underpowered to detect moderation, and the non-significant interaction should be interpreted with this caveat. The reliance on self-report instruments may have introduced response bias. In addition, ADHD symptom severity was assessed using a screening measure rather than a structured diagnostic interview, and participants were not required to meet DSM-5 criteria for ADHD. Therefore, findings reflect associations within a population presenting with ADHD symptoms rather than formally diagnosed ADHD. Finally, the attenuation of the association between IGD severity and bedtime procrastination after adjustment for ADHD symptom severity suggests partial construct overlap, which future studies should disentangle using longitudinal and multi-method designs.

CONCLUSION

This study examined the associations among chronotype, digital gaming disorder severity, and bedtime procrastination in adults presenting with ADHD symptoms. Evening chronotype was consistently associated with greater bedtime procrastination, whereas the association between gaming severity and delayed bedtime appeared to partially overlap with underlying ADHD symptom severity. These findings underscore the multifactorial nature of sleep-related behavioral difficulties in individuals with attention-related complaints. As digital engagement becomes increasingly embedded in daily life, continued investigation of its interaction with circadian preference and self-regulation processes remains clinically relevant. Future longitudinal and multi-method studies are needed to clarify temporal relationships and to inform targeted intervention strategies.

REFERENCES

Aksu, M. H., Yığman, F., & Ekici, E. (2022). Aggression and Coping Strategies in Young Adults with Internet Gaming Disorder Symptoms. *Value in Health Sciences*, 12(2), 199–202. https://doi.org/10.33631/sabd.1108620

Alimoradi, Z., Lin, C. Y., Broström, A., Bülow, P. H., Bajalan, Z., Griffiths, M. D., Ohayon, M. M., & Pakpour, A. H. (2019). Internet addiction and sleep problems: A systematic review and meta-analysis. *Sleep medicine reviews*, 47, 51–61. https://doi.org/10.1016/j.smrv.2019.06.004

Aydin, T., Arabaci, G., Kilintari, M., Taylor, J., & Parris, B. A. (2024). Inhibitory control ability moderates the relationship between internet addiction and inattention in ADHD in a community sample. *Personality and Individual Differences*, 230, 112804. https://doi.org/10.1016/j.paid.2024.112804

Cabelguen, C., Rocher, B., Leboucher, J., Schreck, B., Challet-Bouju, G., Hardouin, J. B., & Grall-Bronnec, M. (2021). Attention deficit hyperactivity disorder and gaming disorder: Frequency and associated factors in a clinical sample of patients with Gaming Disorder. *Journal of behavioral addictions*, 10(4), 1061–1067. https://doi.org/10.1556/2006.2021.00074

Carciofo, R., & Cheung, R. Y. M. (2025). Eveningness and Procrastination: An Exploration of Relationships with Mind Wandering, Sleep Quality, Self-Control, and Depression. *European journal of investigation in health*, psychology and education, 15(5), 79. https://doi.org/10.3390/ejihpe15050079

Culnan, E., McCullough, L. M., & Wyatt, J. K. (2019). Circadian rhythm sleep-wake phase disorders. *Neurologic Clinics*, 37(3), 527–543. https://doi.org/10.1016/j.ncl.2019.04.003

Darvesh, N., Radhakrishnan, A., Lachance, C. C., Nincic, V., Sharpe, J. P., Ghassemi, M., Straus, S. E., & Tricco, A. C. (2020). Exploring the prevalence of gaming disorder and Internet gaming disorder: a rapid scoping review. *Systematic reviews*, 9(1), 68. https://doi.org/10.1186/s13643-020-01329-2

Díaz-Morales, J. F., Ferrari, J. R., & Cohen, J. R. (2008). Indecision and avoidant procrastination: the role of morningness-eveningness and time perspective in chronic delay lifestyles. *The Journal of general psychology*, *135*(3), 228–240. https://doi.org/10.3200/GENP.135.3.228-240

Doğan, S., Öncü, B., Varol Saraçoğlu, G., & Küçükgöncü, S. (2009). Validity and reliability of the Turkish version of the Adult ADHD Self-Report Scale (ASRS-v1.1). *Anatolian Journal of Psychiatry*, 10(2), 77–87.

Dong, G. H., & Potenza, M. N. (2022). Considering gender differences in the study and treatment of internet gaming disorder. *Journal of Psychiatric Research*, 153, 25–29. https://doi.org/10.1016/j.jpsychires.2022.06.057

Evren, C., Dalbudak, E., Topcu, M., Kutlu, N., Evren, B., & Pontes, H. M. (2018). Psychometric validation of the Turkish nine-item Internet Gaming Disorder Scale–Short Form (IGDS9-SF). *Psychiatry Research*, 265, 349–354. https://doi.org/10.1016/j.psychres.2018.05.002

Geng, Y., Gu, J., Wang, J., & Zhang, R. (2021). Smartphone addiction and depression, anxiety: The role of bedtime procrastination and self-control. *Journal of Affective Disorders*, 293, 415–421. https://doi.org/10.1016/j.jad.2021.06.062

Güleç, G. (2020). İnternet oyun oynama bozukluğu belirtileri ve tanısı. In C. Evren (Ed.), *Davranışsal bağımlılıklar: Temel başvuru kitabı* (pp. 351–363). Türk Psikiyatri Derneği Yayınları.

Horne, J. A., & Ostberg, O. (1976). A self-assessment questionnaire to determine morningness–eveningness in human circadian rhythms. *International Journal of Chronobiology*, 4(2), 97–110.

Hsu, T. W., Yen, J. Y., Yeh, W. C., & Ko, C. H. (2024). Circadian typology and physical activity in young adults with gaming disorder. *Medicina*, 60(12), 1950. https://doi.org/10.3390/medicina60121950

Juda, M., Vetter, C., & Roenneberg, T. (2013). Chronotype modulates sleep duration, sleep quality, and social jet lag in shift-workers. *Journal of Biological Rhythms*, 28(2), 141–151. https://doi.org/10.1177/0748730412475042

Kessler, R. C., Adler, L., Ames, M., Demler, O., Faraone S., Hiripi E., Howes M. J., Jin R., Secnik K., Spencer T. & Ustun T. B. (2005). The World Health Organization Adult ADHD Self-Report Scale (ASRS): A short screening scale for use in the general population. *Psychological Medicine*, 35(2), 245–256. https://doi.org/10.1017/S0033291704002892

Kim, H. S., Son, G., Roh, E. B., Ahn W. Y., Kim J., Shin S. H., Chey J. & Choi K. H. (2022). Prevalence of gaming disorder: A meta-analysis. *Addictive Behaviors*, 126, 107183. https://doi.org/10.1016/j.addbeh.2021.107183

Kühnel J, Syrek CJ & Dreher A (2018) Why Don't You Go to Bed on Time? A Daily Diary Study on the Relationships between Chronotype, Self-Control Resources and the Phenomenon of Bedtime Procrastination. *Frontiers in Psychology,* 9:77. https://doi.org/10.3389/fpsyg.2018.00077

Kristensen, J. H., Pallesen, S., King, D. L., Hysing, M., & Erevik, E. K. (2021). Problematic gaming and sleep: A systematic review and meta-analysis. *Frontiers in Psychiatry*, 12, 675237. https://doi.org/10.3389/fpsyt.2021.675237

Kroese, F. M., De Ridder, D. T. D., Evers, C., & Adriaanse, M. A. (2014). Bedtime procrastination: Introducing a new area of procrastination. *Frontiers in Psychology*, 5, 611. https://doi.org/10.3389/fpsyg.2014.00611

Lack, L. C., & Wright, H. R. (2007). Clinical Management of Delayed Sleep Phase Disorder. *Behavioral Sleep Medicine,* 5(1), 57–76. https://doi.org/10.1080/15402000709336726

LeBourgeois, M. K., Hale, L., Chang, A. M., Akacem, L. D., Montgomery-Downs, H. E., & Buxton, O. M. (2017). Digital media and sleep in childhood and adolescence. *Pediatrics*, 140(Supplement_2), S92-S96. https://doi.org/10.1542/peds.2016-1758J

Liau, A. K., Neo, E. C., Gentile, D. A., Sim, T., & Khoo, A. (2015). Impulsivity, self-regulation, and pathological video gaming among youth: Testing a mediation model. *Asia Pacific Journal of Public Health,* 27(2), NP2188–NP2196. https://doi.org/10.1177/1010539511429369

Lin, Y. J., Yen, J. Y., Lin, P. C., Liu, T. L., Chen, C. S., & Ko, C. H. (2023). Circadian typologies and insomnia in individuals with internet gaming disorder comorbid with attention deficit/hyperactivity disorder. *Scientific Reports*, 13, 12764. https://doi.org/10.1038/s41598-023-39462-2

Liu, H., Qiao, X., & Shi, X. (2025). Longitudinal associations between sleep disturbance trajectories and internet gaming disorder mediated by self-control: A six-wave longitudinal investigation. *Psychology Research and Behavior Management*, 18, 169–180. https://doi.org/10.2147/PRBM.S488974

Liu, Z. Y., Chen, Y. J., Bian, T. Y., Xiang Y., Yuan R., Han-xue Yang H. (2025). Associations among smartphone addiction, chronotype, and bedtime procrastination: Bayesian network analysis and pilot intervention. *Current Psychology*, 44, 3326–3339. https://doi.org/10.1007/s12144-025-07407-9

Pontes, H. M., & Griffiths, M. D. (2015). Measuring DSM-5 internet gaming disorder: Development and validation of a short psychometric scale. *Computers in Human Behavior*, 45, 137–143. https://doi.org/10.1016/j.chb.2014.12.006

Pündük, Z., Gür, H., & Ercan, I. (2005). Reliability study of the Turkish version of the morningness–eveningness questionnaire. *Turkish Journal of Psychiatry*, 16(1), 40–45.

Scharkow, M., Festl, R., & Quandt, T. (2014). Longitudinal patterns of problematic computer game use among adolescents and adults: A 2-year panel study. *Addiction*, 109(11), 1910–1917. https://doi.org/10.1111/add.12662

Simiyon, M., Ramamurthy, P., Kattula, D., & Jones, S. (2025). Association between chronotypes and addiction among adults: A systematic review. *BJPsych Open*, 11(Suppl 1), S69. https://doi.org/10.1192/bjo.2025.10230

Soni, R., Upadhyay, R., & Jain, M. (2017). Prevalence of smartphone addiction, sleep quality and associated behaviour problems in adolescents. *International Journal of Research in Medical Sciences*, 5(2), 515–519. https://doi.org/10.18203/2320-6012.ijrms20170142

Steardo, L., D'Angelo, M., Di Stefano, V., Vignapiano, A., Panarello, E., Monaco, F., Fornaro, M., & Steardo, L. (2025). Chronotype and substance use disorder: A systematic review with meta-analysis on the impact of circadian misalignment on psychopathology and clinical course. *Sleep Medicine Reviews*, 82, 102116. https://doi.org/10.1016/j.smrv.2025.102116

Stevens, M. W., Dorstyn, D., Delfabbro, P. H., & King, D. L. (2021). Global prevalence of gaming disorder: A systematic review and meta-analysis. *Australian & New Zealand Journal of Psychiatry*, 55(6), 553–568. https://doi.org/10.1177/0004867420962851

Şenel, A., Atılgan, E., Turhan, M., et al. (2021). Musculoskeletal Symptoms in Adolescents with Internet Gaming Disorders. *Journal of Dependence*, 22(3), 218–225. https://doi.org/10.51982/bagimli.880452

Taylor, B. J., Bowman, M. A., Brindle, A., Hasler, B. P., Roecklein,

K. A., Krafty, R. T., Matthews, K. A., & Hall, M. H. (2020). Evening chronotype, alcohol use disorder severity, and emotion regulation in college students. *Chronobiology International*, 37(12), 1725–1735. https://doi.org/10.1080/07420528.2020.1800028

Uygur, Ö. F., & Bahar, A. (2023). The relationship between attention deficit hyperactivity disorder symptoms and bedtime procrastination. *Journal of Contemporary Medicine*, 13(2), 241–246. https://doi.org/10.16899/jcm.1242778

Yeh, Y. C., Wang, P. W., Huang, M. F., Lin, P. C., Chen, C. S., & Ko, C. H. (2017). The procrastination of Internet gaming disorder in young adults: The clinical severity. *Psychiatry Research*, 254, 258–262. https://doi.org/10.1016/j.psychres.2017.04.055

Yen, J. Y., Liu, T. L., Wang, P. W., Chen, C. S., Yen, C. F., & Ko, C. H. (2017). Association between Internet gaming disorder and adult attention deficit and hyperactivity disorder and their correlates: Impulsivity and hostility. *Addictive behaviors*, 64, 308-313. https://doi.org/10.1016/j.addbeh.2016.04.024

Yıldırım, S., & Kişioğlu, A. N. (2018). New diseases due to technology: nomophobia, netlessphobia, FoMO. *Medical Journal of Süleyman Demirel University*, 25(4), 473–480. https://doi.org/10.17343/sdutfd.380640

Yılmaz Dinç, S., Koçhan, K., & Zat, Z. (2016). The validity and reliability of the bedtime procrastination scale. *International Journal of Humanities and Social Science Invention*, 5(9), 57–62.

Peer-Review

Double blind peer reviewed

Conflict of Interest

The authors declare that they have no conflict of interests regarding content of this article.

Financial Support

The Author report no financial support regarding content of this article.

Ethical Declaration

[X] The study protocol was approved by the Toros University Scientific Research and Publication Ethics Committee (approval date: 24 November 2025; approval number: 09/178). All procedures were conducted in accordance with the ethical standards of the institutional research committee and with the principles of the Declaration of Helsinki.

Authorship Contributions

Concept: BEA Design: BEA, Data collection and entry: BEA, Analysis and interpretation: BEA, Literature search: BEA, Writing: BEA, Critical review: BEA

Corresponding Author

Beyza Erdoğan Aktürk

Tarsus State Hospital, Department of Psychiatry, Mersin, Türkiye

Email: beyzaerdogan128@gmail.com

ORCID iD: 0000-0002-5072-9241

Journal of Dependence, 2026; 27(2):88-100

JOURNAL OF DEPENDENCE

Research Article

At-risk/problem gambling among healthcare workers: An analytical cross-sectional study

Ertan YILMAZ[1], Ahmethan TURAN[2]

DOI: 10.51982/bagimli.617

Abstract

Objective: This study aimed to examine the frequency of at-risk/problem gambling among healthcare workers (HCWs) and to identify associated sociodemographic and behavioral factors. **Methods:** This cross-sectional study was conducted among HCWs of a public university hospital. A total of 236 participants who completed an online survey were included in the analysis. Gambling severity was assessed using the Problem Gambling Severity Index (PGSI). Participants were categorized as non-problem gambling (PGSI=0) and at-risk/problem gambling (PGSI≥1). Group differences were examined and variables associated with gambling status were entered into a multivariable logistic regression model to identify factors independently associated with gambling status. **Results:** Overall, 19.9% of participants were classified as at-risk/problem gamblers. Gambling status was significantly associated with gender, education level, occupation, tobacco use, gambling account ownership, gambling application use, and age. In multivariable analysis, tobacco use, gambling application use, physicians (among the occupational groups assessed) and younger age remained independently associated with at-risk/problem gambling. **Conclusion:** At-risk and problem gambling behaviors are present among HCWs and are associated with identifiable demographic and behavioral factors. These findings underscore the importance of increasing awareness within healthcare institutions and implementing preventive and early identification strategies to mitigate potential individual and occupational consequences.

Keywords: Gambling, Health personnel, Pathological gambling, Risk factor

[1]**Ertan Yılmaz**

Hatay Mustafa Kemal University, Tayfur Ata Sökmen Faculty of Medicine, Department of Psychiatry, Hatay, Türkiye

Email: ertan.yilmaz@mku.edu.tr

ORCID iD: 0000-0002-9926-9661

[2]**Ahmethan Turan**

Hatay Mustafa Kemal University, Tayfur Ata Sökmen Faculty of Medicine, Department of Psychiatry, Hatay, Türkiye

Email: ahmethanturan@mku.edu.tr

ORCID iD: 0000-0002-1482-1470

Received: 2025-12-18

Accepted: 2026-03-04

INTRODUCTION

Gambling is increasingly recognized as a public health issue, as its harms extend beyond individuals who meet the full diagnostic criteria for gambling disorder and may affect families, workplaces, and healthcare systems. Conceptual and empirical studies emphasize that gambling-related harms occur along a continuum and propose a taxonomy encompassing financial, relational, emotional/psychological, health, cultural, and occupational or educational domains (Langham et al., 2016).

Gambling behavior exists on a broad spectrum, ranging from recreational participation to risky patterns associated with escalating losses, functional impairment, and wider harms. Structural characteristics of gambling products—such as rapid event frequency, near-miss features, continuous betting opportunities, and online accessibility—together with environmental factors like aggressive marketing and easy smartphone access, may increase the likelihood of persistent gambling and related harm, even among individuals without a formal diagnosis (Wardle et al., 2024).

In current diagnostic nosology, gambling disorder is classified among addictive disorders in the Diagnostic and Statistical Manual of Mental Disorders, Fifth Edition (DSM-5) due to its shared phenomenology with substance use disorders, including impaired control and continued engagement despite adverse consequences (American Psychiatric Association, 2013). Similarly, the International Classification of Diseases, 11th Revision (ICD-11) recognizes gambling disorder and distinguishes predominantly online and offline forms (World Health Organization, 2022). However, an exclusive focus on diagnosable disorders may overlook a broader group experiencing clinically meaningful gambling-related harms. Consequently, many studies conceptualize "at-risk" and "problem" gambling as a single category, contrasted with "non-problem" gambling, in line with harm-continuum models (Browne & Rockloff, 2018; Wardle et al., 2024).

Empirical evidence has linked at-risk and problem gambling to mental health symptoms and substance use (Dowling et al., 2019) and qualitative research further suggests that gambling may function as an escape-oriented coping strategy, a mechanism consistent with stress-related pathways that may be particularly relevant in shift-based healthcare environments (Wood & Griffiths, 2007). Work-related stressors and irregular schedules may interact with the widespread availability of online gambling, creating opportunities for frequent, short-duration betting episodes. Although such behaviors may be difficult to detect, they can still result in substantial harm.

Problem gambling is associated with a wide range of adverse outcomes, including financial strain, interpersonal conflict, and psychiatric comorbidity. Notably, meta-analytic evidence indicates an elevated risk of suicidal ideation, suicide attempts, and suicide mortality among individuals with gambling problems or disorders, underscoring the importance of early identification of risky gambling patterns (Armoon et al., 2023; Kristensen et al., 2024).

From a prevention perspective, individuals classified as "at-risk" or "problem" gamblers are particularly important, as they may represent an earlier stage along the harm continuum. Interventions at this stage have the potential to prevent progression and reduce adverse outcomes. Population-based studies have demonstrated a prevention paradox, whereby a substantial proportion of the overall harm burden arises from larger groups experiencing lower or moderate levels of severity (Browne & Rockloff, 2018). Accordingly, in the present study, participants were categorized as "at-risk/problem gamblers" (i.e., any level of elevated risk or problem severity) or "non-problem gamblers." This approach was adopted to increase statistical power in risk factor analyses and to align with a public health perspective that prioritizes the identification of employees experiencing potentially modifiable harms before progression to more severe disorder.

HCWs constitute an important population for research on risky gambling for several reasons. First, HCWs constitute large and diverse workforces with varying sociodemographic characteristics, and shift-based schedules may influence both gambling opportunities and coping behaviors. Second, gambling-related harms among healthcare workers may affect not only individual well-being but also work performance and patient safety. Finally, evidence suggests that healthcare providers do not consistently inquire about gambling problems during clinical encounters, indicating potential gaps in awareness and routine screening that could be addressed through occupational research (Christensen et al., 2001).

To date, research on gambling behavior among HCWs has been limited compared with studies conducted in general population samples. Moreover, context-specific factors, such as shift work and stress exposure, may modify risk. Therefore, the present study aimed to estimate the prevalence of at-risk/problem gambling among HCWs and to examine associated factors.

METHODS

Ethical approval for this study was obtained from the Ethics Committee of the first author's institution (July 9, 2025; Approval number: 14). The study was conducted in accordance with the ethical standards of the relevant research committee and with the 1964 Declaration of Helsinki and its subsequent amendments.

Study Design and Sample

This cross-sectional study was conducted among HCWs of a public university hospital. Data were collected via an online survey. The questionnaire, designed by the researchers using Google Forms, was distributed to all HCWs via the hospital information management system and WhatsApp groups. To prevent duplicate responses, participants were required to log in before completing the survey. Participants were assured of data confidentiality, and no identifying information, such as names, was requested. An informed consent form was presented prior to accessing the questionnaire, and participants were informed that they could withdraw from the study at any time without providing a reason.

Inclusion criteria were employment as a healthcare worker at the hospital and age ≥18 years. According to information obtained from the hospital administrative unit, 908 employees were actively working during the study period. A total of 289 individuals participated in the survey; 28 were excluded for not providing informed consent, and 25 were excluded due to inconsistent or inappropriate responses in the sociodemographic section. Ultimately, 236 participants who completed the questionnaire in full were included in the analyses. The initial response rate was 31.8% (289/908), while the final valid response rate after exclusions was 26.0% (236/908). No missing data were present in the final dataset; therefore, complete-case analysis was performed.

Data Collection Tools

Sociodemographic form

The sociodemographic form developed by the researchers included variables such as age, gender, marital status, income level, occupation, and alcohol–substance–tobacco use. Participants were also asked whether they had a mobile gambling account or gambling application, lifetime participation in gambling activities, and participation in gambling activities within the past year. For clarification purposes, a definition of gambling was provided, stating that activities such as purchasing national lottery tickets, scratch cards, playing games (e.g., okey or dice) for money, sports betting/match predictions, casino/slot games, roulette, blackjack (21), and similar card games are all considered gambling activities.

Problem Gambling Severity Index

The Problem Gambling Severity Index (PGSI), developed by Ferris and Wynne (2001), was used to assess gambling behavior and its adverse

consequences. The scale consists of 9 items rated on a 4-point Likert scale (0 = never, 1 = sometimes, 2 = most of the time, 3 = almost always). Total scores range from 0 to 27. Based on total scores, respondents' risk levels for problem gambling are determined. The original internal consistency and test–retest reliability coefficients were reported as 0.84 and 0.78, respectively. The Turkish version was validated by Arcan (2020), with a Cronbach's α coefficient of 0.82. In the original scoring, 0 indicates non-problem gambling, 1–2 low risk, 3–7 moderate risk, and ≥8 problem gambling. However, considering critiques regarding the population used in scale development, previous studies have suggested that scores ≥5 indicate problem gambling and scores 1–4 indicate at-risk gambling (Stone et al., 2015; Williams & Volberg, 2014). In the present study, participants scoring 0 were classified as non-problem gambling, and those scoring ≥1 were classified as at-risk/problem gambling. This categorization was chosen to reflect a broader risk spectrum in line with a harm-continuum perspective. In the current sample, Cronbach's α and McDonald's ω coefficients were both 0.95.

Statistical Analysis

Data were analyzed using jamovi version 2.6 (2024). The distribution of continuous variables was assessed using both visual (histograms and Q–Q plots) and analytical methods. Descriptive statistics were presented as mean ± standard deviation for continuous variables and as number (n) and percentage (%) for categorical variables.

Participants were categorized into two groups based on PGSI scores: non-problem gambling and at-risk/problem gambling. Tobacco and alcohol use variables were presented as multi-category variables in the descriptive table. However, for group comparisons, these variables were dichotomized to ensure adequate expected cell frequencies and increase statistical power (Tobacco use: no/former smoker vs. current smoker; Alcohol use: <1/month vs. ≥1/month). Dichotomization was performed considering both clinical relevance and sample size. Associations between at-risk/problem gambling status and categorical variables were examined using Pearson's chi-square test. When more than 20% of expected cell frequencies were below 5 or when any expected cell frequency was below 5, Fisher's Exact Test was used. Effect sizes were reported using Cramer's V coefficient. For variables with three or more categories (e.g., occupation), Bonferroni-adjusted post-hoc analyses were conducted to identify cell-based differences when overall significance was observed. Substance use was excluded from analyses due to low frequencies. Age was compared between the two groups using independent samples t-test.

Binary logistic regression analysis was performed to identify factors independently associated with gambling status. The multivariable model included gender, occupation, tobacco use, presence of a gambling application, and age. The gambling account variable was excluded due to conceptual and statistical overlap with the gambling application variable to reduce the risk of multicollinearity. The association between gambling account ownership and mobile application use was examined and found to be strong (phi = 0.665), supporting the inclusion of only one of these variables in the multivariable model. Additionally, gambling application use was considered a more current and behaviorally specific indicator. To reduce the risk of overfitting, the number of variables included in the multivariable model was restricted in relation to the number of outcome events. Although education level was associated with gambling status in bivariate analyses, it was not included in the final model to preserve model parsimony. In addition, the distribution of education categories was imbalanced, with a relatively small proportion of participants in the lower education group. For the logistic regression model, β coefficients, standard errors (SE), Wald statistics, p values, odds ratios (OR), and 95% confidence intervals (CI) were reported. Model fit was evaluated using the Hosmer–Lemeshow test, and discriminative ability was assessed using the area under the receiver operating characteristic curve (AUC).

Table 1. Characteristics of the study sample				
Variables	**Categories**	**n**	**%**	**Mean±SD**
Age				*37.00±8.43*
Sex	*Female*	*127*	*53.8*	
	Male	*109*	*46.2*	
Marital status	*Single*	*64*	*27.1*	
	Married	*164*	*69.5*	
	Divorced	*8*	*3.4*	
Education level	*High school or below*	*24*	*10.2*	
	University or higher	*212*	*89.8*	
Occupation	*Physicians*	*126*	*53.4*	
	Nurses and allied health personnel	*66*	*28.0*	
	Other hospital staff	*44*	*18.6*	
Income level	*Low*	*39*	*16.6*	
	Medium	*73*	*30.9*	
	High	*124*	*52.5*	
Shift work	*Daytime only*	*130*	*55.1*	
	Night shifts (including rotating)	*106*	*44.9*	
Tobacco use	*No*	*114*	*48.3*	
	Former user	*28*	*11.9*	
	≤10 cigarettes/day	*34*	*14.4*	
	>10 cigarettes/day	*60*	*25.4*	
Alcohol use	*No*	*101*	*42.8*	
	≤1 time/month	*67*	*28.4*	
	2–4 times/month	*54*	*22.9*	
	≥2 times/week	*14*	*5.9*	
Substance use	*No*	*230*	*97.5*	
	Former user	*4*	*1.7*	
	Yes	*2*	*0.8*	
Gambling account	*No*	*201*	*85.2*	
	Yes	*35*	*14.8*	
Gambling app on mobile	*No*	*215*	*91.1*	
	Yes	*21*	*8.9*	
Family history of gambling	*No*	*223*	*94.5*	
	Yes	*13*	*5.5*	
Lifetime gambling	*No*	*79*	*33.5*	
	Yes	*157*	*66.5*	
Past-year gambling	*No*	*183*	*77.5*	
	Yes	*53*	*22.5*	
Problem gambling	*Non-problem*	*189*	*80.1*	
	At-risk/problem gambling	*47*	*19.9*	

All analyses were two-tailed, and $p < 0.05$ was considered statistically significant.

RESULTS

A total of 236 HCWs were included in the study. The mean age of the participants was 37.00 ± 8.43

years. Of the participants, 53.8% were female (n = 127), and 69.5% were married. The vast majority had a university degree or higher level of education (89.8%). Regarding professional distribution, 53.4% were physicians, 28.0% were nurses or allied health personnel, and 18.6% were other HCWs. Additionally, 44.9% of the participants worked night or rotating shifts. According to the problem gambling classification, 80.1% were categorized as non-problem gamblers, whereas 19.9% were classified as at-risk/problem gamblers. Among participants classified as at-risk/problem gambling (n = 47), 23 (48.9%) were in the low-risk category (scores 1–2), 14 (29.8%) were in the moderate-risk category (scores 3–7), and 10 (21.3%) met the threshold for problem gambling (scores ≥8). Using alternative cut-offs, 33 individuals were classified as at-risk (scores 1–4) and 14 as problem gambling (scores ≥5). Detailed sociodemographic characteristics are presented in Table 1.

When the at-risk/problem gambling group was compared with the non-problem group, a significant difference was observed in gender distribution ($p = 0.040$), with a higher proportion of at-risk/problem gambling among males. Educational level was also significantly associated with gambling status ($p = 0.031$); individuals with a high school education or lower had a significantly higher prevalence of at-risk/problem gambling. A significant difference was found across occupational groups ($p = 0.029$), with physicians demonstrating a higher prevalence of at-risk/problem gambling compared with nurses and allied health personnel. Smoking status was significantly associated with at-risk/problem gambling ($p = 0.006$), and the prevalence was higher among smokers.

The presence of a gambling account ($p < 0.001$) and having a mobile gambling application installed ($p < 0.001$) were both strongly associated with at-risk/problem gambling. In contrast, no significant differences were observed between groups with respect to marital status, income level, shift system, alcohol use, or family history of gambling ($p > 0.05$). Detailed results of the bivariate analyses are presented in Table 2.

In terms of continuous variables, the mean age of the at-risk/problem gambling group (33.5 ± 6.36 years) was significantly lower than that of the non-problem group (37.9 ± 8.68 years) ($p < 0.001$).

A multivariable logistic regression analysis was conducted to identify independent factors associated with at-risk/problem gambling (Table 3). Age, gender, occupation, smoking status, and presence of a mobile gambling application were included in the model. The overall model was statistically significant ($\chi^2 = 47.5$, $p < 0.001$), with a McFadden's R^2 of 0.202. The model demonstrated good discriminatory ability (AUC = 0.791).

In the multivariable analysis, younger age was independently associated with at-risk/problem gambling (OR = 0.94, 95% CI: 0.90–0.99, $p = 0.018$). Each additional year of age was associated with an approximately 6% decrease in the odds of at-risk/problem gambling.

Regarding occupational groups, using nurses and allied health personnel as the reference category, physicians had significantly higher odds of at-risk/problem gambling (OR = 4.22, 95% CI: 1.45–12.24, $p = 0.008$). Current smokers had approximately three times higher odds of at-risk/problem gambling compared with participants who were not current smokers (OR = 3.26, 95% CI: 1.46–7.28, $p = 0.004$).

The strongest association was observed for the presence of a mobile gambling application. Individuals who had a gambling application installed on their mobile device had approximately tenfold higher odds of at-risk/problem gambling (OR = 10.01, 95% CI: 3.38–29.60, $p < 0.001$). Gender was no longer independently significant in the multivariable model ($p = 0.634$).

Table 2. Comparison of participant characteristics according to gambling risk status					
Variables	**Non-problem gambling (n=189)**	**At-risk/problem gambling (n=47)**	**χ^2**	**p**	**Effect size (Cramer's V)**
	n	*n*			
Sex			*4.23*	*0.040*	*0.134*
Female	*108*	*19*			
Male	*81*	*28*			
Marital Status			*0.346*	*0.557*	*0.038*
Married	*133*	*31*			
Single/divorced	*56*	*16*			
Education level			*-*	*0.031†*	*0.148*
High school or below	*15*	*9*			
University or higher	*174*	*38*			
Occupation			*7.10*	*0.029*	*0.173*
Physicians	*97*	*29[a]*			
Nurses and allied health personnel	*60*	*6[b]*			
Other hospital staff	*32*	*12[a]*			
Income level			*1.96*	*0.375*	*0.091*
Low	*29*	*10*			
Medium	*62*	*11*			
High	*98*	*26*			
Shift work			*1.62*	*0.202*	*0.083*
Daytime only	*108*	*22*			
Night shifts (including rotating)	*81*	*25*			
Tobacco use			*7.60*	*0.006*	*0.179*
No/former smoker	*122*	*20*			
Yes (current smoker)	*67*	*27*			
Alcohol use			*2.27*	*0.131*	*0.098*
<1/month	*123*	*25*			
≥1/month	*66*	*22*			
Gambling account			*54.0*	*<0.001*	*0.479*
No	*177*	*24*			
Yes	*12*	*23*			
Gambling app on mobile			*-*	*<0.001†*	*0.366*
No	*182*	*33*			
Yes	*7*	*14*			
Family history of gambling			*-*	*0.143†*	*0.112*
No	*181*	*42*			
Yes	*8*	*5*			
	Non-problem gambling (n=189)	*At-risk/problem gambling (n=47)*	*t*	*p*	
Age	*37.9±8.68*	*33.5±6.36*	*3.86*	*<0.001*	

Different superscript letters indicate statistically significant differences between groups (Bonferroni-adjusted).
† Fisher's exact test was used because at least one expected cell count was below 5; therefore, no χ^2 statistic is reported for these comparisons.

Table 3. Multivariable logistic regression analysis of factors associated with at-risk/problem gambling							
Factor	**β**	**SE**	**Z**	**p**	**OR**	**95% CI**	
						Lower	*Upper*
Age	*-0.059*	*0.025*	*-2.365*	*0.018*	*0.943*	*0.898*	*0.990*
Sex (Ref: Female)	*0.182*	*0.383*	*0.476*	*0.634*	*1.200*	*0.567*	*2.540*
Occupation (Ref: Nahp)							
Physicians	*1.440*	*0.543*	*2.650*	*0.008*	*4.220*	*1.455*	*12.241*
Other staff	*1.074*	*0.600*	*1.790*	*0.073*	*2.928*	*0.903*	*9.495*
Tobacco use (Ref: No/former smoker)	*1.181*	*0.410*	*2.880*	*0.004*	*3.258*	*1.459*	*7.279*
Gambling App (Ref: No)	*2.303*	*0.553*	*4.163*	*<0.001*	*10.008*	*3.383*	*29.600*

Nahp: Nurses and allied health personnel
β values represent log-odds. OR = odds ratio; CI = confidence interval. The model was statistically significant ($\chi^2(6)=47.5$, $p < 0.001$; McFadden $R^2 = 0.202$; AUC = 0.791).

DISCUSSION

In the present study, factors associated with at-risk/problem gambling (defined by combining at-risk and problem gambling into a single outcome variable) among HCWs were examined. The findings indicate that at-risk/problem gambling was significantly more prevalent among younger HCWs, physicians (among the occupational groups assessed), smokers, and individuals with a mobile gambling application installed on their devices. Conceptualizing at-risk and problem gambling within a single category is particularly meaningful from a workplace-based prevention perspective. Within the framework of the prevention paradox, although severe problem gambling represents a relatively small proportion of individuals, a substantial share of total harm may arise from those in the low-to-moderate risk group (Wardle et al., 2019). In high-responsibility and high-stress professions such as HCWs, even lower levels of risky gambling behavior may have indirect effects on job performance, attention, financial stress, and psychosocial well-being.

Differences in gender, education level, and occupational group were identified in relation to at-risk/problem gambling. Gender differences have been widely documented in the epidemiology of problem gambling, with males generally reported to exhibit higher prevalence rates (Cunningham-Williams et al., 1998; Girone et al., 2024). However, the loss of statistical significance for gender in the multivariable model suggests that its effect may be mediated by more proximal determinants such as age, occupational distribution, and particularly digital access. Indeed, contextual shifts such as those observed during the COVID-19 pandemic have demonstrated changes in gambling patterns across product types, including altered dynamics in subtypes such as sports betting (Otis et al., 2022). Emerging evidence also suggests that gambling behaviors and harm patterns may interact with broader gender identity dimensions (Malkin & Stacey, 2024).

The higher prevalence of at-risk/problem gambling among individuals with a high school education or lower indicates that, even within a healthcare workforce, socioeconomic and health literacy differences may translate into differential engagement in risk behaviors. This finding may reflect mechanisms such as misperception of gambling odds, financial vulnerability, limited coping repertoires, or differences in risk-related knowledge and attitudes. However, given that education level was not included in the multivariable model, further analyses incorporating this variable alongside other covariates would be useful to clarify the robustness of this association. The finding that physicians exhibited a higher likelihood of at-risk/problem gambling, and that this association remained

strong in the multivariable analysis, represents one of the more notable results of the present study. Gambling participation and problematic patterns have previously been reported in samples closely connected to healthcare settings (Petry & Mallya, 2004). The medical profession is characterized by long working hours, high cognitive demands, substantial responsibility, performance pressure, and an elevated risk of burnout. In this context, gambling may function for some individuals as a form of escape or emotional regulation. Although physicians may have higher income levels, the absence of a significant association between income and at-risk/problem gambling in the present study suggests that behavioral vulnerability, stress, and accessibility may be more relevant than financial capacity per se. Nonetheless, the relatively limited sample size within occupational subgroups and potential selection effects within specific clinical units should be considered when interpreting these findings. In addition, the relatively elevated prevalence observed among other hospital staff may reflect heterogeneous occupational stressors and varying levels of job control. The lack of statistical significance in the multivariable model may be related to the smaller subgroup size and reduced statistical power. The absence of a significant association with income despite marked occupational differences may be explained by several complementary mechanisms. Gambling behavior may be more closely linked to accessibility and exposure than to disposable income, as online platforms and mobile applications enable sustained engagement even with low financial entry thresholds. Occupational categories may differentiate psychosocial burdens—such as job stress, burnout, sleep disruption, and emotion regulation demands—independently of income level. Thus, the occupation variable may function as a higher-order indicator capturing institutional and psychological determinants not fully reflected by income measures. Additionally, the use of self-reported and broadly categorized income levels may have reduced the ability to detect statistical associations.

The lower mean age observed in the at-risk/problem gambling group, together with the finding that increasing age was independently associated with lower odds of at-risk/problem gambling in the multivariable model, suggests that younger employees may have a higher likelihood of being in the at-risk/problem gambling category. This finding is consistent with longitudinal evidence identifying younger age as an important risk factor for problem gambling (Dowling et al., 2017). Recent population-based analyses have also demonstrated variation in gambling disorder burden across age groups (Salonen et al., 2022). Increased access to gambling through mobile technologies, greater familiarity with digital platforms, higher levels of impulsivity or novelty seeking, and peer influences may be particularly salient among younger individuals. These findings suggest that occupational health services may consider prioritizing screening and educational initiatives for newly recruited and younger staff.

The association between smoking and at-risk/problem gambling remained significant in both bivariate and multivariable analyses. This pattern may reflect the clustering of risk behaviors and shared psychosocial determinants such as stress, impulsivity, reward sensitivity, and coping difficulties (Lorains et al., 2011; Petry, 2005). From a workplace health perspective, this finding suggests that integrated approaches—combining gambling risk assessment with smoking cessation programs, stress management, and mental health support—may be more effective than addressing gambling in isolation. Given that smoking is relatively easy to screen in routine occupational health assessments, it may also serve as a practical entry point for identifying individuals at elevated gambling risk. Studies conducted among healthcare students similarly suggest that gambling and other behavioral addictions may co-occur and may be associated with younger age and digital usage patterns (Cicolini et al., 2018; Comparcini et al., 2018). When considered alongside the findings related to age and mobile applications in the present study, this underscores the potential value of incorporating early screening

and educational interventions not only in clinical settings but also during training and orientation processes.

The strongest association observed in the present study was between at-risk/problem gambling and the presence of a mobile gambling application, with a similarly strong association for having a gambling account in bivariate analyses. These findings highlight the potential importance of digital accessibility in the contemporary gambling ecosystem (Delfabbro & King, 2020; Hing et al., 2014). Mobile applications facilitate constant access, rapid transactions, personalized notifications, near-win experiences, and immediate reward cycles, thereby potentially reinforcing risky usage patterns. In high-intensity and irregular work environments such as hospitals, gambling behavior may be maintained even during brief breaks or short intervals between tasks. Accordingly, beyond individual counseling and referral pathways, institutional awareness programs, digital well-being initiatives, and employee assistance services assume particular importance. Systematic reviews on the prevalence and cross-national variability of problem gambling in the general population emphasize that increasing digitalization and accessibility may reshape risk profiles and highlight the importance of regulatory and preventive strategies (Calado & Griffiths, 2016). Thus, mobile gambling application use should be considered not only as an individual behavioral marker but also a modifiable environmental determinant of access.

No significant differences were identified between groups with respect to marital status, income level, alcohol use, or family history of gambling. These findings are consistent with the heterogeneous results reported in the literature (Abbott, 2020; Afifi et al., 2010; Welte et al., 2004). Contemporary public health frameworks emphasize that gambling-related harm should be evaluated not only in terms of individual sociodemographic characteristics but also in relation to environmental determinants such as accessibility and digitalization (van Schalkwyk et al., 2021; Wardle et al., 2024). In the present sample, the absence of significant differences for marital status and income may reflect the relatively limited socioeconomic variability within a single hospital workforce and the use of categorical measures (e.g., married/single; income level) that may not fully capture more nuanced psychosocial mechanisms such as social support, stress, or financial strain. Furthermore, the 24/7 accessibility of online and mobile gambling may amplify risk patterns and potentially attenuate the relative influence of traditional sociodemographic variables. An important consideration when interpreting these findings is the absence of psychological variables such as depression, anxiety, stress, and impulsivity, which are well-established correlates of gambling behavior. These factors may act as underlying vulnerabilities influencing both gambling behaviors and related risk factors, such as substance use and occupational stress. Therefore, some of the associations observed in this study may reflect shared underlying psychological mechanisms rather than direct relationships between the examined variables, potentially limiting the interpretability of the findings.

The overall significance and good discriminatory performance of the logistic regression model indicate that the selected variables provide a meaningful framework for understanding at-risk/problem gambling in this population. The inclusion of a strong digital access indicator suggests that opportunity and accessibility may play a central role in shaping risk. The attenuation of gender effects further supports the view that risk is more closely associated with the combined influence of age, occupation, smoking, and digital gambling access.

From an applied perspective, incorporating brief gambling screening tools into routine occupational health assessments, implementing brief interventions targeting high-risk groups (younger employees, physicians, smokers, and mobile application users), and strengthening referral pathways to addiction or psychiatric services may be warranted. The ease of assessing mobile application use offers a practical starting point for workplace screening initiatives.

Additionally, institutional messaging that emphasizes confidentiality, adopts a non-judgmental tone, and focuses on early intervention may help reduce stigma associated with gambling-related concerns.

Limitations

Several limitations should be acknowledged. The response rate was approximately 26%, which may introduce selection bias. Non-response bias analysis could not be conducted due to the anonymous nature of the survey and lack of data on non-respondents. Therefore, the direction of potential bias remains uncertain, as individuals with gambling behaviors may have been either more or less likely to participate. Nevertheless, the sample retained variability across key characteristics (e.g., age range and occupational groups), suggesting some degree of heterogeneity; however, the direction and magnitude of potential bias cannot be determined. The use of a dichotomized PGSI variable (≥1) may introduce heterogeneity by combining individuals with varying levels of severity. Accordingly, findings should be interpreted as reflecting a broader risk spectrum rather than clinically defined problem gambling and future studies using alternative cut-offs may help to clarify severity-specific associations. A major limitation of the present study is the absence of psychological variables such as depression, anxiety, stress, and impulsivity, which are well-established correlates of gambling behavior. The lack of these measures may have resulted in unmeasured confounding and limits the interpretation of the observed associations, as these factors could underlie or partially explain the relationships between gambling behavior and the examined sociodemographic and behavioral variables. The relatively low events-per-variable ratio in the multivariable model, particularly given the limited number of outcome events (n = 47) relative to the number of predictors included, may have reduced the stability of the estimates and increased the risk of overfitting. Therefore, the regression findings should be interpreted with caution and considered exploratory. In addition, although education level was associated with gambling status in bivariate analyses, it was not included in the multivariable model to preserve model stability and parsimony. Given the relatively small proportion of participants with lower education (n = 24, 10.2%) and the need to prioritize more proximal behavioral variables within the constraints of a limited number of outcome events, its inclusion may have resulted in unstable estimates and increased the risk of overfitting, thereby contributing to residual confounding. The cross-sectional design precludes causal inferences and limits the ability to determine the temporal direction of the observed associations. The relatively high internal consistency coefficients observed for the PGSI in this sample (Cronbach's α and McDonald's ω = 0.95) should be interpreted with caution, as the high proportion of zero scores may reflect a floor effect and reduced variability rather than solely indicating strong reliability. In addition, self-reported data are subject to social desirability bias and potential underreporting, particularly in stigmatized domains such as gambling. Finally, the single-center design may limit the generalizability of the findings. Nevertheless, by focusing on healthcare workers and examining digital gambling access alongside co-occurring risk behaviors from an occupational health perspective, the present study provides valuable insights.

CONCLUSION

In conclusion, this study enhances the visibility of at-risk/problem gambling among HCWs and contributes to informing institution-based screening and prevention initiatives, particularly in the context of digital gambling accessibility. Strategies that extend beyond severe cases to include early screening and low-intensity interventions targeting a broader risk pool may be more effective in reducing overall harm. Future research employing longitudinal designs and incorporating more detailed psychosocial variables (e.g., stress, burnout, depression/anxiety, impulsivity) would help clarify the mechanisms underlying these associations.

REFERENCES

Abbott, M. W. (2020). Gambling and gambling-related harm: Recent World Health Organization initiatives. *Public Health, Gambling: An Emerging Public Health Challenge*, *184*, 56–59. https://doi.org/10.1016/j.puhe.2020.04.001

Afifi, T. O., Cox, B. J., Martens, P. J., Sareen, J., & Enns, M. W. (2010). Demographic and social variables associated with problem gambling among men and women in Canada. *Psychiatry Research*, *178*(2), 395–400. https://doi.org/10.1016/j.psychres.2009.10.003

American Psychiatric Association. (2013). *Diagnostic and statistical manual of mental disorders, 5th edn.* American Psychiatric Association, Washington, DC.

Arcan, K. (2020). Turkish version of the problem gambling severity index (PGSI-T): Psychometric properties among the university students. *ADDICTA: The Turkish Journal on Addictions*, 7(2), 90–98. https://doi.org/10.5152/ADDICTA.2020.19064

Armoon, B., Griffiths, M. D., Mohammadi, R., & Ahounbar, E. (2023). Suicidal Behaviors and Associated Factors Among Individuals with Gambling Disorders: A Meta-Analysis. *Journal of Gambling Studies*, *39*(2), 751–777. https://doi.org/10.1007/s10899-023-10188-0

Browne, M., & Rockloff, M. J. (2018). Prevalence of gambling-related harm provides evidence for the prevention paradox. *Journal of Behavioral Addictions*, *7*(2), 410-422. https://doi.org/10.1556/2006.7.2018.41

Calado, F., & Griffiths, M. D. (2016). Problem gambling worldwide: An update and systematic review of empirical research (2000–2015). *Journal of Behavioral Addictions*, *5*(4), 592–613. https://doi.org/10.1556/2006.5.2016.073

Cicolini, G., Della Pelle, C., Simonetti, V., Comparcini, D., Sepede, G., & Cipollone, F. (2018). Pathological Gambling among Italian Nursing Students. *Archives of Psychiatric Nursing*, *32*(2), 305–309. https://doi.org/10.1016/j.apnu.2017.11.020

Christensen, M. H., Patsdaughter, C. A., & Babington, L. M. (2001). Health Care Providers' Experiences with Problem Gamblers. *Journal of Gambling Studies*, *17*(1), 71–79. https://doi.org/10.1023/A:1016644416076

Comparcini, D., Simonetti, V., Galli, F., Buccoliero, D., Palombelli, E., Senede, G., & Cicolini, G. (2018). Pathological gambling and internet addiction among nursing students: A pilot study. *Professioni infermieristiche*, *71*(1), 19–29. https://doi.org/10.7429/pi.2018.711019

Cunningham-Williams, R. M., Cottler, L. B., Compton 3rd, W. M., & Spitznagel, E. L. (1998). Taking chances: problem gamblers and mental health disorders--results from the St. Louis Epidemiologic Catchment Area Study. *American Journal of Public Health*, *88*(7), 1093-1096.

Delfabbro, P., & King, D. L. (2020). Gaming-gambling convergence: Evaluating evidence for the 'gateway' hypothesis. *International Gambling Studies*, *20*(3), 380–392. https://doi.org/10.1080/14459795.2020.1768430

Dowling, N. A., Butera, C. A., Merkouris, S. S., Youssef, G. J., Rodda, S. N., & Jackson, A. C. (2019). The Reciprocal Association between Problem Gambling and Mental Health Symptoms/Substance Use: Cross-Lagged Path Modelling of Longitudinal Cohort Data. *Journal of Clinical Medicine*, *8*(11), 1888. https://doi.org/10.3390/jcm8111888

Dowling, N. A., Merkouris, S. S., Greenwood, C. J., Oldenhof, E., Toumbourou, J. W., & Youssef, G. J. (2017). Early risk and protective factors for problem gambling: A systematic review and meta-analysis of longitudinal studies. *Clinical Psychology Review*, *51*, 109–124. https://doi.org/10.1016/j.cpr.2016.10.008

Ferris, J. A., & Wynne, H. J. (2001). *The Canadian problem gambling index* (pp. 1-59). Ottawa, ON: Canadian Centre on substance abuse.

Girone, N., Limosani, I., Ciliberti, C., Turco, M., Longo, L., Colletti, M. A., Cocchi, M., Zita, G., Fiocchi, M. I., Benatti, B., Viganò, C., Percudani, M., & Dell'Osso, B. (2024). Gender Differences in Gambling Disorder: Results from an Italian Multicentric Study. *Clinical Neuropsychiatry*, *21*(4), 313–322. https://doi.org/10.36131/cnfioritieditore20240407

Hing, N., Cherney, L., Blaszczynski, A., Gainsbury, S. M., & Lubman, D. I. (2014). Do advertising and promotions for online gambling increase gambling consumption? An exploratory study. *International Gambling Studies*, *14*(3), 394–409. https://doi.org/10.1080/14459795.2014.903989

Kristensen, J. H., Pallesen, S., Bauer, J., Leino, T., Griffiths, M. D., & Erevik, E. K. (2024). Suicidality among individuals with gambling problems: A meta-analytic literature review. *Psychological Bulletin*, *150*(1), 82–106. https://doi.org/10.1037/bul0000411

Langham, E., Thorne, H., Browne, M., Donaldson, P., Rose, J., & Rockloff, M. (2016). Understanding gambling related harm: A proposed definition, conceptual framework, and taxonomy of harms. *BMC Public Health*, *16*(1), 80. https://doi.org/10.1186/s12889-016-2747-0

Lorains, F. K., Cowlishaw, S., & Thomas, S. A. (2011). Prevalence of comorbid disorders in problem and pathological gambling: Systematic review and meta-analysis of population surveys. *Addiction*, *106*(3), 490–498. https://doi.org/10.1111/j.1360-0443.2010.03300.x

Malkin, M. L., & Stacey, M. (2024). Gambling Behavior Among LGBTQ + Individuals: The Role of Gender and Gender Identity. *Journal of Gambling Studies*, *40*(2), 1037–1060. https://doi.org/10.1007/s10899-023-10272-5

Otis, E., Kim, A. J., Stewart, S. H., Sherry, S. B., & Yakovenko, I. (2022). Changes in sports gambling behavior during the COVID-19 pandemic in Canada. *Frontiers in Psychiatry*, *13*:1018234. https://doi.org/10.3389/fpsyt.2022.1018234

Petry, N. M. (2005). *Pathological gambling: Etiology, comorbidity, and treatment* (Vol. 2). Washington, DC: American Psychological Association.

Petry, N. M., & Mallya, S. (2004). Gambling Participation and Problems Among Employees at a University Health Center. *Journal of Gambling Studies*, *20*(2), 155–170. https://doi.org/10.1023/B:JOGS.0000022307.09299.f5

Salonen, A. H., Castrén, S., Latvala, T. A., Grönroos, T., Levola, J., & Vuori, M. (2022). Gender- and age-stratified analyses of gambling disorder in Finland between 2011 and 2020 based on administrative registers. *Nordic Studies on Alcohol and Drugs*, *39*(6), 623–633. https://doi.org/10.1177/14550725221108793

van Schalkwyk, M. C. I., Petticrew, M., Cassidy, R., Adams, P., McKee, M., Reynolds, J., & Orford, J. (2021). A public health approach to gambling regulation: Countering powerful influences. *The Lancet. Public Health*, *6*(8), e614–e619. https://doi.org/10.1016/S2468-2667(21)00098-0

Stone, C. A., Romild, U., Abbott, M., Yeung, K., Billi, R., & Volberg, R. (2015). Effects of Different Screening and Scoring Thresholds on PGSI Gambling Risk Segments. *International Journal of Mental Health and Addiction*, *13*(1), 82–102. https://doi.org/10.1007/s11469-014-9515-0

The jamovi project. (2024). *jamovi*. (Version 2.6) [Computer Software]. Retrieved from https://www.jamovi.org.

Wardle, H., Degenhardt, L., Marionneau, V., Reith, G., Livingstone, C., Sparrow, M., Tran, L. T., Biggar, B., Bunn, C., Farrell, M., Kesaite, V., Poznyak, V., Quan, J., Rehm, J., Rintoul, A., Sharma, M., Shiffman, J., Siste, K., Ukhova, D., … Saxena, S. (2024). The Lancet Public Health Commission on gambling. *The Lancet Public Health*, 9(11), e950–e994. https://doi.org/10.1016/S2468-2667(24)00167-1

Wardle, H., Reith, G., Langham, E., & Rogers, R. D. (2019). Gambling and public health: We need policy action to prevent harm. *BMJ*, *365*, l1807. https://doi.org/10.1136/bmj.l1807

Welte, J. W., Barnes, G. M., Wieczorek, W. F., Tidwell, M.-C. O., & Parker, J. C. (2004). Risk factors for pathological gambling. *Addictive Behaviors*, *29*(2), 323–335. https://doi.org/10.1016/j.addbeh.2003.08.007

Williams, R. J., & Volberg, R. A. (2014). The classification accuracy of four problem gambling assessment instruments in population research. *International Gambling Studies*, *14*(1), 15–28. https://doi.org/10.1080/14459795.2013.839731

Wood, R. T. A., & Griffiths, M. D. (2007). A qualitative investigation of problem gambling as an escape-based coping strategy. *Psychology and Psychotherapy: Theory, Research and Practice*, *80*(1), 107–125. https://doi.org/10.1348/147608306X107881

World Health Organization. (2022). *ICD-11: International classification of diseases* (11th revision). https://icd.who.int/

Peer-Review

Double blind peer reviewed

Conflict of Interest

The authors declare that they have no conflict of interests regarding content of this article.

Financial Support

The Authors report no financial support regarding content of this article.

Ethical Declaration

Ethical permission was obtained from the Hatay Mustafa Kemal University Non-Interventional Clinical Research Ethics Committee for this study with date 09/07/2025 and number 14, and Helsinki Declaration rules were followed to conduct this study.

Authorship Contributions

Concept: EY, AT, Design: EY, AT, Supervising: EY, Financing and equipment: AT, Data collection and entry: EY, Analysis and interpretation: EY, AT, Literature search: EY, AT, Writing: EY, AT, Critical review: EY, AT

Corresponding Author

[1]**Ahmethan Turan**

Hatay Mustafa Kemal University, Tayfur Ata Sökmen Faculty of Medicine, Department of Psychiatry, Hatay, Türkiye

Email: ahmethanturan@mku.edu.tr

ORCID iD: 0000-0002-1482-1470

Journal of Dependence, 2026; 27(2):101-115

JOURNAL OF DEPENDENCE

Research Article

Presence of psychiatric comorbidities, concurrent alcohol and substance use disorders, and HBV, HCV, and HIV seroprevalence in patients with gambling disorder: a retrospective study

Elif Aktan MUTLU[1], Deniz KOZAK[2], Aslı KOZAK[3], Başak KOZAK[4]

DOI: 10.51982/bagimli.618

Abstract

Objective: Gambling disorder (GD) is a public health concern frequently associated with psychiatric and alcohol/substance use comorbidities. While screening for blood-borne infections (hepatitis B virus (HBV), hepatitis C virus (HCV), and human immunodeficiency virus (HIV)) is standard in substance use treatment, seroprevalence data among individuals with GD remain limited. This study evaluated psychiatric comorbidities, concurrent alcohol/substance use disorders, and HBV, HCV, and HIV seroprevalence in GD patients attending a behavioral addiction clinic. **Methods:** This retrospective study evaluated 177 patients diagnosed with GD (DSM-5 criteria) at Ankara Etlik City Hospital (January-July 2025). Sociodemographic data, substance use history, and psychiatric comorbidities were extracted from medical records. Viral markers (HBsAg, anti-HCV, anti-HIV) were analyzed via ELISA. Statistical analyses included Student's t-test, Mann-Whitney U test, Chi-square test, and Odds Ratio (OR) with 95% confidence intervals. **Results:** Participants were predominantly male (94,9%); mean age was 34,32±7,82 years. HBsAg and anti-HCV positivity were both 0.6%; no HIV-positive cases were detected. Psychiatric comorbidity was present in 59,9% of patients, and 16.9% had concurrent alcohol/substance use disorders. Significant risk factors for additional addictions were being childless (OR: 2,45, p=0.030) and having psychiatric comorbidity (OR: 12,38, p=0.001). Physical comorbidities increased psychiatric disorder risk 4,82-fold (p=0.027). **Conclusion:** Although viral seroprevalence was low, psychiatric and addiction-related comorbidities were prevalent among patients with GD. These findings underscore that a multidisciplinary assessment approach and targeted infection screening for appropriate high-risk individuals may be beneficial in behavioral addiction settings. Further studies with larger, diverse populations are warranted to confirm these observations.

Keywords: Gambling disorder, Behavioral addiction, Hepatitis B virus, Hepatitis C virus, Human immunodeficiency virus, Infectious disease

[1]**Elif Aktan Mutlu**
Department of Psychiatry, Ankara Etlik City Hospital, Ankara, Türkiye
Email: aktanazer@hotmail.com
ORCID iD: 0000-0002-0889-1421

[2]**Deniz Kozak**
Department of Psychiatry, Ankara Etlik City Hospital, Ankara, Türkiye
Email: denizkozak18@hotmail.com
ORCID iD: 0009-0000-7345-8117

[3]**Aslı Kozak**
Child and Adolescent Psychiatry Clinic, Ankara Gülhane Training and Research Hospital, University of Health Sciences, Türkiye
Email: aslikozakk@gmail.com
ORCID iD: 0009-0008-1671-4741

[4]**Başak Kozak**
Department of Infectious Diseases and Clinical Microbiology, Faculty of Medicine, Ankara University, Ankara, Türkiye
Email: basakkozak1997@gmail.com
ORCID iD: 0009-0007-9516-9077

Received: 2025-12-18
Accepted: 2026-03-04

INTRODUCTION

Addiction is a multidimensional chronic phenomenon characterized by an uncontrollable need for a substance or behavior, the persistence of pleasure-seeking as a result of alterations in brain chemistry and the continuation of the action despite adverse consequences (Potenza, 2008; Sadock et al., 2022). There are many subtypes of addiction. Under the heading of Mental, Behavioral or Neurodevelopmental Disorders in the World Health Organization's (WHO) International Classification of Diseases 11th Revision (ICD-11), alcohol and substance use disorders are included under detailed subheadings. Behavioral addictions, in contrast to the ICD-10, are classified in the ICD-11 as 'gambling disorder' and 'gaming disorder'. Furthermore, there is an observed increase in the prevalence of other types of behavioral addictions, such as pornography, eating, and shopping addictions, and findings regarding the clinical and societal significance of these disorders are being increasingly emphasized in the literature (Alimoradi et al., 2022).

GD is a form of behavioral addiction that leads to functional impairment in an individual's social, economic, academic, and health domains, as well as causing familial problems. Due to the global proliferation of online gambling, the incidence of GD has steadily increased, rendering it a public health problem (Petry, 2005). According to WHO 2024 data, it is reported that approximately 1.2% of the global adult population suffers from GD. Numerous studies identify factors such as young age, male gender, low socioeconomic status, comorbid psychiatric illnesses, childhood traumas, and a family history of gambling and substance use disorders as risk factors (Dowling et al., 2017; Çakmak & Tamam, 2018).

Addiction processes entail not only psychological deterioration but also severe physical complications and infection risks. In individuals with alcohol and substance use disorders, the incidence of Blood-Borne Infections (HIV, HBV, and HCV) is significantly higher compared to the general population due to impulsivity, loss of cognitive control, and risky behaviors (e.g., needle sharing, unprotected sexual intercourse) (Stein et al., 2000; Degenhardt et al., 2017). In GD and alcohol-substance use disorders, the repetitive and excessive activation of reward circuits, particularly the mesolimbic dopaminergic pathway, reinforces pleasure-seeking and contributes to the maintenance of addictive behaviors (Potenza, 2008; Grant et al., 2010; Barnes et al., 2015).

The high level of impulsivity observed in cases diagnosed with GD can lead individuals to seek immediate rewards, experience impairment in cognitive reasoning processes, and consequently engage in behaviors that pose a risk for viral transmission (unprotected sexual contact, multiple partners, etc.) (Stein et al., 2000; Potenza, 2008; Grant & Chamberlain, 2014). In this context, determining viral seroprevalence in the GD population is considered a critical necessity for both the optimization of individual health management and breaking the chain of transmission within the scope of public health strategies (Degenhardt et al., 2017; Republic of Turkey Ministry of Health General Directorate of Public Health [HSGM], 2025). Although current clinical guidelines recommend routine screening for HBV, HCV, and HIV in individuals with alcohol and substance use disorders (Turkish Association for the Study of the Liver [TKAD] & Viral Hepatitis Society [VHSD], 2023; WHO, 2025), these data are quite limited in the literature regarding behavioral addictions and specifically GD (Langan et al., 2019).

When the literature is reviewed, it is notable that GD and alcohol and substance use disorders are frequently observed together. Global-scale epidemiological research conducted on the co-occurrence of these two clinical presentations also supports this close relationship (Grant et al., 2010; Lorains et al., 2011). In contrast, the relevant literature has generally prioritized the diagnostic processes, psychopathological characteristics, and neurocognitive dimensions of GD (Petry, 2005; Petry et al., 2005; Lorains et al., 2011); the potential risks this population carries in terms of infectious diseases

and the associated screening requirements have been addressed to a more limited extent (Langan et al., 2019). This situation highlights a gap in the literature regarding the holistic and multidisciplinary clinical management of GD. The primary aim of this study was to contribute to the existing literature by retrospectively analyzing HIV, HCV and HBV seroprevalence among patients diagnosed with GD who presented to a behavioral addiction outpatient clinic. In this retrospective study, psychiatric comorbidities, co-occurring alcohol and substance use disorders, and the seroprevalence of HBV, HCV and HIV were comprehensively evaluated among patients with GD attending a specialized behavioral addiction outpatient clinic. The primary aim of the study was to characterize the psychiatric and addiction-related clinical features of this patient population alongside viral serological findings and to contribute to the limited body of evidence available in the literature. Furthermore, it was anticipated that the integrated assessment of psychiatric comorbidities, co-occurring substance use disorders, and infection seroprevalence would provide a more comprehensive understanding of the clinical profile and risk characteristics of individuals with GD and offer insights relevant to their clinical evaluation and follow-up.

METHODS

Study Design and Sample

The study population of this retrospective research comprised 177 patients diagnosed with gambling disorder according to American Psychiatric Association's Diagnostic and Statistical Manual of Mental Disorders: Fifth Edition (DSM-5) criteria, who presented to the Ankara Etlik City Hospital, Department of Psychiatry, Behavioral Addiction Outpatient Clinic between January 1, 2025 and July 1, 2025.

In the Behavioral Addiction Outpatient Clinic at Ankara Etlik City Hospital, individuals diagnosed with gambling disorder, gaming disorder, compulsive shopping, and pornography addiction are enrolled in structured follow-up and treatment programs. Referrals to the clinic are facilitated by other psychiatry specialists following clinical evaluations of confirmed or suspected behavioral addiction. Upon initial admission, all patients are routinely subjected to comprehensive biochemical screening, ELISA testing, and psychometric evaluations. The laboratory data (HbsAg, anti-HBs, anti-HCV, and anti-HIV) utilized in this study were obtained from these routine clinical procedures.

Procedure

All individuals presenting to the outpatient clinic underwent assessment of behavioral addiction severity using the South Oaks Gambling Screen (SOGS). In addition, the Beck Depression Inventory (BDI) and Beck Anxiety Inventory (BAI) were administered. Comorbid alcohol use disorder and substance use disorder were diagnosed through structured clinical interviews based on the DSM-5 diagnostic criteria and were evaluated as separate clinical variables; therefore, they were not included within the category of psychiatric comorbidities. Psychiatric comorbidities were likewise identified through structured clinical interviews conducted in accordance with DSM-5 diagnostic criteria, and included conditions such as anxiety disorders, depressive disorders, and obsessive-compulsive and related disorders.

A comprehensive mental status examination was performed for each individual and sociodemographic characteristics, psychiatric comorbidities, and additional physical comorbid conditions were recorded. Physical comorbidities evaluated within the scope of the study included diabetes mellitus (DM), hypertension, coronary artery disease (CAD), and chronic kidney disease (CKD). The study included all patients who applied to the Behavioral Addiction Outpatient Clinic during the specified period, were diagnosed with gambling disorder, and had the required laboratory data available in the hospital records system.

This study was approved by the Ethics Committee of Ankara Etlik City Hospital with the decision dated 16/07/2025 and numbered AEŞH-BADEK1-2025-297 and was conducted in accordance with the principles of the Declaration of Helsinki. Strict adherence was maintained to ethical principles regarding the confidentiality and privacy of all participants' data.

Statistical Analysis

Statistical analyses were performed using SPSS version 27 (*Statistical Package for the Social Sciences*). Descriptive statistics were used to present quantitative variables as mean, standard deviation, median, minimum, and maximum values, while qualitative variables were expressed as frequencies and percentages. The conformity of data to a normal distribution was evaluated using the Kolmogorov-Smirnov test and Box Plot diagrams.

For the comparison of two independent quantitative groups, Student's t-test was utilized for normally distributed data, whereas the Mann-Whitney U test was employed for variables that did not follow a normal distribution. Qualitative data were compared using the Chi-Square test, Fisher's Exact test. Risk factors associated with the presence of additional addiction(s) were evaluated using backward stepwise logistic regression analysis. Results were evaluated within a 95% confidence interval, and the level of statistical significance was set at $p<0.05$.

RESULTS

The study population comprised a total of 177 cases, consisting of 94.9% (n=168) males and 5.1% (n=9) females. The ages of the participants ranged from 19 to 51 years, with a mean age of 34.32±7.82 years. Regarding marital status, 62.1% (n=110) were married, 36.2% (n=64) were single and 1.7% (n=3) were divorced. In terms of parental status, 51.4% (n=91) of the participants had children, while 48.6% (n=86) did not. Analysis of residential status and living arrangements revealed that 91.5% (n=162) lived with their families, 7.3% (n=13) lived alone, and 1.1% (n=2) resided with friends or other individuals. Evaluation of educational status revealed that 9.0% of the sample (n=16) had an education level of primary education or below, 48.6% (n=86) were high school graduates, and 42.4% (n=75) had undergraduate or postgraduate degrees. In terms of economic profile, 92.7% of the participants (n=164) had a regular income, whereas 7.3% (n=13) reported having no regular income. These findings indicate that the study population predominantly consisted of young, male individuals with moderate-to-high educational attainment and a high rate of employment **(Table 1).**

All individuals included in the study were being followed with a diagnosis of GD. When additional addictive disorders accompanying GD were evaluated, 16.9% of the cases (n=30) were found to have at least one additional addiction diagnosis. Among these individuals, 43.3% (n=13) had alcohol use disorder, 30.0% (n=9) had substance use disorder and 26.7% (n=8) had both alcohol and substance use disorders. Evaluation of the psychiatric and physical health profiles of the sample demonstrated that 59.9% of the cases (n=106) had at least one comorbid psychiatric disorder, while 8.5% (n=15) had accompanying physical comorbidities, including DM, hypertension, CAD and CKD. Data concerning risky behaviors and medical history showed low frequencies for intravenous substance use (1.1%, n=2) and history of surgical operations (3.4%, n=6). Regarding serological findings, anti-HIV results were negative for all participants (n=177). Seropositivity for HBsAg and anti-HCV was detected in only one case each (0.6%), with these parameters remaining negative for the remaining 99.4% (n=176) of the cohort. These findings indicate that while the prevalence of infectious diseases is low within this behavioral addiction group, the levels of comorbid psychiatric disorders and additional addictions are notably high **(Table 2).**

Table 1. Distribution of Descriptive Characteristics			
Variable		**n**	**(%)**
Gender	**Male**	*168*	*94.9*
	Female	*9*	*5.1*
Age;years	*Mean±SD*	*34.32±7.82*	
	Median (Min-Max)	*33 (19-51)*	
Marital status	**Married**	*110*	*62.1*
	Single	*64*	*36.2*
	Divorced	*3*	*1.7*
Presence of children	**Yes**	*91*	*51.4*
	No	*86*	*48.6*
Living arrangement	**With family**	*162*	*91.5*
	Alone	*13*	*7.3*
	Friends and other	*2*	*1.1*
Educational level	**Primary education or below**	*16*	*9.0*
	High school	*86*	*48.6*
	University	*75*	*42.4*
Income status; TL	**No income**	*13*	*7.3*
	With income	*164*	*92.7*

Table 2. Distribution of Participant Characteristics			
Variable		**n**	**(%)**
Additional addiction	**None**	*147*	*83.1*
	Present	*30*	*16.9*
	-Alcohol	*13*	*43.3*
	-Substance	*9*	*30.0*
	- Alcohol and substance	*8*	*26.7*
Comorbid physical illnesses (DM, Hypertension, CAD, CKD)	**Present**	*15*	*8.5*
	None	*162*	*91.5*
Comorbid psychiatric disorder	**Present**	*106*	*59.9*
	None	*71*	*40.1*
Duration of addiction (years)	*Mean±SD*	*9.10±6.75*	
	Median (Min-Max)	*8 (1-30)*	
IV drug use	**No**	*175*	*98.9*
	Yes	*2*	*1.1*
Surgical history	**None**	*171*	*96.6*
	Yes	*6*	*3.4*
HBsAg	**Negative**	*176*	*99.4*
	Positive	*1*	*0.6*
Anti HCV	**Negative**	*176*	*99.4*
	Positive	*1*	*0.6*
Anti HIV	**Negative**	*177*	*100*
	Positive	*0*	*0*

When analyzing the relationships between the presence of additional addiction and demographic variables, no statistically significant differences were found regarding gender, living arrangement, education level or income status (p>0.05). Conversely, the ages of patients with comorbid addiction were found to be statistically significantly lower compared to those without additional addiction (p=0.002; p<0.01). Regarding the marital status variable, a statistically significant association was identified between the presence of additional addiction and marital status (p=0.021; p<0.05). This finding indicates that the proportion of single individuals was higher, while the proportion of married individuals was significantly lower in the group with comorbid addiction. Similarly, a significant correlation was observed between parental status and the risk of additional addiction. It was determined that the probability of having an additional addiction was 2.45 times higher in childless individuals compared to those with children (OR=2.45; 95% CI:1.05–5.72; p = 0.030) **(Table 3).**

Table 3. Comparison of Descriptive Characteristics Based on the Presence of Additional Addiction

Variable		Additional Addiction				p
	No		Yes			
	n=147	%	n=30	%		
Gender	Male	139	94.6	29	96.7	[a]***1.000***
	Female	8	5.4	1	3.3	
Age	*Mean±SD* *Median (Min-Max)*	*35.15±7.86* *34 (21-51)*		*30.27±6.29* *30 (19-45)*		[b]***0.002****
Marital status	Married	97	66	13	43.3	[c]***0.021****
	Single	47	32	17	56.7	
	[†]Divorced	3	2	0	0	
Parental status	Yes	81	55.1	10	33.3	[c]***0.030****
	No	66	44.9	20	66.7	
Living arrangement	With family	135	91.8	27	90	[a]***0.470***
	Alone	10	6.8	3	10	
	[†]Friends and others	2	1.4	0	0	
Educational level	Primary education and below	12	8.2	4	13.3	[c]***0.066***
	High school	67	45.6	19	63.3	
	University	68	46.3	7	23.3	
Income status	No income	10	6.8	3	10	[a]***0.464***
	With income	137	93.2	27	90	

*†Excluded from evaluation due to case numbers.. aFisher Exact Test; bStudent-t Test; cPearson Chi-Square Test; *p<0.05; **p<0.01*

When examining the clinical factors influencing the risk of additional addiction, it was found that individuals with comorbid psychiatric illnesses were 12.38 times more likely to have an additional addiction compared to those without such a diagnosis, a finding that reached high statistical significance (OR=12.38; 95% CI:2.84–53.9; p=0.001). Similarly, additional psychiatric comorbidity was numerically more frequent among cases with a history of intravenous substance use and both individuals with intravenous substance use were found to have accompanying psychiatric disorders. However, due to the very limited number of cases with intravenous substance use, statistical analysis could not be performed for this variable.

Analysis of addiction duration demonstrated that individuals with additional addictive disorders had a statistically significantly shorter duration of addiction compared to those without additional addiction (p=0.003; p<0.01). On the other hand, no statistically significant association was identified between the presence of comorbid physical illness, history of surgical operation, and the occurrence of additional addiction (p>0.05). Only one case was found to be anti-HCV positive and this individual had an accompanying psychiatric comorbidity. Similarly, only one case was HBsAg positive, and no additional psychiatric disorder was identified in this patient. However, due to the insufficient number of cases in both groups, statistical analysis could not be performed **(Table 4).**

Table 4. Comparison of Participant Characteristics Based on the Presence of Additional Addiction

Variable		Additional Addiction				p
	No		Yes			
	n=147	%	n=30	%		
Comorbid physical illnesses (DM, Hypertension, CAD, CKD)	Present	13	8.8	2	6.7	[a]***1.000***
	None	134	91.2	28	93.3	
Comorbid psychiatric disorder	Present	78	53.1	28	93.3	[c]***0.001****
	None	69	46.9)	2	6.7	
Duration of addiction (years)	Mean±SD	9.35±6.70		7.87±6.98		[d]***0.003****
	Median (Min-Max)	8 (1-27)		5 (1-30)		
IV drug use	No	147	100	28	93.3	-
	†Yes	0	0	2	6.7	
Surgical history	None	143	97.3	28	93.3	[a]***0.269***
	Yes	4	2.7	2	6.7	
HBsAg	Negative	146	99.3	30	100	-
	†Positive	1	0.7	0	0	
Anti HCV	Negative	147	100	29	96.7	-
	†Positive	0	0	1	3.3	

† Excluded from evaluation due to case numbers
*aFisher Exact Test; cPearson Chi-Square Test; dMann Whitney-U Test; *p<0.05; **p<0.01*

Upon analysis of the relationship between the presence of comorbid psychiatric illness and sociodemographic characteristics, no statistically significant differences were observed across variables including gender, age, marital status, parental status, living arrangement, educational level or income status (p>0.05) **(Table 5).**

When the relationship between clinical characteristics and the presence of additional psychiatric disorders was evaluated, individuals with accompanying physical comorbidities were found to have a 4.82-fold higher likelihood of having an additional psychiatric disorder compared to those without physical illness and this association was statistically significant (OR=4.82; 95% CI:1.05–22.0; p=0.027). In contrast, no statistically significant difference was observed between the presence of additional psychiatric disorders and addiction duration or history of surgical operation (p>0.05). Serological parameters, including intravenous substance use, HBsAg and anti-HCV positivity, were not included in the comparative analysis due to the limited number of cases **(Table 6).**

To identify risk factors associated with the presence of additional addictions, age, educational status, marital status, presence of psychiatric comorbidity, duration of addiction, and parental status were included in a backward stepwise logistic regression analysis. The final model obtained after four steps is presented in **Table 7.**

Table 5. Comparison of Descriptive Characteristics Based on the Presence of Comorbid Psychiatric Illness

Variable	Comorbid Psychiatric Illness					p
	Yes		No			
	n=106	%	n=71	%		
Gender	**Male**	*98*	*92.5*	*70*	*98.6*	[a]***0.087***
	Female	*8*	*7.5*	*1*	*1.4*	
Age	*Mean±SD*	*34.06±7.16*		*34.72±8.75*		[b]***0.583***
	Median (Min-Max)	*34 (19-50)*		*31 (21-51)*		
Marital status	**Married**	*63*	*59.4*	*47*	*66.2*	[c]***0.499***
	Single	*40*	*37.7*	*24*	*33.8*	
	[†]**Divorced**	*3*	*2.8*	*0*	*0*	
Parental status	**Yes**	*55*	*51.9*	*36*	*50.7*	[c]***0.877***
	No	*51*	*48.1*	*35*	*49.3*	
Living arrangement	**With family**	*96*	*90.6*	*66*	*93*	[c]***0.480***
	Alone	*9*	*8.5*	*4*	*5.6*	
	[†]**Friends and others**	*1*	*0.9*	*1*	*1.4*	
Educational level	**Primary education and below**	*8*	*7.6*	*8*	*11.3*	[c]***0.636***
	High school	*51*	*48.1*	*35*	*49.3*	
	University	*47*	*44.3*	*28*	*39.4*	
Income status	**No income**	*9*	*8.5*	*4*	*5.6*	[c]***0.475***
	With income	*97*	*91.5*	*67*	*94.4*	

† Excluded from evaluation due to case numbers
aFisher Exact Test; bStudent-t Test; cPearson Chi-Square Test

In the final model, age the presence of psychiatric comorbidity, and educational status emerged as independent factors significantly associated with additional addictions. The explanatory power of the model was 85.9%.

According to the model, each one-unit increase in age was associated with a reduction in the risk of additional addictions (OR=0.891, 95% CI:0.826–0.961). In contrast, the presence of a psychiatric comorbidity increased the risk of additional addictions by 21.732-fold (OR=21.732, 95% CI:4.115–114.773).

Using university education as the reference category, individuals with a primary school education or lower had a 6.239-fold higher risk of additional addictions (OR=6.239, 95% CI:1.099–35.412), whereas high school graduates had a 3.034-fold higher risk (OR=3.034, 95% CI:1.081–8.520) compared with those holding a university degree.

DISCUSSION

This study aimed to evaluate psychiatric comorbidities, concurrent alcohol and substance use disorders and the seroprevalence of HBV, HCV and HIV among patients diagnosed with GD who presented to the Behavioral Addiction Outpatient Clinic of the Department of Psychiatry at Ankara Etlik City Hospital. In addition, by examining the sociodemographic and clinical characteristics of these patients, the study sought to provide a more comprehensive characterization of the clinical

profile associated with GD. Given the limited number of studies in our country investigating psychiatric comorbidities and viral seroprevalence concurrently in individuals with GD, the present findings are expected to contribute to the existing literature. The use of standardized ELISA assays for HBsAg, anti-HCV, and anti-HIV testing in all participants represents a methodological strength that enhances the consistency and reliability of the data. Furthermore, by integrating perspectives from addiction psychiatry and infectious diseases, this interdisciplinary approach may improve the understanding of the complex clinical needs of this patient population and highlight the importance of comprehensive screening and multidisciplinary follow-up strategies.

Table 6. Comparison of Participant Characteristics Based on the Presence of Comorbid Psychiatric Illness

Variable		Comorbid Psychiatric Illness				p
	Yes		No			
	n=106	%	n=71	%		
Comorbid physical illnesses (DM, Hypertension, CAD, CKD)	Present	13	12.3	2	2.8	[c]***0.027****
	None	93	87.7	69	97.2	
Duration of addiction (years)	Mean±SD	9.01±6.69		9.23±6.88		[d]***0.945***
	Median (Min-Max)	8 (1-30)		7 (1-27)		
IV drug use	No	104	98.1	71	100	-
	†Yes	2	1.9	0	0	
Surgical history	None	102	96.2	69	97.2	[a]***1.000***
	Yes	4	3.8	2	2.8	
HBsAg	Negative	106	100	70	98.6	-
	†Positive	0	0	1	1.4	
Anti-HCV	Negative	105	99.1	71	100	-
	†Positive	1	0.9	0	0	

† Excluded from evaluation due to case numbers
*aFisher Exact Test cPearson Chi-Square Test; dMann Whitney-U Test;*p<0.05;*

Table 7. Logistic Regression Analysis of Risk Factors Associated with Additional Addictions

	B	p	ODDS	%95 CI	
				Lower	Upper
Constant	-1.145	***0.422***	0.318		
Age	-0.116	***0.003****	0.891	0.826	0.961
Comorbid psychiatric disorder (present)	3.079	***0.001****	21.732	4.115	114.773
Educational level (University)		***0.044****			
Educational level (Primary education and below)	1.831	***0.039****	6.239	1.099	35.412
Educational level (High school)	1.110	***0.035****	3.034	1.081	8.520

**p<0.05* ***p<0.01*

In our study, the participant profile (largely composed of young, male, and actively employed individuals) is consistent with the sociodemographic risk factors frequently highlighted for GD in the literature (Dowling et al., 2017; Çakmak & Tamam, 2018; Moreira et al., 2023; Tran et al., 2024). The male predominance observed in GD and other behavioral addictions is attributed to differences in

neurobiologically based impulsivity and risk-taking tendencies (Potenza, 2008; Cross et al., 2011), as well as societal gender norms (Fattore et al., 2014; Merkouris et al., 2016).

The literature indicates that the prevalence of blood-borne infections, including HBV, HCV and HIV is higher among individuals with alcohol and substance use disorders than in the general population (Degenhardt et al., 2017; Keskin & Güzel, 2025; Yıldırım et al., 2025). Given the frequent comorbidity between behavioral addictions and substance use disorders, this increased risk of infection is attributable not only to biological routes of transmission but also to the behavioral and social factors associated with the addiction process. In particular, the sharing of injection equipment during intravenous substance use is recognized as one of the major risk factors for the transmission of blood-borne pathogens, especially HBV and HCV. In our study, hepatitis serological positivity was observed descriptively among participants with a history of intravenous substance use; however, statistical analysis could not be performed because of the limited number of cases in this subgroup.

Furthermore, alcohol and psychoactive substance use are known to increase impulsivity and impair decision-making processes, thereby contributing to a greater likelihood of engaging in high-risk behaviors such as unprotected sexual intercourse and having multiple sexual partners (Stein et al., 2000; Rees et al., 2001; Topçuoğlu & Bez, 2005; Grant & Chamberlain, 2014). Previous studies have further demonstrated that these behavioral patterns not only facilitate the transmission of infectious diseases but also contribute to a higher overall infection burden through delayed healthcare utilization, reduced participation in routine screening programs, and poor adherence to treatment (Altice et al., 2010; Grebely et al., 2015).

In our study, the detected HBsAg positivity rate of 0.6% (n=1) was found to be relatively low when compared with the global average prevalence of approximately 3.5% (despite regional variations), the reported rate of approximately 4% for the Turkish general population, and prevalence values in the literature for individuals with substance use disorders, which range between 2.2% and 5.5% (Türker et al., 2022; Yıldırım et al., 2025). The literature emphasizes that populations diagnosed with alcohol and substance use disorders possess a higher risk profile for HBV infection compared to the general population (Degenhardt et al., 2017; Keskin & Güzel, 2025; Yıldırım et al., 2025). This increased risk is associated with variables such as intravenous substance use, the sharing of contaminated equipment, and risky sexual behavior patterns (Stein et al., 2000; Rees et al., 2001; Topçuoğlu & Bez, 2005). In this context, it can be stated that the HBsAg prevalence obtained in our study diverges from the findings of numerous studies focusing on substance use.

Similarly, the 0.6% (n=1) anti-HCV positivity identified in our study appears generally consistent with reported data indicating that approximately 0.7% of the adult population worldwide is infected with HCV, as well as prevalence values slightly below the estimated 0.3% for the general population of Turkey (TKAD & VHSD, 2023). Furthermore, the literature highlights opioid use disorder and intravenous substance use as being among the most potent risk factors for HCV infection, with reported seropositivity rates in these groups reaching over 52% (Degenhardt et al., 2017; Toker Uğurlu et al., 2020; Ceylan et al., 2022; Tariq et al., 2022; Yıldırım et al., 2025). Accordingly, the detection of anti-HCV positivity in one of the two participants with a history of intravenous substance use in our study, although insufficient to permit statistical inference because of the limited sample size, represents a noteworthy observation that underscores the importance of parenteral transmission in the epidemiology of HCV infection.

In our study, all participants were found to be seronegative for anti-HIV, a finding consistent with Türkiye overall low-prevalence epidemiological profile in light of both national and global epidemiological data (HSGM, 2024; The Joint United

Nations Programme on HIV/AIDS [UNAIDS], 2024; WHO, 2025). According to UNAIDS (2024) and WHO (2025) reports, approximately 40.8 million individuals worldwide are living with HIV, and the prevalence in the adult population ranges between 0.7% and 0.8%. While these rates are substantially higher in endemic regions such as Sub-Saharan Africa, Türkiye continues to be classified among low-prevalence countries according to WHO criteria. Data published by HSGM in 2024 also indicate that although the number of registered HIV cases in Türkiye exceeds 51.000, the prevalence in the general population remains below 0.1%. In this context, the absence of anti-HIV seropositive cases in our sample appears to be compatible with the low-prevalence epidemiological structure observed in our country. Nevertheless, considering the relatively limited sample size of the study, it should also be acknowledged that low-frequency HIV infections may not have been represented within the sample, which may have contributed to the observed seroprevalence rate of 0%.

The low viral seroprevalence observed in our study is likely to reflect the combined influence of multiple factors. Among individuals with alcohol and substance use disorders, the principal determinants of viral transmission include intravenous substance use, syringe sharing and engagement in high-risk sexual behaviors while under the influence of substances (Stein et al., 2000; Rees et al., 2001; Topçuoğlu & Bez, 2005). In contrast, 83.1% of the patients with GD in our cohort had no history of an additional addiction and only 1.1% (n = 2) reported a history of intravenous substance use, suggesting that the study population had a relatively low-risk behavioral profile.

In addition, the national HBV vaccination program implemented in Türkiye since 1998 has made a substantial contribution to increasing population immunity, particularly among young adults (Türker et al., 2022; HSGM, 2025). Given that the mean age of our study population was 34.2 years, it is plausible that a considerable proportion of participants may have benefited from the protective effects of this vaccination strategy.

Nevertheless, the identification of only one HBsAg-positive case and one anti-HCV-positive case warrants cautious interpretation of the observed seroprevalence rates. In addition to the possibility that these infections are genuinely uncommon in the study population, the limited sample size and the very low number of positive cases may also have contributed to the findings. Accordingly, the current study design does not permit attribution of the low viral seroprevalence to any single factor. Rather, the results should be interpreted within a multifactorial framework that considers the behavioral characteristics of the sample, population-level preventive health measures and the methodological limitations of the study.

The finding that 59.9% of patients diagnosed with GD in our sample had at least one psychiatric comorbidity and that 16.9% had a concurrent alcohol and/or substance use disorder suggests that psychiatric comorbidities and additional addictions are common in this patient population, highlighting the potentially complex clinical nature of GD. These high comorbidity rates are consistent with literature emphasizing that GD, rather than being an isolated issue, shows high rates of co-occurrence with other psychopathologies such as depression, anxiety, attention deficit, impulse control, and personality disorders (Petry et al., 2005; Rodriguez-Monguio et al., 2017). This supports the perspective that behavioral addictions might best be approached not only as independent clinical entities but also as significant indicators of potential psychiatric comorbidities (Demiralay et al., 2021).

The analyses performed provide important data regarding the sociodemographic correlates of this clinical picture. Within our cohort, it was observed that patients with an additional addiction were significantly younger ($p=0.002$) and had higher rates of being single ($p=0.021$). Specifically, the finding that childless individuals had a 2.45-fold higher probability of having an additional addiction compared to those with children (OR=2.45; $p=0.030$) parallels the relevant literature, where

factors such as young age, single marital status and childlessness are considered significant risk factors for the development of additional addictions (Barnes et al., 2015; Moreira et al., 2023). It is hypothesized that these demographic characteristics may contribute to additional addiction processes by influencing individuals' tendency toward risky behaviors and their level of openness to new experiences (Potenza, 2008; Çakmak & Tamam, 2018). In this context, it is thought that the absence of social control and responsibility mechanisms, such as marriage and parenthood, may leave young GD patients more vulnerable to other addictions and potentially contribute to the expansion of the addiction spectrum (Dowling et al., 2017).

Our clinical findings suggest a close relationship between GD, alcohol/substance use disorders, and psychiatric comorbidities. In particular, the 12.38-fold higher likelihood of an additional addiction among individuals with a comorbid psychiatric disorder (OR=12.38; p=0.001) points to a substantial degree of overlap between these clinical conditions.

Biopsychosocial models propose that alcohol and substance use disorders and behavioral addictions share common neurobiological mechanisms, particularly within the mesolimbic dopaminergic system responsible for reward processing, motivation and impulse control. Functional alterations within this system are thought to contribute to the development of similar behavioral patterns and phenotypic characteristics across both forms of addiction (Griffiths, 2005; Potenza, 2008; Barnes et al., 2015).

Hypersensitivity of the dopaminergic system and impaired impulse control may further weaken individuals' ability to regulate their behavior and adversely affect treatment adherence (Potenza, 2008; Kaya et al., 2019; Grant & Chamberlain, 2014; Miezah et al., 2024). Consequently, behavioral addictions appear to exhibit important similarities to alcohol and substance use disorders not only in terms of their neurobiological underpinnings but also with respect to clinical course and treatment response (Petry, 2005; Potenza, 2008; Grant et al., 2010). In our cohort, the significantly shorter duration of addiction among patients exhibiting impulsive behaviors and dual diagnoses (p = 0.003) is consistent with the notion that concurrent addictions might accelerate the clinical progression of GD and increase its overall disease burden (Grant et al., 2010; Grant & Chamberlain, 2014; Ford & Håkansson, 2020).

Accordingly, it is recommended that patients presenting with GD should be evaluated through a comprehensive clinical framework that extends beyond the primary behavioral addiction to include potential co-occurring alcohol and substance use disorders as well as the risk of parenterally transmitted infections associated with these conditions. Furthermore, the 4.82-fold higher likelihood of psychiatric comorbidity among individuals with serious physical illness (OR=4.82; p=0.027) suggests that the impact of GD may extend beyond mental health to broader aspects of overall health and functioning (Ford & Håkansson, 2020). Collectively, while taking the study's limitations into account, these findings emphasize the potential value of a multidisciplinary approach to the management of GD and strongly highlight the need for larger, multicenter, and longitudinal studies to validate and expand upon the present results.

Limitations

Several limitations of this study should be acknowledged:

The study utilized a single-center and retrospective design with data obtained from existing medical records, which introduces a potential risk of selection bias.

The very low positivity rates for viral markers (HBsAg: 0.6%, n=1; and anti-HCV: 0.6%, n=1), representing a "low event rate," may limit the statistical power of inferential analyses and potentially increase the risk of Type II error.

The accuracy of the variables is contingent upon patient self-reports and hospital records;

furthermore, data from a single center may limit the generalizability of the findings to populations in different geographic regions.

As the cohort comprised solely individuals diagnosed with GD, the findings may not be applicable to other forms of behavioral addictions.

Clinical details such as the severity and duration of the addiction, as well as relapse rates in behavioral addictions, could not be evaluated due to the retrospective nature of the data.

Although ELISA results were extracted from electronic health records, prior history of infections or follow-up for seroconversion was not performed.

CONCLUSION

This study indicated that the seroprevalence of HBV, HCV and HIV among individuals diagnosed with GD was generally low. HBsAg and anti-HCV positivity were each detected in 0.6% of participants (n=1), whereas no cases of anti-HIV

Our analyses further showed that individuals with psychiatric comorbidity were 12.38 times more likely to have an additional addiction (p=0.001). Moreover, the presence of a serious physical illness was associated with a 4.82-fold increased risk of psychiatric comorbidity (p=0.027), while younger age, being unmarried, and being childless were identified as significant correlates of additional addiction. Collectively, these findings suggest that individuals with behavioral addictions are characterized not only by addictive behaviors but also by complex biopsychosocial vulnerabilities.

In light of these findings, the adoption of a holistic and multidisciplinary approach to the evaluation of individuals with behavioral addictions appears warranted. In particular, among patients with psychiatric comorbidity and concurrent alcohol and/or substance use disorders, appropriate screening for HBV, HCV, and HIV may facilitate the early identification of occult infections, timely referral to preventive healthcare services, and improved access to vaccination programs, thereby providing important clinical and public health benefits.

Accordingly, increasing awareness of infectious diseases during psychiatric follow-up, implementing targeted screening strategies in high-risk populations, and integrating psychoeducation and interventions that promote preventive health behaviors into treatment programs may improve patient care. However, given the low event rate and the inherent limitations of the single-center retrospective design, larger multicenter prospective studies are needed to validate the present findings and enhance their generalizability.

REFERENCES

Alimoradi, Z., Lin, C. Y., Broström, A., Bülow, P. H., Bajalan, Z., Griffiths, M. D., Ohayon, M. M., & Pakpour, A. H. (2019). Internet addiction and sleep problems: A systematic review and meta-analysis. *Sleep Medicine Reviews, 47*, 51–61. https://doi.org/10.1016/j.smrv.2019.06.004

Alimoradi, Z., Lotfi, A., Lin, C. Y., Griffiths, M. D., & Pakpour, A. H. (2022). Estimation of behavioral addiction prevalence during COVID-19 pandemic: A systematic review and meta-analysis. *Current Addiction Reports, 9*(4), 486–517. https://doi.org/10.1007/s40429-022-00435-6

Altice, F. L., Kamarulzaman, A., Soriano, V. V., Schechter, M., & Friedland, G. H. (2010). Treatment of medical, psychiatric, and substance-use comorbidities in people infected with HIV who use drugs. *The Lancet, 376*(9738), 367–387. https://doi.org/10.1016/S0140-6736(10)60829-X

American Psychiatric Association. (2013). Diagnostic and statistical manual of mental disorders (5th ed.). https://doi.org/10.1176/appi.books.9780890425596

Barnes, G. M., Welte, J. W., Tidwell, M. C. O., & Hoffman, J. H. (2015). Gambling and substance use: Co-occurrence among adults in a recent general population study in the United States. *International Gambling Studies, 15*(1), 55–71. https://doi.org/10.1080/14459795.2014.990396

Ceylan, M. R., Çelik, M., Esmer, F., Levent, E., & Örer-Beğinoğlu, Ö. (2022). Madde kullanım bozuklukları ve hepatit C: Bir halk sağlığı sorunu [Substance use disorders and hepatitis C: A public health problem]. *Klimik Dergisi, 35*(4), 258–262. https://doi.org/10.36519/kd.2022.3905

Cross, C. P., Copping, L. T., & Campbell, A. (2011). Sex differences in impulsivity: A meta-analysis. *Psychological Bulletin, 137*(1), 97–130. https://doi.org/10.1037/a0021591

Çakmak, S., & Tamam, L. (2018). Kumar oynama bozukluğu: Genel bir bakış [Gambling disorder: An overview]. *Bağımlılık Dergisi (Journal of Dependence), 19*(3), 78–97. https://izlik.org/JA65XB62NB

Degenhardt, L., Peacock, A., Colledge, S., Leung, J., Grebely, J., Vickerman, P., Stone, J., Cunningham, E. B., Trickey, A., Dumchev, K., Lynskey, M., Griffiths, P., Mattick, R. P., Hickman, M., & Larney, S. (2017). Global prevalence of injecting drug use and sociodemographic characteristics and prevalence of HIV, HBV, and HCV in people who inject drugs: A multistage systematic review. *The Lancet Global*

Health, 5(12), e1192–e1207. https://doi.org/10.1016/S2214-109X(17)30375-3

Demiralay, Ş., Keser, İ., & Güven, F. M. (2021). Özel bir hastanenin psikiyatri servisinde bağımlılık tedavisi alan hastaların sosyodemografik ve klinik özelliklerinin retrospektif analizi [Retrospective analysis of sociodemographic and clinical characteristics of patients receiving addiction treatment in the psychiatry ward of a private hospital]. *Klinik Psikiyatri Dergisi (Journal of Clinical Psychiatry), 24*(3), 383–393. https://doi.org/10.5505/kpd.2021.57960

Dowling, N. A., Merkouris, S. S., Greenwood, C. J., Oldenhof, E., Toumbourou, J. W., & Youssef, G. J. (2017). Early risk and protective factors for problem gambling: A systematic review and meta-analysis of longitudinal studies. *Clinical Psychology Review, 51*, 109–124. https://doi.org/10.1016/j.cpr.2016.10.008

Fattore, L., Melis, M., Fadda, P., & Fratta, W. (2014). Sex differences in addictive disorders. *Frontiers in Neuroendocrinology, 35*(3), 272–284. https://doi.org/10.1016/j.yfrne.2014.04.003

Ford, M., & Håkansson, A. (2020). Problem gambling, associations with comorbid health conditions, substance use, and behavioural addictions: Opportunities for pathways to treatment. *PLoS One, 15*(1), e0227644. https://doi.org/10.1371/journal.pone.0227644

Grant, J. E., & Chamberlain, S. R. (2014). Impulsive action and impulsive choice across substance and behavioral addictions: Cause or consequence? *Addictive Behaviors, 39*(11), 1632–1639. https://doi.org/10.1016/j.addbeh.2014.04.022

Grant, J. E., Potenza, M. N., Weinstein, A., & Gorelick, D. A. (2010). Introduction to behavioral addictions. *The American Journal of Drug and Alcohol Abuse, 36*(5), 233–241. https://doi.org/10.3109/00952990.2010.491884

Grebely, J., Robaeys, G., Bruggmann, P., Aghemo, A., Backmund, M., Bruneau, J., Byrne, J., Dalgard, O., Feld, J. J., Hellard, M., Hickman, M., Kautz, A., Litwin, A., Lloyd, A. R., Mauss, S., Prins, M., Swan, T., Schaefer, M., Taylor, L. E., & Dore, G. J. (2015). Recommendations for the management of hepatitis C virus infection among people who inject drugs. *International Journal of Drug Policy, 26*(10), 1028–1038. https://doi.org/10.1016/j.drugpo.2015.07.005

Griffiths, M. D. (2005). A "components" model of addiction within a biopsychosocial framework. *Journal of Substance Use, 10*(4), 191–197. https://doi.org/10.1080/14659890500114359

Joint United Nations Programme on HIV/AIDS. (2024). *World AIDS Day report 2024*. https://www.unaids.org/

Kaya, E., Akpınar, D., & Akpınar, H. (2019). Bağımlılığın patofizyolojisi [Pathophysiology of addiction]. *Muğla Sıtkı Koçman Üniversitesi Tıp Dergisi, 6*(3), 166–170.

Keskin, N., & Güzel, Y. (2025). Opioid kullanım bozukluğu olan hastalarda HIV, hepatit B ve C enfeksiyonlarının sıklığı ve klinik özellikler [Prevalence and clinical characteristics of HIV, hepatitis B and C infections in patients with opioid use disorder]. *Bağımlılık Dergisi (Journal of Dependence), 26*(4), 421–430. https://doi.org/10.51982/bagimli.1676292

Langan, K., Wall, M., Potts, W., & Himelhoch, S. (2019). Prevalence and potential predictors of gambling disorder among people living with HIV. *AIDS Care, 31*(4), 421–426. https://doi.org/10.1080/09540121.2018.1499858

Lorains, F. K., Cowlishaw, S., & Thomas, S. A. (2011). Prevalence of comorbid disorders in problem and pathological gambling: Systematic review and meta-analysis of population surveys. *Addiction, 106*(3), 490–498. https://doi.org/10.1111/j.1360-0443.2010.03300.x

Merkouris, S. S., Thomas, A. C., Shandley, K. A., Rodda, S. N., Oldenhof, E., & Dowling, N. A. (2016). An update on gender differences in the characteristics associated with problem gambling: A systematic review. *Current Addiction Reports, 3*(3), 254–267. https://doi.org/10.1007/s40429-016-0106-y

Miezah, D., Mahama, I., Moustafa, A. A., & Nkrumah, I. K. (2024). Impulsivity and its relationships with social media addiction, internet addiction, and smartphone addiction. In *The Psychology and Neuroscience of Impulsivity* (pp. 85–228). Elsevier.

Moreira, D., Azeredo, A., & Dias, P. (2023). Risk factors for gambling disorder: A systematic review. *Journal of Gambling Studies, 39*(2), 483–511. https://doi.org/10.1007/s10899-021-10085-w

Petry, N. M. (2005). *Pathological gambling: Etiology, comorbidity, and treatment* (Vol. 2). Washington, DC: American Psychological Association.

Petry, N. M., Stinson, F. S., & Grant, B. F. (2005). Comorbidity of DSM-IV pathological gambling and other psychiatric disorders: Results from the National Epidemiologic Survey on Alcohol and Related Conditions. *The Journal of Clinical Psychiatry, 66*(5), 564–574. https://doi.org/10.4088/JCP.v66n0504

Potenza, M. N. (2008). The neurobiology of pathological gambling and drug addiction: An overview and new findings. *Philosophical Transactions of the Royal Society B: Biological Sciences, 363*(1507), 3181–3189. https://doi.org/10.1098/rstb.2008.0100

Potenza, M. N. (2014). The neural bases of cognitive processes in gambling disorder. *Trends in Cognitive Sciences, 18*(8), 429–438. https://doi.org/10.1016/j.tics.2014.03.007

Rees, V., Saitz, R., Horton, N. J., & Samet, J. (2001). Association of alcohol consumption with HIV sex- and drug-risk behaviors among drug users. *Journal of Substance Abuse Treatment, 21*(3), 129–134. https://doi.org/10.1016/S0740-5472(01)00190-8

Republic of Türkiye Ministry of Health, General Directorate of Public Health. (2024). *HIV/AIDS statistics*.

Republic of Türkiye Ministry of Health, General Directorate of Public Health. (2025). *Türkiye viral hepatitis control program (2025-2030)* (Publication No. 1364). Ankara.

Rodriguez-Monguio, R., Errea, M., & Volberg, R. (2017). Comorbid pathological gambling, mental health, and substance use disorders: Health-care services provision by clinician specialty. *Journal of Behavioral Addictions, 6*(3), 406–415. https://doi.org/10.1556/2006.6.2017.054

Sadock, B. J., Sadock, V. A., & Ruiz, P. (Eds.). (2022). *Kaplan & Sadock's synopsis of psychiatry: Behavioral sciences/clinical psychiatry* (12th ed., pp. 269–337). Wolters Kluwer.

Stein, M. D., Hanna, L., Natarajan, R., Clarke, J., Craig, P., & Friedmann, P. (2000). Alcohol use patterns predict high-risk HIV behaviors among active injection drug users. *Journal of Substance Abuse Treatment, 18*(4), 359–363. https://doi.org/10.1016/S0740-5472(99)00101-5

Tariq, M., Shoukat, A. B., Akbar, S., Hameed, S., Naqvi, M. Z., Azher, A., Saad, M., Rizwan, M., Nadeem, M., Javed, A., Ali, A., & Aziz, S. (2022). Epidemiology, risk factors, and pathogenesis associated with a superbug: A comprehensive literature review on hepatitis C virus infection. *SAGE Open Medicine, 10*, 20503121221105957. https://doi.org/10.1177/20503121221105957

Toker Uğurlu, T., Güvendik, C., & Ateşci, F. (2020). Bir AMATEM kliniğinde yatan opioid bağımlısı hastalarda HCV enfeksiyonu ve tedavi oranları [HCV infection and treatment rates in patients with opioid dependence in an AMATEM clinic]. *Journal of Dependence, 21*(2), 108–114.

Topçuoğlu, V., & Bez, Y. (2005). Madde kullanımına bağlı enfeksiyonlar [Infections related to substance use]. *Journal of Dependence, 6*(2), 89–96.

Tran, L. T., Wardle, H., Colledge-Frisby, S., Taylor, S., Lynch, M., Rehm, J., Volberg, R., Marionneau, V., Saxena, S., Bunn, C., Farrell, M., & Degenhardt, L. (2024). The prevalence of gambling and problematic gambling: A systematic review and meta-analysis. *The Lancet Public Health, 9*(8), e594–e613. https://doi.org/10.1016/S2468-2667(24)00126-9

Turkish Association for the Study of the Liver (TASL) & Association for the Fight Against Viral Hepatitis (VHSD). (2023). *Türkiye hepatitis B diagnosis and treatment guideline 2023*.

Turkish Association for the Study of the Liver (TASL) & Association for the Fight Against Viral Hepatitis (VHSD). (2023). *Türkiye hepatitis C diagnosis and treatment guideline 2023*.

Türker, N., Örmen, B., & Karaca, B. (2022). Hepatit B enfeksiyonu epidemiyolojisi [Epidemiology of hepatitis B infection]. In N. Demirtürk (Ed.), *Hepatit B virüs enfeksiyonu* (1st ed., pp. 16–22). *Türkiye Klinikleri*.

World Health Organization. (2024, December 2). *Gambling*. https://www.who.int/news-room/fact-sheets/detail/gambling

World Health Organization. (2025). *HIV statistics, globally and by WHO region, 2025* (WHO/UCN/HHS/SIA/2025.03).

World Health Organization. (2025, January). *International statistical classification of diseases and related health problems* (11th ed.). https://icd.who.int/browse/2025-01/mms/en

World Health Organization. (2026). *Consolidated guidance on hepatitis B and C prevention, testing, treatment, service delivery and monitoring: An implementation handbook for a public health approach*.

Yıldırım, M. H., Gül Yurtsever, S., Peker, B. O., Bağcı, B., Kaya, S., Müderris, T., & Aksoy Gökmen, A. (2025). Alkol ve madde kullanım bozukluğu olan AMATEM hastalarında hepatit B, hepatit C, HIV ve sifiliz seroprevalansının değerlendirilmesi [Evaluation of hepatitis B, hepatitis C, HIV and syphilis seroprevalence in AMATEM patients with alcohol and substance use disorder]. *Firat Medical Journal, 30*(4), 274–27

Peer-Review

Double blind peer reviewed

Conflict of Interest

The authors declare that they have no conflict of interests regarding content of this article.

Financial Support

The Authors report no financial support regarding content of this article.

Ethical Declaration

Our study was approved by the Ankara Etlik City Hospital Ethics Committee (Ethics Committee Approval No: AEŞH-BADEK1-2025-297) and was conducted in accordance with the principles of the Declaration of Helsinki. Informed consent was obtained from all participants, and ethical principles regarding the confidentiality and privacy of the data were meticulously adhered to.

Authorship Contributions

Concept: EAM, Design: EAM, DK, AK, BK, Supervising: EAM, Financing and equipment: EAM, Data collection and entry: EAM, DK, Analysis and interpretation: EAM, Literature search: EAM, DK, AK, BK, Writing: EAM, DK, AK, BK, Critical review: EAM, DK, AK, BK.

Corresponding Author

[1]**Deniz Kozak**

Department of Psychiatry, Ankara Etlik City Hospital, Ankara, Türkiye

Email: denizkozak18@hotmail.com

ORCID iD: 0009-0000-7345-8117