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Internet addiction and depression: a study among adolescents

Adicción a internet y depresión: un estudio en adolescentes

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Abstract

Objective: *The goal of our study is to determine the level of Internet addiction (IA) in adolescents by utilizing the IA scale.* **Methods:** *We employed two tools: the IA test (IAT) and the beck depression inventory (BDI), complemented by a sociodemographic information form, to assess IA and depression levels.* **Results:** *A total of 201 participants were included. A positive correlation was found between daily Internet usage time and IAT scores (r = 0.388, p < 0.001) and between BDI scores and IAT scores (r = 0.161, p = 0.013). Females had a lower mean IAT score (63.56 ± 28.08) (p < 0.001). The BDI scores varied significantly across the groups (p = 0.004). The mean BDI scores were higher in the severe addiction group (13.53 ± 7.15) compared to the moderate (11.04 ± 6.62), mild (10.11 ± 5.38), and normal usage groups (9.28 ± 5.54). A significant difference was found in gender distribution across the groups (p = 0.001). The presence of suicidal ideation differed significantly across the groups (p = 0.002). The presence of depression showed a significant difference (p = 0.038).* **Conclusions:** *Our study reveals a significant correlation between increased Internet usage and heightened levels of IA and depression among adolescents, with notable gender differences in IA severity.*

Keywords: Internet addiction. Depression. Adolescents. Students.

Resumen

Objetivo: *Determinar el nivel de adicción a internet en adolescentes utilizando una escala de adicción a internet.* **Método:** *Nuestro estudio involucró a 201 estudiantes con adicción a internet. Empleamos dos herramientas, la IAT (internet addiction test) y el BDI (beck depression inventory), que se complementaron con un formulario de información sociodemográfica, para evaluar los niveles de adicción a internet y de depresión.* **Resultados:** *Se encontró una correlación positiva entre el tiempo diario de uso de internet y las puntuaciones del IAT (r = 0.388; p < 0.001), así como entre las puntuaciones del BDI y del IAT (r = 0.161; p = 0.013). Las mujeres tuvieron una puntuación media más baja en el IAT (p < 0.001). Las puntuaciones del BDI variaron significativamente entre los grupos (p = 0.004). Las puntuaciones medias del BDI fueron más altas en el grupo de adicción grave en comparación con los grupos de adicción moderada y de uso normal. Se encontró una diferencia significativa en la distribución por sexo entre los grupos (p = 0.001). La presencia de ideación suicida difirió significativamente entre los grupos (p = 0.002). La presencia de depresión mostró una diferencia significativa (p = 0.038).* **Conclusiones:** *Nuestro estudio revela una correlación significativa entre mayor uso de internet y niveles elevados de adicción y depresión en adolescentes, con diferencias de sexo notables en la gravedad de la adicción.*

Palabras clave: Adicción a internet. Depresión. Adolescentes. Estudiantes.

Introduction

The advent of the Internet has revolutionized the way we communicate, learn, work, and entertain ourselves. This transformation became even more pronounced with the onset of COVID-19 restrictions, leading to a surge in the global Internet user base from 738 million in 2000 to 4.9 billion in 2021, marking a staggering 5 times growth within two decades[1-3]. Data from the Internet World Stats reveal that by 2019, approximately 4.5 billion people, representing 58.8% of the world's population, were actively using the Internet. This significant statistic underscores that over half of the world's population engaged in online activities during this period. The proliferation of affordable mobile technology has further facilitated Internet access, with the number of smartphone users worldwide reaching 3.8 billion in 2021, a notable increase from just over 1 billion in 2013[3]. The prevalence of Internet access among children is now widespread. Data from the American Community Survey highlight this trend, revealing that 95% of children aged 3-18 in the United States has access to the Internet at home. The majority of these children are using computers, while a smaller proportion utilizes smartphones for Internet access. Amidst this growing digital engagement, concerns regarding Internet addiction (IA) have intensified over the past two decades, prompting researchers to delve deeper into understanding and defining this phenomenon, alternately referred to as IA, problematic Internet use (PIU), or IA disorder (IAD)[4].

With digital technologies advancing rapidly and more individuals turning to the Internet, new forms of addiction-related behaviors have emerged. IA is characterized by excessive or compulsive Internet usage that leads to distress or impairment. A specific subset of this behavior, Internet gaming disorder (IGD), has gained recognition in the Diagnostic and Statistical Manual of Mental Disorders, fifth edition (DSM-5)[5], and gaming disorder (GD) is acknowledged in the International Classification of Diseases by the World Health Organization[6]. These developments indicate a broader understanding of the various subtypes of IA, including compulsive gaming, sexual preoccupations, and excessive email/text messaging. However, further research is necessary to delineate the nuances across these subtypes[7].

The relationship between IA and risky behaviors in adolescents and young adults, such as drinking, smoking, suicidal behavior, gambling, and drug abuse, is a growing concern[8,9]. Studies have indicated a positive correlation between IAD and these risky behaviors[10,11]. Investigations have revealed associations between levels of Internet dependence and heightened risks of suicidal behavior, while time spent on Internet gaming has been linked to increased alcohol consumption[12,13]. However, not all studies have found significant correlations between these behaviors[14]. For instance, smoking has been suggested as a potential facilitator for developing IAD[15,16]. Research involving Chinese adolescents has shown that those with IAD or IGD may engage in more risky activities, highlighting the need for further examination in this area[17].

IA, particularly among adolescents, has increasingly been recognized as a significant mental health concern. Excessive Internet use can lead to a host of negative mental health outcomes, including insomnia, anxiety, depression, low self-esteem, impulsiveness, mood disorders, strained family relationships, self-harm, and suicidal tendencies[18-20]. The widespread availability of mobile devices has perpetuated constant Internet connectivity among young people, often serving as a primary communication tool and an escape mechanism. However, when the Internet becomes the main coping strategy for stress, it can lead to numerous adverse effects[21].

The goal of our study is to determine the level of IA in adolescents by utilizing the IA scale.

Materials and methods

The study sample consisted of 201 adolescents (students) from Diyarbakir City Center who voluntarily agreed to participate in the study. Information about the study was provided to all students, and consent was obtained from those who agreed to participate. The sociodemographic information form and scales were distributed to the students. Ethical approval was obtained from Dicle University non-interventional local ethical committee (number: 222).

IA test (IAT)

This questionnaire is composed of 20 statements. Please read each statement with attention and, using the 5-point Likert scale, choose the response (0, 1, 2, 3, 4, or 5) that most accurately reflects your experiences. If you find two options equally applicable, select the one that best describes your typical behavior over the past month. It is important to consider each statement thoroughly before making a decision. These statements generally pertain to offline behaviors and

situations unless specified otherwise. The total score on the IAT is calculated by adding up your ratings for each of the 20 items. Each item is scored on a 5-point scale, ranging from 0 to 5. The highest possible score is 100. A higher score indicates greater severity of the issue. Scores from 0 to 30 suggest a normal level of Internet usage. Scores between 31 and 49 indicate a mild level of IA, while scores from 50 to 79 suggest a moderate level. Scores range from 80 to 100 point toward severe Internet dependence[22].

Beck depression inventory (BDI)

The BDI was employed to assess depression levels. It features 21 questions, each offering four possible answers. These questions are designed to evaluate the physical, behavioral, and cognitive symptoms of depression, as well as to gauge the severity of depression, which can range from mild to severe. Responses are rated on a scale from 0 to 3, leading to a maximum possible score of 63 and a minimum of 0. The scoring categories are as follows: scores under 14 indicate minimal depression; scores between 14 and 19 suggest mild depression; scores from 20 to 28 denote moderate depression; and scores between 29 and 63 are indicative of severe depression[23].

Statistical analysis

In the analysis, SPSS version 26.00 software served as the primary tool. Results were presented as mean ± standard deviation (SD), n (%), or median (Q1-Q3). For comparing normally distributed variables across independent groups, we utilized the Student's t-test. When dealing with non-parametric or ordinal variables, the Mann–Whitney U test was employed. To assess the correlation coefficients and determine the statistical significance of normally distributed variables, Pearson's test was applied. Conversely, Spearman's test was used for evaluating variables that were not normally distributed. The χ^2 test was utilized for the comparisons of the categorical variables. A $p < 0.05$ was deemed indicative of statistical significance.

Results

A total of 201 participants were included, 47.7% of them were female (n = 96) and 52.3% (n = 105) of them were male. The sociodemographic data and scale scores of the participants are summarized in table 1.

Table 1. Sociodemographic data and scale scores

Characteristics	Mean	SD	Minimum	Maximum
Age	13	1.88	9	18
Mother age	39.19	6.53	26	58
Father age	43.28	6.66	29	63
Number of siblings	5.35	2.45	2	13
IAT scores	72.28	25.78	35	100
BDI scores	11.99	7.17	0	38

*IAT: internet addiction test; BDI: beck depression inventory; SD: standard deviation.

The average age of the participants was found to be 13 ± 1.88 years. Participants had 5.35 ± 2.45 siblings. Regarding the scale scores, the IAT scores were 72.28 ± 25.78. BDI scores averaged at 11.99 ± 7.17.

The correlation between various sociodemographic factors and IAT scores is detailed in table 2. A notable finding was the positive correlation between daily Internet usage time and IAT scores. This correlation was moderate (r = 0.388) and highly significant (p < 0.001). In addition, a significant but relatively weak positive correlation was observed between the BDI scores and IAT scores (r = 0.161, p = 0.013). This indicates a relationship between higher levels of depressive symptoms and greater IA tendencies.

The comparative analysis of IAT scores across different demographic and behavioral variables is presented in table 3. The results showed significant differences in IAT scores based on several factors. A significant difference was observed in the mean IAT scores between females and males. Females had a lower mean score (63.56 ± 28.08), while males exhibited a higher mean score (81.15 ± 34.89) (p < 0.001). The analysis of IAT scores based on school success (categorized as poor, moderate, and good) did not reveal a statistically significant difference (p = 0.318). There was a statistically significant difference in IAT scores between individuals who smoke and those who do not (p = 0.008). Smokers had a higher mean score (81.29 ± 36.48) compared to non-smokers (67.89 ± 29.97). Participants with Internet access at home had a higher mean score (86.15 ± 30.98) compared to those without (66.01 ± 31.79) (p < 0.001). Similar to home access, having Internet access in one's own room was associated with higher IAT scores. Those with personal room access had a mean score of 87.42 ± 35.68, whereas those without had a score of 70.58 ± 31.87, and this difference was statistically significant (p = 0.009).

Table 2. Correlation to Internet addiction test score

Characteristics	r	p
Age	0.019	0.772
Mother age	−0.051	0.514
Father age	−0.106	0.169
Number of siblings	−0.047	0.462
Internet usage time (h/day)	0.388	0.000
BDI scores	0.161	0.013

*BDI: Beck Depression Inventory.

Table 3. Comparisons in terms of Internet addiction test score

Characteristics	Mean ± SD	p-values
Gender		0.000
Female	63.56 ± 28.08	
Male	81.15 ± 34.89	
School success		0.318
Poor	76.37 ± 35.55	
Moderate	68.29 ± 28.96	
Good	68.89 ± 31.60	
Smoking		0.008
Yes	81.29 ± 36.48	
No	67.89 ± 29.97	
Internet access at home		0.000
Yes	86.15 ± 30.98	
No	66.01 ± 31.79	
Internet access in her/his room		0.009
Yes	87.42 ± 35.68	
No	70.58 ± 31.87	

*SD: standard deviation.

Table 4 presents a subgroup analysis of IAT scores, categorizing participants into four groups: severe addiction, moderate addiction, mild addiction, and normal usage. The analysis examined various factors across these groups. The mean age across the groups did not show a significant difference (p = 0.501). The BDI scores varied significantly across the groups (p = 0.004). The mean scores were higher in the severe addiction group (13.53 ± 7.15) compared to the moderate (11.04 ± 6.62), mild (10.11 ± 5.38), and normal usage groups (9.28 ± 5.54). A significant difference was found in gender distribution across the groups (p = 0.001). Smoking status showed no significance (p = 0.067). The presence of suicidal ideation differed significantly across the groups (p = 0.002). It was more prevalent in the severe addiction group (n = 12)

compared to the other groups. The presence of depression also showed a significant difference (p = 0.038), being higher in the severe addiction group (n = 22) compared to others. There was a significant difference based on home Internet access (p = 0.017). No significant difference was observed in terms of personal room Internet access across the groups (p = 0.341).

Discussion

In our study, we have identified significant findings that contribute to the understanding of Internet usage and its psychological impacts. The results indicate a positive correlation between Internet usage time and scores on the IAT, as well as between BDI scores. Notably, male participants exhibited higher IAT scores, suggesting a greater tendency toward IA in this demographic. Our findings also reveal a nuanced relationship between increased Internet accessibility and various psychological and behavioral aspects. While enhanced Internet access correlates with higher rates of smoking, elevated depression levels, and an increase in suicidal thoughts, it interestingly does not appear to impact school success performance.

IA is increasingly recognized in the literature as a new form of addiction, drawing significant attention from both psychologists and clinicians. It is particularly impactful on adolescents, bringing with it a range of psychological, sociological, and physiological adversities[5,7,10]. This assertion is supported by various studies[2,24,25]. Diagnosing individuals with IA is a process that cannot be arbitrary nor solely based on observation. Similar to chemical dependencies, IA follows criteria outlined in the DSM[5]. Due to its nature as a behavior-based addiction, the diagnosis of IA relies on tools and techniques such as tests, scales, criteria, and checklists. In addition, reliable diagnoses can be further enhanced by gathering data through observations and interviews with the individual's family and social circle[5,22].

Recent epidemiological research has consistently shown a year-on-year increase in the global prevalence of IA and depression, as highlighted in studies by Shorey et al. and Xin et al.[26,27]. However, an intriguing observation emerges from Ye et al.'s meta-analysis, which indicates a reduced risk of depression in studies conducted during 2021-2022[28]. This unexpected trend may stem from a range of factors, such as the limited scope of research data included, the diversity of measurement tools used, and the variation in age groups studied.

Table 4. Comparisons in terms of Internet addiction test score (subgroup analysis)

Characteristics	Severe addiction (n = 90)	Moderate addiction (n = 50)	Mild addiction (n = 18)	Normal usage (n = 43)	p-value
Age	12.87 ± 1.63	13.4 ± 2.07	13.14 ± 2.15	12.84 ± 1.82	0.501
BDI scores	13.53 ± 7.15	11.04 ± 6.62	10.11 ± 5.38	9.28 ± 5.54	0.004
Gender					
Female	29 (32.2%)	31 (62%)	10 (55.5%)	26 (60.5%)	0.001
Male	61 (67.8%)	19 (38%)	8 (44.5%)	17 (39.5%)	
Smoking					
Yes	39 (43.3%)	15 (30%)	4 (22.2%)	10 (23.2%)	0.067
No	51 (56.7%)	35 (70%)	14 (77.8%)	33 (76.8%)	
Suicidal ideation					
Yes	12 (13.3%)	14 (28%)	2 (11.1%)	0 (0%)	0.002
No	78 (86.7%)	36 (72%)	15 (83.3%)	42 (97.7%)	
Depression					
Yes	22 (24.4%)	6 (12%)	1 (5.5%)	4 (9.3%)	0.038
No	66 (73.3%)	44 (88%)	17 (94.5%)	39 (90.7%)	
Internet access at home					
Yes	42 (46.6%)	19 (38%)	8 (44.5%)	8 (18.6%)	0.017
No	46 (51.2%)	30 (60%)	9 (50%)	34 (79.1%)	
Internet access in her/his room					
Yes	17 (18.8%)	7 (14%)	3 (16.7%)	3 (6.9%)	0.341
No	71 (78.8%)	42 (84%)	14 (77.8%)	39 (90.7%)	

*BDI: Beck Depression Inventory.

Research from Finland by Tóth-Király indicates that depression significantly elevates the risk of IA[29]. This finding aligns with Shensa et al. who note that individuals with depressive symptoms may be as prone to IA as to other behavioral addictions, such as gambling and eating disorders[30]. Complementing this, Geng et al. suggest that excessive Internet use can, in turn, increase the likelihood of depression[31]. This cycle is particularly evident in adolescents, where heightened IA may lead to a neglect of constructive activities and reduced face-to-face social interactions, factors that can exacerbate depression, as discussed by Al Mukhaini et al.[32]. Our study's findings align with existing literature, presenting a significant observation: a positive correlation between daily Internet usage time and IAT scores. Furthermore, we noted a positive correlation between BDI scores and IAT scores (r = 0.161, p = 0.013), suggesting a link between increased depressive symptoms and heightened tendencies toward IA.

Moreover, the impact of IA on depression appears to be more pronounced than the reverse, highlighting a need for more in-depth future research to explore this dynamic further. An intriguing aspect of this relationship was uncovered in a Chinese longitudinal study by Zhang et al. which found that the link between IA and depression was specific to the female adolescent population[33]. Conversely, our study revealed higher IAT scores among males. A significant difference was observed in the mean IAT scores between females and males. Females had a lower mean score (63.56 ± 28.08), while males exhibited a higher mean score (81.15 ± 34.89) (p < 0.001).

Our study, focusing on IA, depression, and their interplay with various sociodemographic factors, offers important insights but also faces several limitations. Conducted with 201 adolescents from Diyarbakir City Center, the findings might not be widely generalizable due to the unique cultural, social, and economic backdrop of this group. The study's cross-sectional design limits us to observing correlations, not establishing causality between Internet usage, IA, and depression. Utilizing self-report measures such as the IAT and the BDI introduces potential biases, as participants may underreport or overreport symptoms. Crucially, our study did not control for factors such as socioeconomic status, family dynamics, or other health conditions, which might influence both Internet habits and mental health. The evolving criteria for diagnosing IA, along with rapid

technological changes, pose challenges in maintaining the relevance and comparability of our results.

Conclusions

Our study reveals a significant correlation between increased Internet usage and heightened levels of IA and depression among adolescents, with notable gender differences in IA severity. These insights contribute to the broader understanding of IA as a growing mental health concern, particularly in the context of the digital age's rapid evolution.

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Conflicts of interest

The authors declare no conflicts of interest.

Ethical disclosures

Protection of human and animal subjects. The authors declare that the procedures followed were in accordance with the regulations of the relevant clinical research ethics committee and with those of the Code of Ethics of the World Medical Association (Declaration of Helsinki).

Confidentiality of data. The authors declare that they have followed the protocols of their work center on the publication of patient data.

Right to privacy and informed consent. The authors have obtained the written informed consent of the patients or subjects mentioned in the article. The corresponding author is in possession of this document.

Use of artificial intelligence for generating text. The authors declare that they have not used any type of generative artificial intelligence for the writing of this manuscript nor for the creation of images, graphics, tables, or their corresponding captions.

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