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Investigation of Sleep Quality and Lifestyle Behaviors in Adolescents with Internet Gaming Disorder: Role of Internet Addiction

İnternet Oyun Oynama Bozukluğu Olan Gençlerde Uyku Kalitesi ve Yaşam Tarzı Davranışlarının İncelenmesi: İnternet Bağımlılığının Rolü

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ABSTRACT

Objectives: This study aimed to investigate sleep quality and lifestyle behaviors and their associations with internet addiction (IA) in adolescents with internet gaming disorder (IGD).

Materials and Methods: After recording sociodemographic data, the IA scale was used to evaluate the severity of IA. The participants were also asked questions regarding sleep and lifestyle using a face-to-face interview technique.

Results: A total of 84 participants between the ages of 10-17 were included in the study. The participants were divided into two groups diagnosed with IGD (group I; n=44) and healthy controls (group II; n=40). There was no statistically significant difference between groups I and II (p>0.05), except for body mass index (p=0.02), smoking status (p=0.04), medication use (p=0.0001), and the time spent on computer use (p=0.0001). An increase in IA was correlated with different sleep disturbances in adolescents with and without IGD.

Conclusion: The findings indicate that IA may be associated with sleep disorders in adolescents regardless of the diagnosis of IGD.

Keywords: Internet gaming disorder, sleep, adolescent, lifestyle, internet addiction

ÖZ

Amaç: Bu çalışma, internet oyun oynama bozukluğu (IGD) olan ergenlerde uyku kalitesi ve yaşam tarzı davranışlarını ve bunun internet bağımlılığı (IA) ile ilişkilerini araştırmayı amaçlamaktadır.

Gereç ve Yöntem: Sosyodemografik veriler kaydedildikten sonra, katılımcıların IA şiddetini değerlendirmek için IA ölçeği kullanıldı. Katılımcılara ayrıca yüz yüze görüşme tekniği ile uyku ve yaşam tarzına ilişkin sorular adlı anket uygulandı.

Bulgular: Çalışmaya 10-17 yaş arası toplam 84 katılımcı alındı. Katılımcılar IGD tanılı (grup I; n=44) ve sağlıklı kontroller (grup II; n=40) olmak üzere iki gruba ayrıldı. Grup I ve grup II arasında, vücut kitle indeksi (p=0,02), sigara içme durumu (p=0,04), ilaç kullanımı (p=0,0001) ve bilgisayar başında geçirilen süre (p=0,0001) dışında istatistiksel olarak anlamlı fark yoktu (p>0,05). IA artışı, IGD'si olan ve olmayan ergenlerde farklı uyku sorunları ile korele idi.

Sonuç: Bulgular, IA'nın, IGD tanısından bağımsız olarak ergenlerde bazı uyku bozuklukları ile ilişkili olabileceğine işaret etmektedir.

Anahtar Kelimeler: İnternet oyun oynama bozukluğu, uyku, ergen, yaşam tarzı, internet bağımlılığı

Introduction

Internet addiction (IA) is generally characterized by the inability to prevent excessive use of the internet, the increasing need for the time spent on the internet, the loss of importance of the time spent without being connected to the internet, the emergence of situations such as excessive nervousness, tension, and restlessness when deprived, and gradual worsening of one's work, social and family life.[1] The excessive use of the internet or computer is especially common in school-aged youth and

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negatively affects their psychological and physical development, social relations and decreases their academic achievement.[2] The findings of a meta-analysis examined thirty-one nations across seven world regions and estimated the overall prevalence of IA as 6.0%.[3]

In the past, games that have held an important role in the development of children and adolescents were often played in open spaces with real interactions among peers. Nowadays, with the development of technology, games are being played in virtual environments accessed by the internet. As a result of the penetration of online games throughout all areas of social life, individuals are constantly busy with online gaming tools.[4,5] When the desire to play cannot be controlled by the person and causes a change in feelings, thoughts, and social life, addiction, which was defined as internet gaming disorder (IGD), can be mentioned.[6] Despite being a relatively new term, IGD is becoming more prevalent, especially among children and adolescents. The global prevalence of gaming disorder has recently been found to be 3.05% in a study that included 226,247 participants from 17 countries.[7] Specifically, the prevalence of IGD was reported as 4.6% in a meta-analysis considering the last decades.[8]

Lin et al.[9] have specifically described problematic online gaming behaviors as a serious public health problem and have shown that IGD negatively affects coping strategies, resilience and causes higher perceived stress and depression. In addition, competence areas, such as sociability, academic achievement, and various activities, are negatively associated with IGD.[10-12] Regular sleep has a significant impact on the physical, mental, and behavioral development of children.[13] However, it can be presumed that when technology is misused, the first sacrifice is mostly made from sleep time.

Sleep health, which is determined by sleep duration, continuity, timing, alertness, and satisfaction, is a critical indicator of overall health.[14] Technology use in adolescents is predicted and negatively associated with sleep health.[15] The IGD, as a disorder of problematic technology use, has great risk to threaten the physical and mental health of children and adolescents by compromising the sleep health. However, few studies have investigated the effects of IGD on sleep health in children and adolescents. This study aimed to investigate sleep quality and lifestyle behaviors and their association with IA in adolescents with IGD.

Material and Method

This cross-sectional study was conducted at the Bakırköy Training and Research Hospital for Neurology, Psychiatry, and Neurosurgery from March 2021 to June 2021. The IGD group was invited to participate in this study. During the examination, the patients were evaluated by a trained clinician and diagnosed with IGD according to the DSM-5 criteria. All the interviews were supervised by experienced child psychiatrists. Written approval for this study was obtained from the hospital administration. Ethical approval for this study was obtained from the Non-Invasive Clinical Research Ethics Committee of İstanbul University-Cerrahpaşa, (approval number: 2020-36, date: 04.11.2020). Each participant was informed of the study procedure, which was conducted in accordance with the Declaration of Helsinki. They provided written informed consent to participate in the study. The data used in the analyses were collected from adolescents diagnosed with IGD and healthy controls using a face-to-face interview technique by one researcher.

Participants

The sample of this study consisted of 44 adolescents diagnosed with IGD who applied for the first time to Bakırköy Training and Research Hospital Child and Adolescent Psychiatry Outpatient Clinic due to problematic internet use or other reasons, and 40 healthy controls in the same age group. The inclusion criteria of the IGD group were children between 10 and 17 years of age and a clinical diagnosis of IGD based on the DSM-5 criteria. Thus, the exclusion criteria of the IGD group were clinical diagnoses, including psychotic disorder, bipolar disorder, autism spectrum disorder, intellectual disability, and severe neurological conditions that impair clinical interview and/or data collection. Healthy controls were included if they had no previous psychiatric diagnosis or psychotropic drug use. Participants diagnosed with sleep disorders and cognitive problems that would affect the accuracy of the answers to the questionnaires were excluded from the study. The sample size was calculated using the Raosoft sample size calculator [http://www.raosoft.com/samplesize.html], considering the incidence of IGD as 4.6% among the 20,000 population,[8] with a 90% confidence interval. It was calculated that with 40 adolescents diagnosed with IGD and 40 healthy adolescents, at least 80 participants should be reached.

Sociodemographic Data Form

Age, sex, height, weight, smoking and alcohol usage, education degree, medication, and consumption of caffeinated beverages were recorded on the sociodemographic data form.

Internet Addiction Scale

To evaluate IA, the Internet Addiction Scale (IAS), developed by Young[16] and adapted to Turkish by Kutlu et al.[17], consisting of 20 questions, was used. This Likert-type scale was scored by asking the participants to choose the most convenient option among "always (5), often (4), sometimes (3), rarely (2), never (1)" for each item. The lowest score that can be obtained from the scale is 20 and the highest score is 100. A higher total score indicates a higher risk of addiction. A score of 80 was considered an indication of a significant deterioration in functionality and addiction. A score of 49 and below is defined as "average internet user" without any problems related to internet use in their life.

Questions Regarding Sleep and Lifestyle

The questionnaire was developed by Garmy et al.[18] to determine the sleep-related parameters of the participants and to evaluate

their television and computer habits. The Turkish validity and reliability of the questionnaire were assessed by Bay and Ergün[19] and it was found to be valid and reliable for collecting self-reported data in school-age children. The questionnaire consisted of 12 items on children's sleep habits and problems related to sleep. One of the outcomes of this questionnaire was categorical, four were ordinal, and seven were continuous.

Statistical Analysis

Data were statistically analyzed using the Statistical Package for Social Sciences (SPSS) version 20.0 (IBM Inc., Armonk, NY). In the statistical analysis, the variables considered are presented with their mean, standard deviation, and percentage values. The Shapiro-Wilk test was used to determine the conformity of the data to the normal distribution. Groups, demographics, and clinical characteristics were compared using the Mann-Whitney U test or chi-square test. The correlation between factors related to sleep habits and IAS score was analyzed using Spearman Correlation Analysis. In all analyses, $p<0.05$ (two-way) values were considered statistically significant.

Results

A total of 84 participants between the ages of 10 and 17 were included in this study. Group I consisted of participants with IGD (n=44), whereas healthy controls were included in group II (n=40). Participants who did not complete the entire questionnaires (n=4) were excluded from the study. Thus, the data from 80 participants were used in the statistical analysis.

The mean body mass index (BMI) was significantly higher in group I than in group II (p=0.02). The percentiles of participants who smoked (p=0.04) and used regular medication (p=0.0001) were also significantly higher in group I. A comparison of the sociodemographic data of the participants is shown in Table 1.

The IA scores were significantly higher in group 1 than in group 2 ($p<0.001$). While the participants with 80 points or more were 17.5% in group 1, they were not in group 2. A comparison of IA scores of the participants is presented in Table 2.

A comparison of the answers of each group to questions regarding sleep and lifestyle is shown in Table 3. There was no statistically significant difference between groups I and II ($p>0.05$), except for the time spent with a computer (p=0.0001).

Table 1. Sociodemographic data of the participants

Variables	Group I (n=40) Mean ± SD	Group II (n=40) Mean ± SD	p-value
Age (years)	14.90±1.72	15.28±2.42	0.21
BMI (kg/m²)	21.79±3.82	19.98±3.56	0.02[a]
	n (%)	n (%)	
Gender			
Woman	7 (17.5)	12 (30)	0.09
Male	33 (82.5)	28 (70)	
Education degree			
Primary school	19 (47.5)	11 (27.5)	0.06
High school	21 (52.5)	29 (72.5)	
Smoking			
Yes	8 (20.0)	2 (5.0)	0.04[b]
No	32 (80.0)	38 (95.0)	
Regular use of medication			
Yes	23 (57.5)	0 (0.0)	0.0001[b]
No	17 (42.5)	40 (100.0)	
Alcohol use			
Yes	2 (5.0)	3 (7.5)	0.64
No	38 (95.0)	37 (92.5)	
Consumption of caffeinated beverages			
Yes	25 (62.5)	31 (77.5)	0.14
No	15 (37.5)	9 (22.5)	
If yes, how many glasses per day? (Mean ± SD)	3.60±2.02	2.93±1.79	0.14

Group I; diagnosed with internet gaming disorder, group II; healthy controls, BMI: Body mass index, SD: Standard deviation, [a]Mann-Whitney U Test; [b]Pearson chi-square test

When the correlations of IAS scores and factors of sleep habits in Group I were investigated, the IAS score was negatively correlated with "time spent asleep on vacation" (r=-0.326, p=0.04); and positively correlated with "Frequency of sleep at school" (r=0.423, p=0.007) and "frequency of difficulty waking up in the morning" (r=0.351, p=0.02) in Group I. In group II, the IAS score was negatively correlated with "time spent asleep in school days" (r=-0.333, p=0.03) and "time spent in bed on vacation" (r=-0.310, p=0.05); and positively correlated with "frequency of difficulty falling asleep" (r=0.455, p=0.003) and "frequency of sleep at school" (r=0.372, p=0.01). These correlations are presented in Table 4.

Table 2. Comparison of internet addiction scale scores between two groups

	Group I (n=40)	Group II (n=40)	p-value
Internet addiction scale total score (Mean ± SD)	59.57±19.78	42.00±16.94	<0.001[a]
Internet addiction scale total score range [n (%)]			
49 and below	16 (40.0)	29 (72.5)	0.002
50-79	17 (42.5)	11 (27.5)	
80 and above	7 (17.5)	0 (0)	

Group I; diagnosed with internet gaming disorder, Group II; healthy controls [a]Mann-Whitney U test, SD: Standard deviation

Table 3. Comparison of answers of two groups to the questions regarding sleep and lifestyle

Questions	Group I (n=40)	Group II (n=40)	p-value
Television in the room [n (%)]			
Yes	4 (10.0)	6 (15.0)	0.49
No	36 (90.0)	34 (85.0)	
Time spent watching TV (min) (Mean ± SD)	84.75±79.05	85.87±74.23	0.77
Time spent with a computer (min) (Mean ± SD)	285.00±220.56	84.21±91.67	0.0001[a]
Frequency of difficulty falling asleep [n (%)]			
Never	10 (25.0)	10 (25.0)	0.42
Rarely	16 (40.0)	20 (50.0)	
Often	6 (15.0)	7 (17.5)	
Every night	8 (20.0)	3 (7.5)	
Frequency of sleep at school [n (%)]			
Never	11 (27.5)	4 (10.0)	0.21
Rarely	9 (22.5)	14 (35.0)	
Often	11 (27.5)	13 (32.5)	
Every day	9 (22.5)	9 (22.5)	
Difficulty waking up in the morning [n (%)]			
Never	3 (7.5)	4 (10.0)	0.94
Rarely	12 (30.0)	10 (25.0)	
Often	12 (30.0)	13 (32.5)	
Every day	13 (32.5)	13 (32.5)	
Happiness at school [n (%)]			
Very	4 (10.0)	7 (15.5)	0.39
Enough	20 (50.0)	22 (55.5)	
None	16 (40.0)	11 (27.5)	
Average time to start bedtime preparation before the school day (o'clock)	~11.30 pm	~10.57 pm	0.05
Time spent in bed on school days (hours) (Mean ± SD)	7.45±7.71	7.39±1.72	0.70
Time spent asleep on school days (hours) (Mean ± SD)	7.04±1.22	7.48±1.67	0.36
Time spent in bed on vacation (hours) (Mean ± SD)	9.86±1.81	9.67±1.49	0.76
Time spent asleep on vacation (hours) (Mean ± SD)	9.26±2.29	9.70±1.51	0.28

Group I; diagnosed with internet gaming disorder, Group II; healthy controls [a]Mann-Whitney U Test, SD: Standard deviation

Table 4. Bivariate correlations among the score of the internet addiction scale and sleep habits of participants

Variables	Internet addiction scale			
	Group I (n=40)		Group II (n=40)	
	r	p	r	p
Time spent in bed on school days	-0.181	0.26	-0.375	0.20
Time spent asleep on school days	-0.224	0.16	-0.333	0.03[a]
Time spent in bed on vacation	-0.218	0.18	-0.310	0.05[a]
Time spent asleep on vacation	-0.326	0.04[a]	-0.262	0.11
Frequency of difficulty falling asleep	0.301	0.059	0.455	0.003[a]
Frequency of sleep at school	0.423	0.007[a]	0.372	0.01[a]
Frequency of difficulty in waking up in the morning	0.351	0.02[a]	0.189	0.24

Group I; diagnosed with internet gaming disorder, Group II; healthy controls [a]Spearman correlation analysis, p≤0.05

Discussion

In this study, it was found that adolescents with IGD had a higher body mass index, more cigarette smoking, more drug use, and more time spent on a computer than controls. Among the adolescents with IGD, 17.5% had comorbid IA. However, in those with IGD, IAS scores seemed to be negatively associated with the time spent asleep on vacation, positively associated with the frequency of sleep at school, and negatively associated with the frequency of difficulty in waking up in the morning. Conversely, in healthy controls, the IAS score was negatively correlated with the time spent asleep during school days and the time spent in bed during vacation, and positively correlated with the frequency of difficulty falling asleep and the frequency of sleep at school.

Although the causal association between screen time and bad sleep has not been confirmed, there is a relationship that is supported by many studies.[20] have focusing on the negative effects of IGD and have underlined various physical and psychological conditions such as personality changes, hyperactivity, learning disorders, psychomotor disorders, health problems caused by lack of activity and movement, and antisocial behaviors.[9,21,22] As a result of this study, it was determined that IA is correlated with bad sleep habits in adolescents independently from IGD diagnosis.

It has been reported that technological device use of children in inappropriate duration, frequency, and different postures poses risks threatening health status such as developmental problems, musculoskeletal system problems, physical inactivity, obesity, and poor sleep quality.[23] The time spent with computer use was reported as 2 h a day in a study that included 15-year-old adolescents from three countries.[24] In our study, the time spent with computer use was found to be approximately 1.5 h a day in healthy children and adolescents and approximately 4.5 h a day in participants with IGD. In accordance with these durations, we believe that the BMI of adolescents with IGD was also significantly higher than that of healthy participants in this study, even though the mean BMI was not severe enough to be considered obese.

Developing sleep problems is most likely when the IA criteria are met among adolescents.[25] Carter et al.[26] Have reported strong and consistent evidence of a relationship between access device use and reduced sleep quantity and quality, such as increased daytime sleepiness. Although there was no statistically significant difference between healthy children and adolescents and those with IGD in this study, both groups reported more frequent sleep at school, which increased with higher IA intensity.

A study investigating the association between IGD and sleep problems in Singapore concluded that participants with IGD were more likely to have sleep problems such as early morning awakening problems, sleep dissatisfaction, sleep interference, difficulties with daytime functioning, and distress caused by the sleep difficulties.[27] In this study, it was shown that an increase in IA was correlated with different sleep disturbances in adolescents with and without IGD. With the increase in addiction, adolescents with IGD sleep less on vacation days but find it more difficult to wake up in the morning. On the other hand, adolescents without IGD sleep less on school days and spend less time in bed on vacation days, with an increase in addiction. In addition, there was a moderate positive correlation between the frequency of difficulty falling asleep and the increase in addiction. However, in this study, there was no statistically significant difference between adolescents with and without IGD in terms of sleep disturbances. This may be due to the deteriorating sleep quality of adolescents in this age range.

Study Limitations

Some limitations should be considered when interpreting the findings. Obtaining data from a single center and having a relatively small sample size may prevent generalization of the results. The fact that IA severity was determined instead of IGD severity may have been a complicating factor in understanding the relationship between IGD and sleep problems. Most adolescents with IGD regularly use psychotropic drugs, which may affect their sleep parameters. Moreover, comorbid mental disorders of IGD (except IA) were not evaluated in this study, which requires further investigation. On the other hand,

contrary to the expectation that excessive gaming seems phenomenologically to be a subtype of IA disorder, few of the adolescents with IGD also had IA based on the threshold of the IAS. This suggests that the two clinical diagnoses may differ from each other, supporting the scientific literature.

Conclusion

Although it can be concluded that dysfunctional gaming can be hazardous, a better understanding of the etiology and consequences of this activity would be useful for both the health and education of adolescents. More evidence is needed on who is at greater risk and where game-related health problems persist, establishing what kind of help services would be most effective in the rehabilitation of children and adolescents with IGD.

Ethics

Ethics Committee Approval: Ethical approval for this study was obtained from the Non-Invasive Clinical Research Ethics Committee of İstanbul University-Cerrahpaşa, (approval number: 2020-36, date: 04.11.2020).

Informed Consent: Consent was obtained from all patients.

Peer-review: Internally peer-reviewed.

Authorship Contributions

Surgical and Medical Practices: C.M., Concept: C.M., A.Ş., İ.İ.İ., İ.E., N.B.Ö., E.K.M., Design: C.M., A.Ş., E.K.M., Data Collection or Processing: İ.İ.İ., İ.E., N.B.Ö., Analysis or Interpretation: C.M., A.Ş., E.K.M., Literature Search: C.M., İ.İ.İ., İ.E., N.B.Ö., Writing: C.M., A.Ş., İ.İ.İ., İ.E., N.B.Ö.

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