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Original Article *Özgün Araştırma*

EFFECTS OF ATTENTION-DEFICIT/HYPERACTIVITY DISORDER TREATMENT ON INTERNET GAMING DISORDER, SOCIAL MEDIA ADDICTION, AND CYBERBULLYING IN CHILDREN AND ADOLESCENTS

Çocuk ve Ergenlerde Dikkat Eksikliği Hiperaktivite Bozukluğu Tedavisinin İnternet Oyun Oynama Bozukluğu, Sosyal Medya Bağımlılığı ve Siber Zorbalık Üzerine Olan Etkisinin Değerlendirilmesi

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ABSTRACT

Objective: There are many studies investigating the comorbidity of attention-deficit/hyperactivity disorder and internet gaming disorder and cyberbullying. However, there are few studies evaluating the effect of attention-deficit/hyperactivity disorder treatment on them. This study's primary objective was to investigate the effects of attention-deficit/hyperactivity hisorder treatment on internet gaming disorder, social media addiction, and cyberbullying.

Material and Methods: We recruited 76 subjects diagnosed with attention-deficit/hyperactivity disorder. Forty children and adolescents between ages of 9 and 18 who were followed up with a diagnosis of attention-deficit/hyperactivity disorder and received regular attention-deficit/hyperactivity disorder treatment were included in Group 1. Group 2 consisted of 36 children and adolescents with attention-deficit/hyperactivity disorder who were diagnosed for the first time. The participants were assessed using the internet gaming disorder Scale, Social Media Addiction Scale, and the Cyberbullying and Online Aggression Survey Instrument.

Results: Internet gaming disorder was significantly more frequent in the untreated group than in the treatment-receiving group. However, there was no significant difference between the groups in terms of social media addiction. When the groups were evaluated in terms of cyberbullying, no differences were observed between the groups.

Conclusion: Attention-deficit/hyperactivity disorder symptoms may play a role as an important risk factor of internet gaming disorder. Effective treatments for attention-deficit/hyperactivity disorder may prevent the onset of internet gaming disorder.

***Keywords**: Attention-deficit hyperactivity disorder, cyberbullying, internet gaming disorder, social media addiction*

ÖZ

Amaç: Dikkat eksikliği hiperaktivite bozukluğu ile internet oyun oynama bozukluğunun ve siber zorbalığın komorbiditesini inceleyen çok sayıda çalışma vardır. Ancak dikkat eksikliği hiperaktivite bozukluğu tedavisinin bunlar üzerine etkisini inceleyen çalışma sayısı kısıtlıdır. Bu çalışmanın temel amacı dikkat eksikliği hiperaktivite bozukluğu tedavisinin internet oyun oynama bozukluğu, sosyal medya bağımlılığı ve siber zorbalık üzerine olan etkilerini incelemektir.

Gereç ve Yöntemler: Çalışmaya dikkat eksikliği hiperaktivite bozukluğu tanısı olan 76 olgu dahil edildi. Yaşları 9-18 aralığında olan ve dikkat eksikliği hiperaktivite bozukluğu tanısı ile takip edilip düzenli olarak tedavi alan 40 çocuk ve ergen Grup 1 olarak çalışmaya alındı. Grup 2'ye dikkat eksikliği hiperaktivite bozukluğu tanısı yeni konmuş 36 çocuk ve ergen dahil edildi. Katılımcılar internet oyun oynama bozukluğu ölçeği, sosyal medya bağımlılığı ölçeği ve siber zorbalık ve internet saldırganlığı tarama ölçeği ile değerlendirildi.

Bulgular: Tedavi almayan grupta internet oyun oynama bozukluğu tedavi alan gruba göre anlamlı derecede yüksek bulundu. Ancak gruplar arasında sosyal medya bağımlılığı açısından farklılık saptanmadı. Gruplar arasında siber zorbalık açısından da farklılık saptanmadı.

Sonuç: Dikkat eksikliği hiperaktivite bozukluğu semptomları internet oyun oynama bozukluğu için önemli bir risk faktörü olabilir. Dikkat eksikliği hiperaktivite bozukluğunun etkili bir şekilde tedavi edilmesi oyun bağımlılığın başlamasını etkileyebilir.

***Anahtar Kelimeler**: Dikkat eksikliği hiperaktivite bozukluğu, internet oyun oynama bozukluğu, siber zorbalık, sosyal medya bağımlılığı*

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INTRODUCTION

Internet gaming disorder (IGD) was defined as recurrent and persistent use of the internet to play games, leading to clinically significant impairment or distress. IGD was included in the most recent version of the DSM-5 as a condition needing further study (1,2). Internet addiction, also described as pathological internet use, is defined as a person's inability to control their use of the internet, leading to marked distress and/or functional impairment. In a systematic review on problematic internet use and psychopathology, based on 20 articles, 75% of studies reported significant correlations with depression, 100% with symptoms of attention-deficit/hyperactivity disorder (ADHD), 57% with anxiety, and 60% with obsessive-compulsive symptoms (3). In a study conducted by Yen et al. in 2793 university students, it was reported that adult ADHD was associated with internet addiction, and the most predictive criterion for internet addiction was attention problems, followed by impulsivity (4). Generally, adolescents spend more time on the internet than adults, predisposing themselves to internet addiction (5). Children and adolescents with ADHD also have a higher risk of social media addiction and game addiction than other children (6).

Research on medications for IGD is scarce. Methodological variability prevents strong conclusions about the efficacy of any treatment for IGD (7). Medications that have been studied include escitalopram, bupropion, methylphenidate (MPH), and atomoxetine (ATM) (7–9). As a treatment strategy, 12-week medication with ATM or MPH was found to reduce the severity of IGD (10). It was suggested that the principles in ADHD treatment might be applied in the treatment of patients with internet use disorders (11).

Peer bullying is defined as aggressive behavior towards a feeble one, whereas peer victimization is defined as being a target of aggressive behavior by peers (12,13) With the development of technology and improvements in electronic communication such as email, chat rooms, and social networks, there is also a change in the methods of peer bullying. Cyberbullying is a new form of online victimization and aggression (14). Heiman et al. reported no significant difference between students with or without ADHD in terms of the time spent on the internet. However, they indicated that students with ADHD who were cyber witnesses and those affected by cyberbullying reported more feelings of loneliness and a lower social self-efficacy than students without ADHD (15). In a study conducted with 2590 students in China, it was found that 28% of the participants had cyberbullying behaviors in the last six months, and 44.5% were affected by cyberbullying. In addition, bullying behavior was found to be more frequent among those with online gaming addiction. Being male, having low school success, spending more than two hours of online time per day, and being exposed to more physical discipline behavior in the family was associated with bullying and victimization (16). Only a study investigating the association of MPH use and traditional bullying and cyberbullying in adolescents with ADHD demonstrated that cyberbullying behaviors were more common in the non-treated group (17).

Based on the previous studies and the comprehensive notions above, we hypothesized that receiving ADHD treatment would reduce the development of IGD, social media addiction, and cyberbullying. In the current study, we aimed to investigate the effects of ADHD treatment (ATM and MPH) on internet gaming disorder, social media addiction, and cyberbullying. As far as we know, this is the only study investigating the effects of ADHD treatment on social media addiction.

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MATERIALS AND METHODS

Subjects

Forty (33 males and 7 female) children and adolescents between 9 and 18 years of age who were followed up at the Child and Adolescent Psychiatry outpatient clinic with the diagnosis of ADHD and who received regular MPH or ATM treatment for at least six months were included in Group 1. Group 2 consisted of 36 (30 males and 6 females) children and adolescents with ADHD who were diagnosed for the first time or had received medication for less than one month. These groups were compared in terms of online game addiction, social media addiction, and cyberbullying. Patients with history of or current episodes of psychiatric diseases other than ADHD and mental retardation were excluded from the study.

The study was approved by the local ethics committee (Akdeniz University Faculty of Medicine Ethics Committe of Clinical Research, date: 06.03.2019, issue number: 2019/44). All children and parents taking part in the study were informed about the study, and the parents gave their written consent.

Measures

Patients who were admitted to our outpatient clinic were diagnosed with ADHD using the structured diagnostic interview and the Diagnostic and Statistical Manual of Mental Disorders-Fifth Edition (DSM-V) criteria. The sociodemographic characteristics were evaluated using a sociodemographic data form prepared by the researcher.

In the sociodemographic data form, age, sex, grade, parent-reported school achievement (as bad, average, good), level of income, medical history, weight, and height were noted. Whether the participants have smartphone, computer, tablet and game console and the average time they spent with them on the days they were at or out of school were also evaluated. The video games they preferred were noted.

Internet Gaming Disorder Scale – Short Form (IGDS9-SF): The IGDS9-SF-TR scale was developed by Pontes and Griffiths (18). The Turkish validity and reliability study has been conducted (19). This scale is used to assess the severity and harmful effects of IGD by evaluating online and/or offline gaming activities for over 12 months. The nine questions of the scale are answered using a 5-point Likert scale. The score is the sum of the player's answers, and total scores can range from 9 to 45, with high scores indicating high-grade gaming disorder.

Social Media Addiction Scale Short Form: This scale was developed by van den Eijnden, Lemmens, and Valkenburg (20). The validity and reliability study of the scale was conducted by Taş (21). The scale consists of 9 “yes/no” questions. If five or more items are coded as “yes” it shows that the individual has social media addiction.

Cyberbullying and Online Aggression Survey Instrument-CBOASI: This instrument was developed by Hinduja and Patchin and was adapted to Turkish culture by Özdemir and Akar (22,23). The instrument was used to measure the frequency/prevalence of online aggression/cyberbullying, offending, and victimization.

Statistical Analysis

The Statistical Package for the Social Sciences (SPSS) Version 21 software package was used for statistical calculations. The student's t-test was used to compare parametric data showing normal distribution, and the Mann-Whitney U test was used for data with non-normal distribution. The Chi-square test was used to compare categorical data. $p<0.05$ was accepted as statistical significance.

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RESULTS

There was no significant difference between the groups in terms of age, sex, parental age, and economic level of families. It was found that the academic achievement of the group who received regular treatment was significantly higher than the group that did not (Table 1). There was no significant difference between the groups in terms of the education level of mothers and the education level of fathers (p=0.80, p=0.97).

Table 1: Sociodemographic characteristic of the groups

Variable	Treatment receiving (n=40)	Untreated (n=36)	p
Sex†			
Male	33 (82.5%)	30 (83.3%)	.58
Female	7 (17.5%)	6 (16.7%)	
Age (Years) ‡ (Mean, SD)	12.18 (2.16)	12.08 (2.27)	.86
Academic achievement (n, %) †			
Good	15 (38.5%)	8 (23.5%)	
Moderate	19 (48.5%)	9 (26.5%)	.03
Poor	5 (16.5%)	17 (50%)	
Year of education ‡ (Mean, SD)	5.90 (2.39)	5.94 (2.47)	.94
Mothers' age (year) §, (Median, IQR)	40 (9)	36 (6.5)	.53
Fathers' age (year) §, (Median, IQR)	44.66 (6.39)	43.2 (7.34)	.38
Number of siblings §, (Median, IQR)	1.18 (0.78)	1.19 (0.82)	.92
Employment of mother† (n, %)			
Yes	20 (51.3%)	18 (52.9%)	.99
No	19 (48.7%)	16 (47.1%)	
Level of income†			
Low	6 (15%)	5 (13.9%)	
Medium	20 (50%)	19 (52%)	.97
High	14 (35%)	12 (33.3%)	

†, Chi-squared test; ‡, Student's t-test, §, Mann Whitney U test

When the average time spent on the internet on weekdays was compared, this period was significantly longer in the untreated group than the treated group. When the time spent on the internet on the weekend was evaluated, the mean duration was longer in the treated group, but there was no significant difference between them. There was no difference between the groups in terms of the duration of phone, computer, console, and tablet use (Table 2).

The game addiction scores were significantly higher in the untreated group than the treatment group. Game addiction was also more frequent in boys than girls. When social media addiction was evaluated in terms of whether receiving ADHD treatment or not, there was no difference between them (Table 3). No difference was found between the groups in terms of game types (single player or online/multiplayer) (p=0.41). When the groups were examined in terms of game types, it was found that the most played game was Player Unknown's Battlegrounds. It was found that the duration of daily gaming and social media in the weekdays and on the weekend was longer in the employed mothers' children than the children of unemployed mothers (p=0.12; 0.12 respectively).

When the groups were evaluated in terms of cyberbullying, it was found that very few adolescents were affected by cyberbullying or perpetrators in both groups. In our study, in 72 youths with ADHD, the rate of being affected by cyberbullying was 12.5% lifetime, and 7% in the last month. Two adolescents reported that they had cyberbullied someone in the last month. However, there were no differences in untreated and treatment-receiving groups in terms of cyberbullying rates (p=0.99). Cyberbullying scores in the groups were not different in terms of sex (p=0.340).

Table 2: Evaluation of game and social media durations

Variable	**Treatment receiving (n=40) (mean±SD)**	**Untreated (n=36) (mean±SD)**	**p**
Weekday daily play and social media duration	0.50±0.64	0.92±1.01	.04
Weekend daily play andsocial media duration	1.64±1.23	1.57±1.44	.52
Time spent with tablet/phone in the weekdays	0.94±1.17	1.8±2.70	.39
Time spent with tablet/phone on the weekend	3.33±3.51	2.72±3.34	.28
Time spent at the computer in the weekdays	0.56±1.74	0.80±1.80	.40
Time spent at the computer on the weekend	1.36±2.28	1.50±3.31	.44
Time spent with console in the weekdays	0±0	0.26±1.07	.64
Time spent at the console on the weekend	0,23±0,74	0.50±1.87	.61

Mann Whitney U test.

Table 3: Comparison of groups in terms of game addiction and social media addiction

Variable	**Treatment receiving (n=40) (mean±SD)**	**Untreated (n=36) (mean±SD)**	**p**
IGDS9-SF-TR scores	19.26±7.61	24.17±9.95	.02
Social media addiction scores	2.10±1.23	2.17±2.95	.92

Student's t-test

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DISCUSSION

Problems related to excessive use of technology such as video gaming and internet use have been increasingly investigated (2). Increased use of the internet causes several risks in children and adolescents, such as refusal to attend school and mental health problems (5,24). IGD is often comorbid with ADHD (25,26). This is defined as the emergence of gaming addiction as a comorbid disorder of ADHD. Furthermore, they have the same pharmacologic and physiologic mechanisms, and there is a potential genetic link between the two disorders (27). It was reported that children with ADHD had more excessive use of the internet, spent more time online, and went to bed later than children without ADHD (26). Chan and Rabinowitz reported that adolescents who played more than one hour of video games per day might have more severe ADHD symptoms than adolescents who did not (28). In our study, youths with ADHD were compared in terms of IGD and social media use in two groups, regarding whether they had received treatment or not. We found that the untreated group had higher scores in IGD than the treatment-receiving group. This finding supports that the treatment of ADHD has a positive impact on gaming disorder. Consistent with our study, the relationship between ADHD and IGD has also been demonstrated in a pharmacological research study examining the effectiveness of MPH and ATM on improving IGD symptoms (10,29). In a study conducted in 62 drug-naive children with internet video game addiction and comorbid ADHD, it was reported that after eight weeks of treatment with extended-release MPH, there was a significant reduction in time spent with the internet. This finding was positively correlated with improvements in attention (29,30). In a study comparing MPH and ATM's effectiveness on problematic online gaming in adolescents with ADHD, both MPH and ATM improved IGD symptoms, and this improvement was correlated with a reduction in impulsivity. The authors suggested that impulsivity might play a substantial role in the emergence of problematic online gaming (10). IGD and ADHD seem to share a common reward and sensitization mechanism that is mostly mediated by dopamine. Findings indicate that video games activate the brain's dopamine reward system and lead to substantial dopamine release at the time of video game playing (27,31). People with ADHD get bored easily with everything. Given the easy accessibility of the internet, individuals participate in many activities at the same time. Moreover, it is difficult for people with ADHD to control themselves, which may cause internet addiction (3). Studies investigating the relationship between addictive social media networking and ADHD are scarce (6). Recent findings indicate that adolescents with ADHD symptoms are more likely to show addiction to social media (32,33). However, in our study, we found no significant difference between the untreated and treatment receiving groups in terms of social media use.

Cyberbullying is defined as intentional act performed to harm another person through technologies such as text messaging, email, or social networking sites and is enforced by an individual or a group (16). In our study, in 72 youngsters with ADHD, the rate of being affected by cyberbullying was 12.5% (n=9) and 7% reported to be affected by cyberbullying in the last month. Two adolescents reported that they had cyberbullied someone in the last month. However, there was no difference in untreated and treatment-receiving groups in terms of cyberbullying rates. Also, the relatively small number of subjects who reported experiencing cyberbullying could account for the lack of statistical significance. A study conducted in 114 students with developmental disabilities showed that cyberbullying was relatively more prevalent and was related to intelligence quotient (IQ), comorbidity with ADHD, depressive feelings, self-esteem, and frequency of computer use (34). In another study conducted in 42 youngsters with ADHD and/or Asperger syndrome, it

was reported that the participants were affected by cyberbullying at a high rate (35).

This study has several limitations. First, we did not examine anxiety and depression levels using self-reported scales. Previous studies reported the relationship between internet addiction (also bullying) and anxiety and depression (3). Secondly, we did not consider the ADHD subtypes. ADHD subtypes (inattention, hyperactivity/impulsivity) may affect internet addiction and bullying behaviors in different ways. Thirdly, the study's limited sample size may cause cyberbullying and social media addiction not to differ between the two groups.

In this study, we found that IGD was significantly more frequent in the untreated group than in the treatment-receiving group. ADHD symptoms may play a role as an important risk factor of gaming disorder. Clinical practitioners should be aware of diagnostic and therapeutic relationships between both disorders. Effective treatments for ADHD may prevent the onset of gaming disorder. Additional well-designed and longitudinal clinical studies investigating the mechanisms and treatment options between both disorders are needed to advance the field.

Conflict of Interest: The authors declare that they have no conflicts of interest.

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