Pathological Internet Use, Aggression, and Cyberbullying in Children and Adolescents With Attention Deficit Hyperactivity Disorder

ABSTRACT

Objective: The aim of this study was to evaluate the relationship between pathological internet use, aggression, and cyberbullying/victimization in children with attention deficit hyperactivity disorder.

Methods: Male children (10-18 years old) with attention deficit hyperactivity disorder (n = 30) and without any diagnosis (n = 30) were evaluated using Questionnaire of Computer/Internet Use of Children and Adolescents (Children-Adolescent Form and Parent Form), Children's Aggression Scale-Parent Version, Young Internet Addiction Scale, and Cyber Bullying and Online Aggression Survey Instrument.

Results: Weekly internet/computer using time, Young Internet Addiction Scale scores, Children's Aggression Scale-Parent Version scores were higher in the attention deficit hyperactivity disorder group. When all participants included in the study were compared for the availability of rules related to the PC/internet use at their homes, it was determined that there were rules by 53.3%, and the rate of setting rules was higher in the control group than attention deficit hyperactivity disorder group. There is a high level of positive correlation between Internet Addiction Scale score and duration in internet use in the attention deficit hyperactivity disorder group. Those who experienced cyberbullying throughout their lives were at a higher rate in the attention deficit hyperactivity disorder group compared to the control group. “Physical aggression without provoking” subgroup of Children's Aggression Scale-Parent Version is correlated with cyberbullying in the attention deficit hyperactivity disorder group and cyber victimization in the control group.

Conclusion: Children with attention deficit hyperactivity disorder have higher levels of aggression and pathological internet use than healthy controls, but there is no difference between cyberbullying and victimization. Cyberbullying/victimization is independent of diagnosis. For this reason, it is necessary to create awareness and preventive measures of cyberbullying.

Keywords: Adolescent, aggression, attention deficit hyperactivity disorder, child, child psychiatry, cyberbullying, internet use

Introduction

Attention deficit hyperactivity disorder (ADHD) is characterized by difficulties in focusing and maintaining attention, hyperactivity, and impulsivity, with a worldwide prevalence of 5.29%. In Turkey, the rate of ADHD was found to be 12.4% in the epidemiological study of Children’s Mental Disorders in Turkey EPICAT-T (The prevalence of childhood psychopathology in Turkey; a cross-sectional multicenter nationwide study: EPICAT-T) conducted in 5830 second-, third-, and fourth-grade children from 30 different cities.

Pathological internet use (PIU) can be defined as the inability of an individual to resist the urge to use the internet; occurrence of withdrawal symptoms such as irritability and aggression; impairment in family, occupational, and social life. It is said to be common; the risk...
is 2-3 times higher in males particularly in children and adolescents seen in pediatric psychiatric clinics.

Comorbid psychiatric disorders were found to be 3.8 times higher in a study conducted in persons with PIU particularly in individuals with coexisting ADHD. In another study, Mottram et al showed that higher impulsivity levels are associated with greater time spent on the internet.

Bullying is the physical and mental damage suffered by an individual directly such as by being beaten or indirectly such as by being teased, frightened, nicknamed, and so on. It is a common problem among children and adolescents, often seen in the form of cyberbullying. Cyberbullying is getting more important as children spend more time in the cyber environments at the present time. Cyberbullying may occur anytime and spread quickly; it becomes difficult for the adults to monitor and regulate as it is frequently observed outside the school areas. It is easier because of the physical distance between the bully and the victim. Bully victimization, including cyberbullying, was found to be associated with short- and long-term mental and physical health problems as well as academic failure.

According to the literature, the children and adolescents diagnosed with ADHD are reported to be in the high-risk group in terms of being subject to conventional bullying and abuse. Moreover, conventional bullying is often accompanied by cyberbullying.

The information about the relation among the PIU, aggression, cyberbullying, and cyber victimization in children and adolescents is limited in the case of coexisting ADHD. Children diagnosed with ADHD without any treatment had been reported as having more cyberbullying and victimization.

The purpose of this study is to assess the relationship between PIU, aggression, and cyberbullying in children and adolescents diagnosed with ADHD. The findings will help identify the factors that increase the risk of victimization of individuals with ADHD and facilitate their treatment.

**Methods**

In this study, the male children and adolescents aged 10 to 18 years who were referred to the child psychiatry outpatient clinic between September 2017 and June 2018 were assessed according to Diagnostic and Statistical Manual of Mental Disorders, Fifth Edition (DSM-5) diagnostic criteria and the semi-structured diagnostic interview schedule of the Schedule for Affective Disorders and Schizophrenia for School-Age Children-Present and Lifetime Version (K-SADS-PL). The reasons for including only the male gender in our study are as follows: The androgen was taken under control because it was considered to be the confounding factor when examining the aggression and related factors in adolescence, and it was anticipated to be difficult to create a gender-balanced homogeneous group because ADHD was observed 9 times more for the males in the admissions to the clinic. This study was approved under Protocol No: 2017/1221 by the Aydın Adnan Menderes University Local Non-Interventional Clinical Research Ethics Committee and informed consents were obtained from all participants.

The study was composed of two groups: children with ADHD without any additional psychiatric disease included in the study as the “case group” and 30 healthy children without any psychiatric disease who are considered to be as the “control group.” All participants in the ADHD and control groups were evaluated and determined by child and adolescent psychiatrists. The ADHD group was determined with K-SADS-PL by researchers who are child and adolescent psychiatrists. The consensus was achieved by evaluating the diagnosed patients by a second investigator. First, the ADHD group was determined, then the control group was determined according to appropriate criteria by age matching. Neither participant had any medical, chronic, metabolic, genetic, endocrine, or neurological diseases and neither of them was on medication.

The sample size of the study was determined in the G*Power program based on the sample study. The sample size was calculated to be at least 26 participants in each group according to the two-way hypothesis by taking type I error level $\alpha = 0.05$, power $\beta = 0.8$, and $d = 0.8$.20,21

**Data Collection Tools**

Sociodemographic and clinical data form was developed by the researchers to assess some demographic variables.

**ADD/ADHD DSM-IV-Based Diagnostic Screening and Rating Scale (ADD/ADHD DSM-IV Rating Scale)**

It was developed by Atilla Turgay considering Diagnostic and Statistical Manual of Mental Disorders, Fourth Edition (DSM-IV) diagnostic criteria. It has a total of 41 items. Items are scored from 0 to 3, one by one, as none, a little, much, and too much. For the diagnosis of ADHD in a child/adolescent, at least 6 of the 9 items in the attention deficit must be filled as 2 or 3, and at least 6 of the 9 questions in the hyperactivity and impulsivity section must be filled in as 2 or 3. The validity and reliability study of attention deficit disorder/ADHD DSM IV Rating Scale was performed by Ercan et al, and Cronbach’s alpha value was found to be 0.92.

**Children Aggression Scale-Parent Version**

It assesses the frequency, severity, and diversity of aggressive, as distinct from nonaggressive, disruptive behaviors of children and adolescents and consists of 33 items. The domains assessed include verbal aggression, aggression against objects and animals, provoked physical aggression, unprovoked physical aggression, and use of weapons. The scale is a 5-point Likert-type scale. In terms of frequency and intensity description, the options are “never, once or twice, 3-5 times, 6-10 times, and more than 10 times.” A minimum of 0 and a maximum of 132 points are taken from the scale. The validity and reliability study of CAS-PV was performed by Ercan et al and Cronbach’s alpha value was found to be 0.93.
Assessment Questionnaire for Internet Use by Children and Adolescents (Child-Adolescent and Parent Form)
This form prepared by the researchers consisted of questions for both the child/adolescent and the parents about internet use such as the availability of internet at home, availability of internet access, the most frequent reasons for use, the time of daily/weekly use, the purpose of the internet use, whether the parents use the internet at home, and whether there are any rules related to the internet use at home.

Young Internet Addiction Scale
Internet Addiction Scale was created by Young by adapting the Pathological Gambling criteria in DSM-IV. Young Internet Addiction Scale (YIAS) is a 20-item 5-point Likert-type scale. Each item includes options such as “Never”, “Rarely”, “Sometimes”, “Often” or “Always.” A minimum of 20 and a maximum of 100 points are taken on the scale. If the total score is 80 and above, internet addiction is mentioned. Those with a score between 50 and 79 are classified as a group with borderline symptomatic features. Below 50 points describe normal internet users.26,27 The validity and reliability study of YIAS was performed by Bayraktar et al.27 and its Cronbach’s alpha value was found to be 0.91, and its reliability study of Cyberbullying and Online Aggression Screening Scale-Turkish was performed by Özdemir and Akar, and Cronbach’s alpha was 0.87.

Cyberbullying and Online Aggression Screening Scale
This scale measures the cyberbullying victim and being the cyberbully. There are questions for both subgroups including the statements such as “Someone made shaming and offending comments about me on the internet” and “I made shaming and offending comments about someone on the internet” and asking the platform (e.g., mobile phone, Facebook, online game, etc.) where those conditions occurred. The validity and reliability study of Cyberbullying and Online Aggression Screening Scale-Turkish was performed by Bayraktar et al. and its Cronbach’s alpha value was found to be 0.94.15,28,29

Statistical Analysis
Statistical analysis of the study was performed using the Statistical Package for Social Science 21.0 program (IBM SPSS Statistics for Windows, Version 21.0. Armonk, NY: IBM Corp.). Conformity to normal distribution was evaluated according to the Kolmogorov–Smirnov test, histogram, and skewness–kurtosis coefficients. Categorical variables are presented with percentages and frequencies, measurement data with mean (SD), median (minimum and maximum), measurement data with mean (SD), median (minimum and maximum), measurement data with mean (SD), median (minimum and maximum), measurement data with mean (SD), median (minimum and maximum), measurement data with mean (SD). Chi-square test and Fisher’s exact test were used to compare the 2 groups in categorical data. In order to compare the 2 groups in the measurement data, Student’s t-test was used for those who fit the normal distribution, and the Mann–Whitney U-test was used for those who did not fit the normal distribution. In order to evaluate the correlation between measurement data, Pearson’s correlation coefficient was used for those who fit the normal distribution, and the Spearman correlation coefficient was used for those who did not fit the normal distribution. Relationships between variables are explained by the correlation coefficient (r/rho) and the relevant acceptable error level (P value). Type 1 error level was taken as α = 0.05.

Results
The median age was determined to be 13.00 (10.00-17.00) years for all children, and there is no statistical difference between ADHD and the control group in terms of age and parental sociodemographic characteristics (P = .899).

When the children and adolescents in the ADHD group were assessed according to the DSM-5 diagnostic criteria, they were found to meet the diagnostic criteria for combined type by 46.66% (n = 14), predominantly inattentive type by 30.00% (n = 9), and predominantly hyperactive type by 23.33% (n = 7).

When the age of starting to use the internet was compared between the groups, it was similar as being 8.60 (SD = 2.24) years in the ADHD group and 8.96 (SD = 2.57) years in the control group (P = .712). The median time of internet use was determined to be 13.50 (2.00-100.00) hours/week, and the difference between the group was statistically significant (P = .020) (Table 1). When the time of internet use was compared according to the ADHD sub-presentations, no statistically significant difference could be found (P = .285).

According to the data about the place where they access the internet, the participants in the ADHD group go online at home by 93.33% and at the internet café by 6.67%; the participants in the control group go online at home by 80.00%, at the internet café by 6.67%, at the homes of their relatives by 6.67%, at school by 3.33%, and at the homes of their friends by 3.33% (P = .366)

Every participant has a computer or tablet in their homes. These instruments were in the children’s room by 56.66% (n = 34). When all participants included in the study were compared for the availability of rules related to the PC/internet use at their homes, it was determined that there were rules by 53.33%, and the rate of setting rules was higher in the control group (62.50%) than the ADHD group (37.50%) (P = .038).

Internet Addiction in the Groups
Internet addiction scale (IAS) scores of the participants were compared. The mean score (reviewer 3, item 5) was 44.13 (13.16) in the ADHD group and 33.03 (9.28) in the control group (P < .001) (Table 1). When the IAS scores of the case group were compared according to the ADHD sub-presentations, no statistically significant difference could be found between the groups (P = .233). There is a high level of positive correlation between IAS score and duration in internet use in the ADHD group (P < .001) (Table 2).

Table 1. Comparison of Duration in Internet Use and Internet Addiction Score Between the ADHD and Control Groups

|                      | ADHD (n = 30) | Median (Min-Max)/Mean (SD) | 95% CI          | P         |
|----------------------|--------------|----------------------------|-----------------|-----------|
| Duration in internet use (hour/week) |              | 14.00 (1.00-85.00)       | 11.72-23.47     | .020      |
|                      | HC (n = 30)  | 7.00 (2.00-40.00)        | 6.16-13.23      |           |
| Internet addiction score |              | 44.13 (13.16)           | 39.21-49.04     | <.001     |
|                      | HC (n = 30)  | 33.03 (9.28)            | 29.64-36.42     |           |

ADHD, attention deficit hyperactivity disorder; HC, healthy control; SD, standard deviation; CI, confidence interval.
Table 2. The Correlation Between the Internet Addiction Scores and Exposure Age and Time

| Internet addiction score | ADHD (n = 30) | HC (n = 30) | P  |
|-------------------------|--------------|-------------|----|
| First Age of Internet Use (Year) | | | |
| Internet Use (Hour/Week) | | | |
| ADHD | r = −0.24 | 0.608 |
| HC | r = 0.198 | <.001 |
| P | r = −0.17 | 0.140 |
| ADHD, attention deficit hyperactivity disorder; HC, healthy control.

Table 3. Comparison of Cyberbullying and Cybervictimization Status Among ADHD and Control Groups

| | ADHD (n = 30) | HC (n = 30) | P  |
|-------------------------|--------------|-------------|----|
| I have been cyberbullied in my life | 13 (43.33) | 4 (13.33) | <.001 |
| I have witnessed cyberbullying | 12 (40.00) | 11 (36.66) | <.001 |
| I have been cyberbullied in the last month | 4 (13.33) | 1 (3.33) | <.001 |
| I have cyberbullied someone in the last month | 4 (13.33) | 1 (3.33) | <.001 |
| ADHD, attention deficit hyperactivity disorder; HC, healthy controls.

Table 4. Comparison of Children Aggression Scale Scores Among the ADHD and Control Groups

| | ADHD (n = 30) | HC (n = 30) | 95% CI | P  |
|-------------------------|--------------|-------------|--------|----|
| Verbal aggression | 11.00 (3.00-33.00) | 4.00 (0.00-17.00) | 9.6-15.7 | <.001 |
| Agression to objects/animals | 2.00 (0.00-9.00) | 0.00 (0.00-4.00) | 2.0-3.4 | <.001 |
| Provoked physical aggression | 4.00 (0.00-18.00) | 1.00 (0.00-15.00) | 3.4-7.5 | .011 |
| Unprovoked physical aggression | 4.00 (0.00-18.00) | 0.00 (0.00-5.00) | 1.3-3.8 | .001 |
| Use of weapons | 0.00 (0.00-5.00) | 0.00 (0.00-5.00) | 0.1-1.2 | .973 |
| Total score | 20.50 (4.00-69.00) | 5.00 (0.00-39.00) | 17.2-30.0 | <.001 |
| ADHD, attention deficit hyperactivity disorder; HC, healthy controls.
In the case group, a moderate positive correlation was found between the “cyberbullying score” and the “unprovoked physical aggression” domain (r = 0.28, \( P = .031 \)). In the ADHD group, a moderate positive correlation was found between the “cyberbullying score” and the “unprovoked physical aggression” domain (r = 0.41, \( P = .021 \)). When the participants in the control group were examined, a moderate positive correlation was found between the “cyber victimization” score and the unprovoked physical aggression domain (r = 0.40, \( P = .032 \)) (Table 5).

### Discussion

In our study, ADHD and healthy control groups stated to have similar experiences in terms of cyberbullying and cyber victimization. However, the rate of “cyberbullying and/or being cyberbullied in the last month” is 4 times higher in the ADHD group than the control group. However, the rate of “cyberbullying and/or cyberbullied in the last month” in the ADHD group was 4 times higher than in the control group. The detected 4 times difference, although not statistically significant, is clinically valuable. A study conducted with 251 male adolescents showed that the children and adolescents diagnosed with ADHD were actually under a high risk of abuse, and the risk of being cyberbullied was increasing. Additionally, when compared according to the clinical ADHD presentations in the literature, a study reported that the male adolescents diagnosed with combined type ADHD were under a higher risk of being cyberbullied perpetrators than those with predominantly inattentive type ADHD, and another study reported that there was an important relationship between hyperactivity symptoms and being cyberbullied. It shows that impulsivity plays a particular role in cyberbullying among the basic clinical symptoms of ADHD. In our study, no significant difference was found among the clinical ADHD presentations, and the rates were found to be similar. This may be because the sample size was smaller than the previous studies. Additionally, lack of oppositional defiant disorder or anxiety disorder coexisting with ADHD may have caused that no difference occurred compared to the healthy controls. However, the other reason may be that cyberbullying and victimization are getting widespread at a large scale even in all non-clinical groups.

While 38.3% of the children and adolescents in our study reported that they had witnessed others being cyberbullied, they stated that their own rate of cyberbullying or being cyberbullied in the last month was less frequent as being 8.3%. The reason for finding similar rates of witnessing cyberbullying in the groups with and without ADHD may be that the participants of both groups are in the same development stages and live in similar social environments. One of the reasons for the frequency difference between participants’ score of witnessing cyberbullying and the score of cyberbullying/being cyberbullied may be that the data were obtained from the self-report scales, thus real information was not wished to be shared. However, the fact that witnessing cyberbullying might have happened at any period of time but cyberbullying/being cyberbullied was assessed only for the last month due to the structure of the scale might be another reason.

There was no difference between the ADHD and control group in terms of the age of starting to use the internet and computer and the starting ages was also similar in ADHD sub-presentations and this is similar to national statistics. This is possible because the technological devices have an important place in children’s and adolescents’ lives as they become easily accessible because the families are at similar income levels. However, it indicates that the internet use poses a problem for the children of all ages.

Related to the impulsivity level of the children with ADHD, it is suggested that the time they spend on the internet will increase because they are unable to stop themselves and fail to manage their time due to the problems in the executive functions. Consistently, when the times of weekly computer and internet use of the participants in our study were compared, it was understood that the time spent was significantly more in the ADHD group, but it was similar among the ADHD subtypes. In our study, the average weekly exposure time is about twice as high in the ADHD group compared to the control group.

When the availability of internet-related rules at home was compared, the parents of the healthy control group without ADHD were found to set more limitations and rules for computer and internet use at home than the ADHD group. Lack of time limitation may be a reason for the internet use amount to be more in the ADHD group. Additionally, improper parent attitudes in coping with the children with ADHD characteristics may also cause problematic use. Therefore, training the parents about parenting, healthy internet use, and proper attitude/skill development can be useful for developing preventive measures.

There are studies about the relationship between the clinical sub-presentations of ADHD and the PIU which suggest that the risk increases as the impulsivity level increases, other studies are showing that the risk of addiction is higher due to self-medication in the cases of a motivational syndrome or reward deficiency, such cases are clinically similar to the predominantly inattentive type ADHD, therefore
PIU can be observed in all subtypes of ADHD.\textsuperscript{8,33-35} In our study, no difference was found between the ADHD subtypes and the scores of the Internet Addiction Scale. The number of cases being low in each subgroup may be another reason for the lack of difference; however, the default mode network of the basic problem in ADHD can be explained by the cortico-striatal-thalamic loop while the possible role of the compulsive use and nucleus accumbens-based reward pathway in addictions can be explained by different neurobiological factors underlying a similar internet addiction.\textsuperscript{36,37}

In our study, the condition of being a cyberbully showed an increase in all participants as the level of PIU increased. But when the sample was divided into ADHD and control groups, no relationship could be found between PIU severity and cyberbullying/cyber victimization for both groups. It demonstrates that cyberbullying cannot be attributed to the internet use alone. The time spent on the internet, starting to use the internet at early ages, and the lack of parental control constitute the risk factors accordingly. Therefore, participants’ age of starting to use the internet, the time spent weekly on the internet, and the availability of any rule related to the internet users in the family were compared to cyberbullying and victimization level in our study; however, no statistically significant relationship could be found. Such information could have been reported differently in our study as it was based on self-report. The contradictory results in this field indicate the need for further studies particularly about the relationship between the time spent on the internet and the cyberbullying/victimization.

Our study could not determine any difference in the scores of the Internet Addiction Scale according to the purposes of use of the participants in the ADHD group. This is possible because people spend a very long time on the internet also for other activities other than games (e.g., social media) at present. In their study conducted with 2114 students, Yen et al\textsuperscript{16} showed that those with weekly internet use of more than 20 hours were under a higher risk of PIU than those with weekly internet use of less than 20 hours.\textsuperscript{26} In our study, the IAS scores increased as the time spent on the internet increased both in the entire sample and in the ADHD group. Also, ADHD medication has been reported as lowering the cyberbullying and victimization.\textsuperscript{16} Accordingly, taking preventive measures such as time management and family education seems important for the entire group including the children and adolescents diagnosed with ADHD.

A study conducted on adolescents reported that disruptive and hostile aggressive behaviors created a tendency to PIU.\textsuperscript{16} Another study including 2293 adolescents emphasized that the intensive internet use posed an important risk for aggression.\textsuperscript{38} Similarly, when the entire working group was assessed for the relationship between the scores of YIAS and CAS-PV scales in our study, a significant relationship was found between the total and subgroup scores of the level of PIU and the aggression level. Aggression level increases with the increase in PIU. But aggression did not differ among ADHD and control groups. This may show that aggression is not a core problem in ADHD.

In our study, cyberbullying increases with the increase in aggression. Our data about being a cyberbully are similar to those in the literature.\textsuperscript{16,30} Recent research on ADHD showed that adolescents who do not take anti-ADHD medication are at risk for physical, sexual, and cyberbullying victimization and also for cyberbullying.\textsuperscript{16} When compared to the disruptive behavior groups in other publications, having lower aggression scores can be explained by the fact that there are no additional diagnoses in the ADHD group in our study.

Self-report scales leading to recall bias, relatively small sample size, and only male participants enrolled are limitations of our study. Being the new dimension of the PIU and bullying, the cyberbullying and victimization gradually increase due to the technological opportunities and mainly due to the COVID-19 pandemic developed recently. Our results are useful for taking preventive mental health measures, creating awareness for both the mental health professionals and the parents in order to establish the interventions, and serving as a basis for the further studies especially internet use which is increasing in every pandemic day.

\textbf{Ethics Committee Approval:} This study was approved under Protocol No: 2017/1221 by the Aydin Adnan Menderes University Non-Interventional Clinical Research Ethics Committee.

\textbf{Informed Consent:} Informed consents were obtained from all participants.

\textbf{Peer Review:} Externally peer-reviewed.

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