

## Relationship between Symptoms of Disruptive Behavior Disorders and Unsafe Internet Usage in Early Adolescence

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### ABSTRACT

**Introduction:** Children and adolescents are at the highest risk for negative effects of internet usage. Risk taking and erroneous decision making have been described as major behavioral characteristics of patients with attention deficit hyperactivity disorder (ADHD). ADHD and its association particularly with oppositional defiant disorder/conduct disorder are correlated with risk-taking behaviors. This study was conducted to evaluate how disruptive behavior disorder symptoms are associated with internet usage, particularly unsafe internet usage, in early adolescents.

**Methods:** A sample of 1389 secondary school students was invited to the survey. All children were given an invitation letter and Conners' Parent Rating Scale (CPRS) forms were sent to their parents. The accepted participants filled in questionnaire forms, which consisted of questions interrogating demographic information and internet usage habits.

**Results:** Responses indicated that 27.4% (n=249) of the participants encountered unwanted content unintentionally and nearly one-third

(n=280, 30.4%) had chatted online with people they did not know. Additionally, respondents who had more severe ADHD symptoms were more likely to report surfing online mainly for the purpose of chatting than respondents with milder ADHD symptoms. Students with comparatively higher attention deficit scores were also significantly more likely to report meeting in person with strangers they knew only from internet chatting. Analyses have demonstrated the presence of a significant difference between study participants with and without conduct disorder as for internet overusage or meeting with their internet acquaintances.

**Conclusion:** This study suggests that there may be a significant relation between ADHD symptoms, conduct disorder and pathological and unsafe internet usage. Evaluating adolescents with ADHD and conduct disorder with this risk in mind is important in the development of both preventive and interventional strategies.

**Keywords:** Internet usage habits, early adolescence, attention-deficit hyperactivity disorder symptoms, conduct problems, unsafe internet usage

### INTRODUCTION

Internet usage has become an essential part of daily life and is increasing worldwide. In Turkey, the incidence of internet usage dramatically increased from 13.93% in 2005 to 41.6% in 2010 (1). Children and adolescents are at the highest risk for negative effects of internet usage. Many terms are used to describe the adverse effects of internet usage, including internet addiction, internet dependency, pathological internet usage, excessive internet usage and problematic internet usage (2,3). Investigations also indicated that youngsters spending time surfing on the internet are at a risk of exposure to harassment and bullying, sexual solicitation, a variety of pornographic and provocative material and meeting dangerous people or even sexual predators (4,5,6,7). Risk-taking behaviors of adolescents have been observed both in the public and medical practice with their patient are undesired consequences (8). Alcohol consumption, cigarette smoking, unprotected sex, dangerous driving and aggression toward others are real life risks that have been the focus of interest of researchers (9). Researchers have also reported that many risky behaviors had been transferred to online sites, such as sharing personal information (school name, e-mail address and pictures), communication with strangers, arranging meetings with strangers after meeting them first via social media or in chat rooms, telling obscene jokes, entering pornographic websites and trying to bypass internet filters and blocks (10,11,12). Problematic internet usage (PIU) is a psychiatric condition involving maladaptive thoughts and pathological behaviors (13). Problematic users waste their precious time surfing on the internet, with adverse behavioral and functional consequences. For instance, they neglect their job, ignore their responsibilities toward their family, sleep less and feel like that life is boring without internet (14). PIU is related to many psychiatric problems, particularly attention deficit hyperactivity disorder (ADHD) (15,16). ADHD is characterized by inattention, impulsivity and hyperactivity and is recently estimated to affect 3.5% of school-aged children worldwide (17). Children and adolescents diagnosed with ADHD manifest unwillingness toward doing their homework and achieving their academic responsibilities, while they demonstrate marked tendency and desire to watch TV, play video games and surf on the internet (18). Patients



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**Received:** 18.07.2013 **Accepted:** 27.02.2014 **Available Online Date:** 07.07.2015

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with ADHD are known to show increased sensitivity toward awarding and award-seeking behaviors (19). Patients with ADHD frequently confront difficulties in stopping and controlling their behaviors (20). Risk taking and disadvantageous decision making have been described as major behavioral characteristics of patients with ADHD (21). Patients with ADHD are more frequently exposed to accidental injuries and traffic accidents (22,23,24,25,26,27). They also engage in more risky sexual behaviors more often than their peers (28). Adolescence is a period during which social development is at its maximum, the struggle to form an identity is intense and various identity trials are undertaken. Acceptance by peers and social approval are major concerns of adolescents. Therefore, the fact that adolescents feel more relaxed about building an online relationship rather than offline and that they can hide their true identities has popularized establishment of relationships via internet (29). ADHD is associated with impaired functioning in cognitive, academic, familial and eventually occupational domains of daily life. Importantly, in ADHD, social functioning is also impaired. In social life of children with ADHD, problems such as being less liked by peers, having fewer mutual relationships and not being preferred by more popular peers can be encountered (30). Diminishing social performance of children with ADHD may lead to rejection by their peers and this may result in social isolation (31). Internet may be regarded as beneficial means of facilitating establishment of social relationships between patients with ADHD and their peers.

In literature, to define risky and unsafe sources of internet for adolescents, terms such as unsafe internet usage, internet risks and also the concept of digital safety has been regularly used (32). Unsafe internet usage in ADHD is another interesting but an unexplored research area. This study aimed to investigate how ADHD symptoms are associated with internet usage, particularly unsafe internet usage in early adolescents.

## METHODS

### Procedure

For this study, 1389 secondary school students in grades six to eight residing in or near the center of the city of Bursa were invited. After approval grant from the Ethics Committee of the regional National Education Administration, the study was performed in accordance with ethical standards laid down in the 1964 Declaration of Helsinki. Care was taken to randomly select participating schools with different socioeconomic status. All children were selected from three different grades and twelve schools. Invitation letters explaining the goals, methods, voluntary design, benefits and potential adverse outcomes of the study were sent to their parents. The confidentiality of results was guaranteed. Along with the invitation letter, the Conners' Parent Rating Scale (CPRS) questionnaire forms were sent to their parents (33). After the letters and completed questionnaire forms returned to surveyors, researchers visited schools and explained the goals and methods of the study to students. Students, whose parents consented to enroll in the study, filled in a questionnaire form. On these questionnaire forms, students wrote down their demographic information, answered two questions about the number of hours they usually spent surfing on the internet per day and their most important reasons for going online. Internet overusage was defined as spending more than 3 h online per day and the participants were categorized into Groups 1 and 2. Groups 1 and 2 used the internet <3 h and ≥3 hours a day, respectively. Reasons given for going online were classified as follows: 1- playing games, 2- chatting and entering into social networks and 3- access into educational sites. Participants were then asked questions about unsafe internet usage and their internet usage habits. The first item of the ques-

tionnaire was related to threats from internet content, such as morally inappropriate websites or shocking web pages. The other two items were concerned with threats resulting from risky online communication, for example, talking online with strangers or meeting them outside.

### Measurements

Children's behavior was rated by the Conners' Parent Rating Scale, which was developed by Conners, revised by Goyette et al. (33) and adapted to Turkish population by Dereboy et al. (34).

The Conners' rating scale consists of 48 questions for the assessment of behavioral patterns. Evaluation of each item is made by a 4-point scale ranging from "never" (0) to very often (3). The answers are grouped into subscales to determine the behavioral characteristics. Parents' ratings are grouped in attention deficit (AD), hyperactivity/impulsivity (H/I), oppositional defiant behavior (ODD) and conduct disorder (CD) categories. Cut-off points of clinically significant scores for this version are 5 points for AD, 6 points for H/I, 6 points for ODD and 18 points for CD.

### Statistical Analysis

For the analysis of the study data, Statistical Package for the Social Sciences (IBM-SPSS Inc., Chicago, IL, USA) 13.0 for Windows was used. Numerical variables derived from measurements were expressed as means ± standard deviations together with their range values, while categorical variables were indicated as frequencies and percentages. Compatibility of study variables to normality hypothesis was checked using Shapiro–Wilk normality test. In intergroup comparisons of numerical variables in compliance with normal distribution hypothesis, independent sample t test was used, whereas for intergroup comparisons of variables in discordance with this hypothesis, Mann–Whitney U test was used. For comparisons among more than two groups, Kruskal–Wallis test was employed. For intergroup comparisons of categorical variables, Pearson's *chi-square* and Fisher's exact *chi-squared* tests were utilized.

## RESULTS

Most of the students (940/1389; 67.3%) summoned by invitation letters responded to all questions and a CPRS form was sent to their parents to be completed. After return of the completed forms by their parents to school, students were enrolled in the study. There were 420 male (44.5%) and 516 female (55.1%) students and four students did not respond to this questionnaire. The mean age of the study group was 13.1±0.9 years. Mean ages of female and male students were similar (female students: 13.04±0.89 years; male students, 12±0.91 years;  $p>0.05$ ).

### Internet Usage Characteristics of the Participants

Majority of the 940 students ( $n=656$ ; 69.8%) indicated that they have an internet connection at their homes and 3% ( $n=25$ ) of them stated that they are online for more than 20 h a week. Weekly online surfing hours differed between genders. In total, 1.1 % of the female ( $n=5$ ) and 5.2% of the male ( $n=20$ ) students were online for more than 20 h a week ( $p=0.001$ ). Besides, 25.7% ( $n=242$ ) of 940 participants had been online in internet cafés. Common reasons reported by students for internet usage are shown in Table 1.

### Characteristic Features of Unsafe Internet Usage by the Participants

"Pornographic audiovisual material," which students encountered unintentionally during online surfing, was defined as "unwanted content" within the context of this study. Responses to questions regarding unsafe inter-

**Table 1.** Conners' subscale scores of students according to some of their characteristic features

	AD ≥5 n (%)	p	H/I ≥6 n (%)	p	ODD ≥6 n (%)	p	CD ≥18 n (%)	p
<b>Gender</b>								
Male (n=420)	145 (34.5)	0.004**	198 (47.1)	0.691	22 (5.2)	0.396	27 (6.4)	0.052*
Female (n=516)	134 (26)		250 (48.4)		21 (4.1)		18 (3.5)	
Total (n=936) <sup>a</sup>	279 (29.8)		448 (47.9)		43 (4.6)		45 (4.8)	
<b>Time spent on the internet</b>								
<20 (hours/week) (n=816)	245 (30)	0.828	394 (48.2)	0.870	36 (4.4)	0.104	37 (4.5)	0.029***
≥20 (hours/week) (n=25)	7 (28)		13 (52.0)		3 (12)		4 (16)	
Total (n=841) <sup>a</sup>	252 (29.9)		407 (48.3)		39 (4.6)		41 (4.9)	
<b>Major reasons for going online</b>								
• Playing games								
Yes (n=129)	34 (26.4)	0.721	60 (46.5)	0.523	8 (6.2)	0.396	6 (4.7)	0.935
No (n=548)	153 (27.9)		272 (49.6)		22 (4)		22 (4)	
Total (n=677) <sup>a</sup>	187 (27.6)		332 (49)		30 (4.4)		28 (4.1)	
• Chatting								
Yes (n=108)	41 (38)	0.011**	58 (53.7)	0.354	6 (5.6)	0.449	9 (8.3)	0.028***
No (n=557)	145 (26)		272 (48.8)		23 (4.1)		18 (3.2)	
Total (n=665) <sup>a</sup>	186 (28)		330 (49.6)		29 (4.4)		27 (4.1)	
• Homework								
Yes (n=366)	93 (25.4)	0.192	181 (49.5)	0.826	12 (3.3)	0.205	10 (2.7)	0.094
No (n=325)	97 (29.8)		158 (48.6)		18 (5.5)		18 (5.5)	
Total (n=691) <sup>a</sup>	190 (27.5)		339 (49.1)		30 (4.3)		28 (4.1)	
AD: attention deficit; H/I: hyperactivity/impulsivity; ODD: oppositional defiant disorder; CD: conduct disorder *Chi-square test with Yates correction. **Pearson chi-square test. ***Fisher's exact test. <sup>a</sup> Total number of students taking the survey								

net usage indicated that some (n=249; 26.5%) participants came across unwanted contents inadvertently, nearly one third of the total number of participants (n=280; 29.8%) chatted online with strangers and still one third of the latter group (n=93; 9.9%) made friends with these people outside (n=940). Characteristics of unsafe internet usage are shown in Table 2.

**CPRS Scores of the Participants and their Internet Usage Characteristics**

Results of the CPRS test performed on the study group yielded the following mean scores: attention deficit: 3.53±2.80 pts (0–18 pts); hyperactivity/impulsivity: 5.46±3.00 pts (0–12 pts); oppositional defiant behavior: 1.91±2.20 pts (0–12 pts); and conduct disorder: 5.28±5.81 pts (0–32 pts). CPRS subscale scores of students are given in Table 1. Mothers of the participants were primary school (58.7%; n=535), high school (n=241; 23.5%) or university (n=162; 17.8%) graduates. A statistically significant difference was not found between clinically meaningful Conners' subscale (AD, H/I, ODD and CD) scores and educational level of the mothers (p=0.221, p=0.780, p=0.328 and p=0.250, respectively). The relationship between unsafe internet usage and CPRS subscale scores is analyzed in Table 3.

**DISCUSSION**

Studies show that adolescents are using internet primarily for communication, entertainment and educational purposes in decreasing order of

frequency (11,12). Studies in our country showed that adolescents use internet mainly for playing games and gambling. Other reasons for going online are obtaining knowledge, chatting online and entering social networks (35). Our student participants also used the internet for these purposes; however, in contrary to most studies, homework and school-related research seem to be at top of the list of reasons for using the internet in our study. This educational use of internet could stem from the fact that our study group consisted of a younger age group than other studies. Besides, our study groups were under more strict parental control as for internet usage. Moreover, proper completion of questionnaire forms in school could be a contributing factor.

Chou and Hsiao (36) reported that problematic users stayed online for 20 to 25 h a week. According to another study, internet was surfed for an average of 8.48 h a week by pathological users (3). Some studies indicated a relationship between excessive internet usage and PIU (3,37). In this study, 3% of the participants reported that they used the internet for more than 20 h a week. Some literature studies have demonstrated a correlation between ADHD, conduct disorders and PIU (38,39,40,41). Besides, investigations showed that excessive internet usage in children is commonly found in association with other problematic bad habits, such as drinking alcohol and substance abuse (42,43,44). Excessive internet usage was not only associated with risky offline activities but also with a variety of risky online activities, includ-

**Table 2.** Unsafe internet usage characteristics of the participants

	Encountering unwanted content on the internet n (%)	p		Chatting with strangers online n (%)	p		Meeting with people acquainted on the internet n (%)	p
<b>Gender</b>			<b>Gender</b>			<b>Gender</b>		
Male (n= 411)	116 (28.2)	0.636	Male (n=414)	176 (42.5)	0.001**	Male (n=417)	69 (16.5)	0.001**
Female (n=496)	133 (26.8)		Female (n=503)	103 (20.5)		Female (n=503)	24 (4.8)	
Total (n=907) <sup>a</sup>	249 (27.5)		Total (n=917) <sup>a</sup>	279 (30.4)		Total (n=920) <sup>a</sup>	93 (10.1)	
<b>Time spent on the internet</b>			<b>Time spent on the internet</b>			<b>Time spent on the internet</b>		
<20 (hrs/week) (n=800)	221 (27.6)	0.868	<20 (hrs/week) (n=807)	246 (30.5)	0.002*	<20 (hrs/week) (n=809)	79 (9.8)	0.010***
≥20 (hrs/week) (n=24)	7 (29.2)		≥20 (hrs/week) (n=23)	14 (60.9)		≥20 (hrs/week) (n=25)	7 (28)	
Total (n=824) <sup>b</sup>	228 (27.6)		Total (n=830) <sup>b</sup>	260 (31.3)		Total (n=834) <sup>b</sup>	86 (10.3)	

\*Chi-square test with Yates correction. \*\*Pearson chi-square test. \*\*\*Fisher's exact test. <sup>a</sup>Total number of students answered questions about sex and unsafe usage of internet. <sup>b</sup>Total number of students answered questions about time period consumed online and unsafe usage of internet.

**Table 3.** Correlation between unsafe internet usage of students and Conners' subscale scores

	Encountering unwanted content on the internet n (%)	p	Chatting with strangers online n (%)	p	Meeting outside with people met on the internet n (%)	p
AD≥5	77 (28.5)	0.621	100 (36.2)	0.012**	39 (14.1)	0.007**
AD<5	172 (26.9)		180 (28)		54 (8.3)	
H/I≥6	140 (31.6)	0.005**	141 (31.7)	0.437	48 (10.8)	0.475
H/I<6	109 (23.3)		139 (29.3)		45 (9.4)	
ODD≥6	10 (24.4)	0.796	16 (38.1)	0.353	7 (16.7)	0.182
ODD<6	239 (27.5)		264 (30.1)		86 (9.8)	
CD≥18	11 (25.6)	0.919	16 (36.4)	0.476	11 (25)	0.003***
CD<18	238 (27.5)		264 (30.1)		82 (9.3)	

AD: attention deficit; H/I: hyperactivity/impulsivity; ODD: oppositional defiant disorder; CD: conduct disorder  
\*Chi-square test with Yates correction. \*\*Pearson chi-square test. \*\*\*Fisher's exact test

ing bullying others, meeting new online contacts offline and sending sexual messages (45).

Adolescents report that friends are their most important sources of social support, even more helpful than their families (46). In our study, adolescents who used internet mainly for chatting purposes also scored higher on both AD and CD subscales. Various investigations have emphasized frequently reported problems that adolescents with ADHD have with their peers, including deficient social skills and peer rejection (47,48). AD as one of the core symptoms of ADHD is reported to be correlated with rejection by peers (49). In addition, some studies indicated that when compared with patients with ADHD symptoms alone, ADHD cases with concomitant ODD and/or CD had experienced more problematic relations with their peers (50). In other words, adolescents who have few friends and difficulties in developing social relationships are turning to the internet to satisfy their social needs. In essence, they may substitute internet for face-to-face relationships they desperately desire to establish.

Our data obtained from CPRS forms showed that adolescents who scored relatively higher on H/I subscales encountered significantly increased num-

ber of unwanted content. This phenomenon leads to the conclusion that adolescents with higher H/I subscale scores may have opened pop-up windows or similar messages more frequently than those with lower total scores. Pop-up windows may appear while downloading any kind of music or picture links and may contain unwanted content (51). It has been reported that these pop-up windows are perceived as a negative input and ignored by a conscious user (52). However, in circumstances in which the user's cognitive capacity is low, the pop-up windows may be perceived as beneficial and valuable. It is known that in these instances, the pop-up messages cause fewer disturbances to the user and consequently are avoided less frequently (53).

Another topic that is included when discussing unsafe internet usage is the tendency for adolescents to chat with people they meet on the internet or arrange meetings outside with strangers they met online (54). Some of our study participants (29.8%) reported that they have chatted online with people they did not know and 9.9% of them confessed that they actually had face-to-face meetings with these people. Various studies have shown that the percentages of people who communicate with strangers online range between 4% and 14.6% (55,56). The results of the study by Dowdell further substantiated the importance of these percentages. 243

They reported that 84% of 404 junior high school students, with a median age of 12, had arranged meetings with people they met online and 5% of them were sexually harassed by these individuals (57).

Analysis of ADHD scores have revealed that attention deficit was significantly associated with online chatting with a stranger and meeting them outside. Conduct disorder was also strongly associated with seeing strangers outside. Considering our findings, patients with conduct disorders are at an increased jeopardy of adapting risky internet behaviors. Some investigations have indicated a correlation between ADHD symptoms and risk-taking behaviors. Adolescents with ADHD have demonstrated much more risky sexual behaviors compared to their peers (28). Some studies have reported that if symptoms of ADHD and conduct disorders in children persist, then they will be more prone to exhibit risky driving behaviors in their adolescence (24,25,26). Barkley et al. (27) reported that ADHD and its association particularly with oppositional defiant disorder/conduct disorder is correlated with substantially increased risks for less safe driving behaviors and these patients experienced more adverse driving sequelae, such as accidents and injuries. The researchers attract the attention of clinicians to these patients and their parents.

In this study, Conners' subscale scores were evaluated in consideration with safe internet usage characteristics. Thus, students who had significantly higher clinical scores were found to exhibit more risky habits regarding unsafe internet usage. Students who scored higher on the H/I scale encountered unwanted content more frequently and it was observed that students with significantly higher clinical scores on the AD scale had shown a higher tendency to chat with strangers and meet with these individuals later. Students with clinically significant higher scores on the conduct disorder scale had risky behaviors mainly consisting of meeting strangers with whom they have been chatting on the internet. As a result, we can suggest the presence of a significant correlation between ADHD symptoms, conduct disorder and risky internet behaviors. Various etiological factors might explain this correlation. First, several behavioral studies reported deficits of response inhibition in children with AD/HD. According to Barkley's theory of AD/HD (58), deficient behavioral inhibition is the core deficit of the disorder. Behavioral inhibition may be separated into three interrelated processes called "inhibition of the initial prepotent response to an event," "stopping of an ongoing response," and "interference control" (59). Evidence for deficient behavioral inhibition comes from studies using stop signal paradigm (60). Children with ADHD or ODD/CD have shown deficits in behavioral response inhibition (61). Impaired inhibitory control might contribute to unsafe internet usage. Second, increased sensitivity of ADHD patients toward "awarding and award seeking behaviors" (the reward deficiency theory) has been reported. [9] K. Blum, E.R. Braverman, J.M. Holder, J.F. Lubar, V.J. Monastra and D. Miller et al., Reward deficiency syndrome: a biogenetic model for the diagnosis and treatment of impulsive, addictive and compulsive behaviors, *Journal of Psychoactive Drugs* 32 (Suppl. i-iv) (Nov 2000), pp. 1-112 [Review]. This theory proposes that individuals who are less satisfied with "natural rewards" tend to adopt "unnatural rewards" as a way to seek an enhanced stimulation of the reward pathway (62). Mesolimbic dopamine has been designated as the award marker transmitter of this cycle (63). Because of a deficiency in D2 receptors, patients with ADHD have a marked tendency to induce comparable dopamine release and pleasurable sensations via compulsive and risky behaviors, which include abusive use of alcohol, cocaine, amphetamine, other illicit substances and gambling (64). It is noteworthy that some of these behaviors have been tied to comorbid ODD/

CD, apart from ADHD *per se* (65). Online chatting with strangers and meeting with them outside might be relatively another unnatural reward. In addition, risky internet behavior may be a compensatory activity for poor social skills, interpersonal difficulties and lack of pleasure in the daily lives of children with ADHD and conduct disorder.

In summary, uncontrolled internet usage of adolescents might cause many risks and problems. We can also deduce that for adolescents with ADHD, this must be accepted as a risk factor along with risky internet usage. Evaluating adolescents with ADHD, with respect to the presence of this risk, is important in improvising both preventive and interventional strategies.

The limitation of this study is the cross-sectional and restrictive design. Moreover, because adolescents who had higher scores were not evaluated clinically by pediatric psychiatrists, the differential diagnosis part of the study is missing. Because evaluations leading to a psychiatric diagnosis were not performed, the results of the study should be interpreted with this limitation in mind. Besides, as another limitation of our study, self-reports of students were taken into consideration in the evaluation process of our rating scale and internet usage.

Large sample size of our study conveys robustness to our survey. In addition, our study was important because it investigated the current topic of unsafe internet usage in children with symptoms of ADHD. Furthermore, in contrast with many other studies, our study group consists of much younger (<14 years) individuals and results are noteworthy because of their possible future implications.

**Acknowledgements:** We would like to thank Bursa Eğitim Vakfı (BURSEV), a foundation for education in Bursa for their help in printing and distributing the survey. We also wish to thank the teachers and the school administration for their support.

**Conflict of Interest:** No conflict of interest was declared by the authors.

**Financial Disclosure:** This project was supported by the Bursa Education Foundation (BURSEV)

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