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Attention deficit hyperactivity symptoms and Internet addiction

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Abstract The objective of this study was to evaluate the relationship between attention deficit-hyperactivity/impulsivity symptoms and Internet addiction. In total, 535 elementary school students (264 boys, 271 girls; mean age, 11.0 ± 1.0 years) were recruited. The presence or severity of Internet addiction was assessed by the Young's Internet Addiction test. Parents and teachers of the children completed the DuPaul's attention deficit hyperactivity disorder (ADHD) rating scale (ARS; Korean version, K-ARS) and Child Behavior Checklists. Children with the highest and lowest quartiles in K-ARS scores were defined to be in ADHD and non-ADHD groups, respectively. Five children (0.9%) met criteria for a definite Internet addiction and 75 children (14.0%) met criteria for a probable Internet addiction. K-ARS scores had significant positive correlations with Young's Internet Addiction test scores. The Internet addiction group had higher total scores of K-ARS and ADHD-related subcategories in the Child Behavior Checklists than the non-addiction group. The ADHD group had higher Internet addiction scores compared with the non-ADHD group. Therefore, significant associations have been found between the level of ADHD symptoms and the severity of Internet addiction in children. In addition, current findings suggest that the presence of ADHD symptoms, both in inattention and hyperactivity-impulsivity domains, may be one of the important risk factors for Internet addiction.

Key words attention deficit hyperactivity disorder, children, Internet addiction.

INTRODUCTION

Internet addiction is a relatively new concept in psychiatry. Internet addiction, including personal computer game addiction, is currently becoming a serious mental health problem among children and adolescents in South Korea.[1] Many children and adolescents indulge themselves in Internet surfing and personal computer games at home or at Internet cafés which are equipped with high-speed Internet access. The rate of Internet use in elementary school students in Korea was reported as 91.3% in one recent study.[2]

Internet addiction, also described as pathological Internet use, is conceptualized by an individual's inability to control his or her use of the Internet, which eventually causes marked distress and/or functional impairment.[3–5] The description regarding Internet addiction in the psychological literature has been based on the definition for substance dependence or pathological gambling.[6] Internet addiction is now classified as an impulse control disorder, while not yet completely settled in its definition.[3,4,7,8] It shares characteristics of substance dependence such as preoccupation, changes of mood, tolerance, withdrawal, distress, and functional impairment.

Previous studies regarding child and adolescent Internet addiction have mainly been case summaries,

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along with the assessment for associated psychological variables such as depression, anxiety, interpersonal relations, impulsivity, and communicative patterns.[5,8–10] However, there have been few studies about psychiatric disorders and Internet addiction.

Attention deficit hyperactivity disorder (ADHD) has been known to be one of the risk factors for the addictive use of substances during adolescence.[11,12] In addition, adolescents with limited attentional abilities may have a higher risk of problematic use of substances.[11] More importantly, clinical observation has shown that children and adolescents with ADHD tend to indulge in watching television, playing video games, and Internet use while being reluctant to engage in tasks requiring sustained mental effort.[13]

The objective of this cross-sectional study was to evaluate the relationship between ADHD symptoms and Internet addiction in Korean elementary school students. We hypothesized that the level of ADHD symptoms would be associated with the severity of Internet addiction in children.

METHOD

Subjects

A total of 752 elementary school students (4th–6th year levels) in Jinju city, a mid-sized city located in the southern part of South Korea, were recruited. Investigators visited schools, explained the purpose of the study to students and teachers, acquired ascents and consents, distributed the questionnaires, and collected them after 3 days. The authors also sent a letter to the parents indicating the objective of the study, the benefits, a guarantee of confidentiality, a contact telephone number and email address of the prime investigator for any questions and concerns, and the researcher's intent that we would inform the results personally after analysis. The letter also included the announcement that all parents were free to refuse to respond if they did not agree with the objective of the study.

The response rate was 71.1%, which resulted in 535 (264 boys, 271 girls) study subjects for the final analysis. Mean ± standard deviation (SD) of age was 11.1 ± 1.0 and 11.1 ± 1.0 in boys and girls, respectively. All children reported that they currently used the Internet.

Assessments

Attention deficit-hyperactivity/impulsivity symptoms were assessed by the Korean version of DuPaul's ADHD rating scale (K-ARS), parents and teachers versions, standardized by So *et al*. [14] It has 18 symptom lists of ADHD, based on the 4th edition of the Diagnostic and Statistical Manual of Mental Health Disorders-IV (DSM-IV) diagnostic criteria, nine for attention deficit and nine for hyperactivity-impulsivity domains. Internal constancy of K-ARS by age is 0.77–0.89. In interrater reliability between parents and teachers, Pearson correlation coefficients are 31–0.97 and statistically significant ($P < 0.01$).[14] Concurrent validity from the correlations with the Korean version of the Child Behavior Checklist (K-CBCL) and Korean version of Conner's scale, previously standardized scales for behavioral symptoms of children, is also high ($P < 0.05$).[14] Subjects with the highest 10 percentile in the total K-ARS scores (≥ 39) are assigned to 'ADHD' group ($n = 55$) and lowest quartile (≤ 2) to the 'non-ADHD' group ($n = 63$), based on the method of DuPaul (1991) that 90th percentile score in ARS is used for the screening of ADHD.[15]

For screening emotional and behavioral problems, the K-CBCL was used.[16] Internal constancy of K-CBCL was 0.61–0.86 by age group. In reliability, Pearson correlation coefficient of interrater reliability between parents was 0.69 and of test-retest reliability was 0.68.[16]

Each student completed a questionnaire of Internet use which covered the total Internet usage (hours) per week, years of Internet use, the main purpose of Internet use, the influence of the Internet, personal and family histories of addictive behaviors for other activities and substances including alcohol. In addition, they completed Young's Internet Addiction test (IAT).[17] IAT consists of 20 self-rating questions with the Likert scale of one (rarely) to five (always). This examines the degree of preoccupation, compulsive use, behavioral problems, emotional changes, and impact on life related to Internet usage. The range of the total IAT score 50–79 is regarded as having occasional or frequent problems due to Internet use. A total score of ≥80 is regarded as having significant problems in one's life. Therefore, we defined the subjects with scores over 50 as the addiction group, having problems with Internet use. IAT is not yet standardized in Korea so we used the translated version by Song, and its internal constancy (Cronbach's alpha) of IAT has been reported to be 0.92.[18] We defined the 'Internet addiction' group as IAT ≥50 ($n = 71$) and the 'Internet non-addiction' group as IAT < 49 ($n = 464$).

Group differences in demographic variables involving continuous data were computed using independent *t*-test. Between-group comparisons involving categorical data were assessed using χ^2 tests. Correlations between K-ARS and IAT scores, the differences in K-ARS scores between Internet addiction and the non-addiction groups, and the differences in the IAT scores between ADHD group and non-ADHD group, were

analyzed. Statistical significances were defined at the 0.05 level, two-tailed.

RESULTS

Boys had significantly higher total K-ARS scores (23.4 ± 16.6 vs. 12.0 ± 12.0; d.f. = 533; t = 9.12; $P < 0.01$), higher inattention scores (13.3 ± 8.9 vs. 7.2 ± 7.2; d.f. = 533; t = 8.76; $P < 0.01$), and higher hyperactivity/impulsivity domain scores (13.3 ± 8.9 vs. 7.2 ± 7.2; d.f. = 533; t = 8.60; $P < 0.01$) when compared to girls. A total of 75 students (14.0%) met criteria for 'experiencing occasional or frequent problems' in IAT. Five (0.9%) students met the criteria of 'causing significant problems in one's life'. There was a higher prevalence of Internet addiction in boys than girls (20.8% vs. 9.3%; d.f. = 1; $\chi^2 = 14.2$; $P < 0.01$). Also, boys showed significantly higher IAT scores compared with girls (39.6 ± 13.4 vs. 33.6 ± 11.7; d.f. = 533; t = 5.47; $P < 0.01$) (Table 1).

IAT scores correlated significantly with domains of inattention ($r = 0.35$, $P < 0.001$), hyperactivity-impulsivity ($r = 0.29$, $P < 0.001$), and total K-ARS scores ($r = 0.34$, $P < 0.001$). Correlations between IAT and K-ARS scores remained significant ($P < 0.001$) after controlling for other confounding variables, such as withdrawal, somatic complaints, anxiety/depression, social immaturity, and internalizing problems as measured by the K-CBCL (Table 2).

There was no significant difference in self-perceived socioeconomic status between groups. The Internet addiction group preferred playing games to other Internet usage including chatting, news, email, and surfing. The rate of game as a main usage compared to other activities was significantly higher in the Internet addiction group (73.8%) than the non-addiction group (51.9%; $\chi^2 = 13.2$; d.f. = 1; $P < 0.01$). Internet use time was significantly longer in the Internet addiction group than in the non-addiction group. The Internet addiction group reported a more frequent past personal history of addictive behavior for other activities (16.3%), most commonly using video games, compared with the non-addiction group (6.4%; $\chi^2 = 9.2$; d.f. = 1; $P < 0.01$) but not in the family history of other kinds of addiction (Table 3).

The Internet addiction group had significantly higher scores in inattention (15.8 ± 10.1 vs. 9.3 ± 7.9; d.f. = 533; t = 6.54; $P < 0.01$), hyperactivity-impulsivity (11.5 ± 9.3 vs. 6.7 ± 7.0; d.f. = 533; t = 5.43; $P < 0.01$), and total K-ARS scores (27.4 ± 18.4 vs. 16.0 ± 14.3; d.f. = 533; t = 6.30; $P < 0.01$) than the non-addiction group, both in parent's and teacher's ratings (Table 4).

The Internet addiction group had significantly higher T-scores than the non-addiction group in ADHD-related subcategories in K-CBCL including attention problems, delinquent behavior, aggressive behavior, externalizing problems, and total problems. Also, the Internet addiction group showed significantly

Table 1. Characteristics of attention deficit hyperactivity disorder symptoms and Internet addiction in children

	Boys ($n = 264$)		Girls ($n = 271$)		t (d.f. = 533)/χ^2	Difference between genders	All children ($n = 535$)
	Mean ± SD	Range	Mean ± SD	Range			Mean ± SD
Age	11.1 ± 1.0	9–13	11.1 ± 1.0	9–13	$t = -0.47$	$P = 0.99$	11.1 ± 1.0
SES (%)							
Above middle	183 (69.3)		188 (69.4)		$\chi^2 = 0.00$ (d.f. = 1)	$P = 1.00$	
Below middle	72 (27.3)		74 (27.3)				
K-ARS							
Inattention	13.3 ± 8.9	0–43	7.2 ± 7.2	0–50	8.76	$P < 0.01$	10.2 ± 8.6
Hyp-imp	10.1 ± 8.5	0–38	4.8 ± 5.4	0–43	8.60	$P < 0.01$	7.4 ± 7.6
Total scores	23.4 ± 16.6	0–95	12.0 ± 12.0	0–76	9.12	$P < 0.01$	17.7 ± 15.5
Mean scores	39.6 ± 13.4	20–88	33.6 ± 11.7	20–84	5.47	$P < 0.01$	36.6 ± 12.9
IAT							
Frequency (%)							
Mild (20–49)	209 (79.2)		246 (90.8)				455 (85.0)
Moderate (50–79)	51 (19.3)		24 (8.9)		$\chi^2 = 14.2$ (d.f. = 1)	$P < 0.01$	75 (14.0)
Severe (80–100)	4 (1.5)		1 (0.4)			5 (0.9)	

K-ARS, The sum of rating scores of parents and teachers.

ADHD, attention deficit hyperactivity disorder; SES, Socio-economic status; K-ARS, Korean version of ADHD rating scale; Hyp-Imp, Hyperactivity-impulsivity; IAT, Young's Internet Addiction test.

Table 2. Correlations between levels of Internet addiction and attention deficit hyperactivity disorder symptoms

	IAT scores		Partial correlation coefficients controlling for				
	r	*P*	Social withdrawal	Somatic complaints	Anxiety depression	Social immaturity	Internalizing problems
Inattention							
Parents	0.31**	<0.01	0.29**	0.30**	0.28**	0.26**	0.26**
Teachers	0.27**	<0.01	0.25**	0.26**	0.22**	0.21**	0.21**
Total inattention	0.35**	<0.01	0.34**	0.35**	0.33**	0.32**	0.33**
Hyp-Imp							
Parents	0.25**	<0.01	0.28**	0.29**	0.27**	0.26**	0.28**
Teachers	0.23**	<0.01	0.24**	0.24**	0.22**	0.22**	0.23**
Total Hyp-Imp Scores	0.29**	<0.01	0.29**	0.30**	0.27**	0.27**	0.27**
Total K-ARS Scores	0.34**	<0.01	0.33**	0.34**	0.32*	0.31*	0.31*

*$P < 0.05$; **$P < 0.01$.

ADHD, attention deficit hyperactivity disorder; IAT, Young's Internet addiction test; K-ARS, Korean version of ADHD rating scale; Hyp-Imp, Hyperactivity-impulsivity.

Table 3. Characteristics of Internet usage in the Internet addiction and non-addiction groups

	Internet addiction group ($n = 80$)	Non-addiction group ($n = 455$)	t (d.f. = 533)/χ^2	*P*
Age (mean ± SD)	11.3 ± 0.9	11.0 ± 1.0	$t = 2.60$	0.01
Socioeconomic status (%)				
Above middle	70.7	72.9	$\chi^2 = 0.05$ (d.f. = 1)	0.82
Low	29.3	27.1		
Time being spent for Internet use† (%)				
<40 (hours/week)	64 (80.0)	444 (98.7)	59.49	<0.01
≥40 (hours/week)	16 (20.0)	6 (1.3)		
Duration of Internet use† (%)				
<12 months	19 (24.4)	144 (31.9)	1.79	0.18
≥12 months	59 (75.6)	307 (68.1)		
Main usage† (%)				
Chatting	2 (2.5)	19 (4.2)		
Game	59 (73.8)	236 (51.9)		
Email	15 (18.8)	162 (35.6)		
Others‡	4 (5.0)	38 (8.4)		
Previous addiction§ (%)	13 (16.3)	29 (6.4)	$\chi^2 = 9.17$ (d.f. = 1)	<0.01
Family addiction¶ (%)	4 (5.0)	15 (3.3)	$\chi^2 = 0.62$ (d.f. = 1)	0.43

†Responses are less then complete; ‡includes news, surfing, etc.; §percentage subjects with a personal history of addiction to other activities or substances (the total number of responses in addiction and non-addiction groups, $n = 69$ and 452, respectively); ¶percentage subjects with a family history of addiction to other activities or substances (the total number of responses in addiction and non-addiction groups, $n = 67$ and 448, respectively).

higher degrees of withdrawal, somatic complaints, anxious/depressed, social problems, thought problems, and internalizing problems, than the non-addiction group did. However, there were no significant differences in school competence, total social competence, and emotional lability (Table 5).

The ADHD group reported more history of other addictive behaviors in the past (25.5%) than the non-ADHD group (3.2%; $\chi^2 = 13.25$; d.f. = 1; $P < 0.01$). There was no significant difference in the frequency of addictive behaviors among family members between groups (Table 6).

Table 4. Comparison of attention deficit hyperactivity disorder symptoms between the Internet addiction and the non-addiction groups

	Internet addiction group† (n = 80)	Non-addiction group† (n = 455)	t (d.f. = 533)/χ^2	P
Inattention				
Parents	7.9 ± 5.3	4.7 ± 4.2	t = 6.03	P < 0.01
Teachers	8.0 ± 6.9	4.6 ± 5.4	t = 4.94	P < 0.01
Total inattention	15.8 ± 10.1	9.3 ± 7.9	t = 6.54	P < 0.01
Hyp-Imp				
Parents	5.8 ± 4.9	3.3 ± 3.9	t = 4.94	P < 0.01
Teachers	5.8 ± 6.7	3.4 ± 4.7	t = 3.96	P < 0.01
Total Hyp-Imp	11.5 ± 9.3	6.7 ± 7.0	t = 5.43	P < 0.01
Total K-ARS	27.4 ± 18.4	16.0 ± 14.3	t = 6.30	P < 0.01
ADHD group‡ (%)	18 (22.5)	37 (8.1)	χ^2 = 18.22 (d.f. = 1)	P < 0.01

†Internet addiction group, IAT score ≥ 50, non-addiction group ≤ 49; ‡the total number of subjects who belong to 'ADHD group'.

ADHD, attention deficit hyperactivity disorder,Hyp-Imp, Hyperactivity-impulsivity; K-ARS, Korean version of ADHD rating scale.

Table 5. Comparison of the Korean Child Behavior Checklist† between Internet addiction group and non-addiction groups

	Internet addiction group (n = 80)	Non-addiction group (n = 455)	t (d.f. = 519)	P
Social	50.1 ± 12.7	53.6 ± 13.2	–2.13	P < 0.05
School	52.2 ± 12.1	54.1 ± 11.8	–1.27	0.20
Total social competence	50.4 ± 15.4	54.1 ± 15.5	–1.91	0.06
Withdrawn	52.8 ± 12.5	45.5 ± 16.2	3.74	P < 0.01
Somatic complaints	49.5 ± 8.8	47.0 ± 8.1	2.48	P < 0.05
Anxious/depressed	50.3 ± 9.6	46.0 ± 8.7	4.01	P < 0.01
Social problems	53.4 ± 9.6	48.1 ± 8.5	4.90	P < 0.01
Thought problems	50.7 ± 9.0	47.7 ± 6.1	3.69	P < 0.01
Attention problems	52.0 ± 9.8	46.3 ± 8.6	5.26	P < 0.01
Delinquent behavior	50.3 ± 9.8	46.9 ± 7.4	3.59	P < 0.01
Aggressive behavior	51.4 ± 11.1	45.1 ± 9.3	5.38	P < 0.01
Internalizing problems	50.6 ± 9.3	45.3 ± 9.1	4.74	P < 0.01
Externalizing problems	51.4 ± 11.0	44.9 ± 9.4	5.50	P < 0.01
Total behavior problems	51.3 ± 10.1	44.5 ± 9.6	5.75	P < 0.01
Sex problems	22.7 ± 24.3	29.7 ± 24.0	–2.36	P < 0.05
Emotional lability‡	21.9 ± 23.9	25.9 ± 21.4	–1.47	0.14

†T-Scores of subcategories of K-CBCL; ‡emotional lability is a Korean-specific subcategory.

K-CBCL, Korean Child Behavior Checklist.

The ADHD group showed significantly higher IAT scores than the non-ADHD group (44.1 ± 16.4 vs. 30.1 ± 9.0; d.f. = 116; t = –5.8; P < 0.001). Consequently, 32.7% of the ADHD group and 3.2% of the non-ADHD group met criteria for the Internet addiction group (χ^2 = 18.22; d.f. = 1; P < 0.001) (Table 6). Of the subjects, 22.5% in the Internet addiction group and 8.1% in the non-addiction group belonged to the ADHD group (χ^2 = 18.22; d.f. = 1; P < 0.001) (Table 4).

DISCUSSION

In our study, 80 (14.9%) of the total 535 students met the criteria of definite or probable Internet addiction,

Table 6. Comparison of Internet addiction score between attention deficit hyperactivity disorder and non-attention deficit hyperactivity disorder groups

	ADHD group ($n = 55$)[†]	Non-ADHD group ($n = 63$)[‡]	t (d.f. = 116)/χ^2	P
Previous addiction[§] (%)	14 (25.5)	2 (3.2)	$\chi^2 = 13.25$	$P < 0.01$
Family addiction[¶] (%)	6 (10.9)	4 (6.3)	$\chi^2 = 1.68$	0.20
IAT score	44.1 ± 16.4	30.1 ± 9.0	$t = -5.82$	$P < 0.01$
Internet addiction group[††] (%)	18 (32.7)	2 (3.2)	$\chi^2 = 18.22$	$P < 0.01$

[†]ADHD group, upper 10 percentile of each subset and total K-ARS scores; [‡]non-ADHD group, lower 10 percentile of each subset and total K-ARS scores; [§]the number of subjects with a personal history of addiction to other activities or substances; [¶]the number of subjects with a family history of addiction to any activities or substances; [††]the number of subjects who belong to the Internet addiction group.

ADHD, attention deficit hyperactivity disorder; IAT, Young's Internet Addiction test.

as measure by IAT. This prevalence of Internet addiction in children is similar to the prevalences reported in adults (14.6%)[19] or in 2nd year high school students (14.3%).[20]

ADHD symptoms, both in inattention and hyperactivity–impulsivity domains, had significant positive correlations with the degree of Internet addiction. The Internet addiction group had greater ADHD symptoms compared with the non-addiction group. The ADHD group had a greater severity of Internet addiction than the non-ADHD group. Also, the ADHD group had a greater prevalence of Internet addiction than the non-ADHD group. Vice versa is also true. These findings may suggest that ADHD symptoms, both in inattention and hyperactivity-impulsivity domains, may be, potentially, important risk factors for Internet addiction.

The current study started from our clinical impression that children and adolescents with ADHD tended to indulge in watching television (especially shows and cartoons), video games, and Internet surfing while being reluctant to engage in tasks which require sustained mental efforts. Our findings are in line with our clinical observations.

There may be presumptive explanations for the above results. First, at the level of the behavioral regulation, children with ADHD may have deficiencies of attention, strategic flexibility, planning, working memory, and self-monitoring of behavior.[21,22] Evidence for behavioral dys-regulation comes from studies using stop signal paradigm.[23] Deficient inhibitory control and the lack of strategic flexibility in subjects with ADHD may interfere with the self-regulation of Internet use.

Second, hypotheses regarding the cognitive regulation in subjects with ADHD may explain our findings. According to the Sonuga-Barke's hypothesis (2002),[24] cognitive and motivational dysfunction in subjects with ADHD causes changes in quality/quantity of task engagement, and preference for immediate rewards and events over delayed ones. In a similar context, the tendency of stimulation-seeking in children with ADHD has been reported.[25] Internet use characteristically provides ever-changing, multimodal stimuli and an immediate reward with a minimal delay. Consequently, Internet use may fit the cognitive style of ADHD very well. The fact that the children in the Internet addiction group are more involved in games than in other usages also supports this assumption, as games are the most stimulating and immediately rewarding activities on the Internet.

In addition, Internet addiction may be a compensatory activity for poor social skills, interpersonal difficulties, and the lack of pleasure in the daily lives of children with ADHD. To exclude this possibility, we examined the correlations between IAT scores and K-ARS scores after controlling for possible confounding variables from the K-CBCL. Even after these confounding variables were taken into consideration, the degree of ADHD symptoms per se, correlated with the severity of Internet addiction.

It would be noteworthy to remark on the relationships between ADHD symptoms and addictive behaviors for substances. Prior studies have suggested poor neurocognitive skills in ADHD children as an independent risk factor for substance-related disorders, while others suggested the role of the conduct disorder as a mediator for substance related disorders.[11,12,26,27] There has been one report that the hyperactivity and poor executive cognitive capacity in late childhood was an important risk factor for substance use in early adolescence.[28] In addition, the notion of 'reward deficiency hypothesis' proposes that individuals who are less satisfied with natural rewards tend to adopt substances as

a way to seek an enhanced stimulation of the reward pathways.[29,30] Internet addiction can serve as another relatively new kind of 'unnatural reward'. Reward deficiency hypothesis may be potentially important in studying the relationship between ADHD and addictive behaviors.

Findings of the current study also indicate that the Internet addiction group had a more frequent history of addictive behaviors or preoccupations for other activities such as reading comic books, watching television, purchasing toys, listening to music, and most commonly, playing video games. We think that the addictive behavior for Internet use may be regarded, in the future, to be in the continuum with other kinds of addictions, especially alcohol and other substances.

In addition, we think it is worthwhile to consider the relationship between game addiction and Internet addiction. Many subjects with Internet addiction have previous histories of addictive behaviors for video games, and the main usage of the Internet in the subjects in the Internet addiction group, was game. However, we think that Internet game addiction cannot displace Internet addiction because even the subjects in the Internet addiction group reported other usages of the Internet except game, although they were not the primary usage.

Limitations of the current study include: (i) This study was a descriptive, cross-sectional study. Prospective study is required to define ADHD symptoms as a long-term risk factor for Internet addiction; (ii) The diagnosis of Internet addiction needs to be refined with standardized diagnostic tools to improve the reliability and validity; (iii) Due to the lack of a structured clinical interview, the presence of high-function pervasive developmental disorder could not be excluded, which is required by the DSM-IV or International Classification of Diseases (10th revision) in order to make a diagnosis of ADHD; and (iv) The subjects who scored high on the K-ARS and IAT did not receive child psychiatric evaluation, the diagnosis of ADHD and other psychiatric diagnosis by clinical and structured assessment was not possible in this study. We suggest, therefore, that further studies include the following: (i) diagnostic evaluation of the subjects who scored high on the K-ARS and IAT, using standardized diagnostic tools; and (ii) assessment of the relationship between the neurocognitive function associated with attention deficit/hyperactivity-impulsivity symptoms and Internet addiction.

In conclusion, we report significant associations between ADHD symptoms and the severity of Internet addiction in children. Our findings suggest that the presence of ADHD symptoms may play a role as an important risk factor of addictive behaviors for Internet use.

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