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Internet addiction and self-evaluated attention-deficit hyperactivity disorder traits among Japanese college students

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Abstract

Aim—Internet addiction (IA), also referred to as Internet use disorder, is a serious problem all over the world, especially in Asian countries. Severe IA in students may be linked to academic failure, attention-deficit hyperactivity disorder (ADHD), and forms of social withdrawal, such as

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DISCLOSURE STATEMENT

All authors have nothing to declare. The views expressed in the manuscript are those of the authors and do not necessarily represent the views of the Department of Veterans Affairs.

AUTHOR CONTRIBUTIONS

Corresponding author (M.T.T.) served as a primary coordinator of this study by proposing the idea and drafting the study protocol. M.T.T., A.T., M.W., and T.K. contributed to conception and design of the study protocol. M.T.T., T.S., and M.T.Y. collected and analyzed the data. M.T.T. drafted a manuscript, and all authors supervised the writing, commented on the revisions of the article, and approved the final manuscript.

hikikomori. In this study, we performed a survey to investigate the relation between IA and ADHD symptoms among college students.

Methods—Severity of IA and ADHD traits was assessed by self-report scales. Subjects were 403 college students (response rate 78%) who completed a questionnaire including Young's Internet Addiction Test (IAT) and the Adult ADHD Self-Report Scale–V1.1.

Results—Out of 403 subjects, 165 were male. The mean age was 18.4 ± 1.2 years, and mean total IAT score was 45.2 ± 12.6. One hundred forty-eight respondents (36.7%) were average Internet users (IAT < 40), 240 (59.6%) had possible addiction (IAT 40–69), and 15 (3.7%) had severe addiction (IAT ≥ 70). Mean length of Internet use was 4.1 ± 2.8 h/day on weekdays and 5.9 ± 3.7 h/day on the weekend. Females used the Internet mainly for social networking services while males preferred online games. Students with a positive ADHD screen scored significantly higher on the IAT than those negative for ADHD screen (50.2 ± 12.9 vs 43.3 ± 12.0).

Conclusion—Our results suggest that Internet misuse may be related to ADHD traits among Japanese youth. Further investigation of the links between IA and ADHD is warranted.

Keywords

attention-deficit hyperactivity disorder; hikikomori; Internet addiction; Internet use disorder; neurodevelopmental disorders

The japanese ministry of Internet Affairs and Communications reported that the Internet diffusion rate was 82.8% in 2014.[1] The Internet has become an indispensable tool for our daily lives. However, as the number of Internet users becomes higher, problems related to Internet use become more serious too.[2]

There has been an ongoing debate as to whether Internet addiction (IA) is a psychiatric disorder.[3] Young initially proposed provisional diagnostic criteria for subjects with problematic Internet use with her naming of 'Internet addiction' in reference to DSM-IV-TR criteria for substance dependence,[4] and some regard it as one type of behavioral addiction.[5] In response to this debate on conceptualizing problematic Internet use, Young revised her definition of IA and made it closer to an impulse-control disorder.[6] In DSM-5,[7] Internet gaming disorder is listed in a chapter of 'Conditions for Further Study,' though the term 'IA' has been used more casually to describe individuals with pathological Internet use.[8]

Recent epidemiological studies demonstrate that IA may be a common problem all over the world, especially in Asian countries.[5,9–12] A report from Taiwan revealed that the prevalence of IA among elementary and junior high school students was higher than 10%.[13] In Japan, the prevalence rate of IA has been reported to range between 2.8% and 9.9% among youths.[14] Although IA is related to various psychiatric conditions,[15] several previous studies have demonstrated that attention-deficit hyperactivity disorder (ADHD) is one of the most common comorbidities of IA[16–19] with an 83.8% comorbidity rate among adolescents who were referred to a child and adolescent psychiatry clinic in Turkey.[20]

In this study, we investigated the relation between IA and self-reported ADHD traits among college students in Japan.

METHODS

The subjects of this study were 515 new students of five colleges in Sapporo, Japan. Initially, research collaborators for data collection were recruited through the social network of the first author of this paper. Then, five teachers of five colleges agreed to participate in this study voluntarily and distributed questionnaire sheets as printed matter in their classrooms, bringing the total number of subjects to 515. The study questionnaire consisted of questions about demographics (age, sex, etc.), Internet use (purpose, methods, length of Internet use on weekdays and weekend, etc.), Adult ADHD Self-Report Scale (ASRS)-V1.1 Part A (ADHD Screener)[21] and Young's Internet Addiction Test (IAT).[22]

The IAT consists of 20 questions regarding Internet use that all begin with a sentence of 'How often do you', for example, 'How often do you find that you stay online longer than you intended?' Response choices are: 1 = rarely, 2 = occasionally, 3 = frequently, 4 = often, and 5 = always. The IAT is used to assess the level of IA with a score range of 20–100. In this study, we assessed the severity of Internet problems based on the original cut-off points proposed by Young.[22] The scores on IAT for each group in this study were: 20–39 points for an average user, 40–69 for possible addiction, and 70–100 points for severe addiction.

The ASRS was developed in conjunction with the World Health Organization and a workgroup on adult ADHD that consisted of experts in this field. The ASRS-V1.1 Symptom Checklist has two parts: Part A (six items) and Part B (12 items). These 18 items correlate closely with diagnostic criteria of ADHD in DSM-IV-TR. The ASRS asks respondents about the past 6 months and uses a 5-point response scale (never, rarely, sometimes, often, and very often). The ASRS V-1.1 Part A is recommended as a screening tool for adult ADHD.[23] When four or more items are more frequent than the cut-off in Part A (sometimes or more frequent for Q1 to Q3, and often or more frequent for Q4 to Q6), the respondents are advised to undergo further clinical assessment for the diagnosis of ADHD.

We distributed anonymous questionnaires, with response to the questionnaire deemed indicative of consent. Statistical analyses were performed by using STATFLEX Ver.6. The study protocol was approved by the ethics committee of Tokiwa Hospital prior to data collection.

RESULTS

There were a total of 403 respondents (165 male, 233 female, and five unknown) with a response rate of 78.3%. The mean age was 18.4 ± 1.2 years. Regarding the main method for using the Internet, 43.0% and 50.3% of male students used a computer and smartphone, respectively, while 81.1% of females used a smartphone exclusively. When we asked the purpose of Internet use, 39.4% of males answered Internet gaming, whereas 75.1% of females used it for social networking services, such as Facebook, Twitter, and LINE (a free application for smartphones often used for [group] chatting). The mean length of Internet use was 4.1 ± 2.8 h (male 4.0 ± 2.6 h/female 4.1 ± 2.9 h) on weekdays and 5.9 ± 3.7 h (male 6.0 ± 3.7/female 5.9 ± 3.7) on weekends. The group comparison based on the purpose of

Internet use revealed that gamers spent more time on the Internet (4.53 ± 3.0 h on weekdays, 6.12 ± 2.9 on weekends, $P < 0.01$).

The overall IAT score was 45.2 ± 12.6, with 148 (36.7%) average Internet users (IAT < 40), 240 (59.6%) having possible addiction (IAT 40–69), and 15 (3.7%) with severe addiction (IAT ≥70). Following previous studies that regarded subjects with ≥70 on IAT as addiction,[14] the rate of IA was 3.7% in this study. The largest epidemiological survey on IA in Japan using Young's scale (IAT) demonstrated that, among 15 191 high school students, 59.8% (55.4% male and 63.7% female) of them had a possible addiction (IAT ≥ 40), and the rate of severe addiction (IAT ≥ 70) was 4.6% (3.9% male and 5.2% female).[24] Our results are consistent with these results. In regards to sex difference, mean IAT score, and the rates of average Internet users, possible addicts, and severe addicts in each sex were as follows: 45.4 ± 12.6, 60 (36.4%), 97 (58.8%), and 8 (4.9%) in males; and 44.9 ± 12.6, 87 (37.3%), 139 (59.7%), and 7 (3.0%) in females, respectively.

Concerning self-acknowledged ADHD traits, 109 out of 403 subjects (27.0%: 29.7% male, 25.3% female) screened positive on the ASRS V1.1 Part A. A two-group comparison (Student's *t*-test) between those with and without a positive ADHD symptom screen showed no difference in time spent on the Internet, both on weekdays (4.23 ± 3.1 vs 4.10 ± 2.7, $P = 0.6960$) and the weekend (6.11 ± 3.8 vs 5.87 ± 3.6, $P = 0.5582$) (Fig. 1). However, students with a positive ADHD screen scored significantly higher on the IAT (50.2 ± 12.9 vs 43.3 ± 12.0, $P = 0.0001$) (Fig. 2). In regard to the severity of problematic Internet use according to the total score on the IAT, in the group of students without a positive ADHD screen ($n = 294$), the proportions of average users, possible addicts, and severe addicts were 41.5%, 56.5%, and 2.0%, respectively (Fig. 3). On the other hand, among students with a positive ADHD screen, these were 23.9%, 67.9%, and 8.3%, respectively. Among 403 subjects, only nine students (four male and five female) had both a positive ADHD screen and severe addiction on the IAT.

DISCUSSION

In the DSM-5, Internet gaming disorder is included in 'Conditions for Further Study,' which suggests that the condition could be recognized as an independent clinical entity in a future revision. According to diagnostic criteria in the DSM-IV-TR, IA was categorized into Impulse-Control Disorder Not Otherwise Specified provisionally in clinical settings because of the common underlying psychopathology with other behavioral addictions.[5] Recent studies have demonstrated commonalities between ADHD and IA in terms of clinical manifestations and biological pathophysiology, especially impaired function of the prefrontal cortex.[25–27]

To the best of our knowledge, the present study is the first to demonstrate the relation between IA and ADHD traits among Japanese college students, who have a higher educational level than the general population, and our results are consistent with previous studies that have revealed high comorbidity rates of Internet overuse in ADHD, especially in Asian countries.[13,16,19,20]

The results of the present study suggest that those who screened positive for ADHD appear more likely to be problematic Internet users. We speculate that ADHD traits, such as impulsivity, could be related to difficulty in controlling Internet and online gaming use.

The latest comprehensive literature review from Canada suggests that there may be a link between IA and *hikikomori*,[28] a form of prolonged social withdrawal,[29–33] in that intense and sustained Internet use may naturally lead individuals to become recluses in their own rooms with little social contact. Our case-vignette study has demonstrated the possibility of diagnosing *hikikomori* cases as IA in South Korea.[34] A Korean study on *hikikomori* reported a high comorbidity rate of ADHD and/or IA in *hikikomori* cases.[35] It is also notable that our male college students favored online gaming in their Internet use while female students used the Internet mainly for social networking. In Japan, LINE, a free application for text chatting on smartphones, is the most common tool for the youth to communicate with each other. In addition, *hikikomori* is known to be much more common in males. Thus, it may be that males with Internet use problems are more prone than females to *hikikomori*, given their preference for Internet use that does not center on social communication.

This study has several limitations; for example, the sample size was limited, and only college students were invited to participate. Furthermore, ADHD was screened by self-report, and none of our subjects underwent further evaluations for clinical diagnosis according to the DSM-5. Also, scales for Internet use, such as the IAT, have limited validity. It has been reported that subjects with IA could have one or more psychiatric comorbidities.[15] However, we did not assess any psychiatric symptoms related to depression, anxiety disorder, sleep disorder, and so forth in this study.

To the best of our knowledge, this is the first study to investigate the relation between ADHD traits and IA in Japanese college students. A notable finding of our study is that many of the subjects were aware of problems in regard to Internet use along with their ADHD-related symptoms, such as inattention, impulsivity, and hyperactivity. We used two self-report scales based on self-knowledge behaviors; thus, it is possible that, although our participants were aware of the inappropriateness of their behavior, they were unable to regulate their behavior.

In response to the incredibly rapid increase of Internet users, the number of people with problematic Internet use has been increasing. We need to intervene with the youth who overuse the Internet as early as possible. Appropriate education for students on how to use the Internet properly will be necessary. We await further studies in this emerging field.

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References

1. Ministry of Internal Affairs and Communications. Information and Information Communications Technology. Japan Ministry of Internal Affairs and Communications; Tokyo: 2015.
2. Greist J. The Internet: Every good thing has a dark side. World Psychiatry. 2010; 9:95–96. [PubMed: 20671895]
3. Griffiths MD, Kuss DJ, Billieux J, Pontes HM. The evolution of Internet addiction: A global perspective. Addict Behav. 2016; 53:193–195. [PubMed: 26562678]
4. Young KS. Psychology of computer use: XL. Addictive use of the internet: A case that breaks the stereotype. Psychol Rep. 1996; 79:899–902. [PubMed: 8969098]
5. Aboujaoude E. Problematic internet use: An overview. World Psychiatry. 2010; 9:85–90. [PubMed: 20671890]
6. Young KS. Internet addiction: The emergence of a new clinical disorder. Cyberpsychol Behav. 1998; 1:237–244.
7. American Psychiatric Association. Diagnostic and Statistical Manual of Mental Disorders: DSM-5. American Psychiatric Association; Washington, DC: 2013.
8. Shaw M, Black DW. Internet addiction: Definition, assessment, epidemiology and clinical management. CNS Drugs. 2008; 22:353–365. [PubMed: 18399706]
9. Yen CF, Yen JY, Ko CH. Internet addiction: Ongoing research in Asia. World Psychiatry. 2010; 9:97. [PubMed: 20671897]
10. Cao F, Su L. Internet addiction among Chinese adolescents: Prevalence and psychological features. Child Care Health Dev. 2007; 33:275–281. [PubMed: 17439441]
11. Kim K, Ryu E, MY C, et al. Internet addiction in Korean adolescents and its relation to depression and suicidal ideation: A questionnaire survey. Int J Nurs Stud. 2006; 43:185–192. [PubMed: 16427966]
12. Park SK, Kim JY, Cho CB. Prevalence of Internet addiction and correlations with family factors among South Korean adolescents. Adolescence. 2008; 43:895–909. [PubMed: 19149152]
13. Chen YL, Chen SH, Gau SS. ADHD and autistic traits, family function, parenting style, and social adjustment for Internet addiction among children and adolescents in Taiwan: A longitudinal study. Res Dev Disabil. 2015; 39:20–31. [PubMed: 25617844]
14. Nakayama H, Higuchi S. Internet addiction. Nihon Rinsho. 2015; 73:1559–1566. (in Japanese). [PubMed: 26394521]
15. Ko CH, Yen JY, Yen CF, Chen CS, Chen CC. The association between Internet addiction and psychiatric disorder: A review of the literature. Eur Psychiatry. 2012; 27:1–8. [PubMed: 22153731]
16. Cao F, Su L, Liu T, Gao X. The relationship between impulsivity and Internet addiction in a sample of Chinese adolescents. Eur Psychiatry. 2007; 22:466–471. [PubMed: 17765486]
17. Chou WJ, Liu TL, Yang P, Yen CF, Hu HF. Multidimensional correlates of Internet addiction symptoms in adolescents with attention-deficit/hyperactivity disorder. Psychiatry Res. 2015; 225:122–128. [PubMed: 25466226]
18. Dalbudak E, Evren C, Aldemir S, Taymur I, Evren B, Topcu M. The impact of sensation seeking on the relationship between attention deficit/hyperactivity symptoms and severity of Internet addiction risk. Psychiatry Res. 2015; 228:156–161. [PubMed: 25962354]
19. Ho RC, Zhang MW, Tsang TY, et al. The association between Internet addiction and psychiatric co-morbidity: A meta-analysis. BMC Psychiatry. 2014; 14:183. [PubMed: 24947851]
20. Bozkurt H, Coskun M, Ayaydin H, Adak I, Zoroglu SS. Prevalence and patterns of psychiatric disorders in referred adolescents with Internet addiction. Psychiatry Clin Neurosci. 2013; 67:352–359. [PubMed: 23859664]
21. Kessler RC, Adler L, Ames M, et al. The World Health Organization Adult ADHD Self-Report Scale (ASRS): A short screening scale for use in the general population. Psychol Med. 2005; 35:245–256. [PubMed: 15841682]
22. Young, KS. Caught in the Net: How to Recognize the Signs of Internet Addiction – and a Winning Strategy for Recovery. Wiley; New York:

23. Kessler RC, Adler LA, Gruber MJ, Sarawate CA, Spencer T, Van Brunt DL. Validity of the World Health Organization Adult ADHD Self-Report Scale (ASRS) Screener in a representative sample of health plan members. Int J Methods Psychiatr Res. 2007; 16:52–65. [PubMed: 17623385]
24. Institute for Information and Communications Policy. Survey on Usage of Application Software for Smartphone and Internet Addiction Among High School Students. Ministry of Internal Affairs and Communications; Tokyo: 2014.
25. Balconi M, Finocchiaro R. Deficit in rewarding mechanisms and prefrontal left/right cortical effect in vulnerability for Internet addiction. Acta Neuropsychiatr. 2016:1–14.
26. Nie J, Zhang W, Chen J, Li W. Impaired inhibition and working memory in response to internet-related words among adolescents with Internet addiction: A comparison with attention-deficit/hyperactivity disorder. Psychiatry Res. 2016; 236:28–34. [PubMed: 26778632]
27. Sepede G, Tavino M, Santacroce R, Fiori F, Salerno RM, Di Giannantonio M. Functional magnetic resonance imaging of Internet addiction in young adults. World J Radiol. 2016; 8:210–225. [PubMed: 26981230]
28. Stip E, Thibault A, Beauchamp-Chatel A, Kisely S. Internet addiction, hikikomori syndrome, and the prodromal phase of psychosis. Front Psychiatry. 2016; 7:6. [PubMed: 26973544]
29. Teo AR. A new form of social withdrawal in Japan: A review of hikikomori. Int J Soc Psychiatry. 2010; 56:178–185. [PubMed: 19567455]
30. Teo AR, Fetters MD, Stufflebam K, et al. Identification of the hikikomori syndrome of social withdrawal: Psychosocial features and treatment preferences in four countries. Int J Soc Psychiatry. 2015; 61:64–72. [PubMed: 24869848]
31. Teo AR, Gaw AC. Hikikomori, a Japanese culture-bound syndrome of social withdrawal? A proposal for DSM-5. J Nerv Ment Dis. 2010; 198:444–449. [PubMed: 20531124]
32. Tateno M, Park TW, Kato TA, Umene-Nakano W, Saito T. Hikikomori as a possible clinical term in psychiatry: A questionnaire survey. BMC Psychiatry. 2012; 12:169. [PubMed: 23061675]
33. Kato TA, Shinfuku N, Sartorius N, Kanba S. Are Japan's hikikomori and depression in young people spreading abroad? Lancet. 2011; 378:1070. [PubMed: 21924990]
34. Kato TA, Tateno M, Shinfuku N, et al. Does the 'hikikomori' syndrome of social withdrawal exist outside Japan? A preliminary international investigation. Soc Psychiatry Psychiatr Epidemiol. 2012; 47:1061–1075. [PubMed: 21706238]
35. Lee YS, Lee JY, Choi TY, Choi JT. Home visitation program for detecting, evaluating and treating socially withdrawn youth in Korea. Psychiatry Clin Neurosci. 2013; 67:193–202. [PubMed: 23683149]

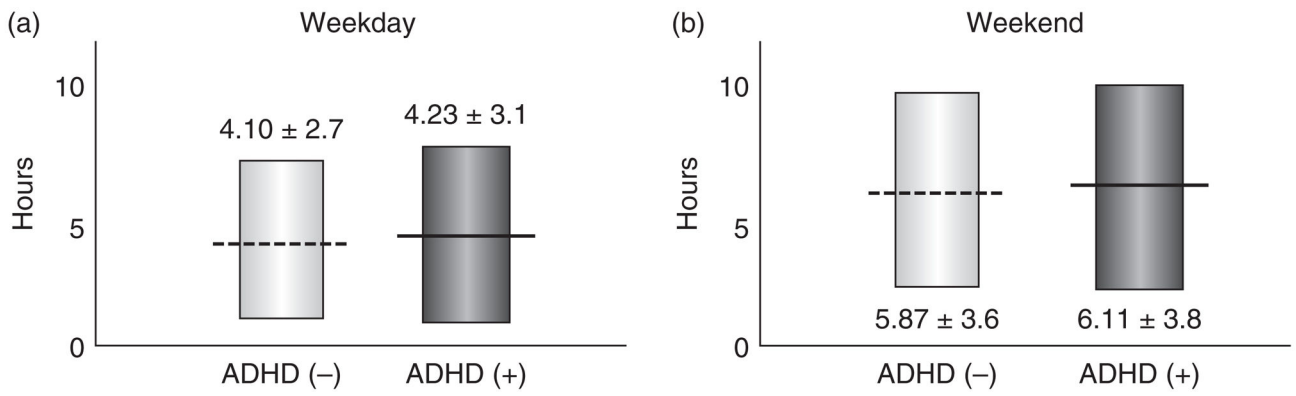

Figure 1.

Mean length of daily Internet use on (a) weekdays and (b) the weekend for individuals screened for attention-deficit hyperactivity disorder (ADHD) symptoms. Students with and without ADHD traits spent the same amount of time on the Internet.

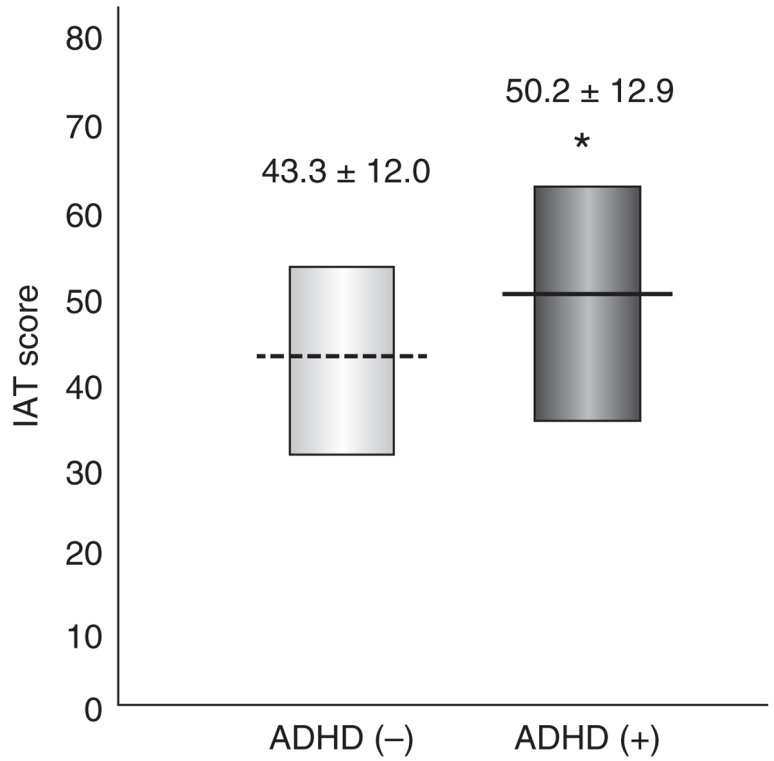

Figure 2.
Severity of Internet addiction assessed by total Internet Addiction Test (IAT) score for individuals screened for attention-deficit hyperactivity disorder (ADHD) symptoms. The total IAT score was significantly higher in students with ADHD traits (*P = 0.0001).

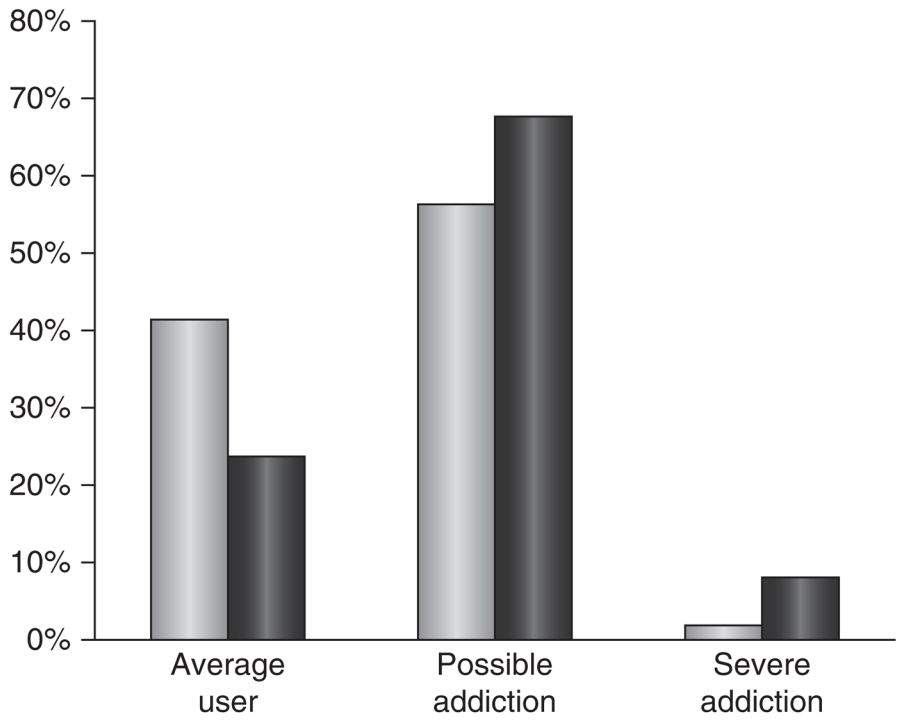

Figure 3.

Severity of Internet use was stratified by students' attention-deficit hyperactivity disorder (ADHD) screening results. In students ( ), without ADHD traits (n = 294), the proportion of average users, possible addicts, and severe addicts was 41.5%, 56.5%, and 2.0%, respectively. On the other hand, in students ( ), with ADHD traits, it was 23.9%, 67.9%, and 8.3%, respectively.