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Internet Addiction and Attention-Deficit/Hyperactivity Disorder Traits among Female College Students in Japan

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Objectives: Previous studies have reported that internet addiction (IA) is associated with attention-deficit/hyperactivity disorder (ADHD) consistently. However, in terms of gender, there are controversial findings. We aimed to investigate the relation between IA and self-acknowledged ADHD traits among female college students in Japan.
Methods: The study questionnaire consisted of questions about demographics, Adult ADHD Self-Report Scale-V1.1 Part A (ADHD screener) and Young's Internet Addiction Test (IAT). When four or more items are more frequent than the cut-off on ADHD screener, the subject was categorized into students with a positive ADHD screen. We defined students with total IAT score of 70 and higher as IA.
Results: A total number of respondents was 369 (mean age: 19.0±0.7 years). Seventy-seven subjects were screened positive on ADHD screener (20.9%). Students with a positive ADHD screen scored significantly higher on the IAT (54.2±14.2 vs. 42.5±11.3). The rates of IA in students with and without a positive ADHD screen were 18.2% and 1.0%, respectively.
Conclusion: Results of this study demonstrated the relation between IA and self-evaluated ADHD traits among female college students in Japan. Appropriate education for students on how to use the internet properly will be necessary to prevent IA.

Key Words: Internet addiction; Internet gaming disorder; Pathological internet use; Internet over use; Developmental disorder; Attention-deficit/hyperactivity disorder.

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INTRODUCTION

In the past decade, internet addiction (IA) has gained widespread attention globally and the internet has become ubiquitous in daily life. Indeed, the number of internet users in Japan has exceeded 100 million.[1] As the number of internet users increases, problems related to internet overuse have become more serious and complex.[2] The reported prevalence of IA is extremely variable, ranging from less than 2% to more than 30%, mainly due to differences in methodology applied in each study.[3-7] However, there is a general agreement among researchers that the problem of IA is more serious in Asian countries.[8]

A consistent finding regarding IA is the high rate of associated psychiatric comorbidity. Common psychiatric comorbidities of IA include mood disorders, anxiety disorders, sleep disorders, other addictive disorders, and attention-deficit/hyperactivity disorder (ADHD).[9-11] Young,[12] a psychologist in the United States, initially proposed provisional diagnostic criteria for individuals with problematic internet use, which she named 'internet addiction,' with reference to the Diagnostic and Statistical Manual of Mental Disorders-IV-TR (DSM-IV-TR) criteria for substance dependence. After some lively debate on conceptualizing problematic internet use, Young[12] revised her definition of IA and brought it closer to an impulse-control disorder. Subsequently, many researchers regard IA as a type of behavioral addiction.[13] Although only internet gaming disorder is listed in the conditions for Further Study section of DSM-5,[14] the term IA has been used more casually to describe individuals with problems regarding internet overuse.

ADHD is characterized by symptoms of inattention, hyperactivity, and impulsivity and has a reported prevalence in adults of approximately 3%.[14] Clinical symptoms of ADHD can impair daily functioning and quality of life in various ways. In some cases, ADHD can negatively impact the lives of patients and their families through comorbid IA, affecting finances, education, and relationships.

We have previously reported on the relationship between

IA and self-reported ADHD traits among Japanese college students,[15] with results that are consistent with findings from other countries. Both male and female students screening positively for ADHD scored significantly higher on a self-rating scale assessing IA than did those screening negatively for ADHD. However, the effect of gender on the relationship between IA and ADHD remains unclear. A systematic review by Wang et al.[16] reported that there was a significant sex difference, with a significantly higher rate of IA in male than in female individuals. In contrast, Yen's group have reported that the association between IA and ADHD is more significant among female college students than among male students.[17]

In this study, we aimed to investigate the relationship between IA and self-acknowledged ADHD traits among female college students in Japan.

METHODS

Participants

This study was conducted in a similar manner to our previous study.[15] Briefly, research collaborators for data collection were recruited through the social network of the first author. College teachers voluntarily agreed to participate in this study as research collaborators. After a verbal explanation of the study in the classroom, the research collaborators distributed the questionnaire sheets as printed matter to students who agreed to participate in the study voluntarily (provisional consent). The students were requested to complete the questionnaire in their classroom. We distributed anonymous questionnaires, with response to the questionnaire deemed indicative of consent.

In this study, we defined participants who received the questionnaire as subjects and those who filled out the questionnaire completely as respondents. Therefore, we recruited 500 female college students as subjects in this study. Some of the subjects withdrew their provisional consent to participate in this study after reading the questionnaire. Questionnaire sheets without responses to self-rating scales were excluded from the statistical analyses. As a result, among 500 subjects, 369 students completed the questionnaire and were included in this study as respondents.

Self-rating scales

The study questionnaire comprised questions about demographics and internet use, the Adult ADHD Self-Report Scale (ASRS)-V1.1 Part A,[18] and Young's Internet Addiction Test (IAT).[12,13]

The ASRS was developed in conjunction with the World Health Organization and a workgroup on adult ADHD that consisted of experts in the field.[18] The ASRS-V1.1 Symptom Checklist has two parts: Part A (6 items) and Part B (12 items). These 18 items correlate closely with the DSM-IV-TR diagnostic criteria for ADHD. The ASRS asks respondents about the past 6 months and uses a 5-point response scale (never, rarely, sometimes, often, and very often). The 6 items of the ASRS-Part A are as follows: 'How often do you have trouble wrapping up the final details of a project, once the challenging parts have been completed? (Q1),' 'How often do you have difficulty getting things in order when you have to do a task that requires organization? (Q2),' 'How often do you have problems remembering appointments or obligations? (Q3),' 'When you have a task that requires a lot of thought, how often do you avoid or delay getting started? (Q4),' 'How often do you fidget or squirm with your hands or feet when you have to sit down for a long time? (Q5),' and 'How often do you feel overly active and compelled to do things, like you were driven by a motor? (Q6).' ASRS-Part A is recommended as a screening tool for adult ADHD. When 4 or more out of 6 items are more frequent than the cut-off in Part A (sometimes or more frequent for Q1−Q3, and often or more frequent for Q4−Q6), the respondents have symptoms highly consistent with adult ADHD and are advised to undergo further clinical assessment.

Although the ASRS V-1.1 Part A should be used to assess the number of items that are more frequent than the cut-off we used the scale in this study in a modified manner. To investigate the correlation between IA severity and the level of self-acknowledged ADHD traits, we tentatively designated scores to the response choices regarding frequency as follows: 1=never, 2=rarely, 3=sometimes, 4=often, and 5=very often. Thus, total scores for the ADHD screen ranged from 6 to 30.

The IAT comprises 20 questions regarding internet use that all begin with '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 scores ranging from 20 to 100. In this study, we assessed the severity of internet problems based on the original cut-offs proposed by Young[12] to define the groups in this study as follows: 20−39 points for an average user, 40−69 points for possible addiction, and 70−100 points for severe addiction.

Statistical analyses

Statistical analyses were performed with StatFlex Ver. 6 (Artech Co., Ltd., Osaka, Japan). A two-group comparison between those with and without a positive ADHD screen was performed with Student's t-test. To investigate the association between mean IAT score and total ASRS score, a

Pearson's correlation coefficient was calculated. Statistical significance was set at $p<0.05$.

Ethics

We strove to protect personal information of the participants. Questionnaires were anonymous, with a response to the questionnaire deemed indicative of consent. The study protocol was approved by the Ethics Committee of Tokiwa Hospital prior to data collection (IRB No. TH-20160418-1). This study was conducted in accordance with the principles of the Declaration of Helsinki.

RESULTS

Results are summarized in Table 1. The total number of respondents was 369, with a mean age of 19.0±0.7 years. Regarding the purpose of internet use, 78.41% of respondents reported using it for social networking services and only 10.3% reported using it for internet gaming.

With regard to self-evaluated ADHD traits, 77 out of 369 participants (20.9%) screened positively on the ASRS-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 on weekdays (5.9±4.3 vs. 5.0±4.0, p=0.122). In contrast, there was a significant difference in time spent on the internet at the weekend (8.2±4.8 vs. 6.6±4.6, p=0.013). As shown in Table 1, students with a positive ADHD screen scored significantly higher on the IAT (54.2±14.2 vs. 42.5±11.3, p<0.001).

Concerning the severity of problematic internet use represented by total IAT scores, in the group of students with a positive ADHD screen (n=77), the proportion of average users, possible addicts, and severe addicts were 13.0%, 68.8%, and 18.2%, respectively. In contrast, among 292 students without a positive ADHD screen, only 3 students (1.0%) were classified into the severe addiction group with the IAT. These results are summarized in Fig. 1. A chi-squared test revealed that this was statistically significant (p<0.001).

To investigate the association between total IAT scores and the ADHD screen, a Pearson's correlation coefficient was calculated, which suggested a statistically significant relationship as shown in Fig. 2 (r=0.5222, p<0.0001).

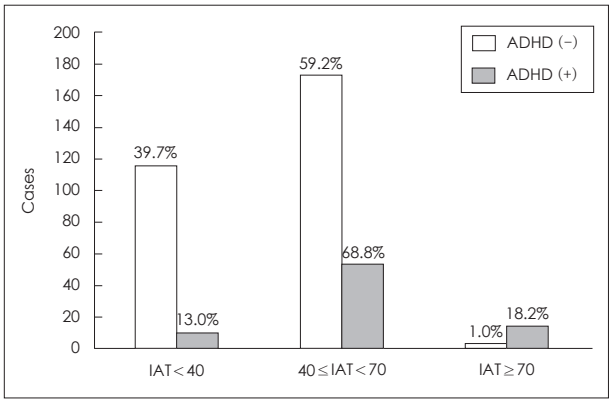

Fig. 1. Distribution of the severity of internet addiction. ADHD: attention-deficit/hyperactivity disorder, IAT: Internet Addiction Test.

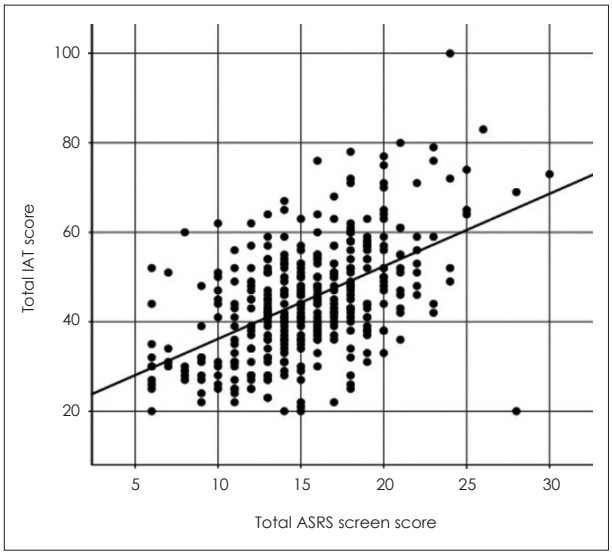

Fig. 2. Correlation between total IAT score and total ASRS screen score. ASRS: Adult attention-deficit/hyperactivity disorder Self-Report Scale, IAT: Internet Addiction Test.

Table 1. Summary of the results

	Total (n=369)	ADHD (−) (n=292)	ADHD (+) (n=77)	p value
Age	19.0±0.7	19.0±0.7	19.1±0.8	0.183
Internet use (hrs)				
Weekdays	5.2±4.1	5.0±4.0	5.9±4.3	0.122
Weekend	7.0±4.7	6.6±4.6	8.2±4.8	0.013
Mean IAT score	44.9±12.9	42.5±11.3	54.2±14.2	<0.001
IAT<40 (%)	126 (34.1)	116 (39.7)	10 (13.0)	
40≤IAT<70 (%)	226 (61.2)	173 (59.2)	53 (68.8)	
IAT ≥70 (%)	17 (4.6)	3 (1.0)	14 (18.2)	

ADHD: attention-deficit/hyperactivity disorder, IAT: Internet Addiction Test

DISCUSSION

In parallel with the rapid increase internet users, the number of people with IA has also increased steeply, especially among young people. It is necessary for us to intervene with children and adolescents who may overuse the internet as early as possible to avoid negative outcomes. To enable this, we must understand which individuals are prone to be addicted to the internet. Our results suggest that female college students with self-acknowledged ADHD traits have a higher risk of IA than do those without ADHD traits.

Our results demonstrate that Japanese female college students spend longer on the internet than we anticipated. For example, current college students tend not to refer to a conventional dictionary but rather use the internet when they write a paper. Indeed, internet use for academic purposes might increase the time spent on the internet by college students.

Previously, IA was provisionally categorized as an Impulse-Control Disorder Not Otherwise Specified in clinical settings because of common underlying psychopathology shared with other behavioral addictions. Impulsivity is one the three core features of ADHD along with inattention and hyperactivity. We speculate that ADHD traits, in particular impulsivity, could be related to difficulty in controlling internet and online gaming use. Accumulating evidence demonstrates the commonalities between IA and ADHD in terms of biological pathophysiology, such as impaired function of the prefrontal cortex.[19-21] Han et al.[22] reported that methylphenidate might decrease time spent gaming online among adolescents with ADHD.

Results from our previous study revealed that the rate of IA in college students with and without a positive ADHD screen were 8.3% and 2.0%, respectively,[15] The difference we observed in the current study was more prominent than the previous, with rates of IA in college students with and without a positive ADHD screen observed as 18.2% and 1.0%, respectively. We do not have a clear explanation for these differences in the results, which may have been affected by sampling bias.

Our previous study demonstrated that male college students mainly used the internet for online gaming while female students mainly used the internet for social networking.[15] In Japan, women access the internet via smartphones more frequently than do men. The most common tool via which young people communicate with each other online is LINE, a free application for text chatting on smartphones. The mobility of a smartphone bind users to the internet anywhere and anytime. In contrast, among male internet users, intense and sustained internet use may subsequently lead them to become recluses in their own rooms to enjoy online gaming with little social contact with others (hikikomori).[23-26] Our previous case-vignette study has demonstrated the possibility of diagnosing cases of hikikomori as IA in South Korea.[27] Furthermore, a Korean study reported a high comorbidity rate of ADHD and IA in hikikomori cases[28] Moreover, hikikomori is known to be much more common in men. Indeed, men with internet overuse may be more prone than women to hikikomori because of their preference for internet use that does not center around social communication. Our current results demonstrate that female college students spend longer time on the internet on the weekend than on weekdays. Because the participants in this study were recruited in the classroom, there were no cases of hikikomori. Less internet use on weekdays might simply reflect the fact that the students are attending college classes. However, we assume that even female students prefer to spend time with friends online than being with their friends in person.

With regard to the prevalence of ADHD, clinical studies indicate a prevalence of 3% among adults, with a male to female ratio approaching 1:1 with increased age.[14,29] In this study, one-fifth of female college students screened positively for ADHD traits and these individuals scored higher on the IAT compared with those without a positive ADHD screen. These results suggest that there would is a substantial number of young females with IA proneness and we should be aware of the potential risk of IA among female college students.

This study has several limitations that should be borne in mind when interpreting our results. For example, the sample size was too small to draw certain conclusions, and only female college students were included. Moreover, scales for internet use, such as the IAT, have limited validity and reliability. Although it has been reported that individuals with IA often have psychiatric comorbidities,[30] we did not assess any psychiatric symptoms related to depression, anxiety disorder, sleep disorder, etc. Furthermore, none of our participants underwent further evaluations for clinical diagnosis according to the DSM-5.

CONCLUSION

The present study demonstrated the relationship between IA and self-evaluated ADHD traits among female college students in Japan, who have a higher educational level than the general population. Our results are consistent with previous studies that have revealed high comorbidity rates of IA and ADHD. The number of people with IA is increasing and appropriate education for students about how to use the

internet appropriately will be necessary. Further studies are therefore required in this field to increase our understanding of IA and related psychiatric symptoms, and the associated risk factors.

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Conflicts of Interest

The authors have no financial conflicts of interest.

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