Prevalence rate of Internet addiction among Japanese college students: Two cross-sectional studies and reconsideration of cut-off points of Young’s Internet Addiction Test in Japan

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Aim: Due to variation in estimates of the prevalence of Internet addiction (IA) in prior research, we conducted two cross-sectional studies over 2 years investigating the prevalence rate of IA in college students in Japan and reconsidered appropriate cut-off points of a self-rating scale to screen possible IA.

Methods: This study was composed of two parts: survey I in 2014 and survey II in 2016, which were conducted in the same schools with an interval of 2 years. The study questionnaire included questions about demographics and Internet use, and Young’s Internet Addiction Test (IAT). Additionally, the subjects in survey II were asked about self-reported IA.

Results: There were 1005 respondents in total with a mean age (±SD) of 18.9 ± 1.3 years. The mean IAT scores remained stable between 2014 and 2016: 45.2 ± 12.6 in survey I and 45.5 ± 13.1 in survey II (overall mean IAT score of 45.4 ± 13.0). With respect to self-reported IA in survey II, a total of 21.6% admitted to having IA (score of 5 or 6 on a 6-point Likert scale). We categorized these subjects as IA, and the remainder as non-IA. The mean IAT score showed a significant difference between these two groups (57.8 ± 14.3 vs 42.1 ± 10.7, P < 0.001).

Conclusion: The severity of IA symptoms among Japanese college students has appeared stable in recent years, with mean IAT scores of over 40. Our results suggest that a screening score cut-off of 40 on the IAT could be reconsidered and that 50 might be proposed for the cut-off.

Key words: behavioral addiction, Internet addiction, Internet gaming disorder, Internet use disorder, pathological Internet use.

THE NUMBER OF Internet users in Japan has reached over 100 million and the penetration rate of the Internet was 83.5% in 2015.1 The Internet has changed our lives dramatically and has become a daily necessity globally. However, as Greist has pointed out, every good thing has a dark side and many Internet users suffer from Internet-related problems. One of them is Internet addiction (IA), otherwise referred to as ‘Internet use disorder,’ ‘Internet overuse,’ or ‘pathological Internet use.’ IA is not listed as a psychiatric disorder in the DSM-5 or ICD-10. Nonetheless, there is ongoing debate as to whether IA is a clinical entity in psychiatry, which dates back about two decades to the first
proposal of diagnostic criteria for patients with problematic Internet use by Kimberly Young in 1996. Young revised her definition of IA 2 years later and made it closer to an impulse-control disorder in the DSM-IV. In the DSM-5’s chapter on Conditions for Further Study, only Internet gaming disorder – problematic Internet overuse for gaming – is included; however, the term IA has been used more frequently to describe individuals with severe Internet overuse.

Accumulating studies demonstrate that IA may be a common mental health problem all over the world. With an increase of interests and concerns in IA in society, many studies have been conducted to investigate the prevalence of IA. However, the rate of IA shows extreme variability, ranging from only 1.6% to as high as 36.7%, mainly due to differences in methods applied in each study.

In addition, since IA often has comorbid psychiatric disorders, early detection and early intervention for IA is of great concern among all medical professions. For this purpose, making use of existing screening tools with a reliable cut-off point would be necessary. However, the cut-off points for each study have not been uniform. For example, studies from Italy and China set the cut-off point of Young’s Internet Addiction Test (IAT) at 50, while many studies from Japan have applied an IAT cut-off point of 40.

In this study, we conducted two cross-sectional studies over 2 years to investigate the prevalence rate of IA in Japanese college students and reconsidered the appropriate IAT cut-off points in Japan.

METHODS

Participants

This study was composed of two parts: survey I in 2014 and survey II in 2016, which were conducted in the same schools with an interval of 2 years. The subjects of this study were students of five colleges in Sapporo, Japan. In survey I, a study questionnaire was distributed to a total of 515 new students of the five colleges. In survey II, a study questionnaire was distributed to new students and some students in the second-year classes of the same five colleges involved in survey I. A total of 800 questionnaire sheets were distributed in survey II. None of the students were involved in both survey I and II because the students invited to survey I were only new students of the 2-year college course.

In this study, we defined the subjects who received the questionnaire in the classroom as participants and those who filled out the questionnaire completely as respondents. The sex ratio of the respondents is reported in Table 1.

### Table 1. Summary of the results

<table>
<thead>
<tr>
<th></th>
<th>Total (Male/female/blank)</th>
<th>Survey I (n=403)</th>
<th>Survey II (n=602)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Whole n=1005 (345/626/34)</td>
<td>(165/233/5)</td>
<td>(180/393/29)</td>
</tr>
<tr>
<td>Age (years)</td>
<td>18.9 ± 1.3</td>
<td>18.4 ± 1.2</td>
<td>19.3 ± 1.3</td>
</tr>
<tr>
<td>(Male/female)</td>
<td>(18.9 ± 1.4/18.9 ± 1.3)</td>
<td>(18.5 ± 1.4/18.4 ± 1.2)</td>
<td>(19.3 ± 1.3/19.3 ± 1.2)</td>
</tr>
<tr>
<td>Mean IAT score</td>
<td>45.4 ± 13.0</td>
<td>45.2 ± 12.6</td>
<td>45.5 ± 13.2</td>
</tr>
<tr>
<td>(Male/female)</td>
<td>(45.8 ± 13.3/44.9 ± 13.0)</td>
<td>(45.4 ± 12.6/44.9 ± 12.6)</td>
<td>(46.2 ± 14.0/44.9 ± 12.9)</td>
</tr>
<tr>
<td>IAT &lt; 40</td>
<td>349 (34.7%)</td>
<td>148 (36.7%)</td>
<td>201 (33.4%)</td>
</tr>
<tr>
<td>IAT &lt; 50</td>
<td>644 (64.1%)</td>
<td>258 (64.0%)</td>
<td>386 (64.0%)</td>
</tr>
<tr>
<td>40 ≤ IAT &lt; 70</td>
<td>613 (61.0%)</td>
<td>240 (59.6%)</td>
<td>373 (62.0%)</td>
</tr>
<tr>
<td>50 ≤ IAT &lt;70</td>
<td>318 (31.6%)</td>
<td>130 (32.3%)</td>
<td>188 (31.2%)</td>
</tr>
<tr>
<td>IAT ≥ 70</td>
<td>43 (4.3%)</td>
<td>15 (3.7%)</td>
<td>28 (4.7%)</td>
</tr>
</tbody>
</table>

The results are expressed as mean ± SD. The results in each sex are shown in parentheses in order of male/female.
Measures

The study questionnaire for survey I consisted of questions about demographics (age, sex, etc.) and Internet use (purpose, methods, length of Internet use on weekdays and weekend, etc.). The Adult ADHD Self-Report Scale (ASRS)-V1.1 Part A (ADHD Screener) and Young’s IAT were also included.

The IAT consists of 20 questions regarding frequency of Internet use. All questions begin with a sentence of ‘How often do you;’ for example, ‘How often do you find that you stay online longer than you intended?’ (Q1).’ The questions comprise several facets of behavioral addiction, such as preoccupation, loss of control, and psychological dependence. Response choices are: 1 = rarely, 2 = occasionally, 3 = frequently, 4 = often, and 5 = always. The IAT score range is 20–100. The reliability and validity of the Japanese version of the IAT has been investigated.

The ASRS was developed as a screening tool for adult ADHD in conjunction with the World Health Organization and a workgroup on adult 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 ADHD Screener includes the following six items: ‘How often do you have trouble wrapping up the final details of a project, once the challenging parts have been done?’ (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). In the ADHD screener, when four or more items are more frequent than the cut-off (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. These six out of 18 questions were found to be the most predictive of symptoms consistent with ADHD (sensitivity = 68.7%, specificity = 99.5%). The reliability and validity of the Japanese version of the ASRS has been reported.

Some of the results of survey I have been reported previously, focusing on the relation between IA and self-evaluated ADHD traits.

A study questionnaire for survey II was similar to that of survey I with an additional question regarding self-reported dependency on the Internet. The subjects were asked to answer a question – ‘Are you addicted to the Internet?’ on 6-point Likert scale (6 = strongly agree, 5 = agree, 4 = slightly agree, 3 = slightly disagree, 2 = disagree, and 1 = strongly disagree). A Likert scale is a psychometric scale commonly applied in a survey using questionnaires. We have used a Likert scale to measure the degree of agreement with certain statements in our previous studies. In referring to a large-scale survey using a 6-point Likert scale, we developed a simple self-reported dependency scale on the Internet, in which scores of 5 or 6 were considered as representing addiction.

Procedure

Initially, research collaborators for data collection were recruited through the social network of the first author of this paper. Then, one teacher from each of the five colleges agreed to participate in this study voluntarily. After verbal explanation of the study in their classrooms, the research collaborators distributed the questionnaire sheets as printed matter to students who were eager to participate in the study after college classes. The students were asked to complete the questionnaire in their classrooms and to put it in a collection box at an exit of the classroom. Respondents anonymously answered the questions. It took about 10 to 15 min for them to complete the questionnaire. Questionnaire sheets with blank answer(s) on the IAT were excluded from statistical analyses.

Statistical analyses

Statistical analyses were performed by using StatFlex Ver. 6 (Artech Co., Ltd., Osaka, Japan). Study results were expressed as mean ± SD for continuous variables and as percentages for categorical variables. For two-group comparisons, data were analyzed using Welch’s t-test. In all cases, statistical significance was set at P < 0.05.

Ethics

The study protocol was approved by the ethics committee of Tokiwa Hospital prior to data collection. In addition, each college obtained permission from its Institutional Review Board or equivalent committee. Questionnaires were anonymous with response
to the questionnaire deemed indicative of consent. This study was conducted according to the principles of the Declaration of Helsinki.

RESULTS

Primary results are summarized in Table 1. The result of each sex is described in parentheses. There were 1005 respondents in total (403 respondents in survey I and 602 in survey II) with an overall response rate of 76.4% (78.3% and 75.3%, respectively). The mean age was 18.9 ± 1.3 years overall (18.4 ± 1.2 in survey I and 19.3 ± 1.3 in survey II). Because survey I invited new students exclusively while survey II involved some second-year students, the mean age of the subjects in these two studies showed significant difference (P < 0.001). In survey I, the mean length of Internet use was 4.13 ± 2.8 h on weekdays and 5.94 ± 3.7 h per day on the weekend, and these values were significantly shorter than those of survey II, which were 5.38 ± 4.2 h on weekdays and 7.27 ± 4.9 h per day on the weekend (P < 0.001 for both). However, the IAT scores in both studies were similar: 45.2 ± 12.6 in survey I and 45.5 ± 13.1 in survey II (P = 0.7717), making an overall IAT score of 45.4 ± 13.0.

When we asked the purpose of Internet use in survey I, 39.4% of male respondents answered ‘Internet gaming,’ whereas 75.1% of female respondents used it for social networking services. Similarly, in survey II, 36.1% of male respondents answered ‘Internet gaming’ while 78.4% of female respondents answered ‘social networking services.’

Concerning self-acknowledged ADHD traits and IA, a two-group comparison between those with and without a positive ADHD symptom screen demonstrated that students with a positive ADHD screen scored significantly higher on the IAT in both survey I (50.2 ± 12.9 [n = 109] vs 43.3 ± 12.0 [n = 294], P < 0.001) and survey II (53.9 ± 14.5 [n = 134] vs 43.1 ± 11.8 [n = 468], P < 0.001). It should be noted that the mean IAT score in each group was higher than 40.

In regard to sex difference of the mean IAT score, there were no statistically significant differences between male and female respondents: overall (male vs female), 45.8 ± 13.3 vs 44.9 ± 13.0 (P = 0.290); survey I, 45.4 ± 12.6 vs 44.9 ± 12.6 (P = 0.317); and survey II, 46.2 ± 14.0 vs 44.9 ± 12.9 (P = 0.294).

The severity of Internet problems can be categorized based on the cut-off points on the IAT proposed by Young. The scores on the IAT for each group in initial analyses were: 20–39 points for an average user, 40–69 for possible addiction, and 70–100 points for severe addiction. Furthermore, referring to some previous studies, we included a cut-off point of 50 for addition. The results are shown in Table 1.

With respect to self-reported IA in survey II, a total of 21.6% (130/602) admitted to having IA (score of 5 or 6 on the 6-point Likert scale). For further analysis to explore an optimal cut-off on IAT for college students in Japan, we defined these 130 subjects as IA in this study, and the remainder (n = 472) as non-IA. The distribution of IAT scores for both the IA group and the non-IA group is represented in Figure 1. The mean IAT score showed a significant difference between these two groups (57.8 ± 14.3 vs 42.1 ± 10.7, P < 0.001).

DISCUSSION

Internet technology has changed our daily lives dramatically. Adolescents and young adults in particular may be attracted by and preoccupied with various online activities. Consequently, the number of people with problematic Internet use may be increasing. In response to increasing interest in IA, a large number of studies have been carried out. Accumulating evidence on IA has demonstrated several consistent findings, such as the high rate of psychiatric comorbidity, close relation to ADHD symptoms, and the globalization of this phenomena. However, the prevalence rate of IA in previous studies shows extreme variability.

The large variance in prevalence rate of IA could be explained by the fact that the diagnostic criteria for IA has not yet been validated. There are several proposed diagnostic criteria for IA. Young proposed a diagnostic questionnaire for IA referring to the DSM-IV criteria for pathological gambling. Diagnostic criteria by Ko et al. reflect four main components of addiction: excessive use, tolerance, withdrawal, and functional impairment. Chen et al. also proposed a diagnostic tool, named the Chen Internet Addiction Scale, which is often used in Chinese-speaking countries. The frequency of the use of these diagnostic instruments highly depends on the place or country of each study.
Among numerous diagnostic instruments and diagnostic criteria proposed thus far, Young’s IAT has been used most casually and frequently. In Japan, many previous studies investigating the prevalence of IA have used three score categories (20–39, 40–69, and 70–100). A cut-off point of 40 for possible addiction seems too low to be used as a screener because in our previous study as many as 63.3% of 403 college students met this criterion. The mean IAT scores in both of our surveys were higher than 40: 45.2 ± 12.6 in survey I and 45.5 ± 13.2 in survey II. Our unpublished results of a survey on IA among Japanese high-school students demonstrated that the mean IAT score was 45.2 ± 12.6 in total (n = 456, mean age of 16.2 ± 0.7 years), 43.8 ± 13.4 in boys (n = 215) and 44.8 ± 14.2 in girls (n = 241). The mean IAT scores reported by So et al. were higher than 40 in respective groups of autism spectrum disorder (ASD) and/or ADHD in adolescents in Japan: ASD alone, 45.2 ± 17.3 (n = 83); ADHD alone, 42.7 ± 19.1 (n = 24); and ASD + ADHD, 47.9 ± 22.3 (n = 25). All these results suggest that an IAT cut-off of 40 is too low to screen possible IA in Japanese adolescents and young adults.

Young initially proposed her diagnostic criteria and the cut-off points two decades ago when Internet use and penetration were much lower. As the number of Internet users has increased, the cut-off points of assessment tools for IA should be reconsidered. Different cut-off points, such as 40, 50, 70, and 81 on the IAT would produce very different prevalence rates. The subjects and the time period are also substantial factors for studies. The great difference in the prevalence of IA reported from previous studies may result from differences in, for example, age, occupation, place of residence, and the timing of the cross-sectional studies. We repeated two cross-sectional studies on IA among college students. Comparison of the two surveys’ results from 2014 and 2016 showed nearly identical IAT scores. The replication of findings from our previous survey after a 2-year period helps validate the results.

Our primary challenge in this pair of surveys was to estimate the most appropriate IAT cut-off point to identify subjects with higher risk of developing IA, which is considered as a behavioral addiction. Psychiatrists commonly rely on interviews and/or self-reports to diagnose behavioral addictions. As the clinical diagnosis of behavioral addiction relies, in part, on self-awareness of the uncontrollability of an impulse, we provisionally diagnosed subjects who had self-reported being addicted to the Internet as having IA, which resulted in an overall IA prevalence of 21.6%. When it is used as a screener, the IAT needs to rule out subjects with lower risk of developing IA. As we mentioned above, several studies whose subjects were adolescents or young adults reported that mean IAT scores were higher than 40. Osada investigated the reliability and validity of the

![Figure 1. Distribution of Young’s Internet Addiction Test (IAT) scores in Internet addiction (IA) group and non-IA group. Upper and lower bars indicate the number of respondents in each score category on Young's IAT in the non-IA and IA groups, respectively. The vertical lines indicate the total IAT scores of 40, 50, 70, and 100.](image)
Japanese version of the IAT by applying Young’s Diagnostic Questionnaire of IA to 299 college students (aged 19.4 ± 2.67 years, 184 male, 115 female). As a result, Osada proposed an IAT cut-off point of 53 to screen possible IA. Recently, Kimberly Young, a developer of the IAT, used the cut-off point of 50 for the presence of a moderate level of addiction. In her unpublished manuscript, she reports that a total IAT score of 30 and under is considered to reflect a normal level of Internet usage, total scores of 31–49 show the presence of a mild-level addiction, 50–79 represent the presence of a moderate level, and sores of 80–100 indicate a severe dependence upon the Internet (K. Young, unpub. obs., 2010). Taken together, considering the steep increase of Internet usage for our daily living, based on our results, we propose that a cut-off of 50 on IAT be used to define possible addiction for studies in regard to IA in Japan.

The mean length of Internet use in survey II was significantly longer than in survey I (5.38 ± 4.2 h vs 4.13 ± 2.8 h on weekdays and 7.27 ± 4.9 h vs 5.94 ± 3.7 per day on the weekend, P < 0.001 for both). However, the IAT scores in both surveys were similar: 45.5 ± 13.1 in survey II and 45.2 ± 12.6 in survey I (P = 0.772). This result might be explained by the purpose of Internet use. Survey II included second-year college students who use the Internet for job hunting or performing other web searches to write reports. Using the Internet for academic purposes might have affected the self-perception of Internet overuse.

This study has several limitations. A significant weakness of this study is a lack of a reliable external criterion for IA when we explored an optimal IAT cut-off in survey II. To validate an optimal cut-off value in a certain self-rating scale, a sound external criterion should be provided. In this study, IA was screened by self-report alone. None of our subjects underwent further evaluations by clinical professions, nor were we able to verify diagnosis of IA. Scales for Internet use, such as the IAT, have limited validity. The sample size of this study was limited. Only college students were invited to participate in this study.

To the best of our knowledge, this is the first study in Japan to repeat cross-sectional studies that investigate the prevalence rate of IA in college students. A notable finding of our study is that the mean IAT scores were over 40 and almost the same in each sample. Given that a cut-off of 40 has frequently been used in prior research in Japan, our results suggest that this cut-off should be reconsidered.

In response to the rapid increase of Internet users, the number of people with problematic Internet use has been increasing. We need to intervene in cases of young people overusing 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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DISCLOSURE STATEMENT

None of the authors has anything 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 an idea and drafting a study protocol. M.T.T., A.T., and T.K. contributed to conception and design of the study protocol. M.T.T., M.S., and M.T.Y. collected and analyzed data. M.T.T. drafted a manuscript, and all authors supervised writing, commented on the revisions of the article, and approved the final manuscript.

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