

Proposed Diagnostic Criteria of Internet Addiction for Adolescents

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Abstract: The aims of the present study were to develop diagnostic criteria of Internet addiction for adolescents and to examine the discriminating potential and validity of diagnostic criteria by an empirical community study among adolescent populations. We developed 13 candidate diagnostic criteria for characteristic symptoms of Internet addiction in adolescents. A total of 468 adolescents completed the Chen Internet Addiction Scale (CIAS) and were systematically assessed for Internet-using behaviors by seven psychiatrists using the diagnostic interview schedule. The sensitivity, specificity, and diagnostic accuracy of the 13 candidate diagnostic criteria were analyzed with references to the interviewers' global clinical impressions and CIAS results. The cutoff point of the diagnostic criteria to differentiate the Internet-addicted subjects with nonaddicted ones was then determined by the best diagnostic accuracy and the receiver operating characteristic curve. This study selected nine of the 13 candidate diagnostic criteria to construct the diagnostic criteria of Internet addiction for adolescents, which were composed of three main criteria: characteristic symptoms of Internet addiction, functional impairment secondary to Internet use, and exclusive criteria. The diagnostic criteria had high diagnostic accuracy, specificity, negative predictive value, accepted sensitivity, and accepted positive predictive rate. The validity of the diagnostic criteria proposed in this study was further confirmed by comparing the demographic and Internet-using characteristics between those with and without Internet addiction. The diagnostic criteria for Internet addiction can provide health care professionals with a means to communicate and make comparisons of clinical cases.

Key Words: Internet addiction, diagnostic criteria, adolescents.

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Although the Internet is a convenience in modern life, a high proportion of adolescents have developed an addiction to Internet use, which has impaired these individuals' psychological well-being, peer and family interactions, and academic performance (Young, 1998). Addiction to Internet use developed during adolescence might impede adolescents' achievement of psychosocial developmental tasks (Mitchell, 2000). It is important to explore the clinical characteristics of addiction to Internet use among adolescents to form the basis of preventive and interventional strategies. Because Internet use behaviors are prevalent in adolescent populations (Lin and Tsai, 2002), constructing diagnostic criteria to differentiate problematic with nonproblematic Internet use is essential for identifying the cases for whom intervention is necessary.

The clinical features of behavioral problems related to Internet use have been described in various ways, including "Internet addiction disorder" (Bai et al., 2001), "pathological Internet use" (Young, 1998), and "problematic Internet use" (Shapira et al., 2000). Several researchers have tried to construct diagnostic criteria for this clinical issue. Young (1998) modified the diagnostic criteria of pathological gambling in DSM-IV (American Psychiatric Association, 1994) to construct diagnostic criteria for pathological Internet use. He has defined those having five or more of eight characteristic symptoms as cases of pathological Internet use. Shapira et al. (2003) has also proposed diagnostic criteria for problematic Internet use according to the concepts of impulse control disorder in DSM-IV-TR (American Psychiatric Association, 2000), and suggested that it is necessary to exclude behavioral changes secondary to mania (Shapira et al., 2003). According to the concepts of behavioral addiction, Griffiths (1996) has proposed that six characteristic symptoms are necessary to define a behavior as addictive. These symptoms are salience, mood modification, tolerance, withdrawal, conflict, and relapse. However, the diagnostic criteria proposed by Young (1998), Shapira et al. (2003), and Griffiths (1996) were established based on researchers' reviews of the literature and lack empirical evidence to support their contents and cutoff point.

Establishing diagnostic criteria of Internet addiction among adolescents based on empirical studies is critically necessary for the purposes of diagnosis and intervention. The aim of the present study was to develop diagnostic criteria of Internet addiction for adolescents. The discriminating poten-

tial and validity of candidate characteristic symptoms in diagnostic criteria were analyzed by an empirical community study among adolescent populations.

METHODS

Diagnostic Criteria of Internet Addiction

We developed 13 candidate diagnostic criteria for characteristic symptoms of Internet addiction in adolescents according to (1) diagnostic criteria of impulse control disorder and substance use disorder in DSM-IV-TR (American Psychiatric Association, 2000); (2) diagnostic criteria of Internet addiction in previous studies (Christensen

et al., 2001; Griffiths, 1996; Hansen, 2002; Shapira et al., 2003; Young, 1998); and (3) clinical experiences from interviews with 70 subjects visiting a special clinic for problematic Internet use at Kaohsiung Medical University Hospital (Table 1). Based on the candidate diagnostic criteria, we developed the structured diagnostic interview schedule to detect subjects' characteristics of Internet use behavior. There were two or three probing questions to clarify every candidate's criterion, and the subject was determined to have the characteristic symptoms when he/she responded positively to any question for the criterion. The colloquial expressions of probing questions in the structured diagnostic interview

TABLE 1. Profile of Candidate Diagnostic Criteria for Internet Addiction

Criterion	Addictive (N = 72)	Nonaddictive (N = 318)	Sensitivity	Specificity	Diagnostic Accuracy
1. Recurrent failure to resist the impulse to use the Internet					
Yes	63	58	87.5%	81.8%	82.9%
No	9	260			
2. Increased sense of tension immediately before logging onto the Internet					
Yes (32.6%)	44	83	61.1%	73.9%	71.6%
No	28	235			
3. Pleasure, gratification, and relief at the time of logging onto the Internet					
Yes (47.7%)	59	127	81.9%	60.1%	64.1%
No	13	191			
4. Preoccupation with Internet activities					
Yes (30.8%)	57	63	79.2%	80.2%	80.0%
No	15	255			
5. Use of Internet for a period of time longer than intended					
Yes (36.7%)	67	76	93.1%	76.1%	79.3%
No	5	242			
6. Persistent desire and/or unsuccessful attempts to cut down or reduce Internet use					
Yes (35.4%)	65	73	90.3%	77.0%	79.5%
No	7	245			
7. Excessive effort spent on activities necessary to obtain access to the Internet					
Yes (18.2%)	40	31	55.6	90.3%	83.9%
No	32	287			
8. Excessive time spent on Internet activities and leaving the Internet					
Yes (36.2%)	67	74	93.1%	76.7%	79.8%
No	5	244			
9. Tolerance: a marked increase in the duration of Internet use needed to achieve satisfaction					
Yes (29.0%)	54	59	75.0%	81.4%	80.2%
No	18	259			
10. Withdrawal symptoms					
Yes (23.8%)	55	38	76.4%	88.1%	85.9%
No	17	280			
11. Feeling irritable and restless when Internet use is interrupted					
Yes (39.3%)	53	100	73.6%	68.5%	69.4%
No	19	217			
12. Continued Internet use despite knowledge of having a persistent or recurrent physical or psychological problem likely to have been caused or exacerbated by Internet use					
Yes (25.9%)	53	48	73.6%	84.9%	82.8%
No	19	270			
13. Recurrent Internet use resulting in a failure to fulfill major role obligations at school and home, impaired interpersonal relationships, and behaviors violating school rules or laws					
Yes (36.4%)	70	72	97.2%	77.4%	81.0%
No	2	246			

schedule were further modified according to seven experts' opinions based on practical interviews with 10 adolescents. In the present study, seven psychiatrists conducted diagnostic interviews based on the structured interview schedule for all subjects to determine the diagnosis of Internet addiction. Prior to the formal interviews, all interviewers discussed in detail the contents of the structured interview schedule to standardize the interviews. Interrater reliability was evaluated for seven adolescent cases who visited our clinic for Internet use problems.

Participants and Procedures

To examine the sensitivity, specificity, and diagnostic accuracy of candidate diagnostic criteria of Internet addiction, 468 adolescents (318 males and 150 females) were recruited into this study. They were randomly selected by cluster sampling from two junior high schools (262 adolescents) and one senior high school (206 adolescents) in Kaohsiung City. Informed consent was obtained from all participants prior to commencing the study.

Seven psychiatrists conducted diagnostic interviews based on the structured interview schedule for all participants to determine their responses to probing questions regarding Internet addiction. After interviewing every participant, interviewers made a global clinical impression for the existence of Internet addiction according to their clinical experiences and the concepts of addiction proposed by West (2001). No participants had manic or psychotic symptoms in the present study.

All participants also completed the Chen Internet Addiction Scale (CIAS; Chen et al., 2003). The CIAS contains 26 four-point items that assess five dimensions of Internet use-related problems: compulsive use, withdrawal, tolerance, interpersonal and health problems, and time management problems. The internal reliability of the scale and the subscales in the original study ranged from 0.79 to 0.93, and correlation analyses yielded a significant positive correlation of the CIAS to the hours spent weekly on Internet activity (Chen et al., 2003). Higher CIAS scores indicated increased severity of addiction to Internet activity. Subjects also completed questionnaires that assessed the frequency of Internet use, time spent online every month, and total years since beginning Internet use.

Statistical Analyses

The interrater reliability of 13 candidate diagnostic criteria of Internet addiction and interviewers' global impressions were calculated by the mean of the Cohen κ value among seven psychiatrists. Then the sensitivity, specificity, and diagnostic accuracy of the 13 candidate diagnostic criteria of Internet addiction were analyzed with references to the interviewers' global clinical impressions and CIAS results. Participants were defined as belonging to the addictive group if they had received a global clinical impression of Internet addiction and their CIAS scores were higher than the 75th percentile of all participants. Subjects in the nonaddictive group were those who had received no global clinical impression of Internet addiction and had CIAS scores less than the 75th percentile of all participants. Then the sensitivity,

specificity, and diagnostic accuracy of candidate diagnostic criteria of Internet addiction were evaluated between the addictive and nonaddictive groups. The diagnostic accuracy indicated the percentage of all correct decisions, which is the result of dividing the number of true positives and true negatives by the number of all decisions. The candidate diagnostic criteria with low diagnostic accuracy were excluded from further analyses. The cutoff point of the diagnostic criteria to differentiate the Internet-addictive subjects with nonaddictive ones was then determined by the best diagnostic accuracy and the receiver operating characteristic curve (ROC). Finally, the diagnostic criteria for Internet addiction were constructed.

According to the final diagnostic criteria for Internet addiction, the participants were further divided into case and noncase groups, and their demographic data and characteristics of Internet use behaviors were compared by χ^2 test to examine further the validity of the diagnostic criteria. A p value of less than 0.05 was considered statistically significant.

RESULTS

Of the 468 adolescents recruited into this study, two adolescents refused to participate in diagnostic interview, and 14 adolescents omitted data in the CIAS. A total of 454 adolescents (309 males and 145 females) were further analyzed. Their mean age was 15.25 ± 1.36 years (range, 12–19), and their average duration of education was 9.45 ± 1.19 years (range, 8–11). The interrater reliability evaluated by the mean of the Cohen κ value for 13 candidate diagnostic criteria among seven psychiatrists was 0.84 (range, 0.77–0.95). The mean of the Cohen κ value for global clinical impression of Internet addiction among the seven psychiatrists was 0.86 (range, 0.70–1.00).

As defined here, 72 participants were classified as in the addictive group, and 318 participants were classified as in the nonaddictive group. The specificity, sensitivity, and diagnostic accuracy of 13 candidate diagnostic criteria for Internet addiction are shown in Table 1. The diagnostic accuracy of 13 candidate diagnostic criteria ranged from 64.1% to 85.9%. The diagnostic accuracy of criterion 2, "Increased sense of tension immediately before logging on to the Internet" (71.6%), criterion 3, "Pleasure, gratification, and relief at the time of logging onto the Internet" (64.1%), and criterion 11, "Feel irritable and restless when Internet use is interrupted" (69.4%), were lower, and the diagnostic accuracy of other 10 criteria ranged from 79.3% to 85.9%. Therefore, these three diagnostic criteria with lower diagnostic accuracy were excluded from further analyses.

The remaining criteria were used to construct the diagnostic criteria for Internet addiction. There are three main sections. Criterion A contains nine characteristic symptoms of Internet addiction, including preoccupation, uncontrolled impulse, usage more than intended, tolerance, withdrawal, impairment of control, excessive time and effort spent on the Internet, and impairment of decision-making ability. Criterion B describes functional impairment secondary to Internet use, including the failure to fulfill role obligations at school and home, impairment of social relationships, and violating

TABLE 2. Cutoff Point of Criterion A in Diagnostic Criteria for Internet Addiction

Cutoff Point of Criterion A	Sensitivity	Specificity	Diagnostic Accuracy	Positive Predictive Rate	Negative Predictive Rate
1	97.2%	78.9%	82.3%	51.1%	99.2%
2	97.2%	82.4%	85.1%	55.6%	99.2%
3	97.2%	85.5%	87.6%	60.3%	99.3%
4	94.4%	89.9%	90.7%	68.0%	98.6%
5	91.7%	94.7%	94.1%	79.5%	98.0%
6	87.5%	97.2%	95.4%	87.5%	97.2%
7	73.6%	98.1%	93.6%	89.8%	94.3%
8	45.8%	99.4%	89.5%	94.3%	89.0%
9	19.4%	99.7%	84.9%	93.3%	84.5%

school rules or laws. Criterion C lists the exclusive criteria to eliminate the possibility of psychotic disorder and bipolar I disorder. The number of characteristic symptoms in criteria A necessary to make the diagnosis of Internet addiction was further analyzed by the diagnostic accuracy and ROC analysis (Table 2). The ROC analysis revealed that the area under curve is 96.8%. These results revealed that the cutoff point with six criteria had the best diagnostic accuracy (95.4%), with high specificity (97.1%), accepted sensitivity (87.5%), a

TABLE 3. Proposed Diagnostic Criteria for Internet Addiction

Distinguishing Characteristics of Internet Addiction

- A maladaptive pattern of Internet use, leading to clinically significant impairment or distress, occurring at any time within the same 3-month period
- A. Six (or more) of the following symptoms have been present:
1. Preoccupation with Internet activities
 2. Recurrent failure to resist the impulse to use the Internet
 3. Tolerance: a marked increase in the duration of Internet use needed to achieve satisfaction
 4. Withdrawal, as manifested by either of the following:
 - i. Symptoms of dysphoric mood, anxiety, irritability, and boredom after several days without Internet activity
 - ii. Use of Internet to relieve or avoid withdrawal symptoms
 5. Use of Internet for a period of time longer than intended
 6. Persistent desire and/or unsuccessful attempts to cut down or reduce Internet use
 7. Excessive time spent on Internet activities and leaving the Internet
 8. Excessive effort spent on activities necessary to obtain access to the Internet
 9. Continued heavy Internet use despite knowledge of having a persistent or recurrent physical or psychological problem likely to have been caused or exacerbated by Internet use
- B. Functional impairment: one (or more) of the following symptoms have been present:
1. Recurrent Internet use resulting in a failure to fulfill major role obligations at school and home
 2. Impairment of social relationships
 3. Behavior violating school rules or laws due to Internet use
- C. The Internet addictive behavior is not better accounted for by psychotic disorder or bipolar I disorder

high negative predictive rate (97.1%), and an accepted positive predictive rate (87.5%). The proposed diagnostic criteria for Internet addiction are listed in Table 3.

According to the proposed diagnostic criteria for Internet addiction, 90 participants were diagnosed as having Internet addiction (case group), and 364 did not have Internet addiction (noncase group). Demographic and Internet use characteristics were compared between the case and noncase groups (Table 4). The results indicate that the subjects in the case group were more likely to be males ($\chi^2 = 4.88; p = 0.027$), be younger ($\chi^2 = 8.46; p = 0.004$), have a higher frequency of Internet use ($\chi^2 = 60.54; p < 0.001$), spend more time on Internet use ($\chi^2 = 41.70; p < 0.001$), and play online games ($\chi^2 = 56.33; p < 0.001$) than those in noncase group. No difference in duration since beginning Internet use was found between the case and noncase groups.

DISCUSSION

Constructing the diagnostic criteria for Internet addiction is the first step to differentiate the adolescents with problematic Internet use from those with normal Internet use behaviors. Although there is still debate about whether Internet addiction is a distinct disorder or a behavior problem secondary to another disorder (Shaffer et al., 2000), several studies have reported critical symptoms of Internet addiction. In the present study, we constructed candidate diagnostic criteria based on the characteristic symptoms of behavioral addiction and impulse control disorder and examined the relationships of diagnostic criteria with both psychiatrists' clinical impressions and the results of the participants' self-reported questionnaire. We also employed statistical methods, including sensitivity, specificity, diagnostic accuracy,

TABLE 4. Comparison Between the Case and Noncase Groups According to the Proposed Diagnostic Criteria for Internet Addiction

Variable	Case (N = 90)	Noncase (N = 364)	χ^2	p Value
Gender				
Male	70	239	4.88	0.027
Female	20	125		
Age (years)				
16 or older	27	171	8.46	0.004
Younger than 16	63	193		
Internet use in every day				
Yes	53	67	60.54	<0.001
No	37	296		
Time spent on Internet (hours per week)				
20 or more	40	51	41.70	<0.001
Less than 20	50	313		
Duration of Internet use (years)				
5 or more	44	153	1.38	0.240
Less than 5	46	211		
Playing online games				
Yes	68	117	56.33	<0.001
No	22	247		

positive predictive rate, negative predictive rate, and ROC, to evaluate the validity of diagnostic criteria. The diagnostic criteria for Internet addiction constructed in this study can provide health care professionals with a means to communicate and make comparisons of clinical cases.

We also developed the structured interview schedule based on diagnostic criteria for Internet addiction. Applying the structured interview schedule allows psychiatrists to assess systematically subjects' characteristics of Internet use behavior and distinguish problematic Internet use from normal Internet use behaviors.

The diagnostic criteria in criterion A for Internet addiction include preoccupation, uncontrolled impulse, usage more than intended, tolerance, withdrawal, impairment of control, excessive time and effort spent on the Internet, and impairment of decision-making ability. These characteristic symptoms of Internet addiction are similar to those proposed in previous studies (Christensen et al., 2001; Hall and Parsons, 2001; Shapira et al., 2003). Most diagnostic criteria in criterion A are very similar to diagnostic criteria for pathological gambling in DSM-IV and behavior addiction defined by Goodman (1993); however, the criterion, "Excessive effort spent on activities necessary to obtain access to the Internet," is an exception. This criterion was modified from a diagnostic criterion for substance dependence in DSM-IV, which emphasizes that the subjects spend a great deal of time obtaining substances for abuse. In Taiwan, the Internet is widely available, but parents and teachers may limit the time and money adolescents spend on Internet use. Adolescents addicted to the Internet may make great efforts to obtain access to the Internet, such as lying to their parents or teachers, escaping from school or home, waking up after midnight to access computers, stealing or borrowing money from others, and fighting with parents.

This study proposes that six or more criteria in criterion A, consisting of nine diagnostic criteria, are necessary to make an accurate diagnosis of Internet addiction. Compared with the DSM-IV-TR diagnostic criteria for substance dependence (three or more of seven criteria) and pathological gambling (five or more of 10 criteria), the cutoff point seems to be higher. One explanation for this result is that Internet use is more socially acceptable and easily available; therefore, more characteristic symptoms are essential to differentiate between problematic Internet use and normal Internet use behaviors.

Like the opinions for diagnoses of the DSM system (American Psychiatric Association, 1994), functional impairment secondary to Internet use is an important diagnostic concept for Internet addiction (Beard and Wolf, 2001). A previous study also raised the necessity of functional impairment for the diagnosis of behavioral addiction as, for example, cases of exercise dependence (Bamber et al., 2003). Although Internet use is a popular and socially acceptable behavior, problematic Internet use results in poor academic performance and difficulties in interactions with family and peers. We propose criterion B for making a diagnosis of Internet addiction to remind clinicians of the importance of evaluating functional impairment secondary to Internet use.

Candidate criterion 2, "Increased sense of tension immediately before logging onto the Internet," and candidate criterion 3, "Pleasure, gratification, and relief at the time of logging onto the Internet," represented two core symptoms of impulse control disorder that have been proposed as prerequisite criteria of behavior addiction and sexual addiction (Goodman, 1993). However, we found that the diagnostic accuracy of these two criteria was lower than that of other candidate criteria. Candidate criterion 11, "Feel irritable and restless when Internet use is interrupted," is a prevalent symptom among those subjects with problematic Internet use who visit the clinical service settings. In this study, however, its diagnostic accuracy was lower than that of other candidate criteria.

Adolescents who have had Internet addiction diagnosed by the criteria proposed in the present study had higher frequencies of Internet use and spent more time on Internet use. These results further support the assertion that the diagnostic criteria proposed in this study can discriminate between those individuals with different severities of Internet use. We also found that adolescents with Internet addiction were more likely to be males than those who had no Internet addiction, which is congruent with the results of previous studies (Lin and Tsai, 2002; Yang, 2001). This study also found that adolescents with Internet addiction were more likely to play online games. Online games have been reported to provide instantaneous reward and be the most popular online activities for adolescents (Yang, 2001), providing players an imaginary world in which to play a self-designed role. These characteristics of online games may increase the potential for Internet addiction.

The diagnostic criteria for Internet addiction in this study are proposed for adolescents. Further studies are necessary to examine its suitability for adult subjects. Meanwhile, further studies are necessary to retest its validity and to employ it in evaluating the Internet use behaviors of adolescents.

CONCLUSION

The present study established the diagnostic criteria of Internet addiction among adolescents according to the analysis of an empirical community survey. The diagnostic criteria were composed of three main criteria, including characteristic symptoms of Internet addiction, functional impairment secondary to Internet use, and exclusive criteria. The diagnostic criteria had high diagnostic accuracy, specificity, and negative predictive value, accepted sensitivity, and an accepted positive predictive rate. The diagnostic criteria for Internet addiction constructed in this study can provide health care professionals with a means to communicate and make comparisons of clinical cases.

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