Regular Article

Psychiatric symptoms in adolescents with Internet addiction: Comparison with substance use

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Aims: The aim of the present study was to compare psychiatric symptoms between adolescents with and without Internet addiction, as well as between analogs with and without substance use.

Methods: A total of 3662 students (2328 male and 1334 female) were recruited for the study. Self-report scales were utilized to assess psychiatric symptoms, Internet addiction, and substance use.

Results: It was found that Internet addiction or substance use in adolescents was associated with more severe psychiatric symptoms. Hostility and depression were associated with Internet addiction and substance use after controlling for other symptoms.

Conclusions: This result partially supports the hypothesis that Internet addiction should be included in the organization of problem behavior theory, and it is suggested that prevention and intervention can best be carried out when grouped with other problem behaviors. Moreover, more attention should be devoted to hostile and depressed adolescents in the design of preventive strategies and the related therapeutic interventions for Internet addiction.

Key words: adolescent, depression, hostility, Internet addiction, psychiatric symptom, substance use.

THE INTERNET HAS become one of the most popular media and it is utilized by adolescents to enforce their competitiveness, but heavy use of the Internet results in many negative effects. Young has defined problematic Internet-using behavior as 'Internet addiction',[1] while Ko *et al.* have proposed diagnostic criteria to define adolescent Internet addiction.[2] Based on this definition, epidemiological evaluation in Taiwan has demonstrated that 19.8% of adolescents have Internet addiction.[3] Adolescents with Internet addiction usually suffer from problems with their daily routines, school performance, family relationships, and mood.[4–6] However, the question of whether this would produce negative impacts on general mental health and produce more severe psychiatric symptoms is hitherto unknown. Although depression, lower self-esteem and lower life satisfaction have been reported in adolescents with Internet addiction,[4,6,7] the general psychopathology has not been evaluated completely.

According to problem behavior theory, use of alcohol, smoking, and illicit substance use have been grouped as problem behaviors of adolescents, which have the same psycho-social proneness, including social environment, perceived environment, personality, and behavior.[8] It has been suggested that intervention programs directed at the organization of

problem behaviors may be more appropriate than those that have focused on specific behaviors alone.[8] Internet addiction emerged as a behavior problem in adolescents after the Internet was well developed. It has not been included or comprehensively compared to previously defined problem behaviors. If Internet addiction is a new problem behavior, treatment interventions should be developed in comprehensive programs for this problem behavior. Previous reports derived from the same data of the present study have found that Internet addiction shares similar personality and family patterns of substance experience in adolescents.[9,10] If we hypothesize that Internet addiction is one of the problem behaviors defined by problem behavior theory (as Jessor argued in a review of problem behavior that adolescent problem behavior would result in similar health compromising outcomes[8]), Internet addiction may jeopardize mental health just as do other problem behaviors. Yet, the psychiatric symptoms of adolescents with Internet addiction and substance use have not been compared directly.

A previous report demonstrated that teenagers with substance use problems have more severe psychiatric symptoms.[11] As substance use,[12] Internet addiction has been reported to be associated with depression[4,6] and attention-deficit–hyperactivity disorder.[13] Further, heavy Internet users have more severe psychopathology on the Symptoms Checklist 90 Revised.[14,15] However, because there is no clear definition of Internet addiction in these two previous reports, whether adolescents with Internet addiction had poor mental health is unknown.

Until now, there is no conclusive definition for Internet addiction. According to the Ko *et al.* study, the criteria for adolescent Internet addiction are as follows.[2] 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. Six or more criteria should be fulfilled in Criteria A. Criterion B describes functional impairment secondary to Internet use. Criterion C lists the exclusive criteria to eliminate the possibility of psychotic disorder and bipolar I disorder. The diagnostic criteria with good diagnostic accuracy (95.4%), specificity (97.1%), and accepted sensitivity (87.5%)[2] could provide a clear definition to further evaluate the correlates of Internet addiction in epidemiological

research. Accordingly, in the present study the definition of Internet addiction was based on these diagnostic criteria.

Thus, in order to evaluate and compare the psychiatric symptoms for adolescents with Internet addiction and those with substance use, the aims of the present study were to compare psychiatric symptoms between adolescents with and without Internet addiction, as well as between analogs with and without substance use.

METHODS

Participants

Seven of 87 junior high schools, six of 33 senior high schools, and four of 20 vocational high schools in Kaohsiung City and County in Taiwan were selected for evaluation. The selected schools included eight, five, and three schools from urban, suburban, and rural areas, respectively. Two classes were randomly selected from each grade in these schools. A total of 3662 students (2328 male participants and 1334 female participants) were recruited. The mean of their age was 15.48 ± 1.65 years (range 11–21 years). After an informed consent form describing the goal of research had been completed by students, they were invited to anonymously complete a questionnaire identifying psychiatric symptoms, and exploring the extent of Internet use/addiction or experience of substance use. Those who did not complete the questionnaires were excluded from the statistical analysis. The data for the 3517 respondents (2218 male and 1299 female; completion rate, 96.0%) were entered into the final statistical analysis. Approval was also granted by the Institutional Review Board of Kaohsiung Municipal Hsiao-Kang Hospital before commencement.

Measurement instruments

Brief Symptoms Inventory

The Brief Symptom Inventory (BSI) is a shortened form of the Symptoms Checklist 90 Revised.[16,17] It is a 53-item self-report symptom scale designed to measure levels of psychopathology. The BSI measures nine symptom dimensions: somatization, obsession–compulsion, interpersonal sensitivity, depression, anxiety, hostility, phobic anxiety, paranoid ideation and psychoticism. Additionally, there

are three global indices of distress, the General Severity Index (GSI), the Positive Symptom Total (PST), and the Positive Symptom Distress Index (PSDI). The ranges for test–retest values and internal consistency reliability (α coefficients) were 0.68–0.91 and 0.71–0.85, respectively.[16]

Chen Internet Addiction Scale

The Chen Internet Addiction Scale (CIAS) consists of 26 items, scored on a 4-point Likert scale, that assess five dimensions of symptoms of compulsive use, withdrawal, tolerance, and problems of interpersonal relationships and health/time management. The total scores of the CIAS ranged from 26 to 104. Higher CIAS scores indicated increased severity of Internet addiction. In the original study, the internal reliability of the instrument and its subscales ranged from 0.79 to 0.93 and correlation analyses yielded significantly positive correlation of total scale and subscale scores of CIAS with the hours spent weekly on Internet activity.[18] Based on diagnostic interviews conducted according to established criteria for Internet addiction,[2] a threshold CIAS score of 63/64 was deemed to provide good diagnostic accuracy (87.6%) with respect to Internet addiction in adolescents.[3] Participants who had a CIAS score >63 were classified as the Internet addiction group.

Questionnaire for Experience of Substance Use

The Questionnaire for Experience of Substance Use (Q-ESU) inquires dichotomously whether participants currently regularly used tobacco, alcohol, or betel nut, or whether they had ever experienced cannabis, amphetamines, glue, heroin, 3,4-methylenedioxymethamphetamine, or ketamine.[19]

Statistical analysis

The participants who fitted the diagnostic cut-off point of the CIAS were classified as Internet addicts. The most common pattern of substance use in adolescents is occasional use, which does not fulfill DSM-IV criteria for substance use or dependence. But because any pattern of use of illicit substances by adolescents is potentially hazardous, any illicit substance use is usually used to define the at-risk group of adolescents.[20] In contrast, the experience of alcohol or tobacco use is common among adolescents,[20] thus, current regular use of tobacco and alcohol is appropriate to define an at-risk group among adolescents.[21,22] In the present study we defined subjects with substance use experience as adolescents who had had an experience of illicit substance use, or regular use of alcohol, tobacco, or betel nut based on the Q-ESU.

The *t*-test was used to compare psychiatric symptoms on the BSI subscale and its three global indices for adolescents with or without Internet addiction, and those with or without substance use. Associations between psychiatric symptoms and Internet addiction and substance use were further examined using logistic regression analysis controlling for the effects of gender, age and school type. In order to make comparisons between Internet addiction and substance use, all dimensions of the BSI were entered into the regression model. $P < 0.05$ was considered significant for all tests.

RESULTS

The demographic data and prevalence rate of Internet addiction and substance use of participants are shown in Table 1. A total of 733 (20.8%) and 322 (9.2%) participants were classified into the Internet addiction group and substance use group, respectively.

Table 1. Subject data

	n (%)	Mean ± SD
Gender		
Male	2218 (63.1)	
Female	1299 (36.9)	
School		
Senior high school	1126 (32.0)	
Vocational school	930 (26.4)	
Junior high school	1461 (41.5)	
Grade		
7	497 (14.1)	
8	513 (14.6)	
9	451 (12.8)	
10	691 (19.6)	
11	550 (15.6)	
12	815 (23.2)	
Internet addiction		
Yes	733 (20.8)	
No	2784 (79.2)	
Substance use experience		
Yes	322 (9.2)	
No	3195 (90.8)	
Age		15.5 ± 1.7

Table 2. BSI scores for adolescents with or without Internet addiction

	Internet addiction		
	Yes (*n* = 733) Mean ± SD	No (*n* = 2784) Mean ± SD	*t*
Somatization	0.80 ± 0.82	0.51 ± 0.60	8.93***
Obsessive–compulsive	1.43 ± 0.83	1.14 ± 0.74	8.62***
Interpersonal sensitivity	1.25 ± 1.01	0.93 ± 0.86	7.87***
Depression	1.07 ± 0.99	0.68 ± 0.80	9.79***
Anxiety	0.93 ± 0.88	0.64 ± 0.70	8.42***
Hostility	1.23 ± 0.99	0.77 ± 0.79	11.60***
Phobic anxiety	0.84 ± 0.87	0.57 ± 0.65	7.86***
Paranoid	1.09 ± 0.89	0.76 ± 0.71	9.37***
Psychoticism	0.89 ± 0.86	0.55 ± 0.66	10.01***
Additional items	0.87 ± 0.87	0.51 ± 0.64	10.40***
Global index			
General severity index	1.04 ± 0.78	0.71 ± 0.60	10.70***
Positive symptom total	28.59 ± 15.50	22.06 ± 13.97	10.36***
Positive symptom distress index	1.80 ± 0.64	1.58 ± 0.55	8.50***

*$P < 0.05$, **$P < 0.01$, ***$P < 0.001$.
BSI, Brief Symptom Inventory.

The comparisons of scores on all dimensions and three global indices on BSI between adolescents with and without Internet addiction are shown in Table 2. Results demonstrated that adolescents with Internet addiction had higher scores on GSI, PST, PSDI and all dimensions. The comparisons of scores on all dimensions and three global indices on BSI between adolescents with and without substance use are shown in Table 3. Results demonstrated that adolescents with substance use had also

Table 3. BSI scores for adolescents with or without substance use

	Substance use experience		
	Yes (*n* = 322) Mean ± SD	No (*n* = 3195) Mean ± SD	*t*
Somatization	0.88 ± 0.92	0.54 ± 0.62	6.55***
Obsessive–compulsive	1.39 ± 0.86	1.18 ± 0.75	4.27***
Interpersonal sensitivity	1.28 ± 1.04	0.97 ± 0.88	5.21***
Depression	1.18 ± 1.07	0.72 ± 0.82	7.42***
Anxiety	0.93 ± 0.99	0.68 ± 0.72	4.48***
Hostility	1.39 ± 1.05	0.81 ± 0.81	9.57***
Phobic anxiety	0.81 ± 0.94	0.61 ± 0.68	3.65***
Paranoid	1.18 ± 0.96	0.79 ± 0.74	7.01***
Psychoticism	0.92 ± 0.98	0.59 ± 0.68	5.96***
Additional items	0.94 ± 0.96	0.55 ± 0.66	7.16***
Global index			
General severity index	1.10 ± 0.87	0.74 ± 0.62	7.22***
Positive symptom total	28.03 ± 15.58	22.95 ± 14.36	5.61***
Positive symptom distress index	1.91 ± 0.71	1.60 ± 0.55	7.58***

*$P < 0.05$, **$P < 0.01$, ***$P < 0.001$.
BSI, Brief Symptom Inventory.

Table 4. Logistic regression controlling for gender, age, and school

	Internet addiction[†]			Substance use experience[‡]		
	Wald χ^2	OR	95%CI	Wald χ^2	OR	95%CI
Male	86.60***	2.76	2.23–3.41	43.35***	3.02	2.17–4.20
Junior high school[§]	3.11	1.34	0.97–1.87	8.50**	2.04	1.26–3.30
Vocational high school[§]	22.62***	1.72	1.37–2.15	13.64***	1.79	1.32–2.44
Age	2.04	1.07	0.98–1.18	12.43***	1.27	1.11–1.45
Somatization	0.25	1.06	0.85–1.31	8.06**	1.52	1.14–2.03
Obsession-compulsion	0.03	0.98	0.82–1.18	11.74**	0.64	0.50–0.83
Interpersonal sensitivity	2.88	0.86	0.72–1.02	3.03	0.81	0.64–1.03
Depression	4.11*	1.21	1.01–1.46	13.02***	1.58	1.23–2.03
Anxiety	3.97*	0.79	0.63–0.99	9.14**	0.61	0.44–0.84
Hostility	29.38***	1.47	1.28–1.70	40.31***	1.82	1.52–2.20
Phobic anxiety	6.04*	1.27	1.05–1.53	0.13	0.95	0.73–1.24
Paranoid	0.12	0.97	0.79–1.18	1.93	1.21	0.93–1.58
Psychoticism	0.58	1.09	0.88–1.35	0.44	0.91	0.67–1.22
Addition items	6.50*	1.32	1.07–1.64	3.84	1.34	1.00–1.80

*$P < 0.05$, **$P < 0.01$, ***$P < 0.001$.
[†]Internet addiction, $n = 733$; control, $n = 2784$; [‡]substance use experience, $n = 322$; control, $n = 3195$.
[§]Dummy variable for schools was senior high school.
CI, confidence interval; OR, odds ratio.

higher scores on the GSI, PST, PSDI and all dimensions.

The association between psychiatric symptoms on the 10 dimensions of the BSI and Internet addiction was further examined using multiple logistic regression (Table 4). Evaluation for collinearity showed that the condition index was 10.34 and thus acceptable to process regression analysis. The results indicated that adolescents with Internet addiction had higher level of hostility, depression, phobic anxiety, and additional symptoms, and a lower level of anxiety. But age was not significantly associated with Internet addiction.

The association between psychiatric symptoms on the 10 dimensional subscales of BSI and substance use was further examined using multiple logistic regression (Table 4). Results indicated that adolescents with substance experience were older and had higher hostility, more depression, greater somatization, less anxiety, and lower obsessive–compulsive behavior.

DISCUSSION

The present results show that adolescents with Internet addiction have more severe psychiatric symptoms than those without. This finding also corresponds to analogous investigations of excessive Internet use in high schools.[14,15] We also found that adolescents with substance use had more severe psychiatric symptoms than those without. Based on the Mueser *et al.* discussion of comorbidity in substance use and other psychiatric disorders,[23] we suggest four mechanisms to account for the association between Internet addiction and psychiatric symptoms. First, psychiatric symptoms may lead to the onset or persistence of Internet addiction. Second, Internet addiction may precipitate psychiatric symptoms. Third, Internet addiction and psychiatric symptoms may increase vulnerability to each other. Finally, the shared risk factors, either genetic or environmental, lead to the onset or persistence of psychiatric symptoms and Internet addiction.

The Internet can provide social support,[24] achievement[25] and pleasure of control,[26] which provide escape from emotional difficulty. Thus, adolescents with high-level psychiatric symptoms may utilize the Internet to cope with emotional distress. Without effective intervention for psychiatric symptoms, the use of the Internet might progress to addiction. In contrast, addiction to the Internet results in ineffective coping and difficulty in real life.[5] Without intervention for Internet addiction, the repeated negative consequences may cause further deterioration of

psychiatric symptoms. Combining these two different views, Kraut *et al.* proposed a 'rich get richer' model whereby the Internet provides more benefits to those who are already well-adjusted.[27] By contrast, poorly adjusted adolescents may suffer more deleterious effects with heavy Internet use, creating a vicious circle. This bi-directional interaction between Internet addiction and psychiatric symptoms may produce mutual exacerbation, explaining the association. Lacking prospective studies, the association between psychiatric symptoms and Internet addiction cannot be validated by any one of the aforementioned projected explanations; but the results suggest that psychiatric symptoms should be evaluated for adolescents with Internet addition.

From regression analysis, hostility was associated with Internet addiction and substance use in the present sample population. Previous reports have shown that hostility is an adolescent risk factor for smoking initiation,[28] early onset of alcoholism,[29] and substance abuse.[30] Also, hostility has been reported to predict escape-avoidance coping styles and substance use triggered by almost any cue, including negative emotional states and tension.[31] Consequently, it appears reasonable to assume that hostility may be a characteristic that predisposes the adolescent to coping with emotional stress by using escape-avoidance behavior, such as getting into virtual online activities. In contrast, adolescents who spend more time playing electronic games have been reported to have more hostility and be more predisposed to acts of violence.[32,33] Ko *et al.* reported that 75.6% of Internet addicts utilized the Internet to play online games.[2] Thus, the high engagement in violent role-playing games by Internet addicts may partly account for the association with hostility. These results would suggest that adolescents with high hostility deserve more attention in the introduction of preventive strategies, and such hostility should be evaluated for Internet-addicted adolescents.

Depression has been reported to be associated with Internet addiction in an online survey.[4] The present results confirm this observation, and the significant association between Internet addiction and depressive symptoms may indicate that depression should be assessed in adolescents with Internet addiction. Logistic regression also demonstrated that high phobic anxiety is associated with Internet addiction. Because adolescents with phobic anxiety are reluctant to go out, the Internet provides them with a means of contacting others and engaging in game play without

exposure to phobic situations. However, this insularity may prevent them from coping with their problems. But after control of other psychiatric symptoms, anxiety was negatively associated with both Internet addiction and substance experience. This result is different to the present *t*-test results. It suggests that the association between Internet addiction and anxiety may be dependent on whether there is comorbidity with other psychiatric problems. However, further investigations to thoroughly survey the controversial association are necessary.

Older age was found to be associated with substance use. This corresponds to previous reports.[34,35] That the prohibition on legal or illicit substance use might decrease as age increased among adolescents, might partially explain the result. However, age was not associated with Internet addiction. Because the Internet was perceived as a learning tool for adolescents, most adolescents in Taiwan are permitted to use the Internet from primary school onwards. Also, because of the anonymity of the Internet, adolescents' online behavior would not be prohibited according to their age. Thus, the impact of age on Internet addiction of adolescents might be limited.

The present results demonstrate that adolescents with Internet addiction have higher psychiatric symptoms on all 10 dimensions on the BSI as well as in those items concerning substance use. In logistic regression analysis, hostility and depression were associated with Internet addiction as well as substance use. Depression has been reported to be a shared compromising outcome of all problem behavior in adolescents.[8] Also, other behavior problems, such as delinquency and risky driving, have been reported to be associated with hostility.[36,37] The results suggest that adolescents with Internet addiction have poor outcomes for mental health, as do those who have other problem behaviors. This conclusion supports the hypothesis that Internet addiction might well be included in the organization of problem behavior as defined by problem behavior theory. If this hypothesis could be verified in further studies, Internet addiction should be one of the focuses for preventive strategies for organization of problem behavior.

The present results should be interpreted in the light of three limitations. First, social restrictions on substance use may make adolescents unwilling to admit substance use even in anonymous questionnaires. Thus, participants with substance use may be underestimated. Second, the present cross-sectional

research design could not confirm causal relationships between Internet addiction and various psychiatric symptoms. Thus, the association results should be further evaluated in prospective research to demonstrate the causal relationship between psychiatric symptoms and Internet addiction and substance use. Third, lacking information from other investigators, the assessment of Internet addiction was based only on the self-reported perspective of adolescents. If the participants denied or could not estimate their maladaptive Internet use, the Internet addiction would be underestimated.

CONCLUSION

This present study has demonstrated that adolescents with Internet addiction had poor outcome for mental health, as did those with substance use. This result partially supports the hypothesis that Internet addiction is one of the problem behaviors of adolescence as defined by problem behavior theory. Furthermore, hostility and depression were evaluated to be associated with Internet addiction in the present adolescent sample population. Accordingly, more attention should be devoted to hostile and depressed adolescents in the design of preventive strategies and related therapeutic interventions for Internet addiction.

ACKNOWLEDGMENT

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