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Depression and Impulsivity Mediating the Relationship Between Social Anxiety and Internet Addiction

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Abstract

Background: This study extended the stress-vulnerability model in order to understand Internet addiction in Asian countries. A parallel mediation model was proposed to specify that emotional and personality vulnerabilities would mediate the influence of social anxiety on Internet addiction.

Methods: A total of 1127 participants (430 males and 697 females) aged from 17 to 28 were recruited from universities in Singapore. Participants completed a paper-and-pencil questionnaire on standardized psychological scales that assessed social anxiety, depression, impulsivity, and Internet addiction.

Results: About 9.4% of the participants met the cut-off score for Internet addiction. The bootstrapping procedure was conducted to test the hypothesized parallel mediation model. Results showed that social anxiety had a direct effect on Internet addiction, as well as indirect effects via depression and impulsivity. Depression was found to be a stronger mediator than impulsivity. In particular, high levels of social anxiety were related to high levels of impulsivity and depression, which were in turn related to high levels of Internet addiction. The pathways of the proposed parallel mediation model were similar for males and females. There were no gender differences on the levels of Internet addiction, social anxiety, and impulsivity; but females reported more depression symptoms than males.

Conclusions: Internet addiction is common in university students. It is associated with impulsivity and high rates of depression and social anxiety. Prevention and intervention strategies should be designed to address this phenomenon. Assessment and management of social anxiety, depression, and impulsive personality should also be included in the programs that aim to reduce Internet addiction.

Introduction

The Internet is an expanding virtual environment, and its related functions have become integrated into people's daily lives. With the rapid increases of users, there is increasing concern that Internet use may become problematic for some individuals. Internet addiction, or problematic Internet use, refers to excessive or poorly controlled preoccupations, urges, or behaviors regarding computer use and Internet access that lead to impairment or distress [1]. Individuals who are addicted to Internet also display symptoms similar to alcohol and drug addiction such as mood modification, inability to cut down, withdrawal, tolerance, conflict, and relapse [2]. Internet addicts often use the Internet for extended periods, isolating themselves from other forms of social interaction and concentrating almost solely on the Internet rather than on the broader life events.

High school and university students are of substantial risk for developing Internet addiction, as they often have free and unlimited access to the Internet and are expected to make use of this technology for learning purposes [3]. Indeed, studies have found that Internet addiction is more prevalent among adolescents and young adults as compared to the general population [4-6]. For university students, Internet addiction prevalence estimates range from 5%-16% in the United States [7-8] and Asian countries [9-11]. In terms of regional differences, cross-cultural studies have found that university students in Asian countries typically show higher rates of Internet addiction than their counterparts in the United States [11-12].

University students who are addicted to the Internet tend to experience a variety of academic difficulties, health and mental health disturbances, behavioural problems, and disruption of daily routines [1,5,8,13-14]. In particular, Internet addiction is found to relate to cognitive/neurological impairment and poor academic performance.

Physical health issues are also evident, including overweight and obesity due to lack of physical activity and poor nutrition, sleep disorders, chronic fatigue, back pains, and carpal tunnel syndrome. These health issues may decrease the immune system leaving the Internet addicted students prone to infection and disease. Furthermore, mental health symptoms are often found in these students, including depression, attention/hyperactivity disorder, obsessive-compulsive symptoms, and hostility/aggression. Internet addicted students also show behavioral problems of alcohol and drug misuse, self-injuries behavior, and even suicidal attempt.

Proposed Parallel Mediation Model of Internet Addiction

Internet addiction in university students has become a public health concern given its widespread and associations with disturbances in various life domains. Based on the stress-vulnerability model [15], a parallel mediation model of Internet addiction is proposed in order to understand the development and maintenance of Internet addiction. The stress-vulnerability model [15] has been used to explain alcohol and drug addiction [16]. It specifies that life stress may be a risk factor for addiction in individuals who possess specific biological and/or psychological vulnerabilities. With references to findings of meta-analytic and review studies on Internet addiction [4,10], the proposed

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parallel mediation model stipulates that interpersonal stress (social anxiety) is related to Internet addiction, and this stress-addiction relationship is mediated by intrapersonal emotional vulnerability (depression) and biological/personality vulnerability (impulsivity) (Figure 1).

Social anxiety

Social anxiety refers to persistent fear and distress of interpersonal situations that often leads to the anticipation of embarrassment or humiliation [17]. Socially anxious individuals frequently avoid interpersonal situations, adopt maladaptive coping, and seek out a "quick" way to alter their sustained negative emotional states [18]. They frequently turn to alcohol and drug in order to reduce their anxiety and apprehension [18-19]. More recently, the Internet has emerged as an alternate platform/outlet for individuals with social anxiety. As compared to face-to-face interaction, the Internet provides a seemingly safe and less threatening platform to communicate and interact with other people, to search for information, and to shop for merchandise.
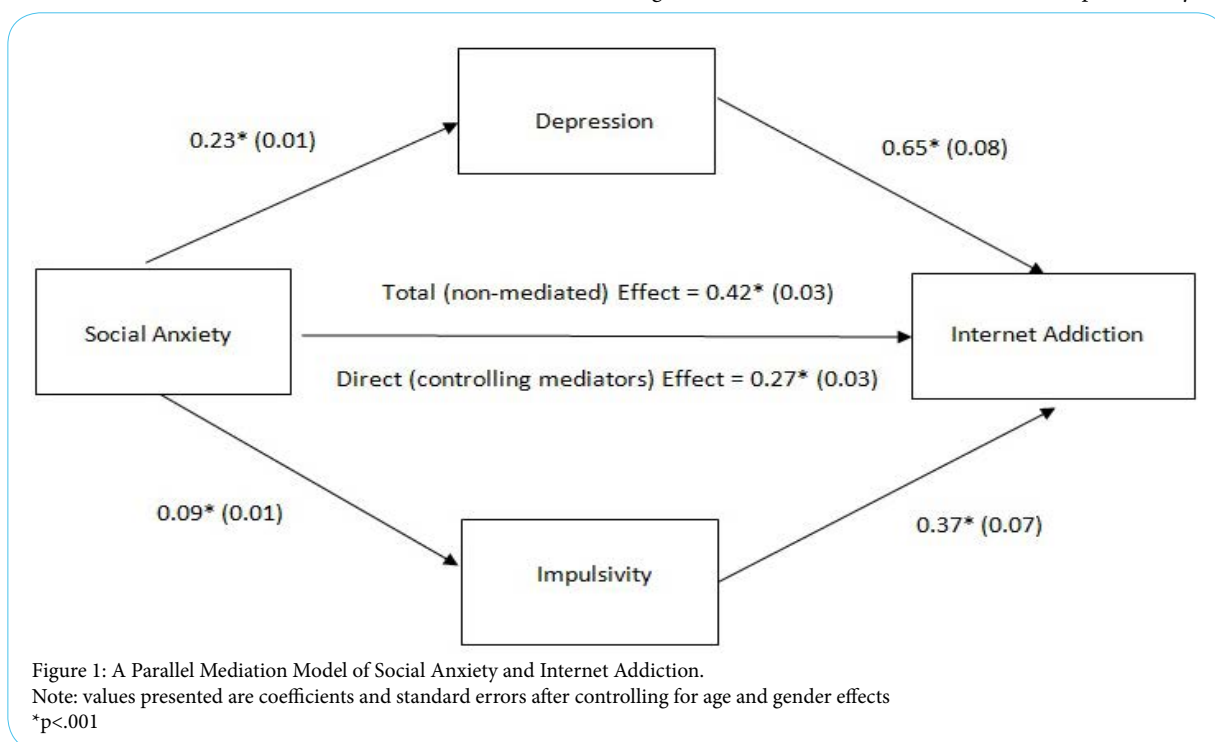
Social anxiety is salient in university students, whose major developmental tasks focus on forming relationships and self-presentation [21-22]. With the availability and widespread use of the Internet, socially anxious students may perceive Internet use as a safe behavior in reducing anxiety or the probability of rejection and negative feedback from others [23]. Some Internet-related activities such as online gaming also give feelings of status and modernity, which may bolster self-esteem. Over time, these students may begin to invest a disproportionate amount of attention, time, and effort on the Internet. They may become increasingly rely on the Internet as a way of avoiding the challenges and demands of social situation. This reliance on the Internet may then lead to addiction-like use of the Internet [23-24]. Indeed, the association between social anxiety and Internet addiction has been found among university students in various countries [5,10,21]. Studies also show that

individuals who rely on the Internet predominantly to satisfy their social or escape needs are at greater risk for developing Internet addiction than those who rely on the Internet predominantly for personal communication and information-gathering purposes [25].

Depression

The rates of depression are substantially higher in university students than in the general population [26]. This may be related to boredom with large blocks of unstructured time, low self-esteem with competition from peers, and feelings of being isolated and intimidated in the campus community. According to the mood management theory [27], individuals arrange their environment in a way that best enables them to terminate or diminish bad moods while facilitating or enhancing good moods. Students who experience depressed mood may turn to Internet use for mood modification [5, 10]. They may have arousal-oriented motivations for Internet use such as entertainment, information seeking, diversion, and relaxation. Online chatting, online gaming, and other Internet activities can also serve as distractions from rumination. Thus, Internet use can provide opportunities for depressed students to receive immediate reassurance and mood alternation [1]. However, excessive time spending on the Internet will also reduce the time for normal social interactions and leisure activities, resulting in further reliance on the Internet for mood enhancement.

Current literature has shown a robust association between depression and Internet addiction in university students [5,10]. Furthermore, researchers have proposed the "problematic Internet-behavior syndrome" to refer to the increased propensity toward Internet addiction among socially anxious students who also experience depressed mood [5]. It is argued that social anxiety is often associated with anxiety and depression, which in turn may negatively influence the ability to cope in social interactions. Socially anxious students who are also depressed may use the Internet as a medium to regulate their social fears and related distress, particularly loneliness

Figure 1: A Parallel Mediation Model of Social Anxiety and Internet Addiction.
Note: values presented are coefficients and standard errors after controlling for age and gender effects
*p<.001

and depression. This combination of fear of real-world rejection and online reassurance may further increase these students' propensity to Internet addiction [28].

Impulsivity

Impulsivity is a facet of personality characterized by the readiness to take immediate and unplanned action as a response to internal and external stimuli with no regard for negative consequences [29]. Impulsivity is also associated with a decreased tolerance for negative emotion and an increased risky behavior when emotionally distressed [30]. Historically, behavioral addiction such as pathological gambling was classified under "impulse control disorders not otherwise specified" within the DSM-IV, suggesting the close association between impulse control and behavioral addiction. Research has also shown that impulsivity is a common feature of gambling and alcohol addiction [31-32]. Individuals with either of these two addictions show a higher rate of delay discounting than those without the addictions [33]. More recently, it is found that impulsivity is also a significant risk factor for Internet addiction in university students in both Asian and Western countries [10,34-35].

There is evidence pointing to a sub-group of socially anxious individuals who are behaviorally disinhibited or impulsive, and that this subgroup tends to show increased risky behavior and substance use [36]. Some studies also indicate that students who are with elevated social anxiety and impulsivity are at greater risk for addiction-related problems such as smoking, alcohol, and drug use [5,37-38]. It is argued that elevated impulsivity in socially anxious students may enhance the salience of the immediate anxiolytic effects (i.e., reducing nervousness and fears of not fitting in) of the addiction, and this may shift student's attention away from the aversive outcomes of addiction.

Purposes of the Present Study and Specific Hypotheses

The present study aimed to test the proposed parallel mediation model in order to understand Internet addiction in university students. Specific hypotheses and pathways of this proposed model were as follows:

1. Social anxiety, depression, and impulsivity will be associated with Internet addiction.
2. Social anxiety will have an indirect effect on Internet addiction through the mediation of depression.
3. Social anxiety will have an indirect effect on Internet addiction through the mediation of impulsivity.

Method

Procedure

A convenience sample of university students aged between 18-28 years old were recruited from different universities in Singapore via advertisement in university websites, student activity centers, and dormitories. Informed written consents were obtained before students individually completed a set of anonymous self-administered questionnaire. Participants voluntarily completed the questionnaire without monetary reward. The questionnaires were in English and took about 15-20 minutes to complete. This study was approved by the Institutional Ethics Review Board of the author's affiliated university.

Participant characteristics

A total of 1300 questionnaires were distributed and 1127 valid questionnaires were collected, with a response rate of 86.7%. Participants included 430 males and 697 females, and about one-third of them were in the first year of their university education. For all participants, their ages ranged from 17 to 28 years old, with the average age being 21.52 years old (SD=1.91). Males were significantly older than females (Means=22.75, 20.76, t=19.72, p<.0001), and this may be related to the fact that Singaporean males at about the age of 18 are required to undergo a 2-year full-time compulsory uniformed service.

Measures

Internet addiction

The 12-item short-form version of the Young's Internet Addiction Test [39-40] was adopted to assess the level of problematic Internet use. Participants rated their pattern of Internet use on a 6-point Likert scale ranging from 0 "never" to 5 "always".

Social anxiety

The 12-item short-form version of the Social Interaction Anxiety Scale [41] was used to measure the level of social anxiety. Participants rated the extent to which each item was characteristic of them on a 5-point Likert scale ranging from 0 "not at all" to 4 "extremely true".

Depression

The 9-item self-report questionnaire based on the DSM-5 criteria [17] was used to measure the level of depression. Participants rated the frequency of the depressive symptoms over the past 2 weeks on a 4-pont Likert scale ranging from 0 "never" to 3 "nearly every day".

Impulsivity

The 8-item Barrett-Impulsiveness Scale-Brief [42] was used to assess the level of impulsivity. Participants rated each item on a 4-point Likert scale ranging from 1 "never" to 4 "always".

Demographics

Participants were also asked about their gender, age, and education level.

Results

Preliminary analyses

Table 1 summarizes the internal reliability alpha values of the scales, descriptive statistics, and correlations among variables. Results showed that younger age was related to higher levels of social anxiety, depression, and Internet addiction (p<.001). Females relative to males were related to higher levels of depression (p<.001). Internet addiction, social anxiety, depression, and impulsivity were correlated with each other in the expected directions (p<.001). About 9.4% of the participants met the criteria for the diagnosis of Internet addiction, using the cut-off score of 36 and above on the Young's Internet Addiction Test [40].

	Age	Gender	Social Anxiety	Internet Addiction	Impulsivity	Depression
Age	1					
Gender	.51*	1				
Social Anxiety	-.15*	0.01	1			
Internet Addiction	-.11*	0.02	0.37*	1		
Impulsivity	-.03	0.04	0.21*	0.33*	1	
Depression	-.21*	0.12*	0.48*	0.35*	0.29*	1
Mean	21.52	-	11.69	22.38	17.6	5.81
Standard Deviation	1.91	-	8.46	9.49	3.39	4.12
Internal Reliability Alpha	-	-	.91	.87	.79	.87

Table 1: Descriptive Statistics and Bivariate Correlations of Major Variables
Note: *p < 0.001

Testing the parallel mediation model

The hypothesized parallel mediation model (Figure 1) was tested with the SPSS PROCESS macros version 3 [43]. The indirect, direct, and total effects of social anxiety on Internet addiction were calculated while controlling for age and gender effects. An indirect effect was considered to be significant if its 95% bootstrap CIs from 5,000 bootstrap samples do not include zero.

Figure 1 shows the coefficients of individual pathways of the hypothesized parallel mediation model. Bootstrapping results showed that the total (non-mediated) effect of social anxiety on Internet addiction was significant (β=.42, SE=.03, t=13.01, p<.001). The direct effect of social anxiety remained significant even after controlling for the two mediators (β=.27, SE=.03, t=7.98, p<.001). The indirect effect of social anxiety on Internet addiction through the two mediators was also significant and estimated to be .14 with a 95% bootstrap CI of .11 to .19. Both depression and impulsivity were significant partial mediators. Specific indirect effect were estimated to be .09 with a 95% bootstrap CI of .05 to .13 for depression, and .06 with a 95% bootstrap CI of 0.04 to .08 for impulsivity. Comparison of the two mediators indicated that the specific indirect effect through depression was larger than the specific indirect effect through impulsivity, with a 95% bootstrap CI of 0.02 to .14. The three variables of social anxiety, depression, and impulsivity accounted for a total of 22.3% of the variances in Internet addiction.

Supplementary Analyses

Supplementary bootstrapping analyses were conducted separately for males and females. Results affirmed that the hypothesized parallel mediation model was robust for both gender.

Two single mediation analyses were also performed to examine how each mediator alone influenced the association between social anxiety and Internet addiction. Results showed that depression and impulsivity were significant partial mediators. The indirect effect of social anxiety on Internet addiction through depression alone was significant and estimated to be .12 with a 95% bootstrap CI of .08 to .16. Similarly, the indirect effect through impulsivity alone was also significant and estimated to be .06 with a 95% bootstrap CI of .04 to .09.

Discussions

According to the recent Internet World Stat, Asia has the highest number of Internet users in the world, approximately 922.3 million, representing 44% of the world's Internet user population. University students in Asia have also shown higher rates of Internet addiction as compared to university students in other countries [11-12]. For the present study, about 9.4% of the surveyed university students in Singapore met the criteria for Internet addiction. This prevalence rate is comparable to rates reported by studies conducted in the United States and European countries [7,39], but lower than other Asian countries such as China and South Korea [9-10]. However, it should be noted that the considerable variance of prevalence rates for Internet addiction among countries may be attributable to differences in diagnostic criteria and assessment tools, study methodologies, and cultural factors.

In line with the current literature, the present study showed that Internet addiction was associated with psychological variables of social anxiety, depression, and impulsivity [5,10,21]. More importantly, the present study has identified the pathways with which the selected psychological variables were linked to Internet addiction. In particular, results supported the proposed parallel mediation model that was based on the stress-vulnerability model [15]. Social anxiety (stress) was found to have a salient direct influence on Internet addiction, as well as indirect influences through emotional (depression) and personality vulnerabilities (impulsivity). In other words, socially anxious students were particularly prone to become addicted to Internet use when they were depressed and/or impulsive. The above findings also supported earlier arguments for a "problematic Internet-behavior syndrome" in understanding the development and maintenance of Internet addiction [5]. It may be that socially anxious students who are depressed and/or impulsive are particularly attracted to the immediate reassurance and mood enhancement features of various Internet activities. However, time spent on the Internet will reduce the opportunities for normal/real-life social interactions and use of alternate coping strategies. This willfurther increase students' apprehension and anxiety in future social situations, resulting in increasing reliance on the Internet as a way of avoiding or coping with social interaction. This reliance on the Internet may then lead to addiction-like use of the Internet [23-24].

This study has several limitations, thus, caution should be taken when generalizing and interpreting its findings. Firstly, this study used self-report instruments instead of diagnostic tools to define Internet addiction and depression. There was no external validation of the frequency of Internet use and no clinical assessment of depression and social anxiety disorder. Thus, findings may reflect either an over- or under-estimation of these conditions. Secondly, the present study did not include information on the nature and contents of Internet

activities, hence, the results might be confounded with different motives for Internet use. In fact, with the availability and diversifications of the Internet technology, clinical and research attention should focus on the specific activities/behaviors that people engage in the Internet, as in online social networking, Internet gaming, and online shopping. Thirdly, demographic data such as ethnicity, faculty and department of study, and social economic status of the families were not collected. It thus remained unclear the extent to which the association between Internet addiction and various psychological variables might vary among subgroups of university students. In addition, this study focused on university students, and results may not be generalized to young adults of similar ages who are employed full-time. Finally, the cross-sectional study design also rendered it difficult to establish directionality and causality between variables and Internet addiction.

Conclusion

University students are major users of the Internet. They are at risk of being addicted to Internet use. Findings of this study indicate that socially anxious students with depressed mood and impulsive personality may be particularly vulnerable to Internet addiction. As such, assessment and management of social anxiety as well as depressed mood and impulsive personality should also be included in the prevention and intervention programs for Internet addiction.

Competing Interests

The authors declare that they have no competing interests.

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