INTERNET DEPENDENCE IN CHINESE HIGH SCHOOL STUDENTS: RELATIONSHIP WITH SEX, SELF-ESTEEM, AND SOCIAL SUPPORT¹, ²

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Summary.—This cross-sectional study investigated the relationships among self-esteem, social support, and Internet dependence. A sample of young people aged between 15 and 18 years old (M age = 16.3 yr., SD = 0.7; 470 boys, 441 girls) completed measures of the Rosenberg Self-Esteem Scale, the Perceived Social Support Scale, and the Internet Dependence Test. According to the cognitive-behavioral model of problematic Internet use, social support should mediate the relationship between self-esteem and Internet dependence. Furthermore, based on previous research it was predicted that boys would score higher on Internet dependence than women. Support for this model was obtained. Internet dependent students were more likely to be boys. Self-esteem and social support were negatively correlated with Internet dependence. The relationship between self-esteem and Internet dependence was mediated by social support. Although the effect sizes were small, the findings of the present study are of significance in investigating adolescents' Internet dependence.

In recent years, the Internet has become a popular entertainment, communication, and education tool for adolescents around the world. According to a survey conducted by the China Internet Network Information Center (CNNIC, 2010), nearly 82.9 million Chinese adolescents habitually used the Internet, and 3 years later this number was approximately 148.9 million and continues to rise (CNNIC, 2014). Despite its widely noted advantages, the Internet also has negative influences.

Excessive Internet use is currently becoming a serious mental health problem in Chinese adolescents (CNNIC, 2006). According to Young’s Internet Addiction Test, Wang, Zhou, Lu, Wu, Deng, and Hong (2011) found in 14,296 high school students in China’s Guangdong province that 12.2% of high school students were identified as engaging in problematic Internet use (scores over 50). By using the same test, Cao, Sun, Wan, Hao, and Tao (2011) surveyed 17,599 students (ages 10 to 24 years, M age = 16.1) in eight cities of China and found that approximately 8.1% showed Internet addiction (scores over 50). Park, Kim, and Cho (2008) found that 10.7% of adoles-

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INTERNET DEPENDENCE IN CHINESE HIGH SCHOOL STUDENTS

cents in South Korea had Internet addiction (scores of 70 or over) according to Young's Internet Addiction scale. Siomos, Dafouli, Braimiotis, Mouzas, and Angelopoulos (2008) found that 11% of 12- to 18-yr.-old adolescents had fulfilled the criteria of Internet addiction in Greece based on the same test. According to the Compulsive Internet Use Scale, 3.7% of 3,105 adolescents in The Netherlands were classified as potentially being addicted to the Internet (scores of 28 and over; Kuss, van Rooij, Shorter, Griffiths, & van de Mheen, 2013). While in the USA, problematic Internet use, as defined by simultaneous acknowledgement of having an irresistible urge to use the Internet, a growing tension that was relieved by Internet use, and trying to cut back on Internet use, was acknowledged by 4% of 3,560 high school students (14–18 yr.) and was more common among Asian (7.86%) and Hispanic (6.07%) students (Liu, Desai, Krishnan-Sarin, Cavallo, & Potenza, 2011). It is no doubt that excessive Internet use was prevalent across Eastern and Western societies, especially in adolescents (Ko, Yen, Liu, Huang, & Yen, 2009; Christakis, 2010; Ko, Yen, Yen, Chen, & Chen, 2012).

Excessive Internet use is defined as when Internet use has become excessive, uncontrolled, and time-consuming to the point of timelessness and severely disrupting people's lives (Kraut, Patterson, Lundmark, Kiesler, Mukopadhyay, & Scherlis, 1998). The terms “problematic Internet use” (Davis, Flett, & Besser, 2002), “Internet addiction” (Young, 1996, 1998), or “pathological Internet users” (Morahan-Martin & Schumacher, 2000; Davis, 2001), etc., are usually considered synonyms of Internet dependence (van den Eijnden, Meerkerk, Vermulst, Sijkerman, & Engels, 2008; American Psychiatric Association, 2010). Instead of “addiction,” the DSM–5 favors “dependence” (for a substance or other such stimulus) and “pathological” (e.g., a gambling disorder). Therefore, this article shall use the term “Internet dependence” to describe the set of symptoms previously mentioned in the literature. Lin and Tsai (1999) selected 615 participants by a stratified sampling from Taiwan high schools and identified 61 students who demonstrated Internet dependence symptoms, namely skipping meals, losing sleep and study time, increasing online expenses, rearranging daily routines, and avoiding interpersonal interaction to become more involved in Internet activities.

Previous research has explored the problems associated with Internet dependence (Young, 1996, Kraut, et al., 1998; Chou & Hsiao, 2000; Bricolo, Gentile, Smelser, & Serpelloni, 2007) such as neglect of academic and domestic responsibilities, disruption of relationships, time management, and health or financial problems. However, much of the literature has paid less attention to why people were online and has been more concerned with content-specific problematic Internet users (e.g., online gambling) or the amount of time they spend online (Caplan, 2002). Previous studies such as Kraut, et al. (1998) and Sanders, Field, Diego, and Kaplan (2000) have focused on the association of psychological depression with such problem-
atic use, while giving less attention to the role that social isolation (i.e., low social support) and lack of self-esteem might play in the process of problematic Internet use (for review, see Ko, et al., 2012).

A number of studies have identified that there was a significant relationship between Internet dependence and psychosocial well-being, including anxiety, depression, loneliness, and life satisfaction (e.g., Young & Rogers, 1998; Morahan-Martin & Schumacher, 2000; Kim, LaRose, & Peng, 2009; Ni, Yan, Chen, & Liu, 2009; Bulut-Serin, 2011; Ko, et al., 2012). Yang and Tung (2007) found that higher scores for dependence, shyness, depression, and low self-esteem were associated with Internet dependence. Self-esteem was found to be significantly negatively associated with “problematic” high scores for Internet use (Kim & Davis, 2009). Depression and social phobia were significantly positively correlated with higher scores for Internet dependence in adolescents in the 2-year follow-up (Ko, Yen, Chen, Yeh, & Yen, 2009). Depression was a predictor of Internet dependence in regression analysis (Morrison & Gore, 2010). Some researchers proposed that one of the major motives such people had was to relieve psychosocial problems (Kim, LaRose, & Peng, 2009), while others suggested that people might be drawn by the perceived variability of or control over identity in the social interactions that the Internet provides (Leung, 2004).

According to Kim and Davis (2009), low self-esteem was a function of perceived rejection, abandonment, or indifference by a significant other; thus, self-esteem should be related to problematic Internet use. Earlier studies showed that self-esteem was correlated with Internet dependence (Armstrong, Phillips, & Saling, 2000; Yang & Tung, 2007; Douglas, Mills, Niang, Stepchenkova, Byun, Ruffini, et al., 2008; Ko, et al., 2009; Kim & Davis, 2009), and in regressions low self-esteem significantly predicted Internet dependence (Kim & Davis, 2009; Meerkerk, van den Eijnden, Franken, & Garretsen, 2010; Bozoglan, Demirer, & Sahin, 2013). Those with low self-esteem had higher hours of Internet usage (Armstrong, et al., 2000; Douglas, et al., 2008). Thus, low self-esteem should predict susceptibility to Internet dependence. Although many researchers have investigated the relationship between self-esteem and Internet dependence, few have focused on the process of how self-esteem was related to Internet dependence.

Previous authors have suggested that social isolation plays an important role in Internet dependence (e.g., Sanders, et al., 2000). Social isolation or lack of social support from family or friends was thought to possibly lead to problematic Internet use (Davis, 2001). Thus, people having feelings of social isolation, less social support, and small social networks may more readily develop dependence on Internet activities.

Among adolescents, social support is often studied from the vantage point of support provided by peers, teachers, or parents. Perceived social support can be considered important because this type of support is more
INTERNET DEPENDENCE IN CHINESE HIGH SCHOOL STUDENTS

According to Davis (2001), lack of social support was a proximal cause of problematic Internet use. Some researchers have indicated that perceived social support is negatively correlated with Internet dependence (Kraut, et al., 1998; Davis, 2001; Özcan & Buzlu, 2007). However, others found a nonsignificant correlation between social support and Internet use (e.g., Swickert, et al., 2002). Given these conflicting and inconsistent research findings, further study is required to clarify the relationship between social support and Internet use. The question is, does the amount of support a person perceives decrease Internet dependence because he or she perceives more social support?

A meta-analysis was conducted of 10 studies on Internet dependence during the period of 1996–2006 and showed that feelings of isolation and loneliness and self-esteem were the main antecedents of Internet dependence (Douglas, et al., 2008). In fact, lonely people can develop a preference for online social interaction that can lead to Internet dependence (Caplan, 2003). Davis (2001) introduced a cognitive-behavioral model of problematic Internet use that attempted to model the etiology, development, and outcomes associated with problematic Internet use. The model proposes that problematic Internet use is a consequence, rather than a cause, of broader psychopathology (e.g., depression and social anxiety). That is to say, existing psychosocial problems predispose people to developing maladaptive behaviors associated with their Internet use, e.g., problematic Internet use. According to Davis (2001), psychosocial problems such as loneliness and depression might play a role as a distal antecedent to problematic Internet use.

Social and personality research has shown that self-esteem is a predictor of the quality of people’s social bonds (Murray, Holmes, & Collins, 2006), and that the quality of social bonds tends to be significantly related to health outcomes (Cacioppo & Hawkley, 2003; Cohen, 2004). Stinson, Logel, Zanna, Holmes, Cameron, Wood, et al. (2008) found that low self-esteem was a psychological risk factor for health problems 2 mo. later (asking participants whether or not they had experienced health problems in the preceding 2 mo.), and that much of the effect was associated with poor social bonds. Based on the above, it was expected that low social support would mediate the relationship between low self-esteem and Internet dependence.

Previous studies have identified sex differences in Internet dependence, in which men are more likely to be Internet dependent (Chou & Hsiao, 2000; Morahan-Martin & Schumacher, 2000; Chou, Condron, & Belleind, 2005; Yang & Tung, 2007; Kim & Davis, 2009; Morrison & Gore, 2010; Cao, et al., 2011; Frangos, Frangos, & Sotiropoulos, 2011). For example, using the 8-item Internet Addiction Diagnostic Questionnaire developed by Young (1996), Yang and Tung (2007) in Taiwanese high schools identi-
fied 13.8% as Internet dependent, with more Internet dependent boys than girls (ratio 3 boys to 1 girl). Using the 20-item Young’s Internet Addiction Test, 8% of adolescents in China were found to score as dependent on the Internet (scores over 50), with more boys than girls (10.4 vs 5.9%; Cao, et al., 2011). There may be two reasons for more men to report higher Internet use than women. First, men, especially adolescents and young adults, use the Internet more than women (Morahan-Martin, 1998). Second, men and women use the Internet differently (Li & Kirkup, 2007; Colley & Maltby, 2008). They reported that their use of the Internet significantly changed their lives. Women tended to report that they found great value in online activities for keeping in touch with family or old friends, searching general information, and shopping, whereas men are more likely to use applications such as Internet games and Internet gambling, which are associated with more problematic use. However, some studies found no relationship between sex and Internet dependence (e.g., Brenner, 1997; Leung, 2004). In this study, differences in Internet dependence between boys and girls among Chinese adolescents were investigated.

Based on the previous arguments, the participants in the current study were high school students (15–18 yr.) in Guangdong Province, China, because the students there have more access to the Internet and therefore are more likely to be Internet users than those in other provinces.

**Hypothesis 1.** Internet dependence is negatively correlated with self-esteem and social support.

**Hypothesis 2.** There are sex differences in adolescents’ Internet dependence.

**Hypothesis 3.** There is a negative relationship between self-esteem and Internet dependence that is mediated by social support.

**METHOD**

*Participants and Procedure*

This sample consisted of a total of 947 students (M age = 16.3 yr., SD = 0.7) receiving education in two high schools and one vocational high school in a district of Guangdong. Criteria for participation included using the Internet regularly and being willing to participate in the study.

The data used in this study were collected in 2010. Prior to conducting the survey, the participants were informed that their participation was voluntary and their answers would remain anonymous. All participants completed a self-report questionnaire (presented in Chinese) in class after the researchers explained the procedures and requirements. The questionnaires were collected immediately after they were completed. Finally, the participants were debriefed and thanked for their participation.
Before the formal analyses, outliers were screened by examining standardized z scores for each variable. This study applied the criterion that any case with a $|z| > 3.0$ was identified as an outlier. Twenty participants had scores that exceeded this criterion. These outliers were eliminated from the dataset to avoid possible interference with the results, leaving a total of 927. Among the respondents, 470 (51.6%) were boys and 441 (48.4%) girls; 16 did not indicate their sex. Meanwhile, 506 (54.8%) of the students were in Grade 1, and 418 (45.2%) in Grade 2.

Measures

Internet Dependence Test.—Internet dependence was assessed with a scale consisting of 16 items and two subscales called Internet dependence symptoms (ID symptoms) and ID-relational problems, which were borrowed and modified from previous studies, as follows. (1) Nine items were selected from the Chinese Internet Addiction Scale’s revision (CIAS–R; Chen, Weng, Su, Wu, & Yang, 2000; Bai & Fan, 2005). Examples of the items included “My physical health has been worse than before because of the Internet,” “Without the Internet, my life would not have fun,” “I have attempted to spend less time online but have not been able to,” and “It happened to me more than once that I slept less than 4 hr. because of being online.” (2) Seven items were modified from the Adolescent Pathological Internet Use Scale (Lei & Yang, 2007). Examples of items included: “I spent longer periods of time online every week than before since last semester,” “If I don’t use the Internet in a certain period, I feel depressed,” and “I have regularly skipped meals because of the Internet.” For all items, responses were indicated as yes or no (reverse scored; anchors 1: yes and 0: no). In this study, total scores were used to indicate an Internet dependence index. Cronbach’s $\alpha$ of the Internet dependence scale in the present study was .76.

Item-total correlations were calculated for each of the 16 items. The results showed that the item-total correlations were all significant, with correlations ranging from .41 to .64. Based on the criterion of .30 as an acceptable item-total correlation (Deacon, Abramowitz, Woods, & Tolin, 2003), all the 16 items were acceptable.

To confirm the overall fit and acceptability of the Internet dependence construct, confirmatory factor analysis (CFA) of a two-factor model (i.e., ID-symptoms and ID-relational problems) was conducted on the items using AMOS 17.0 software. Cases with missing data were deleted listwise. The fit of this two-factor model was tested using standardized maximum likelihood estimations. Results showed that the two-factor structure fit acceptably ($\chi^2 = 237.3, df = 103, \chi^2 / df = 2.30, GFI = 0.96, CFI = 0.92, RMSEA = 0.04$). The correlation between ID-symptoms and ID-relational problems was .86. Given the large number of participants, loadings greater than about .20
<table>
<thead>
<tr>
<th>Item</th>
<th>Loading</th>
<th>Correlation</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. 我曾尝试花更少的时间在网上,但无法做到。</td>
<td>.52</td>
<td>.62†</td>
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<tr>
<td>[I have attempted to spend less time online but have not been able to.]</td>
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<tr>
<td>2. 我需要花更多的时间上网才能获得满足。</td>
<td>.36</td>
<td>.46†</td>
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<tr>
<td>[I need more time online to achieve satisfaction.]</td>
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<tr>
<td>3. 从上学期以来,我每周上网的时间比以前增加了许多。</td>
<td>.33</td>
<td>.50†</td>
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<tr>
<td>[I spent longer periods of time online every week than before since last semester.]</td>
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<tr>
<td>4. 我花费在网络上的时间要比预期的长。</td>
<td>.50</td>
<td>.63†</td>
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<tr>
<td>[I stay online longer than originally intended.]</td>
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<tr>
<td>5. 我只要有一段时间没有上网就会情绪低落。</td>
<td>.33</td>
<td>.38†</td>
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<tr>
<td>[If I don’t use the Internet in a certain period, I feel depressed.]</td>
<td></td>
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<tr>
<td>6. 我下网后其实是要做别的事,却又忍不住再次上网。</td>
<td>.42</td>
<td>.53†</td>
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<tr>
<td>[I can’t help but turn to the Internet right after I get off it even though I intend to do something else.]</td>
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<tr>
<td>7. 我常常不能控制自己上网的冲动。</td>
<td>.52</td>
<td>.58†</td>
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<tr>
<td>[I can’t control my impulse to surf every so often.]</td>
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<tr>
<td>8. 没有网络，我的生活就毫无乐趣可言。</td>
<td>.31</td>
<td>.45†</td>
</tr>
<tr>
<td>[Without the Internet, my life would not be fun.]</td>
<td></td>
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<tr>
<td>9. 即使上网对我与他人的关系造成了负面影响,我也不会减少上网。</td>
<td>.23</td>
<td>.27†</td>
</tr>
<tr>
<td>[I do not reduce Internet use even though surfing on the Internet has a negative influence on relationships with others.]</td>
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<tr>
<td>10. 因为上网的关系,我花在自己喜欢的活动上的时间减少。</td>
<td>.44</td>
<td>.59†</td>
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<tr>
<td>[I spend less time on the activities I enjoy because of being online.]</td>
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<tr>
<td>11. 自从开始上网,我的学习成绩下降。</td>
<td>.45</td>
<td>.54*</td>
</tr>
<tr>
<td>[My school performance has deteriorated since I started going online.]</td>
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<tr>
<td>12. 因为上网,我的身体健康变差。</td>
<td>.30</td>
<td>.42†</td>
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<tr>
<td>[My physical health has been worse than before because of the Internet.]</td>
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<tr>
<td>13. 我曾不止一次因为上网的关系而睡不到4小时。</td>
<td>.32</td>
<td>.48†</td>
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<tr>
<td>[It happened to me more than once that I slept less than 4 hr. because of being online.]</td>
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<tr>
<td>14. 我习惯减少睡眠时间,以便能有更多时间上网。</td>
<td>.33</td>
<td>.39†</td>
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<tr>
<td>[I have routinely cut short on sleep to spend more time online.]</td>
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<tr>
<td>15. 我曾因为上网而没有按时进食。</td>
<td>.34</td>
<td>.56†</td>
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<tr>
<td>[I have regularly skipped meals because of the Internet.]</td>
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<tr>
<td>16. 有人告诉我,我花了太多时间在网络上。</td>
<td>.45</td>
<td>.56†</td>
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<tr>
<td>[I have been told I spend too much time online.]</td>
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</tbody>
</table>

*p < .05, two-tailed. †p < .01, two-tailed.
were significant at the 1% level, but, to emphasize the larger, more important loadings, only those above .30 were accepted. Loadings for all items were greater than .30, which ranged from .31 to .57, indicating an acceptable validity of the measure of ID-symptoms and ID-relations. The items and their respective factor loadings are presented in Table 1, along with the item-total correlations for each item. Based on the item-total correlations and the CFA results, this scale had acceptable psychometric properties among adolescents.

Self-esteem

Self-esteem was assessed using the Chinese version (Wang, Wang, & Ma, 1999) of Rosenberg’s (1965) Self-Esteem Scale (10 items), a widely used and well-validated measure of one’s overall sense of self-worth. Its average reliability coefficient was greater than .80 (Rosenberg, 1965). Each item was answered using a 4-point scale (with anchors 1: Very much like me and 4: Not at all like me). Sample items included, “I feel that I have a number of good qualities,” and “I feel I do not have much to be proud of.” Numerous studies have indicated the reliability and the validity of the Chinese version of this scale (Yan, 2006). Cronbach’s $\alpha$ in the present study was .83. The mean for self-esteem in this study was 2.82 ($SD=0.44$) with ranges of 1–4. High scores indicated high self-esteem.

Perceived Social Support Scale (PSSS).—Perceived social support was measured using the Chinese version of Zimet’s PSSS, developed to determine the perceived social support conditions of participants (Wang, et al., 1999). It is a 7-point scale consisting of 12 items. The scale was adopted with slight modifications in the current study; i.e., leaders and colleagues were replaced by teachers and classmates, respectively. The response format had anchors 1: Strongly disagree, 4: Neutral, and 7: Strongly agree. Cronbach’s $\alpha$ in the present study was .88. The participants’ scores on the scale’s items were averaged to yield an overall social support index. The reliability and validity of the Chinese version of the PSSS were supported (e.g., Huang, Jiang, & Reng, 1996). The mean for social support in this study was 5.07 ($SD=0.90$), with ranges of 1–7. High scores represented high levels of perceived social support.

Analysis

Data were analyzed using SPSS 16.0. The first step in the analysis was to test whether Internet dependence scores were correlated with social support and self-esteem, and second, whether there was a sex difference in Internet dependence and whether the relationship between self-esteem and Internet dependence was mediated by social support. Hierarchical regression analysis was used to investigate the hypothesized path model. A $p$ value less than .05 was considered significant.
Variance inflation factor (VIF) was used to examine the multicollinearity among the independent variables. The statistics showed that all VIF values were less than 1.20, well below the cutoff of 10. Therefore, the VIF scores indicated that multicollinearity was not a problem in the present study.

Normality was evaluated by testing the skewness and kurtosis of each variable. According to the cutoff suggested by Kline (2005), variables with absolute values of skewness greater than 3.0 or with absolute values of kurtosis greater than 8.0 are considered severely non-normal. The results of a descriptive analysis indicated that no variable in the present study was severely non-normal.

RESULTS

Correlations Among Internet Dependence, Social Support, and Self-esteem

Correlations among Internet dependence, social support, and self-esteem were examined. As shown in Table 2, Internet dependence was negatively correlated with social support and self-esteem ($r = -0.13, 95\% CI = -0.06, -0.19, p < .01; r = -0.10, 95\% CI = -0.04, -0.17, p < .01$), suggesting that people who spend more time online tend to have lower social support and self-esteem. Self-esteem was positively correlated with social support ($r = 0.27, p < .01$). According to Cohen’s (1992) effect size guidelines, correlation coefficients of 0.10 should be interpreted as small; 0.30, medium; and 0.50, large. The above significant correlations represented small effect sizes (which would indicate less than a 9% overlap in variance between two variables). The results supported expectations that Internet dependence was significantly negatively associated with self-esteem and social support, although the effects were very small.

Regression Analysis For Internet Dependence

Social support was hypothesized to mediate the relationship between self-esteem and Internet dependence. To further assess the unique contribution of self-esteem and social support to Internet dependence, this
study first performed a regression analysis with Internet dependence as the predicted variable. Sex was reported to be a significant predictor of Internet dependence ($F_{1,901} = 5.41, \beta = -0.08, t = -2.33, p < .05$). Boys scored higher on Internet dependence than girls (boys: $M = 0.19, SD = 0.18$; girls: $M = 0.17, SD = 0.15$). To test the relationship between the independent variable and mediator variable, social support was regressed on sex and self-esteem. After sex was controlled, self-esteem significantly predicted social support ($F_{1,900} = 83.91, \beta = 0.29, t = 9.16, p < .01$).

According to the guidelines developed by Baron and Kenny (1986), mediation is indicated if the relationship between the independent variable (here, self-esteem) and the outcome variable (Internet dependence) substantially decreases after the mediating variable (social support) is added into the model, while the mediator is correlated with the outcome variable. To test this mediation model, a third step was added, containing social support, to the regression analyses of the outcome variables. The results of the hierarchical regressions are shown in Table 3.

As shown in Table 3, sex was entered as a control variable in the first step. In Step 2, Internet dependence was regressed on self-esteem. After controlling for the effect of sex, self-esteem predicted Internet dependence. In Step 3, when social support was added to the models the regression coefficients of the relationship between self-esteem and Internet dependence decreased from $-0.13 (p < .01)$ in the second step to $-0.10 (p > .05)$. The relationship weakened and was non-significant, indicating full mediation.

A Sobel test was used to examine the mediation effects. It produced a test statistic ($z$), along with a significance level. Results of Sobel tests in this study supported social support mediating the relationship between self-esteem and Internet dependence ($z = -2.41, p < .05$), thus providing support for the study’s major hypothesis.

In addition, the moderating effect of sex was studied. A two-way interaction term was created (i.e., sex $\times$ social support or sex $\times$ self-esteem) and all predictors were centered in the regression to reduce multicollinearity. Results showed that the interactions for sex with social support and with self-esteem were not significant in predicting Internet dependence ($\beta = -0.09, p = .09; \beta = -0.01, p = .87$). Since neither of the regression coefficients was significant at .05, nor is there an a priori reason to support this difference, there will be no discussion of this result.

**DISCUSSION**

This study was intended to assess the associations between psychosocial variables and Internet dependence. The unique contribution of this study is that it shows that social support mediates the relationship between self-esteem and Internet dependence. Specifically, low social support is associated with low self-esteem and higher Internet dependence.
<table>
<thead>
<tr>
<th>Variable</th>
<th>Internet Dependence</th>
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<th>Step 1</th>
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<td></td>
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<td>B</td>
<td>SE</td>
<td>β</td>
<td>t</td>
<td>p</td>
<td>B</td>
<td>SE</td>
<td>β</td>
<td>t</td>
<td>p</td>
<td>B</td>
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<td>β</td>
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<td>p</td>
<td>B</td>
<td>SE</td>
</tr>
<tr>
<td>1. Sex</td>
<td></td>
<td>−0.15</td>
<td>0.07</td>
<td>−0.08</td>
<td>−2.33</td>
<td>.02</td>
<td>−0.18</td>
<td>0.07</td>
<td>−0.09</td>
<td>−2.63</td>
<td>.01</td>
<td>−0.14</td>
<td>0.07</td>
<td>−0.07</td>
<td>−2.08</td>
<td>.04</td>
<td>−0.14</td>
<td>0.07</td>
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<tr>
<td>2. Self-esteem</td>
<td></td>
<td>−0.13</td>
<td>0.04</td>
<td>−0.12</td>
<td>−3.22</td>
<td>&lt;.001</td>
<td>−0.13</td>
<td>0.04</td>
<td>−0.12</td>
<td>−3.22</td>
<td>&lt;.001</td>
<td>−0.10</td>
<td>0.05</td>
<td>−0.07</td>
<td>−1.94</td>
<td>.06</td>
<td>−0.10</td>
<td>0.04</td>
</tr>
<tr>
<td>3. Social support</td>
<td></td>
<td>−0.10</td>
<td>0.04</td>
<td>−0.10</td>
<td>−2.85</td>
<td>.00</td>
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<td>−2.85</td>
<td>.00</td>
<td>−0.10</td>
<td>0.04</td>
</tr>
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</table>

**Note.**—Standardized regression coefficients are reported for the respective regression steps, including sex (Step 1), sex and self-esteem (Step 2), and sex, self-esteem, and Social support (Step 3). Standardized betas are reported from the regression equation. *p < .05, two-tailed. †p < .01, two-tailed.
The results support the hypotheses. High self-esteem and social support were found to be associated with a small but statistically significant decrease in Internet dependence. Hierarchical regression analysis indicated a mediating role of social support in the relationship between self-esteem and Internet dependence. Also, there was a significant sex difference in scores for Internet dependence. There are several ways in which these findings are important.

First, results showed that boys scored higher on the Internet dependence test than girls. This result was consistent with some previous findings in Korea (e.g., Heo, Oh, Subramanian, Kim, & Kawachi, 2014) and in Japan (e.g., Sato, 2006) that proportionately in the sample the boys were more likely to use the Internet at problem levels than the girls. It would have to be tested by a further study, but a possible hypothesis for this may be that women often ask for help and support distracting themselves, letting out their feelings, than men (Thoits, 1995). However, the present result was inconsistent with prior online studies of self-described “Internet addiction” (Young, 1996; Young & Rogers, 1998; Ni, et al., 2009) that found no sex differences or found that women self-reported a higher incidence of “Internet addiction.”

Second, the present study found that Internet dependence was significantly negatively correlated with self-esteem. In regression, self-esteem was a good predictor of Internet dependence. This means that people might tend to be more likely to depend on the Internet when they had low self-esteem. The results were consistent with those of previous studies that people with Internet dependence had lower self-esteem than those who did not (Yang & Tung, 2007; Meerkerk, et al., 2010) and those with low self-esteem had increased hours of Internet usage (Armstrong, et al., 2000; Douglas, et al., 2008). Sariyska, et al. (2014) found that persons with a damaged self-esteem had a higher proclivity for becoming Internet dependent in Bulgaria, Spain, Germany, and Colombia. However, it is unclear as to whether low self-esteem is a cause or consequence of Internet dependence. It might be the case that low self-esteem would drive people to use the Internet as an escape or withdrawal, as suggested by Craig (1995). Alternatively, it could be argued that Internet dependence would lead people to have low self-esteem.

Third, Internet dependence was negatively associated with social support. In regression, social support significantly predicted Internet dependence. This means that people will be more likely to depend on the Internet when they have less social support. The results were consistent with the previous studies showing that people who did not have good social skills were more likely to use the Internet more (Kim & Davis, 2009) and those who had less social support had a higher probability of Internet
dependence (Tsai, Cheng, Yeh, Shih, Chen, Yang, et al., 2009). Hills and Argyle (2003) suggested the possibility that the Internet may provide an attractive alternative to an unhappy life for individuals who lack social support by allowing them to “go out” and build an alternative life. However, the current study did not generate any data to evaluate this.

Finally, the present study provides evidence that self-esteem has an indirect relationship with Internet dependence through social support. The results reported here lend a testable and empirical support to the cognitive-behavioral model of PIU introduced by Davis (2001), which posited that the lack of social support was a sufficient cause of PIU. The results were also consistent with the findings of Meerkerk, van den Eijnden, Vermulst, and Garretsen (2007) that problematic Internet use was associated with pre-existing psychological problems, such as depressive symptoms or loneliness. Several authors have asserted that the specific features of the Internet would entrap vulnerable populations because of their psychological problems (Orford, 2005).

Practical Implications

The China Communist Youth League indicated in 2007 that more than 17% of Chinese citizens between 13 and 17 years were becoming dependent on the Internet, while most who were dependent were between 15 and 20 years in China but ages 20–30 years in the West (China Daily, 2010). The effect sizes in the present study were small. However, it cannot be assumed that a small effect size is necessarily unimportant. Rosenthal (1991) has argued that seemingly small effect sizes can be important and be associate with sizable applied effects. Although this finding is not conclusive, it does help illustrate how empirical studies of Internet dependence can help advance understanding of what factors may play a role in the phenomenon.

Limitations

Several limitations of the present study should be noted. First, there were no data about what Internet activities the participants engaged with. This is a serious limitation. What participants do on the Internet is critical information needed for the next step in understanding these relationships. Future work can therefore be improved by including questions about how adolescents use the Internet.

Second, the effect sizes were small, which limit the practical significance. Third, the current research design does not allow conclusions about how psychosocial problems lead to Internet dependence. To ascertain causality, future studies should try to examine how these relationships develop over time using experimental or longitudinal research design. Furthermore, other factors such as people’s personality or their preference for online so-
sial interaction, which have not been measured, might also play a significant role in Internet dependence. Further research should investigate the cognitive-behavioral model of problematic Internet use in different ways of Internet usage after controlling for people's personal preferences.

In conclusion, results provided support for the hypothesis that social support mediates the link between self-esteem and Internet dependence, although the explained variance was small. It will be important in future research to develop further understanding of the correlates, antecedents, and consequences of Internet dependence. The findings contribute to the literature by demonstrating two points. The first point is that paying attention to the level of social support may be important to a better insight into associations between self-esteem and Internet use. The second point is that men are more likely to become dependent on the Internet than women.

REFERENCES


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INTERNET DEPENDENCE IN CHINESE HIGH SCHOOL STUDENTS


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