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Association between online and offline social support and internet addiction in a representative sample of senior high school students in Taiwan: The mediating role of self-esteem

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ABSTRACT

Based on the Sociometer Theory and DuBois' conceptual framework for the relations of perceived social support and self-esteem in adolescence, this study was designed to examine the mediating role of self-esteem in the relationship between online and offline social support and Internet addiction (IA) in a large representative sample of senior high school students in Taiwan. Using a cross-sectional design, 1922 participants (1019 females) were recruited from senior high schools using both stratified and cluster sampling, and a comprehensive survey was administered. Structure equation modeling and bootstrap analyses results showed that IA severity was significantly and negatively predicted by offline social support, and mediated through self-esteem. The results not only supported the Sociometer Theory, but were also consistent with the conceptual framework proposed by DuBois. Online social support positively predicted IA severity, but was unable to predict self-esteem. The mediating role of self-esteem in the relationship between online and offline social support and IA severity were discussed.

1. Introduction

Internet use in modern society has rapidly increased over the past few decades. Since the Internet is extensively used in academic, recreational and business sectors, the relationship between the Internet and modern people has become truly inseparable (Hahn & Kim, 2014). The Internet often functions in a positive way for people to enjoy leisure time, explore information, expand interpersonal relationships, and ubiquitous learning, however, excessive and uncontrolled Internet use has frequently been linked to many maladaptive problems, and the misuse and abuse of the Internet can lead to Internet addiction (IA) (Chou et al., 2017; Liang, Zhou, Yuan, Shao, & Bian, 2016; Scimeca et al., 2017). Although the reported ratios of IA varied widely, it is no doubt that IA has become an emerging social, education and mental health issue around the world (Zhao et al., 2017). IA prevalence among adolescents tend to be the highest (Vondráčková & Gabrhelík, 2016), therefore, it is important for educational agencies and mental health professionals to construct suitable IA prevention programs geared toward adolescents. An increasing importance is needed to consider the developing process of IA as they distinctively exist, so that researchers can set about to examine reciprocal links between outcomes and antecedents of the exposure (Eastin, 2005). Hence, there is an imperative need to identify the psychosocial risk factors and the process of IA.

In recent years, several studies have highlighted self-esteem as an important explanatory factor in the development and maintenance of IA (Armstrong, Phillips, & Saling, 2000; Niemz, Griffiths, & Banyard, 2005; Wiederhold, 2016), and studies have shown that self-esteem is associated with IA (Ko, Yen, Yen, Lin, & Yang, 2007; Mei, Yau, Chai, Guo, & Potenza, 2016; Nie, Zhang, & Liu, 2017; Wartberg et al., 2017; Younes et al., 2016). Mei et al. (2016) compared adolescent problematic Internet users ($n = 85$) and maladaptive Internet users ($n = 260$) with adaptive Internet users

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($n = 1206$) and found that problematic and maladaptive Internet users showed lower self-esteem than adaptive Internet users. Younes et al. (2016) surveyed 600 medical college students and through a logistic regression model, found that lower self-esteem was significantly and independently associated with whether the student has IA. Similarly, Wartberg et al. (2017) examined 1095 adolescents and also found that self-esteem significantly and negatively predicted Internet gaming disorder, both total score and cut-off, in the linear regression model and logistic regression model, respectively. Conducting a one-year follow-up on 517 junior high school students, Ko et al. (2007) excluded students with IA in the first year, and found that low self-esteem (first year) significantly predicted the development of IA in the followed-up year.

With the heightening risks associated with adolescents and IA, the role of perceived social support also plays an important aspect in the development of IA. Numerous studies have found that perceived social support was significantly and negatively associated with IA (Kilic, Avci, & Uzuncakmak, 2016; Wang & Wang, 2013; Wegmann & Brand, 2016; Wu et al., 2016). Comprehensively, we incorporated the Sociometer Theory (Leary & Baumeister, 2000; Leary, 1999; Leary, Tambor, Terdal, & Downs, 1995) and the conceptual framework proposed by DuBois et al. (2002), which integrates the relations of perceived social support and self-esteem to adjustment during adolescence. The theoretical framework in the present study attempts to examine the impact and predictability of perceived social support and self-esteem to IA.

From an evolutionary psychological perspective, the Sociometer Theory proposes that individuals who belong and interact in social groups will have a greater chance at survival and having offspring. Thus, the need to belong serves an evolutionary adaptive function for survival. Human beings gradually evolve to seek for membership, and to avoid being excluded from a group. In order to maintain the relationship of interpersonal support, human beings require a mechanism to monitor the reaction of others, especially when someone does not provide support. Such a psychological mechanism is termed "Sociometer," and is used in social relations and interactions that monitor the acceptance and/or rejection from others. When one observes a decrease of acceptance from others, Sociometer will remind one to be cautious and to put efforts in self-encouragement in order to lower the possibility of being rejected and excluded. The level of self-esteem is able to accurately reflect one's Sociometer condition (Leary, 1999; Leary et al., 1995). In other words, self-esteem is an individual's subjective perception of his/her relational value with society and significant others, and is influenced by the acceptance and value of others. When an individual who often experiences praise, being loved, and other positive relations, will be more likely to have a higher self-esteem level, especially when he perceives being valued by a significant other; on the other hand, encountering failure, criticism, rejection and other negative relations may decrease a person's self-esteem (Leary, 1999; Leary et al., 1995). If an individual continues to experience problems in interpersonal support, his/her self-esteem is significantly threatened, and when such threat is not well defended against, various emotional and behavioral problems can be generated (Leary et al., 1995). Since IA is often viewed as an emotional and behavioral problem manifested through the medium of the Internet (Park, Kang, & Kim, 2014), self-esteem can be expected to significantly mediate the effect of perceived social support on IA. Armstrong et al. (2000) examined the association of IA and low self-esteem, and suggested that Internet addicts are using the Internet as an escape. From a case study perspective, Griffiths (2004) found that individuals with low self-esteem perceive the Internet as a compensation platform to cope with a self-sense of inadequacy. The Internet allows for an individual to alter personalities and social identities, and in turn increases self-satisfaction, but also increases the amount of Internet use, easily heightening one's dependence of the Internet. Niemz et al. (2005) stated that individuals with low self-esteem and who are at a higher risk of IA are related to the characteristics of online disinhibition. The Internet has features of anonymity and asynchronous communication, thus, individuals with a lower sense of self-value can freely show their ideal sense of image on the Internet without the constraints of sex, culture, social class, age, appearance; nor is face-to-face contact required when online, thus, the Internet becomes a secure home base that easily offers a nesting ground for individuals to gain their self-confidence, and in turn, increase their dependence on the Internet.

Based on extensive prior theory and research, DuBois et al. (2002) proposed a conceptual framework in the relations of perceived social support and self-esteem to the emotional and behavioral adjustment during early adolescence, and adopted a 2-year longitudinal study to investigate the influences ($N = 350$). Findings obtained using latent growth-curve modeling were consistent with the hypothesis that self-esteem mediated the effects of perceived social support on emotional and behavioral adjustment. However, to our knowledge, no studies in the past have examined self-esteem as a potential mechanism that underlies the relationship between perceived social support and IA among adolescents. To partly address these gaps, this study aimed to examine the mediating role of self-esteem in the relationship between perceived social support and IA among adolescents.

With the global use of the Internet, apart from real life social support, another type of social support originated from the Internet, which is termed online social support, and may also play an important role in adolescents (Lin et al., 2017). Thus, modern day social support can be separated into online social support and offline social support (Wang & Wang, 2013). In addition, several studies indicated that offline social support is negatively associated with IA, whereas online social support is positively associated with IA (Wang & Wang, 2013; Yeh, Ko, Wu, & Cheng, 2008). No existing studies, however, have examined the association between online social support and self-esteem, nor investigated the mediating role of self-esteem in the relationship between online social support and IA. To partly address these gaps, the present study also aimed to examine the mediating role of self-esteem in the relationship between online social support and IA in a representative sample of senior high school students.

The hypothesized mediational model among the four variables is presented in Fig. 1. We hypothesized that offline social support and online social support were linked to IA and the relationship was mediated by self-esteem, respectively.

2. Methodology

2.1. Participants and procedure

Participants in the present study were recruited from senior high schools in Taiwan. The sample was stratified by school type (i.e. regular or vocational high school) and clustered by class. Based on the 2012 school year data provided by Department of Statistics, Ministry of Education (https://stats.moe.gov.tw/qframe.aspx?qno=MQA1AA2), there were a total of 402,689 regular high school students and 369,436 vocational high school students in Taiwan (ratio of 52: 48). According to the ratio, the present study invited two regular high schools and two vocational high schools from October 2014 to December 2014, and selected 2171 students (1128 regular high school students, yielding 51.95% of the total sample size, which was close to the ratio of the population group). Of them, 1922 students (1019 females) participated, resulting in a response rate of 88.53%. Of the final sample, 939 participants were regular high school students, and 983 participants were vocational

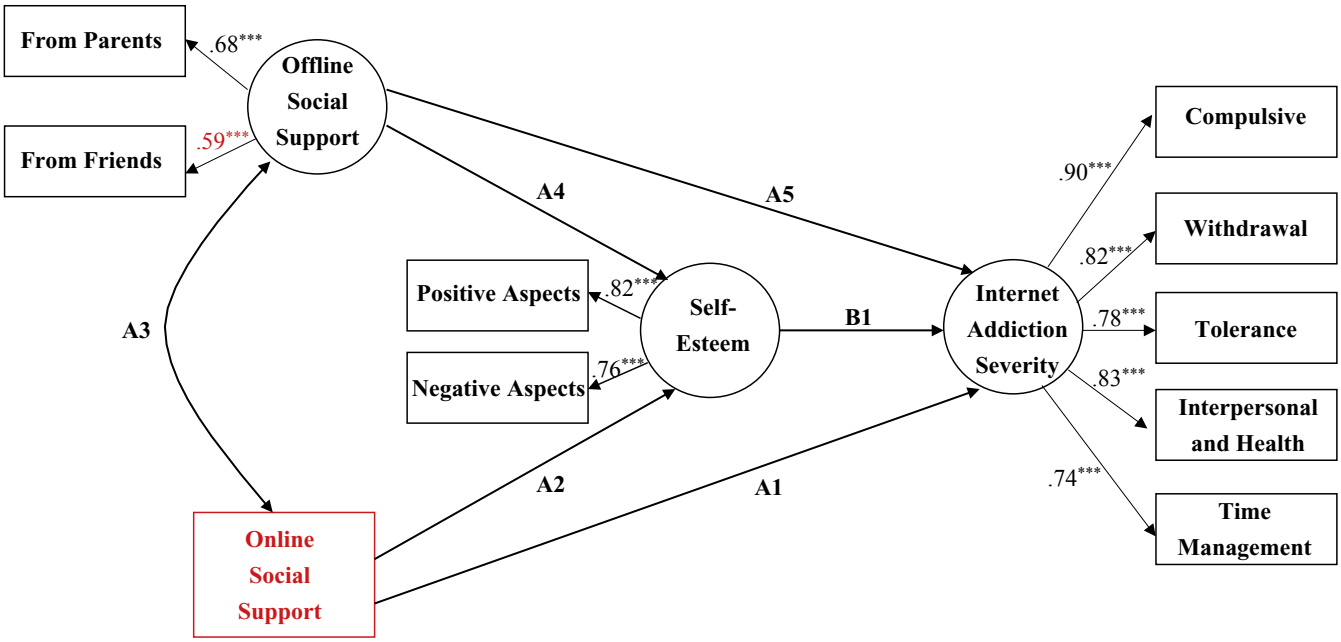

Fig. 1. Mediational model.

high school students.

The study protocol was approved by the review board of the Ministry of Science and Technology in Taiwan. Prior to conducting and administrating the survey battery, full consent was obtained from the principals, the counseling and guidance team, and the class teachers. Each school administrator received a copy of the survey and guidelines for administering the survey. Students were also fully informed of the purpose of the study and voluntary participation was emphasized. Participants provided written consent forms and were informed that they will receive individualized reports of their findings (such as individual scores obtained from the questionnaires, what the scores represent, and related psychoeducational materials) within a couple of months. The first author has a stable cooperative relationship with the participating schools, and has provided necessary interventions and guidance to high-risk students with IA (selected from self-reports in the present study).

2.2. Materials and measurements

2.2.1. Social support scale

This scale comprises of 16 items that assesses perceived social support from parents and friends, which includes two factors with eight items each (Yeh et al., 2008). Higher scores represented a greater degree of perceived offline social support. The ratings in the scale ranged from 1 = *do not apply to me at all* to 4 = *apply to me very much or most of the time*, and the internal consistency coefficients were 0.93 and 0.91 for the subscales of perceived social support from parents and perceived social support from friends in the current study, respectively. In addition, the confirmatory factor analysis also supported evidence of factorial validity, which showed that the two-factor model has a good model fit of the data (GFI = 0.99; CFI = 0.99; IFI = 0.99; NFI = 0.99; NNFI = 0.99; RMSEA = 0.069) and factor loadings were 0.57 and 0.70, respectively.

2.2.2. Virtual social support scale

This scale (Yeh et al., 2008) was revised from the Social Support Scale, and assesses perceived social support from people acquainted only through the Internet as distinguished from people known in real life. Furthermore, Yeh et al. (2008) added two questions to the scale in accordance with the online environment, and the final virtual social support scale has 10 items. Higher scores represented a greater degree of perceived online social support. The scale was also rated on a 4-point scale, ranging from 1 = *do not apply to me at all* to 4 = *apply to me very much or most of the time*, and the internal consistency coefficient was 0.95 in the present study.

2.2.3. The Rosenberg Self-Esteem Scale (RESE)

The RESE (Rosenberg, 1965) comprises of 10 items that evaluates global self-esteem. This scale contains 10 items with half of them describing the positive aspects and the other half describing the negative aspects of one's self-assessment. During the analysis, we reverse coded the negative aspects. McMullen and Resnick (2013) supported the reliability and validity of the RSES, in which the reliability and validity testing for the positive and negative subscales of the RSES was based on confirmatory factor analysis using structural equation modeling and Rasch analysis. This scale has also been successfully used among adolescents in Taiwan (Chang, 2016). It was rated on a 6-point scale, ranging from 1 = *strongly disagree* to 6 = *strongly agree*, and the internal consistency coefficients were 0.91 and 0.88 for the subscales of positive aspects and negative aspects in this study, respectively.

2.2.4. Revised Chen's Internet Addiction Scale (CIAS-R)

The CIAS-R (Chen, Weng, Su, Wu, & Yang, 2003; Mak et al., 2014) is a 26-item self-reported questionnaire, measured on a 4-point Likert scale, with scores ranging from 26 to 104 (higher total score equate to a greater level of IA). Containing five subscales, the CIAS-R includes “Compulsive Use of Internet” (5 items), “Withdrawal Symptoms of IA” (5 items), “Tolerance Symptoms of IA” (4 items), “Interpersonal and Health-Related Problems of IA” (7 items), and “Time Management Problems” (5 items). The internal consistency coefficients of each subscale ranged from 0.78 to 0.81, and the split-half reliability over two weeks is 0.83 (Chen et al., 2003). The CIAS-R has also been successfully used among senior

high school students in Taiwan (Chang, Chiu, Lee, Chen, & Miao, 2014).

2.3. Statistical analyses

The SPSS 18.0 for Windows version was used for data analyses, and the significant level was set at $p < 0.05$. Pearson correlation was used to detect the relationship among all measures. AMOS 18.0 was used for structural equation modeling (SEM) analyses with the robust maximum likelihood method to examine the mediating effect of self-esteem between online and offline social support and IA severity. Sobel test and bootstrap analyses were further used to test the mediation model, respectively (Mackinnon, Lockwood, Hoffman, West, & Sheets, 2002; Shrout & Bolger, 2002).

3. Results

3.1. Pearson correlations among variables

The correlations displayed in Table 1 showed that IA severity were significantly and negatively correlated with self-esteem and offline social support but was positively related to online social support. Moreover, self-esteem was significantly and positively correlated with offline social support, however, no significant correlation was found between self-esteem and online social support.

3.2. The mediating role of self-esteem

Using the SEM by the robust maximum likelihood method, we examined the hypothesized mediational model as shown in Fig. 1. Although there was no significant correlation between self-esteem and online social support, we still included the path between perceived online social support and self-esteem in the hypothesized mediational model. The inclusion of the path was an analysis to examine the observed/obtained scores in the relationship of the coefficients, while SEM analysis examined the true scores between the two variables. The final model indicated that self-esteem was not a mediator for the relationship between perceived online social support and Internet addiction severity. For bootstrap analyses, we deleted the participants with missing values from the model. As a result, forty participants were deleted from the study analysis, yielding a final sample of 1882 participants included in the SEM analysis. The model yielded a significant chi-square: χ^2 (30, $N = 1882$) = 438.452, $p < 0.001$. However, given that a non-significant χ^2 is hard to achieve with large sample sizes, the fit of the models were interpreted on the basis of a range of other fit indices, including the Goodness of Fit Index (GFI), Comparative Fit Index (CFI), Incremental Fit Index (IFI), the Bentler-Bonett Normed Fit Index (NFI) and Bentler-Bonett Non-Normed Fit Index (NNFI), which consider the degrees of freedom of the model. Values greater than 0.90 were regarded to be acceptable by convention (Hu & Bentler, 1999). In addition, a value less than 0.08 for the root mean square error of approximation (RMSEA) would indicate a reasonable error of approximation (Browne & Cudeck, 1993). The fit indices in the models were 0.953 on the GFI, 0.951 on the CFI, 0.951 on the IFI, 0.947 on the NFI, 0.926 on the NNFI, and 0.085 on the RMSEA. The measurement model demonstrated a good fit. Therefore, the overall fit of the mediational model was adequate and able to explain 15.4% of the variance.

Through SEM, we also examined the influences of offline social support and self-esteem on IA severity (Fig. 1). Thus, the model was used to test the mediating hypothesis of "Offline social support – Self-esteem – IA severity". In Model 1 (Table 2), which excludes the path from self-esteem to IA severity, offline social support had a significant effect on IA severity and self-esteem, respectively. Moreover, in Model 2 (Table 2), the effect of offline social support to IA severity decreased from −0.34 ($p < 0.001$) to −0.10 ($p = 0.022$) when the analysis included self-esteem. In addition, the Sobel test (Mackinnon et al., 2002) indicated that the mediated effect was significant for "Offline social support – Self-esteem – IA severity" ($z = -6.54$, $p < 0.001$), demonstrating a mediating effect from offline social support to IA severity through self-esteem.

Furthermore, we also used the bootstrap analyses to examine the indirect effect of offline social support on IA severity via self-esteem (Shrout & Bolger, 2002). As recommended by Mallinckrodt, Abraham, Wei, and Russell (2006), 10,000 bootstrap samples from the data set were created, and a bias-corrected 95% confidence interval for the estimates of the indirect effect was used. Results indicated that the mean indirect (unstandardized) effect of offline social support on IA severity via self-esteem was 0.322, and bias-corrected 95% confidence interval was between 0.238 and 0.409, which did not include zero, thus the indirect effect was statistically significant ($p < 0.001$). Consequently, the mediation model was confirmed.

4. Discussion

Consistent with previous studies, the current study found that offline social support was negatively associated with IA severity (Kilic et al., 2016; Wang & Wang, 2013; Wegmann & Brand, 2016; Wu et al., 2016), online social support was positively associated with IA severity (Wang & Wang, 2013; Yeh et al., 2008), and self-esteem was also negatively associated with IA severity (Ko et al., 2007; Mei et al., 2016; Nie et al., 2017; Wartberg et al., 2017;

Table 2
The path standardized coefficient in the model.

	A1	A2	A3	A4	A5	B1
Model 1	0.19***	−0.03	0.09**	0.63***	**−0.34*****	–
Model 2	0.17***	−0.04	0.08*	0.58***	**−0.10***	−0.29***

*$p < 0.05$. **$p < 0.01$. ***$p < 0.001$.

Table 1
The correlations among variables.

Variables	1	2	3	4	5	6
1. IA severity	–					
2. Self-esteem	−0.31***	–				
3. Offline social support	−0.19***	0.37***	–			
4. Perceived social support from parents	−0.19***	0.34***	0.87***	–		
5. Perceived social support from friends	−0.11***	0.27***	0.80***	0.39***	–	
6. Online social support	0.16***	−0.02	0.06**	−0.01	0.13***	–
M	49.96	39.13	47.66	23.28	24.39	15.88
SD	13.40	8.98	8.82	5.77	4.78	6.83

**$p < 0.01$. ***$p < 0.001$.

Younes et al., 2016). Furthermore, the present study adapted a cross-sectional design, and found that offline social support predicted increased levels of self-esteem, which played a mediation role between offline social support and IA in the sampled senior high school students. This findings were in accordance with the Sociometer Theory (Leary & Baumeister, 2000; Leary, 1999; Leary et al., 1995), and also agrees with DuBois et al.'s (2002) conceptual framework for the relations of social support and self-esteem to adjustment during adolescence; indicating that self-esteem mediates the effects of offline social support on emotional and behavioral adjustment.

Adolescents who do not gain support from their parents and friends will gradually decrease in their self-esteem. The present study also found that perceived social support from parents and friends was able to positively predict self-esteem, which is in accordance with previous research. Harter (1993) believed that low self-esteem is often a result in the lack of unconditional support from parents and peer; Parker and Benson (2004) also pointed out that parental support was related to having a positive self-concept among adolescents. The self-structure of an adolescent includes the perception of self-concept in the parents' point of view, and parental support enhances the experience of a successful environment, inducing the increase of self-esteem among adolescents. On the other hand, adolescents who perceive low parental support will feel rejected, incompetent, and may develop negative evaluations of oneself that causes low self-esteem (Conger, Conger, & Scaramella, 1997; Leary & Baumeister, 2000). Apart from parental support, based on Sullivan's Interpersonal theory of psychiatry, Park et al. (2014) pointed out that alienation from peers would increase a sense of inferiority in early adolescents, and is hurtful to the healthy development of self-conscious. Being able to maintain a satisfactory relationship with one's peer group allows an individual to gain a sense of achievement, and the acceptance, support, and belongingness of peers is the foundation to forming an adolescent's character and high self-esteem.

Early literature has pointed out the influential role of social support on the affect and behavior adaptation in adolescents; self-esteem partakes a meditational role, in which social support can enhance the sense of self-value among children and adolescents, and promotes the healthy adaptation of affect and behavior (DuBois, Felner, Sherman, & Bull, 1994). Studies on early adolescents have also found self-esteem to serve an important mediating role in the relationship between social support and individual influence. Harter (1999) believed that during adolescence, teens increase in their ability to do abstract thinking and self-reflection. In addition, the increase in social support will allow them to internalize such a resource into their self-concept system. Larson (1997) also pointed out that adolescences is a period of increased autonomy, in which teens spend a large amount of time alone; social support may not have a direct influence on adolescents, but rather serve an indirect effect in adaptation. Through a 2-year longitudinal study, DuBois et al. (2002) utilized a latent growth-curve model analysis and found self-esteem mediated the effects of social support on emotional and behavioral adjustment of adolescences. The results in the present study also coincided with the conceptual framework of DuBois et al. (2002) and supported the notion that self-esteem mediated the effects of offline social support on IA.

On the other hand, however, we found that online social support showed a non-significant relationship with self-esteem, and was unable to predict self-esteem. Although past literature has not examined the relationship between online social support and self-esteem, but our results showed a disagreement with the Sociometer Theory. A possible explanation could be explained by Kraut et al. (1998) in which they pointed out that the positive and negative influences in an interpersonal relationship is greatly affected by the maintenance of strong or weak network ties. Strong network ties are defined as an interpersonal relationship that has frequent contacts, close affections and responsibilities; weak network ties indicates that the interpersonal relationship is superficial, fragile and has few contacts. Strong network ties are able to alleviate stress and bring out a positive psychosocial effect (usually due to close physical proximity, such as school, work, church, neighbors, and other real life friendships). On the other hand, online relationships reflect a weak network tie due to its superficial nature, distancing proximity, and inability to provide concrete assistance. In addition, Clark (1996) believed that Internet users are not physically situated in an identical or similar environment as the individual, and thus it is difficult for Internet users to understand the background of the situation, which lowers the applicability of the conversation. In other words, although Internet friends are able to offer online social support, however, virtual interpersonal relationships can be easily broken and hard to maintain on a daily basis. The difference in background lowers the formation of an empathetic relationship, and hinders the ability for the individual to stably internalize the online social support into a sense of self-affirmation. In relation to the characteristic of interpersonal interactions on the Internet, another probable explanation may lie in the different functions between online social support and offline social support. The Internet provides opportunities for anonymous communication and allows for individuals to freely share and express themselves. However, the various real or fake identities online make it difficult to distinguish between true or false information. Furthermore, disinhibition effects also allow Internet users to overly display their generosity and kindness (Barak, Boniel-Nissim, & Suler, 2008), and may cause the individual to question the feedback or even fail to feel any sense of support in real life. Thus, online social support does not enhance the internalization of self-evaluation, self-value, self-importance, self-ability or the sense of being a successful person. In other words, online social support does not increase one's self-esteem.

Several limitations in our investigation require attention. First, regarding the mediating model, the present study has a cross-sectional design, thus, it is difficult to clarify the causal relationship between online social support, offline social support, self-esteem, and IA. Most important of all, cross-sectional analyses of mediation are potentially troublesome (Maxwell & Cole, 2007). We suggest future research to conduct follow-up studies, in order to examine the influential roles in the relationship. Second, in spite of a large sample size, all participants consisted of senior high school students in Taiwan. Therefore, generalizations of our findings to other age groups and countries or cultures may need further consideration. Third, a battery of questionnaires was used to obtain all information through a paper-pencil self-report. Future assessments using interviews and informants might provide a more thorough overview of each participant. Lastly, the full mediation model was able to explain 15.4% variance of IA severity in the total sample, indicating that additional factors may also play part in the adoption process and should be incorporated to replicate the mediation model.

5. Conclusion

Based on the Sociometer Theory and conceptual framework for the relations of social support and self-esteem to adjustment during adolescence by DuBois et al. (2002) as a theoretical framework, the present study examined the contribution of online social support, offline social support and self-esteem in their relationship to IA among senior high school students by using SEM and bootstrap analyses in a cross-sectional study design. The goal of this study was to determine whether online social support and offline social

support were linked to IA and whether the relationship was mediated by self-esteem. Results indicated that IA severity was significantly and negatively predicted by offline social support, and mediated through self-esteem. The results not only are in accordance with the Sociometer Theory, but also supports DuBois et al.'s (2002) conceptual framework. However, although online social support had a significant and positive predictability on IA, it was unable to predict self-esteem. Even though this finding may be at odds with the Sociometer Theory, but it highlights how the online environment can be very different from our offline settings. Varying types of social support may serve different predictabilities in IA, and can influence an individual's self-esteem in distinctive ways.

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