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# School disconnectedness and Adolescent Internet Addiction: Mediation by self-esteem and moderation by emotional intelligence[☆]

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## ABSTRACT

A growing body of research has shown that school disconnectedness (low school bonding) is a salient risk factor for internet addiction (IA) among adolescents. However, the *mediating* and *moderating* mechanisms linking school disconnectedness to IA are still not well understood. This study examined whether self-esteem mediates the relationship between school disconnectedness and IA, and whether this mediating process is moderated by emotional intelligence. A total of 2758 Chinese adolescents ($M_{age}$ = 13.53 years, $SD$ = 1.06) completed a series of anonymous questionnaires on demographic variables, school disconnectedness, self-esteem, emotional intelligence, and IA. After controlling for demographic variables, school disconnectedness was found to be positively associated with IA among adolescents. Mediation analysis indicated that self-esteem partially mediated the relationship between school disconnectedness and IA. Moderated mediation analysis further revealed that emotional intelligence moderated the associations between school disconnectedness and adolescent self-esteem and IA. The negative relationship between school disconnectedness and self-esteem and the positive relationship between school disconnectedness and IA were stronger in adolescents with *higher* levels of emotional intelligence, showing reverse risk-buffering effects. These findings elucidate the role of contextual factors (such as school disconnectedness) and personal factors (such as self-esteem and emotional intelligence) in adolescent IA, and suggest that comprehensive and holistic intervention programs may be promising for reducing IA among adolescents.

## 1. Introduction

With the development of information technology, the internet has become fully integrated into people's lives. Although the internet can offer benefits such as enhanced online learning, social connectedness, and well-being (Park, Kang, & Kim, 2014; Tsitsika et al., 2009), it has also brought negative consequences, such as internet addiction (IA). IA refers to the inability to control one's use of the internet, which leads to psychological, social, school, and/or work difficulties (Spada, 2014). Because adolescents face multiple psychosocial stressors but lack adequate personal resources or experience to cope with them, they are especially vulnerable to IA (al'Absi, 2011). Because of this, IA among adolescents has become a serious worldwide public health concern (Tsitsika, Janikian, Greydanus, Omar, & Merrick, 2013), with its prevalence estimated to be 0.8% in Iceland, 6.3% in China, and 22.2% in

Iran (Petry, Zajac, & Ginley, 2018). Furthermore, a growing body of research has demonstrated that adolescents with IA are more likely to experience academic (Jun & Choi, 2015), psychosocial (Ostovar et al., 2016), and health problems (Yen, Ko, Yen, Chang, & Cheng, 2009). Thus, to effectively prevent adolescent IA, it is essential to examine the potential risk and protective factors that impact IA in adolescents.

In recent years, researchers have begun to investigate the impact of school factors on IA among adolescents (e.g., Jia et al., 2017; Jun & Choi, 2015; Stavropoulos, Kuss, Griffiths, & Motti-Stefanidi, 2016). As a central element of the school experience, school connectedness (also known as school bonding, school belonging, and school attachment) has been found to be closely related to IA in adolescents (Yen et al., 2009). School connectedness refers to how students generally feel about their school and how they connect positively with their peers, teachers, and other adults in the school community (Libbey, 2004). Because

school is the primary setting where adolescents study and live, they may desire trusted, supportive, and caring interpersonal relationships with teachers and peers. If they feel disconnected from school, however, their psychological needs will be frustrated. In contrast, the internet can satisfy individuals' psychological needs (such as relatedness, competence, and autonomy; Ryan, Rigby, & Przybylski, 2006) and reduce the loneliness and social anxiety they experience at school. Thus, adolescents who feel disconnected from school may discover a new "mindport"—the internet—and thus become more prone to IA. Empirical research has supported this view (Chang, Chiu, Lee, Chen, & Miao, 2014; Li, Zhou, Zhao, Wang, & Sun, 2016; Liu, 2007; Yen et al., 2009). For instance, Yen et al. (2009) found a significant link between school disconnectedness and IA among adolescents. Likewise, Chang et al. (2014) found that students with weaker school bonding were more likely to become addicted to the Internet one year later. These findings suggest that school disconnectedness is a vulnerability factor for adolescent IA. However, the underlying mechanisms that could *account for* this link (i.e., mediating mechanisms) and *alter* it (i.e., moderating mechanism) still remain largely unexplored. To answer these questions, the present study employed a complex moderated mediation model. The first goal was to examine whether self-esteem is a mediator of the link by testing the indirect path between school disconnectedness and IA through self-esteem. The second goal was to investigate whether emotional intelligence is a moderator of the link by testing the indirect association between school disconnectedness and IA at different levels of emotional intelligence.

### 1.1. The mediating role of self-esteem

Self-esteem refers to a global evaluation of oneself as a person (Harter, 1990). Individuals with high self-esteem are more satisfied with themselves and have more positive self-concept than those with low self-esteem. There are several reasons to consider self-esteem as a mediator between school disconnectedness and adolescent IA. First, according to Erikson and Erikson (1998) theory of development, the development of self-esteem is a key stage-salient task in adolescence. Second, there is evidence that negative school environment may result in negative self-perception, which in turn increases the risk of a wide range of problematic behaviors (Park et al., 2014; Spencer, 2006). Third, self-esteem is relatively plastic and amenable to intervention, which can be improved to ameliorate the impact of school disconnectedness on adolescent IA (Liu, Wu, & Ming, 2015).

Specifically, sociometer theory (Leary, Tambor, Terdal, & Downs, 1995) and attachment theory (Rothbard & Shaver, 1994) propose that when individuals feel rejected and lack a sense of belonging to a group, they experience a decline in self-esteem; individuals with low levels of self-esteem in turn are likely to experience dejection, engage in substance abuse, exhibit eating disorders, or become involved in other problematic behaviors (Leary, Schreindorfer, & Haupt, 1995). Therefore, self-esteem may be an important mediator linking social belonging (as reflected by school connectedness) to maladjustment outcomes. To our knowledge, no studies to date have examined whether self-esteem is a mediator in the relationship between school disconnectedness and IA among adolescents. However, there is some preliminary support in the literature for this mediation process.

The first piece of evidence is that adolescents who are not connected to school may be predisposed to low levels of self-esteem. Specifically, if students' fundamental need for belonging (such as school belonging) is not satisfied, their pursuit of higher goals such as self-esteem will be greatly compromised (Maslow, 1954). According to sociometer theory, self-esteem is an internal monitor of the degree to which one is valued by others (Leary & Baumeister, 2000). If students lack strong relationships with teachers and schoolmates or do not experience affection and belonging, they may perceive themselves negatively and thus show low levels of self-esteem. Similarly, attachment theory proposes that if individuals fail to establish good relationships with others, they may feel

undervalued and experience a decline in self-esteem. Empirical studies have documented that school disconnectedness was negatively associated with adolescent self-esteem (Foster et al., 2017; Hagborg, 1994; Pachucki, Ozer, Barrat, & Cattuto, 2015). For instance, Foster et al. (2017) found that youth who felt less connected to their schools were more apt to experience low levels of self-esteem. Likewise, a study of 43,832 adolescents showed that lower levels of school attachment were associated with greater declines in self-esteem (Tracy & Erkut, 2002).

The second piece of evidence is that adolescents with lower self-esteem are more likely to become internet addicts. Adolescents with low levels of self-esteem often strive to compensate for this shortcoming, and the internet can provide temporary positive self-perceptions and elicit feelings of autonomy and competence (Ryan et al., 2006), which make adolescents confident about expressing themselves online (Ross et al., 2009). This dynamic becomes a vicious cycle that may eventually lead to IA. Previous research has indeed supported the notion that self-esteem plays a crucial role in shaping IA among adolescents (Chang et al., 2014; Zhang, Dai, & Lei, 2013). For instance, Chang et al. (2014) found that low self-esteem could predict the initiation of IA one year later among Taiwanese adolescents. Similarly, a longitudinal study showed that teenagers with low self-esteem were more likely to be addicted to the Internet than those with high self-esteem (Zhang et al., 2013).

### 1.2. The moderating role of emotional intelligence

While school disconnectedness can have direct and/or indirect impacts on adolescent IA through self-esteem, it does not influence all adolescents equally. According to the risk and protective factor framework (Masten, 2001), IA is the result of a dynamic interplay between risk and protective factors: While risk factors predispose individuals to IA, protective factors increase resilience and decrease the likelihood of IA. Thus, the presence of protective factors may weaken the negative impacts of risk factors on IA. Consequently, it is important to examine the variables that may moderate the direct and/or indirect pathways from school disconnectedness to IA. In this study, we decided to investigate the moderating role of adolescents' emotional intelligence because of the following reasons. First, emotional intelligence is a highly desirable and personally important factor (an important attribute to possess), which may act as a protective asset that enhances resiliency when adolescents are confronted with risk factors (Mayer, 2004). Second, previous research has documented that emotional intelligence could moderate the relationships between risk factors (e.g., stressful life events) and developmental outcomes (e.g., subjective well-being) (Abdollahi, Carlbring, Khanbani, & Ghahfarokhi, 2016; Fu, Ye, & Wen, 2012). Third, there is evidence that the improvement of emotional intelligence can promote the positive development of adolescents (such as experiencing an enhancement in self-esteem; Ruiz-Aranda, Salguero, Cabello, Palomera, & Berrocal, 2012).

Emotional intelligence is a type of social intelligence that involves the ability to monitor one's own and others' emotions, discriminate among them, and use this information to guide one's thinking and actions (Salovey & Mayer, 1990). When adolescents have high emotional intelligence, they have a broad repertoire of strategies for regulating emotion and are more likely to choose adaptive strategies than adolescents with low emotional intelligence (Côté, Miners, & Moon, 2006; Resurrección, Salguero, & Ruiz-Aranda, 2014). Thus, individuals with high emotional intelligence can regulate their emotions more effectively when confronted with problems and are less likely than those with low emotional intelligence to seek exogenic regulating sources such as the internet to alleviate negative emotions (Khoshakhlagh & Faramarzi, 2012; Kun & Demetrovics, 2010a). Thus far, research has documented the main effect of emotional intelligence on IA (Kun & Demetrovics, 2010b; Yanesari, Homayouni, & Gharib, 2010). For instance, Yanesari et al. (2010) found that higher levels of emotional intelligence corresponded to lower levels of IA. Apart from the main

effect of emotional intelligence, there is evidence that emotional intelligence (or similar constructs) interacted with risk factors (e.g., stressful life events) to predict IA among adolescents (Wang et al., 2018). To our knowledge, no research to date has examined whether adolescents' school disconnectedness interacts with emotional intelligence to predict self-esteem or IA. Adolescents with high emotional intelligence have good self-regulation, which can increase the resilience of their development and decrease the likelihood of negative outcomes. Thus, emotional intelligence may moderate the association between school disconnectedness and self-esteem and IA. Moreover, adolescents who have low self-esteem may be protected by their emotional intelligence, which enables them to regulate their emotions effectively when confronted with problems. Thus, emotional intelligence may be a protective factor that reduces the impact of low self-esteem on IA.

Although the above findings suggest that emotional intelligence may moderate the direct and/or indirect relationships between school disconnectedness and adolescent IA, theoretical models diverge in their accounts for the pattern of such a moderation effect. The risk-buffering model proposes that personal assets can attenuate the adverse effects of environmental risk factors on child development. According to this model, the deleterious effects of environmental risks will be *weaker* for individuals who have higher levels of personal assets (Li, 2012). In contrast, the reverse risk-buffering model maintains that personal assets may lose their ability to counteract risk once environmental risks reach a certain level (the protective effects of personal assets are dampened in the face of high environmental risks). In this case, the adverse effects of environmental risks will be *stronger* for individuals who have higher levels of personal assets (Li, 2012).

When these assumptions were applied to the moderation effect of emotional intelligence on the relationship between school disconnectedness and IA, the risk-buffering model would support the finding that adolescents with high levels of emotional intelligence (a personal asset) should demonstrate better adaptation (i.e., low levels of IA) than those with low levels of emotional intelligence when exposed to high levels of school disconnectedness (an environmental risk factor)

(Fig. 1a). In contrast, it would be consistent with the reverse risk-buffering model if adolescents with high emotional intelligence demonstrate better adaptation (i.e., low levels of IA) than those with low emotional intelligence when experiencing low levels of school disconnectedness, while they may show the same maladaptation (i.e., high levels of IA) as those with low emotional intelligence when experiencing high levels of school disconnectedness (Fig. 1b). To the best of our knowledge, no research has examined how school disconnectedness and emotional intelligence interact to impact adolescent IA. On one hand, emotional intelligence may be a protective factor that attenuates the negative impact of school disconnectedness on IA. Thus, the pattern of moderation may be consistent with the risk-buffering model. On the other hand, school disconnectedness is particularly harmful for adolescents (Bonny, Britto, Klostermann, Hornung, & Slap, 2000; Zhang, Lin, Nonaka, & Beom, 2005); therefore, emotional intelligence may not be sufficient to protect them from the impact of school disconnectedness. Consequently, the reverse risk-buffering model may be applicable.

We believe that this is an important research question, because different patterns of moderation suggest different practical implications. If the risk-buffering model applies, intervention programs that seek to cultivate adolescents' emotional intelligence will particularly benefit those with high school disconnectedness. In contrast, if the reverse risk-buffering model holds, the benefits of emotional intelligence should not be overstated, and the adverse impact of school disconnectedness should not be overlooked.

### 1.3. The present study

Guided by sociometer theory, attachment theory, as well as the risk and protective factor framework, the present study examined the impact of contextual factors (i.e., school disconnectedness) and personal factors (i.e., self-esteem and emotional intelligence) on IA among adolescents. Two hypotheses were tested: First, self-esteem will mediate the relationship between school disconnectedness and adolescent IA (Hypothesis 1). Second, emotional intelligence will moderate the direct
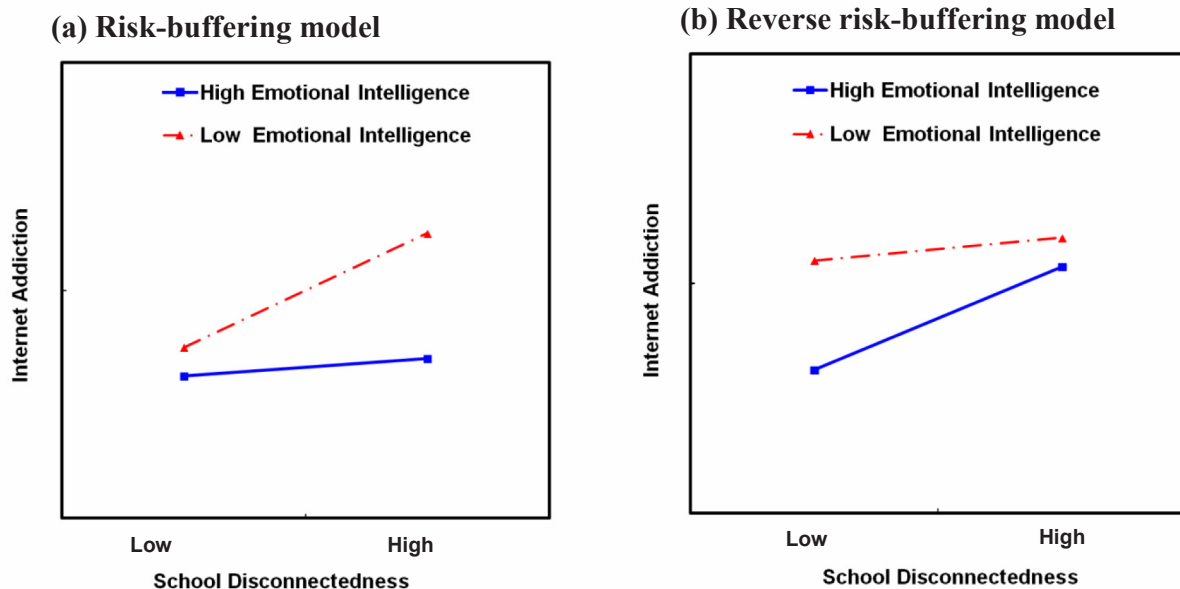


**Fig. 1.** Hypothetical School Disconnectedness × Emotional Intelligence interaction impacts. (a) Risk-buffering model, an interaction in which the adverse impact of school disconnectedness on Internet addiction is much weaker for adolescents with higher levels of emotional intelligence. (b) Reverse risk-buffering model, an interaction in which the adverse impact of school disconnectedness on Internet addiction is much stronger for adolescents with higher levels of emotional intelligence.
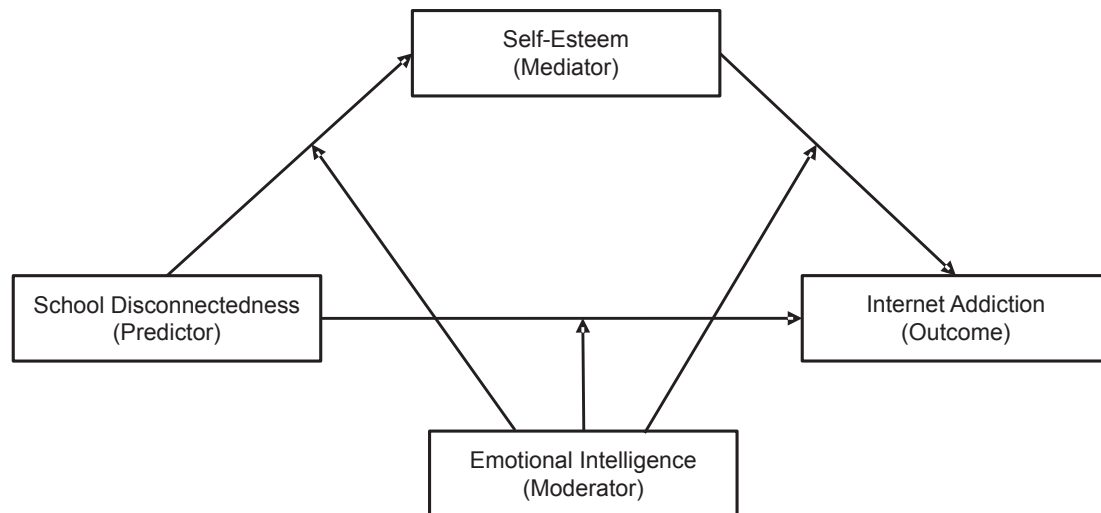
**Fig. 2.** Moderated mediation model of associations between school disconnectedness, emotional intelligence, self-esteem, and Internet addiction.

and/or indirect pathways from school disconnectedness to adolescent IA (Hypothesis 2). Therefore, this study tested a moderated mediation model (see Fig. 2), which can better explain the complex nature of developmental processes than a simple mediation or moderation model. During the past decade, various psychosocial therapies (such as cognitive behavioral therapy, family therapy, and group counseling) and pharmacotherapies (such as antidepressant drugs and psychostimulants) have been developed for the treatment of IA (Nakayama, Mihara, & Higuchi, 2017; Shen, 2018). Recently, preventive interventions that address risk factors before addiction evolves into a more serious form have also started to receive attention. However, research in this area is still in its infancy and often ignore some important environmental and individual factors (Vondráčková & Gabrhelík, 2016). For example, although school is one of the formative environment of adolescent IA, there is no systematic school-based preventive intervention that improves school factors to reduce IA. The findings of the present study will highlight the important role of school factors in adolescent IA and suggest that complex preventive interventions that focus on both environmental (e.g., school) and individual-level factors (e.g., self-esteem, emotional intelligence) may be important in reducing IA.

It is worth mentioning that we examined the impact of contextual (school disconnectedness) and personal factors (self-esteem and emotional intelligence) on IA during adolescence, an important developmental period. Why did we focus on this developmental stage? First, adolescents are important users of the internet, a.k.a. "electronic heroin". Some studies have found that IA is highly prevalent in adolescence (Petry et al., 2018) and is particularly harmful to their current and future development (Jun & Choi, 2015; Ostovar et al., 2016). Second, adolescence is a particularly vulnerable period. The experience of risk factors during adolescence may result in more adverse outcomes than risk factors experienced in later periods. Meanwhile, adolescence is a period of great plasticity, and contextual (school disconnectedness) and personal factors (self-esteem and emotional intelligence) are malleable during this time (Catalano, Oesterle, Fleming, & Hawkins, 2004; Liu et al., 2015; Ruiz-Aranda et al., 2012). This malleability can be exploited in the development of effective programs designed to reduce IA.

## 2. Method

### 2.1. Participants

The data for this study came from the research project *Ecological Risk Factors and Adolescents' Social Adaptation* (Chen, Li, Bao, Yan, &

Zhou, 2015). We recruited participants from ten middle schools through stratified and random cluster sampling in Guangdong Province, China. Specifically, the sample was first stratified by degree of urbanization: developed areas (Guangzhou, Shenzhen) and underdeveloped areas (Meizhou, Heyuan). Second, the sample was stratified by school type (i.e., selective schools and regular schools) in both developed and underdeveloped areas. Selective schools usually have more quality teachers, better resources and stronger students than regular schools. Finally, random cluster sampling was used to select two classes from each grade in each school. Participants were 2758 students in Grades 7 (34.99%), 8 (32.49%), and 9 (32.52%). The mean age of the participants was 13.53 years ($SD = 1.06$, range = 10–19). Fifty-four percent of the participants were female. Parents' education levels were very close to those in the latest census data in China; 31% of the mothers and 40% of the fathers had a high school education or higher. In general, our sample was diverse and representative of the general population in Guangdong province.

### 2.2. Procedure

The Research Ethics Committee of the corresponding author's institution reviewed and approved this study. Prior to data collection, we obtained informed consent from both school authorities and the participating adolescents. Parental consent was not required because the study was a part of routine educational practices and posed minimal risk to participants (the questions being asked were general and the answers were anonymous and confidential). Students completed a set of questionnaires in their classrooms during regular school hours on demographic variables, school disconnectedness, self-esteem, emotional intelligence, and IA. Students took about 20 min to complete all the questionnaires. All measures were administered by trained graduate students in psychology using standardized instructions.

### 2.3. Measures

**School disconnectedness.** School disconnectedness was measured by the School Disconnectedness Scale developed by Li et al. (2016). This scale includes six items assessing students' relationships with their school (e.g., "I want to transfer to another school"). Adolescents indicated their feelings about their schools on a 4-point scale ranging from 1 (*never*) to 4 (*always*). Average scores of all items were computed, with higher scores representing higher levels of school disconnectedness. Previous studies have demonstrated the scale's good reliability and validity for Chinese adolescents (Li et al., 2017). In the present

study, the measure had adequate internal consistency (α = 0.85).

**Emotional intelligence.** Emotional intelligence was measured by the Emotional Intelligence Scale revised by Li et al. (2009). The scale includes 19 items assessing four dimensions of emotional intelligence: self-management of emotions, social skills, empathy, and utilization of emotions (e.g., "I have control over my emotions"). Adolescents rated each item on a 5-point scale ranging from 1 (*strongly disagree*) to 5 (*strongly agree*). Average scores of all items were computed, with higher scores representing higher levels of emotional intelligence. This scale has demonstrated good reliability and validity in samples of Chinese adolescents (Che et al., 2017). In the present study, the measure had adequate internal consistency (α = 0.90).

**Self-esteem.** Self-esteem was assessed using the Chinese version of the Rosenberg Self-Esteem Scale (Rosenberg, 1965). The scale includes ten items measuring an individual's level of global self-esteem (e.g., "I feel that I am a person of worth, at least on an equal plane with others"). Adolescents indicated their perceptions of self-esteem on a 4-point scale ranging from 1 (*strongly disagree*) to 4 (*strongly agree*). Average scores of all items were computed, with higher scores reflecting higher levels of self-esteem. The Chinese version of this scale has been widely used and has demonstrated good reliability and validity (Yang et al., 2013). In the present study, the measure had adequate internal consistency (α = 0.84).

**IA.** IA was measured by Internet Addiction Diagnostic Questionnaire (Li, Zhang, Li, Zhen, & Wang, 2010; originally developed by; Young, 1998). The questionnaire includes ten items assessing adolescents' degree of dependency on the Internet (e.g., "Do you use the internet as a way to escape problems or relieve an unhappy mood?"). Adolescents rated each item on a 6-point scale ranging from 1 (*not at all true*) to 6 (*completely true*). Average scores of all items were computed, with higher scores representing higher levels of IA. This measure has demonstrated good reliability and validity for Chinese adolescents (Li et al., 2017; Zhou, Li, Li, Wang, & Zhao, 2017). In the present study, the measure had adequate internal consistency (α = 0.89).

**Covariates.** Prior research has found that adolescents' gender, age, family socioeconomic status, family functioning, peer relationship, social support, and depressive symptoms are related to IA (Li, Zhang, Lu, Zhang, & Wang, 2014; Mei, Yau, Chai, Guo, & Potenza, 2016; Shi, Wang, & Zou, 2017; Zhou, Zhang, Liu, & Wang, 2017). Thus, we controlled for these demographic variables in our statistical analyses. Gender was a dichotomous variable and was dummy coded (0 = *female*; 1 = *male*). Family socioeconomic status was a factor score (M = 0, SD = 1) derived from factor analysis of father's education, mother's education, father's occupation, mother's occupation, and family income. The way to obtain the factor score is to transform scores of the five indicators into standardized scores, conduct principal component analysis, and then calculate the composite score using the following formula (Ren, 2010): family socioeconomic status = $(\beta_1 * Z_1 + \beta_2 * Z_2 + \beta_3 * Z_3 + \beta_4 * Z_4 + \beta_5 * Z_5)/\varepsilon_f$, where $\beta_1$, $\beta_2$, $\beta_3$, $\beta_4$, and $\beta_5$ are values of factor loading, $\varepsilon_f$ refers to eigenvalue of the first factor, and $Z_1$, $Z_2$, $Z_3$, $Z_4$, and $Z_5$ represent the standardized scores of the five indicators. Higher composite scores indicate higher levels of family socioeconomic status. Family functioning was measured with one item ("Family members do not get along well together", reverse coded) on a 4-point scale (1 = *strongly disagree*, 4 = *strongly agree*). Higher scores indicate better family functioning. Peer relationship was assessed with one item ("My friends seldom care about me", reverse coded) on a 5-point scale (1 = *never*, 5 = *always*). Higher scores represent better peer relationships. Social support was measured with one item ("There are people I can depend on to help me if I really need it"), with possible responses ranging from 1 (*never*) to 5 (*always*). Depressive symptoms were assessed with the question "During the past few weeks, did you feel hopeless about your life?", which was measured on a 7-point scale. Higher scores reflect more depressive symptoms. Finally, given the nested nature of the data (i.e., students nesting within schools), we applied a fixed-effect approach to account for the nested nature of the

data (Cohen, Cohen, West, & Aiken, 2003). School was dummy-coded and controlled in all analyses.

### 2.4. Plan of analyses

All analyses were conducted in SPSS 22.0. In our preliminary analyses, we conducted a descriptive analysis of all variables and used Harman's single-factor test (Podsakoff & Organ, 1986) to check for common-method variance as a result of using the self-report method to collect data.

In primary analyses, we used the SPSS macro PROCESS (Hayes, 2018) to test our models. PROCESS is a computational procedure for SPSS that simplifies the analysis of conditional process models, including moderated mediation models. A benefit of PROCESS is that it automatically generates bootstrap confidence intervals, which account for the possible non-normality of the sampling distribution. The bootstrap method based on 1000 resamples of the data can produce 95% bias-corrected confidence intervals to test the significance of indirect effects. Compared with other methods, this method can provide a more accurate balance between Type 1 and Type 2 errors and generate the most accurate confidence intervals for indirect effects (MacKinnon, Lockwood, Hoffman, West, & Sheets, 2002).

Specifically, to test our study hypotheses, we conducted a series of analyses. First, we tested the meditation model by using the SPSS macro PROCESS (Model 4) and examined the mediating role of self-esteem in the meditation model (i.e., from school disconnectedness to IA). Mediation is supported when the confidence intervals do not contain zero. Second, we tested the moderated mediation model by using the SPSS macro PROCESS (Model 59). We examined the potential moderating role of emotional intelligence in the previously established mediating process. Moderated mediation addresses the interaction between school disconnectedness and emotional intelligence affecting IA (the residual direct relationship), the interaction between school disconnectedness and emotional intelligence affecting self-esteem (the first part of the mediation process), and the interaction between self-esteem and emotional intelligence affecting IA (the second part of the mediation process). Interaction effects can be identified when the confidence intervals do not contain zero. Next, we applied an extension of the Johnson-Neyman (J-N) technique to examine significant interactions for regions of significance (the online tool can be available at https://sites.google.com/a/georgiasouthern.edu/stephen-carden/research; Carden, Holtzman, & Strube, 2017). The technique probed the indirect association between school disconnectedness and IA (mediated by self-esteem) at different levels of emotional intelligence, with bootstrapped 95% confidence bands. In these analyses, we controlled for relevant covariates (i.e., gender, age, socioeconomic status, family functioning, peer relationship, social support, and depressive symptoms) by entering them as predictor variables into regression equations. Thus, these covariates were not underlying factors that explain the direct and indirect associations of school disconnectedness with IA (for technical aspects of statistical control, please see Cohen et al., 2003).

### 3. Results

#### 3.1. Preliminary analyses

Descriptive statistics and Pearson product moment correlation coefficients of study variables are presented in Table 1. Specifically, school disconnectedness was positively associated with IA ($r = 0.22$, $p < .001$), and both self-esteem ($r = -0.24$, $p < .001$) and emotional intelligence ($r = -0.15$, $p < .001$) were negatively correlated with IA. Thus, school disconnectedness is a risk factor for IA, while self-esteem and emotional intelligence are protective factors for IA. In addition, school disconnectedness was negatively related to self-esteem ($r = -0.33$, $p < .001$). Finally, emotional intelligence was positively correlated with self-esteem ($r = 0.33$, $p < .001$).

**Table 1**
Descriptive statistics and correlations for all study variables.

| Variables | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 1. Gender | – | | | | | | | | | | |
| 2. Age | .00 | – | | | | | | | | | |
| 3. Socioeconomic status | **.05** | **−.19** | – | | | | | | | | |
| 4. Family functioning | **−.07** | **−.08** | **.16** | – | | | | | | | |
| 5. Peer relationship | −.00 | **−.07** | **.21** | **.15** | – | | | | | | |
| 6. Social support | −.01 | −.06 | **.16** | **.13** | **.24** | – | | | | | |
| 7. Depressive symptoms | −.03 | **.09** | **−.14** | **−.19** | **−.18** | **−.27** | – | | | | |
| 8. School disconnectedness | .01 | **.15** | **−.17** | **−.18** | **−.19** | **−.27** | **.33** | – | | | |
| 9. Emotional intelligence | **−.07** | −.03 | **.23** | **.22** | **.20** | **.35** | **−.26** | **−.26** | – | | |
| 10. Self-esteem | **.08** | **−.08** | **.21** | **.24** | **.25** | **.25** | **−.42** | **−.33** | **.33** | – | |
| 11. Internet addiction | **.28** | .04 | −.02 | **−.19** | **−.11** | −.05 | **.21** | **.22** | **−.15** | **−.24** | – |
| *M* | 0.46 | 13.53 | 0.00 | 3.39 | 3.91 | 3.05 | 3.14 | 2.09 | 3.73 | 2.83 | 2.47 |
| *SD* | 0.50 | 1.06 | 1.00 | 0.73 | 0.99 | 1.08 | 1.63 | 0.76 | 0.57 | 0.51 | 1.02 |

*Note. N* = 2758. Gender was dummy coded such that 0 = *female* and 1 = *male*. Bold entries represent significant correlations (*p* < .05).

As regard to covariates, boys had lower emotional intelligence (*r* = −0.07, *p* < .001), higher self-esteem (*r* = 0.08, *p* < .001), and higher IA (*r* = 0.28, *p* < .001) than girls. Older adolescents had higher school disconnectedness (*r* = 0.15, *p* < .001), lower self-esteem (*r* = −0.08, *p* < .001), and higher IA (*r* = 0.04, *p* = .03). Adolescents with higher socioeconomic status had lower school disconnectedness (*r* = −0.17, *p* < .001), but higher emotional intelligence (*r* = 0.23, *p* < .001), and higher self-esteem (*r* = 0.21, *p* < .001). In addition, adolescents with better family functioning, peer relationship, and social support had higher levels of emotional intelligence and self-esteem (*r*s = .20 ~ 0.35, *p*s < .001), but lower levels of school disconnectedness and IA (*r*s = −0.27 ~ −0.05, *p*s < .05). Adolescents with more depressive symptoms had lower levels of emotional intelligence and self-esteem (*r*s = −0.42 ~ −0.26, *p*s < .001), but higher levels of school disconnectedness and IA (*r*s = 0.21 ~ 0.33, *p*s < .001). All these correlations were significant and in the expected direction. These covariates were controlled statistically in primary analyses (Cohen et al., 2003).

The data were collected from a series of self-reported questionnaires, which could have resulted in common-method bias. Therefore, Harman's single-factor test (Podsakoff & Organ, 1986) was used to check for common-method variance. All the items in the study were entered into an exploratory factor analysis. Common-method bias is present if a single or general factor accounts for the majority of the variance. The results revealed ten factors with eigenvalues greater than 1.0. Moreover, the first factor accounted for 14.25% of the variance, which was no more than 40%. Therefore, the results confirmed that common-method variance was not a concern in this study.

Testing for the Mediating Role of Self-Esteem (Hypothesis 1).

The first goal of this study was to examine the potential mediating role of self-esteem in the relationship between school disconnectedness and IA in adolescents. This analysis was completed using the PROCESS macro (Model 4). As mentioned earlier, we could obtain 95% bootstrapped confidence interval to test the validity of the mediation model (Hayes, 2018). This method makes no distribution assumption, thus can account for possible non-normality and/or asymmetry of the indirect effect. Moreover, it can provide a balance between power and type I error (Hayes, 2018).

As shown in Fig. 3, after controlling for the covariates, self-esteem mediated the association of school disconnectedness with IA. Specifically, school disconnectedness negatively predicted self-esteem (*B* = −0.11, *p* < .001), which in turn negatively predicted IA (*B* = −0.34, *p* < .001). The positive direct association between school disconnectedness and IA remained significant (*B* = 0.20, *p* < .001). Therefore, the first hypothesis of this study was supported. Self-esteem partially mediated the relationship between school disconnectedness and IA (*B* = 0.04, 95% confidence interval = [0.03, 0.05]). The mediation effect accounted for 19.69% of the total effect of school

disconnectedness on IA (Wen & Fan, 2015).

### 3.2. Testing for moderated mediation (Hypothesis 2)

The second goal of this study was to examine the potential moderating role of emotional intelligence in the direct and/or indirect relationship between school disconnectedness and IA via self-esteem. We completed the moderated mediation analysis using the PROCESS macro (Model 59) to obtain bootstrapped confidence intervals for mediation model at different levels of emotional intelligence. Specifically, we estimated the parameters for two regression models. In Model 1, we estimated the moderating role of emotional intelligence in the relationship between school disconnectedness and self-esteem. In Model 2, we estimated the moderating role of emotional intelligence in the relationship between self-esteem and IA, as well as the residual direct relationship between school disconnectedness and IA. The results of the two models are presented in Table 2. All the covariates were included in the models as control variables.

As Table 2 shows, after controlling for the covariates, Model 1 indicated that school disconnectedness significantly and negatively predicted self-esteem (*B* = −0.10, *p* < .001). Moreover, school disconnectedness interacted with emotional intelligence in predicting self-esteem (*B* = −0.04, *p* = .036). To reveal the nature of this moderation effect, we used the Johnson-Neyman technique to examine the regions of significance (Carden et al., 2017). As shown in Fig. 4, the negative relationship between school disconnectedness and self-esteem was significant for emotional intelligence values greater than or equal to 1.90 for which the confidence bands do not contain zero, and not significantly different from zero for emotional intelligence values less than 1.90 for which the confidence bands contain zero. Thus, the adverse impact of school disconnectedness on self-esteem was stronger for adolescents who had *higher* emotional intelligence, which was consistent with the reverse risk-buffering model (Li, 2012). The full model accounted for 30% of the variance in self-esteem (*R*$^2$ = 0.30, *p* < .001). Model 2 indicated that self-esteem significantly and negatively predicted IA (*B* = −0.32, *p* < .001), but this relationship was not moderated by emotional intelligence (*B* = 0.01, 95% confidence interval = [−0.11, 0.12]). In addition, school disconnectedness significantly and positively predicted IA (*B* = 0.20, *p* < .001), and school disconnectedness and emotional intelligence interacted to predict IA (*B* = 0.12, *p* = .005). As shown in Fig. 5, the positive relationship between school disconnectedness and IA was significant for emotional intelligence values greater than or equal to 2.78 whose confidence bands do not contain zero, and not significantly different from zero for emotional intelligence values less than 2.78 whose confidence bands contain zero. Thus, the adverse impact of school disconnectedness on IA was stronger for those with *higher* emotional intelligence, which was also consistent with the reverse risk-buffering model (Li, 2012). The full
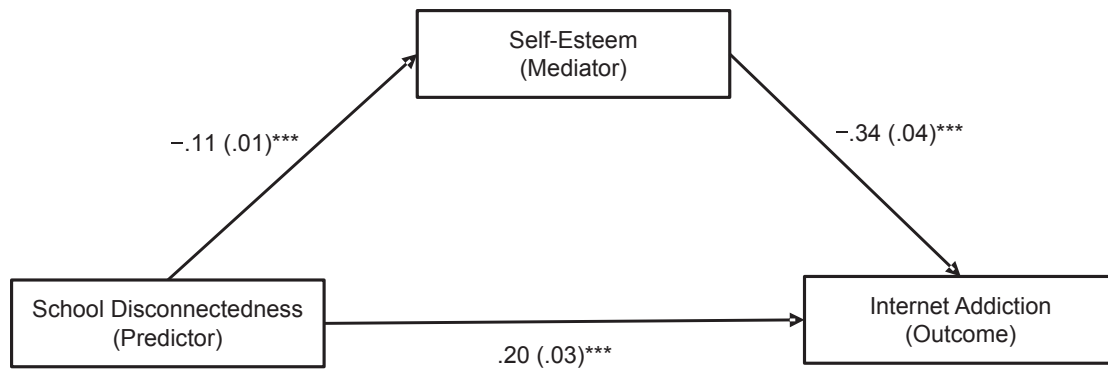
**Fig. 3.** The mediating role of self-esteem. Self-esteem mediated the relationship between school disconnectedness and Internet addiction. Path values are the path coefficients (standard errors). Indirect effect = .04, SE = 0.01, 95% confidence interval = 0.03 to 0.05. All covariates (i.e., gender, age, socioeconomic status, family functioning, peer relationship, social support, and depressive symptoms) were held constant during this analysis but are not presented for reasons of simplicity.

model (including the moderator, interaction terms, and covariates) accounted for 20% of the variance in IA ($R^2 = 0.20$, $p < .001$).

To summarize, emotional intelligence moderated the first part of the mediation process (the impact of school disconnectedness on self-esteem) and the residual direct relationship between school disconnectedness and IA. However, the second part of the mediation process (the impact of self-esteem on IA) was not moderated by emotional intelligence. Thus, the second hypothesis of the present study was only partially supported.

## 4. Discussion

Although evidence suggests that school disconnectedness is a risk factor for IA among adolescents, the underlying mediation and moderation mechanisms are less clear. Guided by earlier research (Chang et al., 2014; Foster et al., 2017; Zhang et al., 2013) and theories (Leary et al., 1995; Masten, 2001; Rothbard & Shaver, 1994), the present study constructed a moderated mediation model to examine *how* school

disconnectedness works and *whether* all adolescents are equally influenced by school disconnectedness. Our findings indicated that the relationship between school disconnectedness and IA was partially mediated by self-esteem, and this mediating process was moderated by emotional intelligence. These findings are not only compatible with sociometer theory and attachment theory, but also fit well with the risk and protective factor framework. These findings suggest that contextual and individual factors that impact IA are not independent, but interrelated. Compared with the simple mediation or moderation models, the complex moderated mediation model can more effectively reflect the mechanisms and conditions through which school disconnectedness increases adolescent IA.

### 4.1. Hypothesis 1. Mediation by Self-Esteem

Our results indicated that school disconnectedness negatively predicted self-esteem, which in turn increased the likelihood of IA among adolescents. This finding supports Hypothesis 1 and suggests that self-

**Table 2**
Testing the moderated mediation effects of school disconnectedness on internet addiction.

| Model | Predictors | B | SE | t | 95% CI |
|---|---|---|---|---|---|
| Model 1 (Self-esteem) | Gender | .10*** | .02 | 5.75 | [.06, .13] |
| | Age | −.00 | .01 | −0.12 | [−.02, .01] |
| | Socioeconomic status | .05*** | .01 | 4.96 | [.03, .07] |
| | Family functioning | .07*** | .01 | 5.92 | [.05, .09] |
| | Peer relationship | .06*** | .01 | 6.38 | [.04, .07] |
| | Social support | .02* | .01 | 2.39 | [.00, .04] |
| | Depressive symptoms | −.08*** | .01 | −15.40 | [−.10, −.07] |
| | School disconnectedness (SD) | −.10*** | .01 | −8.39 | [−.13, −.08] |
| | Emotional intelligence (EI) | .14*** | .02 | 8.84 | [.11, .17] |
| | SD × EI | −.04* | .02 | −2.10 | [−.07, −.00] |
| | $R^2$ | .30 | | | |
| | F | 62.91*** | | | |
| Model 2 (Internet addiction) | Gender | .58*** | .04 | 16.02 | [.50, .65] |
| | Age | .01 | .02 | 0.37 | [−.03, .04] |
| | Socioeconomic status | .02 | .02 | 0.97 | [−.02, .07] |
| | Family functioning | −.13*** | .03 | −4.95 | [−.18, −.08] |
| | Peer relationship | −.04* | .02 | −1.99 | [−.08, −.00] |
| | Social support | .08*** | .02 | 4.23 | [.04, .11] |
| | Depressive symptoms | .06*** | .01 | 4.92 | [.04, .09] |
| | School disconnectedness (SD) | .20*** | .03 | 7.33 | [.14, .25] |
| | Emotional intelligence (EI) | −.06 | .04 | −1.58 | [−.13, .01] |
| | SD × EI | .12** | .04 | 2.82 | [.04, .20] |
| | Self-esteem (SE) | −.32*** | .04 | −7.88 | [−.41, −.24] |
| | SE × EI | .01 | .06 | 0.16 | [−.11, .12] |
| | $R^2$ | .20 | | | |
| | F | 32.63*** | | | |

*Note.* All continuous independent variables were mean centered prior to analysis.
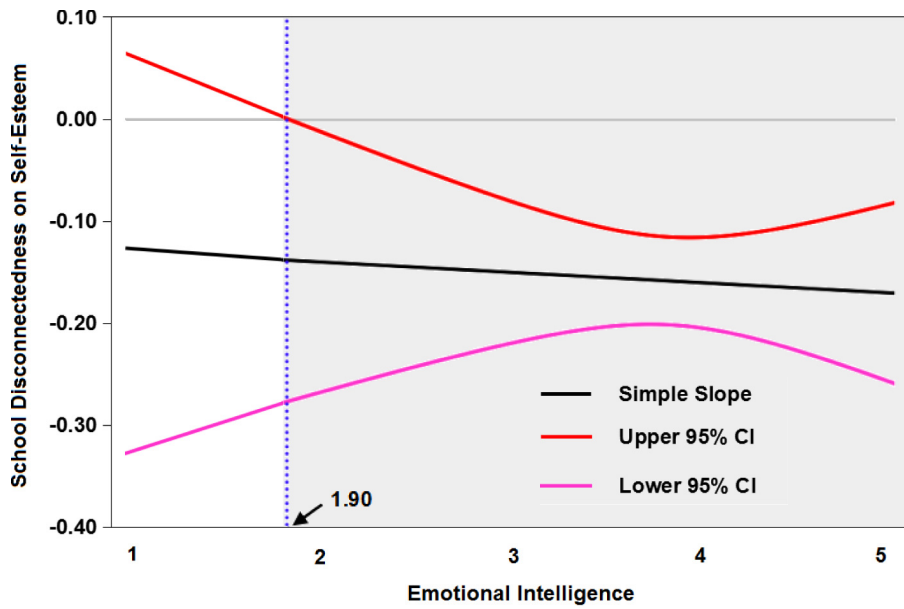*$p < .05$. **$p < .01$. ***$p < .001$.

**Fig. 4.** The conditional association between school disconnectedness and self-esteem as a function of emotional intelligence. The dark line indicates the simple slope of school disconnectedness on self-esteem. Shaded areas represent the regions of significance for the conditional association. The adverse impact of school disconnectedness on self-esteem is more stronger for adolescents with higher levels of emotional intelligence, which is consistent with the reverse risk-buffering model. CI = confidence interval.

esteem may be an important explanatory mechanism for the link between school disconnectedness and adolescent IA. This finding is congruent with sociometer theory (Leary et al., 1995), which posits that if individuals are not valued by others, their "internal monitor" (self-esteem) weakens, which in turn triggers problem behaviors. This finding is also consistent with attachment theory (Rothbard & Shaver, 1994), which postulates that warm relationships are particularly important for adolescents' self-perception, which in turn impacts their developmental outcomes. In our study, when adolescents perceived lack of belonging in school, they also perceived a decline in self-esteem, which increased their IA (Ross et al., 2009). It is worth noting that self-esteem only partially accounts for the relationship between school disconnectedness and IA. Thus, there may be other factors (e.g., deviant peer affiliation) that are worth considering in the mediating process. In summary, by building on sociometer theory and attachment theory, our findings provide the first empirical test of self-esteem as a key mediating mechanism accounting for the relationship between school disconnectedness and IA among adolescents.

In addition to the overall mediation results, each of the individual links in the mediation model is noteworthy. First, according to our findings, individuals who feel less connected to their schools have lower levels of self-esteem. This finding is consistent with previous research (e.g., Foster et al., 2017; Pachucki et al., 2015) and highlights the importance of school experience in shaping adolescents' self-esteem. Disconnectedness from school leads to students' alienation from their schools, which leads them to feel unloved and uncared for in their schools, thereby increasing negative self-perceptions (Spencer, 2006). According to Maslow (1954) hierarchy of needs, a sense of belonging is a foundation for positive self-representation: Thus, if students' fundamental need for belonging (such as school belonging) is not satisfied, their pursuit of higher goals such as self-esteem will be greatly compromised. This finding is particularly meaningful in Chinese culture. China is a collectivist society, where interpersonal connections are emphasized (Zhang et al., 2005). Therefore, a sense of disconnect may be particularly damaging to individual self-esteem in the Chinese context.
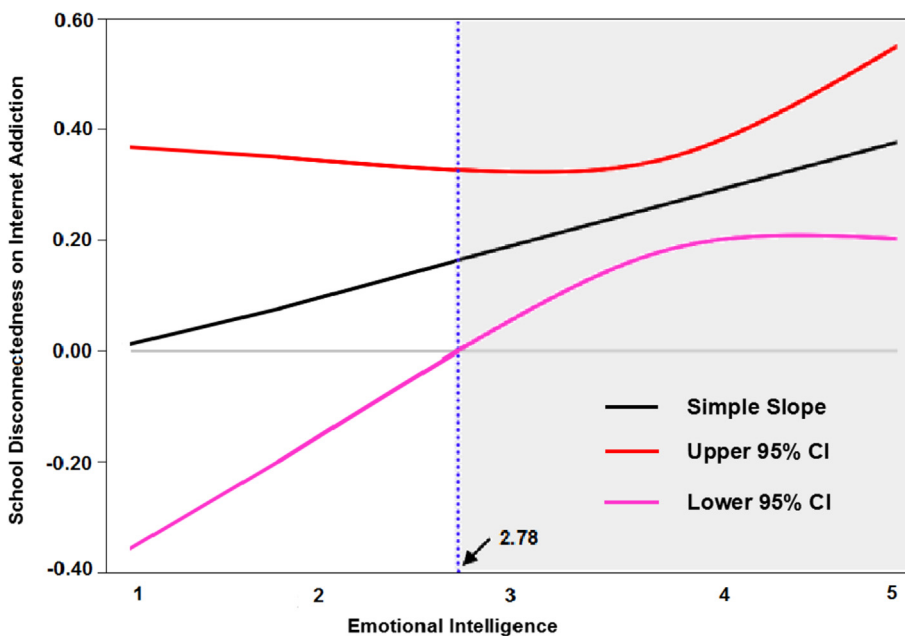


**Fig. 5.** The conditional association between school disconnectedness and Internet addiction as a function of emotional intelligence. The dark line indicates the simple slope of school disconnectedness on Internet addiction. Shaded areas represent the regions of significance for the conditional association. The adverse impact of school disconnectedness on Internet addiction is more stronger for adolescents with higher levels of emotional intelligence, which is consistent with the reverse risk-buffering model. CI = confidence interval.

Second, we also found that adolescents with lower self-esteem were more likely to be addicted to the Internet. This result aligns with previous findings (Chang et al., 2014; Zhang et al., 2013) and shows that self-esteem plays a crucial role in shaping IA among adolescents. A possible explanation is that adolescents with low self-esteem often lack self-confidence and frequently experience negative emotions; thus, they tend to seek self-affirmation and recognition from others on the Internet. In fact, previous research has found that adolescents can feel confident through communication with others and obtain a sense of achievement and value in virtual environments (Ross et al., 2009). These online experiences may eventually result in IA.

Taken together, our findings contribute to the existing literature and highlight how low self-esteem may be an adverse consequence of school disconnect and a key risk factor for adolescent IA. These findings also support the notion of developmental plasticity. School disconnectedness and self-esteem are malleable, which can be improved to reduce adolescent IA.

### 4.2. Hypothesis 2. Moderation by Emotional Intelligence

In addition to the indirect path, our results also partially supported Hypothesis 2. Our results showed that emotional intelligence moderated the first part of the mediation process (the impact of school disconnectedness on self-esteem) as well as the residual direct relationship between school disconnectedness and IA. Both these patterns are consistent with the reverse risk-buffering model (Li, 2012) and suggest that although emotional intelligence serves as an important protective factor at low levels of school disconnectedness, its benefits were erased under high levels of school disconnectedness. Two possible explanations exist for these findings. First, connection is highly valued in collectivist societies such as that of China (Zhang et al., 2005). Accordingly, high levels of school disconnectedness are a serious problem for Chinese adolescents. Therefore, even high levels of emotional intelligence cannot offset the deleterious impacts of school disconnectedness on self-esteem or IA. Second, theoretical (e.g., attachment theory) and empirical studies (e.g., Bretherton, 2005) have suggested that when adolescents are not strongly connected to one context, other contexts are needed to provide the necessary bonding experiences. Therefore, it is plausible that other contextual factors such as the parent-adolescent relationship, rather than emotional intelligence, may better protect adolescents from the negative impacts of school disconnectedness on self-esteem or IA. In fact, Sabatine, Lippold, and Kainz (2017) found that the positive relationship between low school bonding (i.e., school disconnectedness) and youth delinquency was also stronger when individuals had *better* parent-child relationships, which is consistent with the reverse risk-buffering model. The present study is the first to examine the role of emotional intelligence in the impact of school disconnectedness while controlling for several important demographic, personal, and contextual factors. Future studies could examine whether a cumulative protective factor index that incorporates protective factors from multiple different domains acts as a risk-buffering factor. This line of research may help design comprehensive preventive interventions for adolescent IA.

Contrary to our hypothesis, however, emotional intelligence did not moderate the relationship between self-esteem and adolescent IA. This finding suggests that low self-esteem is a salient risk factor for IA among adolescents, and emotional intelligence does not serve as a buffer against the adverse impact of low self-esteem. One possible explanation is that emotional intelligence does not "shoot the arrow at the target" in this process. Specifically, low self-esteem leads to negative self-perception, which makes adolescents eager to build self-confidence and gain self-identity. Internet usage is a commonly used balm for a lack of self-esteem. In contrast, emotional intelligence involves monitoring one's own emotions and adopting useful strategies for guiding one's thinking and behavior. Therefore, although emotional intelligence is a beneficial factor, it cannot effectively attenuate the adverse impact of

low self-esteem. Additional future studies are needed to examine other protective factors that may buffer the relationship between self-esteem and IA. For example, strong parent-adolescent and teacher-student relationships allow adolescents to rely on parents' and teachers' help to cope with stressors such as low self-esteem. Thus, their help may protect adolescents from the negative influence of low self-esteem.

In recent years, methodologists and researchers have heavily focused on the patterns of moderation effects (e.g., Li, 2012). Following this trend, the present study distinguished and examined patterns of moderation by emotional intelligence. Insights into these patterns of moderation may increase our understanding of the limits and benefits of a moderator as well as the challenges adolescents face in different risk contexts (high vs. Low school disconnectedness), which may have important implications for the design and implementation of targeted preventive interventions. Our findings on reverse risk-buffering effects show that we should not only realize that the protective role of emotional intelligence is limited, but should also carry out targeted preventive interventions for adolescents who feel disconnected from school.

### 4.3. Limitations and future directions

This study has several limitations that must be considered when interpreting the findings. First, although cross-sectional studies based on theory are valuable (Shrout, 2011), this design has limitations (Maxwell, Cole, & Mitchell, 2011). For example, bidirectional and dynamic interactions may have occurred among school disconnectedness, self-esteem, and IA. Moreover, mediation and moderation processes need time to unfold (Selig & Preacher, 2009). Therefore, future studies should collect and analyze data employing longitudinal designs (especially full cross-lagged panel designs where all variables of interest are measured at each of multiple time points) to provide evidence for reciprocal relations and longitudinal mediation and moderation effects (Sameroff, 2009). Second, we have used self-report measures to collect data. However, there are some limitations to the exclusive use of self-report measures (such as social desirability and recall bias). Future research should use multiple informants (e.g., self, parents, teachers, and peers) to collect data to strengthen the reliability of the findings. Third, this study is based on a sample of Chinese adolescents and thus we must be cautious about generalizing these findings to other cultures and clinical samples. For example, a collectivistic culture emphasizes belonging and relationships, whereas an individualistic culture pays more attention to personal self-esteem enhancement. Thus, future studies should examine whether similar findings can be obtained in a more individualistic culture (e.g., USA). Fourth, other mediator and moderator variables should be considered in future studies. Specifically, self-esteem is only a partial rather than a complete mediator in the relationship between school disconnectedness and IA. Thus, future research should expand the scope of factors that may serve as mediators (e.g., psychological needs satisfaction and positive outcome expectancy). On the other hand, as mentioned earlier, other moderators may exist (e.g., parent-adolescent and teacher-student relationships) that could be worth considering in the mediating process. Finally, although Young's Internet Addiction Diagnostic Questionnaire has been widely used in the field (Petry et al., 2018), the measure is a screening rather than a diagnostic tool, and data on its cut-off scores are insufficient. Given that there is no agreed-upon effective tool, future research should employ multiple informants to obtain information about IA.

### 4.4. Practical implications

Despite these limitations, the results of the current study have several important implications. First, given that school disconnectedness is a vulnerability factor for IA, and school connectedness is highly valued by Chinese adolescents (Zhang et al., 2005), increasing

adolescents' school connectedness will be important for school administrators, teachers, and parents. It is a pity, however, that there is no systematic school-based program aimed at increasing school connectedness to reduce IA among adolescents (Uysal & Balci, 2018). Second, because self-esteem is an important mechanism connecting school disconnectedness to IA, intervention programs should focus on restoring damaged self-esteem due to school disconnectedness. While self-esteem is established at an early age, it is still malleable during adolescence. For example, a recent meta-analysis has indicated that physical activity intervention can successfully improve adolescents' self-esteem and further ameliorate mental health problems (Liu et al., 2015). Third, because the mediating process is moderated by emotional intelligence, programs that address emotional intelligence could further enhance the effectiveness of interventions. Notably, emotional intelligence only serves a reverse risk-buffering function. Therefore, the benefits of emotional intelligence should not be overstated, and the adverse impact of school disconnectedness should not be overlooked. Finally, our integrated model suggests that both environmental resources (e.g., school belonging) and personal assets (e.g., self-esteem and emotional intelligence) should be considered to reduce IA among adolescents.

## 5. Conclusions

Although much attention has been devoted to understanding the relationship between school disconnectedness and adolescent IA, less attention has been paid to the underlying mediation and moderation mechanisms, and even fewer studies have simultaneously examined the impact of contextual resources (school belonging) and personal assets (self-esteem and emotional intelligence) on IA among adolescents in a moderated mediation model. The present study identifies a mechanistic pathway (i.e., via self-esteem) through which we can better understand the critical process by which how school disconnectedness increases adolescent IA. Moreover, the findings suggest that this indirect process varies with levels of emotional intelligence. Therefore, intervention programs for IA among adolescents must be holistic, addressing both contextual (school disconnectedness) and personal factors (self-esteem and emotional intelligence).

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