Emotional competence as a mediator of the relationship between Internet addiction and negative emotion in young adolescents in Hong Kong

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Abstract Excessive use of the Internet in adolescents has been consistently found associated with multiple health concerns, especially negative emotions, and adversely affected one's quality of life. While emotional competence is considered an important protective factor for youth development, its role in the relationship between Internet addiction and negative mental health outcomes has not been thoroughly investigated. The present study tested the mediation vs. moderation effects of emotional competence in the relation between Internet addiction and negative emotion in young adolescents based on 404 Hong Kong secondary school students (age = 12.4 ± 0.8 years). The results of structural equation modeling supported the mediation effect of emotional competence, but not its moderation effect. Internet addiction has both a direct influence on adolescents' negative emotions, and an indirect effect through decreasing emotional competence. In particular, regulation of emotion appeared to be the only emotional competence dimension that mediates the relationship between Internet addiction and negative emotions. The findings suggest the importance of promoting emotional regulation competence to improve the quality of life of adolescents with Internet addiction problems.

Keywords Internet addiction, emotional competence, negative emotions, adolescent quality of life, mediation effect

Introduction

Internet Addiction and Negative Emotions

In the past two decades, Internet has become an integral part of modern life. While people enjoy the huge number of benefits brought by the Internet, a significant proportion of individuals started to show a tendency to use the Internet in a compulsive and uncontrollable way. They cannot stop or reduce their time spent online even when their excessive Internet use has seriously interfered their quality of life in terms of relationship, work or study, physical and psychological health. An extreme form of this phenomenon is known as Internet addiction (Young 1998) or

problem/pathological Internet use (Goldberg 1995), characterized by a need for longer online time (tolerance), withdrawal symptoms when decreasing Internet use, lack of control, continuation of Internet use despite problem awareness, and relapse (Young 1998; Goldberg 1995; Young and Nabuco de Abreu 2010). It should be noted that while different terms have been used to refer to this phenomenon, we use Internet addiction in the present paper for convenience and consistency.

As an emergent public health issue, Internet addiction has attracted increased attentions from both the public and researchers. The reported prevalence rate ranged from 0.8% to 38%, at least partially due to the various assessment tools and diagnostic criteria adopted in different studies (Chakraborty et al. 2010; Kuss et al. 2014). A recent International meta-analysis study showed an estimated global prevalence rate of Internet addiction as 6.0% (ranged from 2.6% to 10.9%), which was inversely related to both subjective (life satisfaction) and objective indicators of quality of life (quality of environmental conditions) across nations (Cheng and Li 2014). Specifically, Internet addiction has been consistently found comorbid with negative emotions, defined as a state of emotional suffering featured by symptoms of depression and anxiety (Mirowsky and Ross 2002; Horwitz 2007). Researchers reported positive relationships between Internet addiction and depression (Young and Rogers 1998), suicide ideation (Kim et al. 2006), anxiety (Dalbudak et al. 2013), hostility and interpersonal sensitivity (Dong et al. 2011), and loneliness (Pontes et al. 2014). These negative emotions can further lead to a host of adverse outcomes such as poor physical health, interpersonal problems, behavioural problems, and low academic performance particularly among adolescents as they have difficulties in recognizing and handling the influx of various co-experienced emotions (Nook et al. 2018). Given the drastically increasing number of young Internet users, it is necessary to investigate how Internet addiction may result in negative emotions in adolescents.

The displacement theory has often been used to explain the causal relationship between Internet addiction and negative emotions (Young and Rogers 1998). According to this theory, Internet use is an activity that competes with face-to-face social interaction and other daily activities, rather than complements. For people who are addicted to the Internet, online activity occupies them too much time that would otherwise be spent with family and friends in real situations (Nie et al. 2002). The limited scope and depth of one's social interaction would further cause loneliness and negative emotions in the individual. Besides, excessive time spent on the Internet also leads to one's neglect of work, study, as well as other important aspects in real life. Subsequent problems such as impaired functioning at work and academic performance (Chen and Peng 2008; Nalwa and Anand 2003) would also create negative emotions.

Empirically, relatively few researchers have focused on the negative impact of Internet addiction on social-emotional health. Several longitudinal studies did provide evidence for the impact of Internet addiction on negative emotions and social interaction problems. Kraut et al. (1998) tracked changes of Internet use and social circle among 169 people in two years and found that greater use of the Internet resulted in decreased social and family communication, reduced social circle, and increased depression and loneliness. In a two-wave longitudinal study, Lam and Peng (2010) investigated 881 adolescents who did not show emotional problems at baseline survey. After controlling for demographic and other confounding factors, Internet addiction at the first wave significantly predicted increased risk of depression at the second wave (nine months later). With a large sample of Singaporean adolescents (n = 3,034), Gentile et al. (2011) reported that among

youth who became addicted to the Internet in two years, depression, anxiety, social phobia, and school performance all became worse. Moreover, if the adolescent stopped being addicted to the Internet, his/her depression, anxiety, social phobia, and school performance all improved. These findings indicate that it is likely that negative emotions and social interaction problems are the consequences of Internet addiction rather than its predictors. Nonetheless, the mechanism underlying the association between Internet addiction and negative emotions is not fully investigated and further research is needed to clarify this issue.

Role of Emotional Competence

Emotional competence, also known as emotional intelligence, refers to an individual's ability to recognize, understand, manage, and use the emotion of oneself and others (Salovey and Mayer 1990). Goleman (1995) conceptualized emotional competence as encompassing five key components: self-awareness, self-regulation, motivation, empathy, and social skills. In Bar-On's (1997) model, emotional competence involves a combination of interrelated emotional and social competencies. According to these models, people who possess higher level of emotional competence are more likely to handle various emotional problems and experience success in different domains of daily lives than people with lower emotional competence (Spielberger 2004). Empirical findings have provided support to the protective role of emotional competence in people's psychological health (Brackett et al. 2011; Martins et al. 2010; Resurreccion et al. 2014). Emotional competence has been associated negatively with a series of psychological maladjustment such as negative emotions and substance abuse; whereas positively with psychological well-being, like life satisfaction, self-acceptance, and family resilience (e.g., Austin et al. 2005; Benzies and Mychasiuk 2009; Carmeli et al. 2009; Rivers et al. 2013). People with higher level of emotional intelligence were also found to show more adaptive coping styles (Salovey et al. 2002) and better social relationships (Tsaousis and Nikolaou 2005) than less emotionally intelligent people.

Despite the increasing research interest in emotional competence, relatively few studies have investigated its role in the relationship between Internet addiction and the associated psychological problems. In a systematic review of 35 empirical studies, different types of addiction were found negatively related to emotional competence (Kun and Demetrovics 2010), but the majority of the studies focused on substance use disorder, and only two studies addressed Internet addiction. Using a sample of college students, Engelberg and Sjoberg (2004) reported that participants with higher scores on the Internet Addiction Scale (Young 1998) did worse in emotion-decoding tasks (e.g., correctly identify emotions shown in pictures of facial expressions). In another study, Internet addiction was reversely associated with two components of emotional competence, "stress management" and "adaptability" based on Bar-On's model (Parker et al. 2008). These findings supported a negative relationship between emotional competence and Internet addiction. However, it is unknown what exact role emotional competence may play in the association between Internet addiction and negative emotions.

The first possibility is that emotional competence may serve as a moderator. Researchers have argued that using Internet could be a dysfunctional coping strategy for youth who cannot handle stress or have difficulties to adapt to different situations. For example, Kun and Demetrovics (2010) suggested that adolescents might indulge themselves in the Internet as a substitution of real-time

relationship that they do not have in reality. This dysfunctional coping strategy would create further problems in the individual, such as depression, loneliness, and academic stress. It is possible that when the individual has a high level of emotional competence, he or she would be more capable of using other coping strategies to handle the stress and negative emotions associated with one's excessive Internet use. There are findings showing that emotional competence can moderate the effects of negative coping on depression (Davis and Humpherey 2012a). The positive relationship between avoidant coping and depressive symptoms was weaker in adolescents with higher level of emotional competence, than in youth with lower emotional competence (Davis and Humphrey 2012b). In a similar vein, Internet addiction, as a negative coping strategy, its influence on one's negative emotions may also be moderated by one's emotional competence. An individual with higher level of emotional competence may be more capable of handling problems caused by Internet addiction (e.g., interpersonal conflict with family members) and thus avoid the subsequent negative emotions. Moreover, emotional competence would directly enable the individual to regulate or adjust the negative emotion associated with their overuse of the Internet. For example, it was found that two components of emotional competence, use of emotion and regulation of emotion, predicted exciting online activities seeking among Internet addicts (Cheung et al. 2017). Such activities create positive emotions that may counteract one's negative feelings. Therefore, it seems reasonable to assume that when adolescents spend excessive time on the Internet, those with higher emotional competence would display fewer negative emotions, as compared to their counterparts with lower emotional competence.

Alternatively, it is also possible that emotional competence would mediate the relationship between Internet addiction and negative emotion. While the pathogenesis of Internet addiction is undetermined, recent neuroscience findings have revealed structural and functional alterations in young people with Internet addiction similar to changes observed in people with other types of behavioral addiction as well as substance abuse (Cash et al. 2012; Yuan et al. 2011). Similarly, Zhou et al. (2011) reported that adolescents who were addicted to the Internet showed lower brain gray matter density in the left anterior cingulate cortex and left insula, which play important roles in emotion recognition and regulation. The impairment in these components of emotional competence would further result in negative emotions. As such, emotional competence would serve as a mediator. Apart from this, Internet addiction should also have direct negative impact on one's emotion, such as the distress caused by procrastination of important work due to one's over-committed time online, and the anxiety related to the accumulated real problems while one is escaping from the reality (Yen et al. 2007).

The Present Study

The purpose of the present study is to clarify the role of emotional competence in the relationship between Internet addiction and negative emotions by testing two competing models: a moderation model and a partial mediation model (Baron and Kenny 1986; Shrout and Bolger 2002). Specifically, for the moderation model, it was hypothesized that emotional competence would moderate the relationship between Internet addiction and negative emotion: 1) Internet addiction would be positively associated with negative emotions; and 2) such association would be stronger when emotional competence is lower. For the partial mediation model, we hypothesized that Internet addiction would have both direct effect on negative emotion, and indirect effect through the mediation of emotional competence: 1) higher level of Internet addiction would be directly

associated with higher level of negative emotion (direct effect); and 2) Internet addiction would lead to low emotional competence, which in turn affect negative emotion (indirect effect).

Apart from examining the effect of one's overall emotional competence, we also aim to test the relative importance of different emotional competence components in the relationship between Internet addiction and negative emotion. In the present study, Mayer and Salovey's four-factor model of emotional competence was adopted which encompasses self-emotional appraisal, others' emotional appraisal, use of emotion, and regulation of emotion. Negative emotion has been conceptualized as including both the three most common negative emotions (i.e., depression, anxiety, and stress) and loneliness as an unpleasant emotional status closely related to Internet addiction (Hamama et al. 2000; Leary 1990; Shaw and Gant 2002; Young 1999). The findings would contribute to a better understanding about the mechanisms of comorbidity of Internet addiction and negative emotions. Practically, the findings can also help guide the design and implementation of youth programs that aim to reduce negative emotions in young people with Internet addiction.

Methods

Participants

The participants of the present study were recruited from four local secondary schools in Hong Kong from February to April 2016. School consent was obtained from the Head of each school before the study. All Secondary One students in the selected schools were invited to participate. General information about the research purpose and procedure were announced in class to students and sent to their parents in an information sheet. Parents were asked to fill in and return a form to the school if they want to opt their children out. Students were informed that their participation was voluntary and they can choose not to participate or withdraw from the study at any time without any penalty. All students agreed to participate and signed a written consent form. The survey was conducted in a self-administered manner in a classroom with an experienced researcher from the research team standing by to solve general enquires by students.

To encourage students to respond honestly, all questionnaires were completed anonymously and the class teachers were not present during the survey. Students were also ensured that their responses to the questions would be kept confidential and both teachers and parents have no access to the collected data. The survey lasted for around half an hour, and completed questionnaires were collected from 404 students (age = 12.4 ± 0.8 years) including 209 males (51.7%), 193 females (47.8%) and two students (0.5%) who did not indicate their gender.

Measures

For the present study, Internet addiction was measured by the Revised Chen Internet Addiction Scale (CIAS-R). To assess negative emotions, two scales were adopted: the Depression, Anxiety Stress Scale (DASS) and the UCLA Loneliness Scale. Emotional competence was measured by the four-dimensional Wong and Law Emotional Intelligence Scale (WLEIS). Details about the four questionnaires are introduced below.

The Revised Chen Internet Addiction Scale (CIAS-R)

The CIAS-R is a self-reported questionnaire modified from the Chen Internet Addiction Scale (CIAS; Chen et al. 2003) by Taiwan scholars (Ko et al. 2005a) to assess core symptoms of addictive Internet use and the related problems among Chinese population. The 26-item questionnaire measures five aspects of Internet addiction including tolerance, compulsive use, withdrawal symptoms, interpersonal and health-related problems, and time management problems. For each item, participants are asked to respond on a four-point Likert scale ranging from 1 = does not match my experience at all to 4 = definitely matches my experience, in terms of their experience in the past three months. Total score of the CIAS-R ranges from 26 to 104, with a recommended cut-off score of 64 (Ko et al. 2005a). Participants who obtained a score of 64 or above on CIAS-R would be categorized as having Internet addiction. The questionnaire has been validated and shown good psychometric properties in different Chinese populations (Bai and Fan 2005; Lin et al. 2011). The Cronbach's alpha coefficient of the whole scale was reported as 0.97 based on a sample of Hong Kong adolescents (Mak et al. 2014). In the present study, both the total scale and subscales of CIAS showed good internal consistencies, with Cronbach's alpha ranging from 0.75 to 0.93.

Depression Anxiety Stress Scale (DASS)

The 21-item DASS was used to assess three negative emotional states of depression, anxiety, and stress. According to the developers, the DASS was constructed to measure "the ubiquitous and clinically significant emotional states usually described as depression, anxiety and stress" (Psychology Foundation of Australia, 2018) and thus can be used by both researchers and clinicians for either screening normal adolescents and adults or clarifying the locus of emotional disturbance. Each subscale contains seven items. Participants are asked to rate the extent to which they have experienced the described state in the past week on a four-point Likert scale (0 = did not apply to me at all; 3 = applied to me very much, or most of the time). The questionnaire has been translated into different languages and widely used across the world. Good psychometric properties have been reported by researchers from different areas including Hong Kong (Lovibond and Lovibond 1995; Wong et al. 2006). In the present study, the Cronbach's alpha coefficients for depression, anxiety, and stress were .85, .78, and .80, respectively.

UCLA Loneliness Scale

The 20-item UCLA Loneliness Scale was designed to measure an individual's subjective feelings on loneliness and feelings of social isolation. All items are rated on a four-point Likert scale ranged from 1= I never feel this way to 4= I often feel this way. Higher scores represent for higher level of self-perceived loneliness. The measure has good reliability and validity in different populations including Chinese (Russell 1996; Wang and Wang 1999). The Cronbach's alpha was 0.89 based on the present sample of Hong Kong adolescents.

Wong and Law Emotional Intelligence Scale (WLEIS)

The 16-item Wong and Law Emotional Intelligence Scale developed by researchers in Hong Kong (WLEIS, Wong and Law 2002) was used to measure participants' emotional competence. The 16-item questionnaire measures four dimensions of emotional intelligence including self-emotional appraisal, others' emotional appraisal, use of emotion, and regulation of emotion. Respondents rate each item on a five-point Likert scale (1 = strongly disagree, 3 = neutral, 5 = strongly agree), with higher scores standing for better emotional competence. Evidence supporting the factor structure,

reliability, convergent and divergent validity of the WLEIS has been reported across cultures (Law et al. 2008; Libbrecht et al. 2010). The Cronbach's alpha coefficients for the four subscales of WLEIS ranged from 0.82 to 0.92 in the present study, indicating good internal consistency.

Data Analyses

Descriptive statistics of youth Internet addictive behaviors, emotional competence, and indicators of negative emotions were calculated first with SPSS20.0 (IBM, New York). To examine the role of emotional competence in the relationship between youth Internet addiction and negative emotions, two theoretical models (one moderation model and one partial mediation model) were evaluated using structural equation modelling with MPlus7.0 (Li 2017; Park et al. 2014) based on Maximum Likelihood Estimation. Model 1 represents a moderation model, which hypothesizes that Internet addiction would have a direct effect on negative emotion and this effect would be moderated by one's emotional competence. Model 2 is a mediation model in which Internet addiction has both direct and indirect effects on negative emotion; as the indirect effect is mediated by emotional competence. Figures 1a and 1b showed the two models. As gender has often been found as related to both Internet addiction (Ko et al. 2005b) and negative emotions (Park et al. 2014), it was treated as a confounding variable and controlled in the two models.

While various criteria have been adopted to evaluate model fitting, the rules suggested by Hu and Bentler (1995) and Kline (2010) were used in the present study: 1) the CFI, NFI, and TLI values should be equal to or above 0.90 to indicate an acceptable model fit; and 2) for RMSEA, a value of 0.10 or less suggests a reasonable fit.

Results

Descriptive Statistics

Table 1 reports the descriptive results of the key variables. Means and standard deviations of participants' scores on the four scales and their subscales are listed for the whole sample and by gender group. Independent samples t-tests showed that girls reported higher scores in "others' emotional appraisal" than did boys. No significant gender difference was identified in other variables. Using the proposed cut-off score of 64, 63 students (15.6%) can be identified as having Internet addiction problems, including 27 girls (14.0%) and 36 boys (17.2%). Results of Chi-square test also suggested no significant gender difference in the percentage of participants with Internet addictive problems ($x^2 = 0.80$; $p > .05$).

Correlations among variables of Internet addiction, emotional competence, and negative emotions are summarized in Table 2. As predicted, measures of Internet addiction and negative emotions were positively correlated (correlation coefficients ranged from .10 to .34, *ps* < .05); Internet addiction indicators and emotional competence were negatively correlated with moderate level of association (*r* ranged from -.12 to -.19, *ps* < .05). In particular, two components of emotional competence, regulation of emotion and use of emotion, were significantly correlated with Internet addiction subscales (*r* ranged from -.10 to -.21, *ps* < .05) and indicators of negative emotions (*r*

ranged from -.12 to -.37, *ps* < .05). On the other hand, self-emotional appraisal and others' emotional appraisal were less correlated with both Internet addiction and negative emotions.

Model Fit

Three measurement models including Internet addiction, emotional competence, and negative emotions were tested and showed acceptable fit indices. Considering the sample size, subscale scores rather than item scores were used as observed variables. For Internet addiction and emotional competence, the CIAS subscale scores and WLEIS subscale scores were specified as observed variables, respectively. For the latent variable of negative emotions, participants' scores on UCLA Loneliness scale, and the three subscales of DASS (stress, anxiety, and depression) were specified as four observed variables. The model-fitting results based on maximum likelihood estimation are summarized in Table 3, suggesting acceptable to good fit for the three models (Hu and Bentler 1995; Kline 2010).

As mentioned, two competing structural models were tested separately. For the moderation model, gender, Internet addiction, emotional competence, and the interaction between emotional competence and Internet addiction were specified as the exogenous variables, and negative emotion was specified as the endogenous variable. As can be seen in Figure 2, after controlling for the effect of gender, both Internet addiction and emotional competence had significant relationships with negative emotion; Internet addiction was positively associated with negative emotion ($\beta_{estimate}$ = 0.32, β_{se} = .06, p < .001) while emotional competence was negatively associated with negative emotion ($\beta_{estimate}$ = -0.26, β_{se} = .08, p < .01). However, the predictive effect of the interactive term (Internet addiction x emotional competence) on negative emotion was non-significant ($\beta_{estimate}$ = -.09, β_{se} = .07, p = .18). Model fitting indexes also suggest an insufficient fit of the model to the current data: *CMIN/DF* = 4.14, p < .001, *NFI* = 0.86, *CFI* = 0.87, *TLI* = 0.86, *RMSEA* = 0.10 (Kline 2010). Therefore, the results do not support the moderation effect of emotional competence.

For the mediation model, Figure 3 showed the results. First, Internet addiction predicted negative emotion significantly ($\beta_{estimate}$ = 0.33, β_{se} = .06, p < .001), suggesting a direct effect. Second, Internet addiction was negatively associated with emotional competence ($\beta_{estimate}$ = -0.27, β_{se} = .07, p < .001), which further predicted negative emotion reversely ($\beta_{estimate}$ = -0.23, β_{se} = .08, p < .01). This result supported the partial mediation effect of emotional competence on the relationship between Internet addiction and negative emotion. The estimated indirect effect of Internet addiction on negative emotion through emotional competence was 0.06 (p < .05) with 95% confidence interval from 0.01 to 0.12, and the total effect of Internet addiction on negative emotion was 0.39 (p < .001). This model showed acceptable fit indices: *CMIN/DF* = 3.74, p < .001, *NFI* = 0.90, *CFI* = 0.92, *TLI* = 0.90, *RMSEA* = 0.08 (Hu and Bentler 1995; Kline 2010).

To further examine the relative importance of different components of emotional competence, the mediation model was modified. The latent variable of emotional competence was replaced by four observed variables representing four emotional competence components. As seen in Figure 4, the direct effect of Internet addiction on negative emotion remained significant ($\beta_{estimate}$ = .32, β_{se} = .06, p < .001). However, only one component of emotional competence, regulation of emotion, mediated the relationship between Internet addiction and negative emotion. The estimated indirect

effect from Internet addiction to negative emotion through emotional competence was 0.07 (β_{se} = .02) with 95% confidence interval from 0.03 to 0.11. Self-emotional appraisal and others' emotional appraisal were significantly correlated with neither Internet addiction nor negative emotion. Another emotional competence component, use of emotion, was significantly associated with Internet addiction ($\beta_{estimate}$ = -.20, β_{se} = .06, p = .001), but unrelated to negative emotion ($\beta_{estimate}$ = -.06, β_{se} = .06, p = .29). Model fitting indexes also suggested acceptable model fitting: *CMIN/DF* = 3.69, $p < .001$, *NFI* = 0.91, *CFI* = 0.92, *TLI* = 0.91, *RMSEA* = 0.08 (Kline 2010).

Discussion

The present study tested the mediation vs. moderation effects of emotional competence in the relationship between Internet addiction and negative emotion in a sample of Hong Kong adolescents. The results showed that emotional competence, particularly one's ability in emotional regulation, partially mediated the effect of Internet addiction on negative emotions. It can be inferred that negative emotion and loneliness experienced by adolescents who are addicted to the Internet are to some extent due to their impaired ability to regulate emotion caused by Internet addiction. The hypothesized moderation model, on the other hand, was not supported, suggesting that emotional competence, despite its direct effect on negative emotion, cannot buffer the adverse influence of Internet addiction on negative emotions.

The mediation effect of emotional competence found in the present study is partially consistent with previous findings. A review of neuroscientific research showed that people with Internet addictive problems while free from any comorbid psychiatric condition had significant changes in their cortical and subcortical brain regions. These regions are involved in cognitive control and reward processing, functions necessary for emotional competence (Bar-On et al. 2003; Sepede et al. 2016; Vernon et al. 2008). Recent neuroimaging studies on adolescents with Internet addiction further revealed changes in their brain structure that are responsible for regulating emotional behaviors, which may worsen existing emotional problems in the individuals (Zhou et al. 2011). Lack of face-to-face communication due to excessive use of the Internet also negatively affects one's ability to accurately identify and understand emotional cues in social settings (Knapp and Hall 2010; Giedd 2012). These functional and structural impairments related to emotional competence caused by Internet addiction would have negative effects on one's emotional health.

On the other hand, among different emotional competence components, only regulation of emotion was found a significant mediator. Previous findings on other types of addiction indicate that people with addiction tend to have significant difficulties in interpreting and differentiating emotion, i.e., emotional appraisal, as well (Kun and Demetrovics 2010). For example, it was found that people with alcohol abuse are likely to interpret facial expressions falsely (Philippot et al. 1999; Austin et al. 2005). In our study, emotional appraisal (about both oneself and others) was unrelated to Internet addiction. One possible explanation may be that our sample was from a general population while significant relationship between addictive behavior and emotion-decoding skills was often reported based on clinically referred cases suffering from serious addictive problems. Internet addictive behaviors in a group of secondary school students without clinical symptoms may have not created critical changes on their emotional appraisal competence. It is possible that the relationship would be different if a clinical sample with diagnosed Internet addiction is adopted.

Second, we only used questionnaire to measure one's self-perceived emotional competence. Some individuals may not have enough self-awareness about their impaired emotional competence. It would be important to use ability test to assess different dimensions of emotional competence and examine its role in the relationship between Internet addiction and negative emotion in future studies.

The present findings have both theoretical and practical implications for researchers and helping professionals working with adolescents suffering from Internet addiction. Theoretically, the results contribute to our understanding about the adverse influence of Internet addiction on youth's emotional health. Specifically, the mediation model instead of moderation model was supported which indicates that to enhance emotional competence without tackling one's addictive use of Internet may not be effective when treating negative emotion of young Internet addicts, as emotional competence cannot serve as an independent moderator to buffer the effects of Internet addiction. More future research attention needs to be paid to the mechanism of how Internet addiction may jeopardize adolescent's emotional competence.

Regarding the practical implications, first, when treating adolescents with Internet addiction, professionals shall not ignore possible emotional competence deficits, particularly the ability to regulate one's emotion. It would be useful to help the adolescents realize that overuse of the Internet is likely to harm their emotional competence which would further contribute to negative emotions like depression, anxiety, and stress. Second, assessment of emotional competence and emotional problems shall be implemented to screen related problems among these young people so that intervention strategies targeting at the problems could be provided. Third, as emotional competence is considered a malleable competence, especially for young people aged between puberty and mid-twenties, more efforts to promote emotional competence could be made and incorporated as an important component in the development of intervention programs targeting adolescents with Internet addiction. For example, to introduce adolescents with effective approaches on how to manage negative emotions (e.g., mediation, self-talk, keeping an emotion journal) while develop positive emotions (e.g., emotional functioning activity in recreation therapies) (Ostovar et al. 2016), healthy coping strategies, and available resources for adolescents to seek help when they are in severe anxiety or depression (Bodenmann and Shantinath 2004; Proctor et al. 2011).Fourth, more resources should be invested to tackle Internet addiction because its negative impact on adolescents' emotional well-being can be serious.

The mediation effect evidenced by the present study should be interpreted with caution, as several possibilities regarding the relationships among emotional competence, Internet addiction, and negative emotions could not be ruled out based on the current cross-sectional data. First, the role of emotional competence in a reverse relationship that negative emotion leads to Internet addiction was not examined. It is possible that higher emotional competence will protect the individual from developing Internet addiction when they are encountering negative emotions. In this case, emotional competence would function as a moderator. Second, low emotional competence may serve as a common cause for both Internet addiction and negative emotions. For example, adolescents without sufficient emotional competence are more likely to experience negative emotions when encountering adversity in their lives and at the same time to indulge themselves into the Internet as a way to escape from the problems. Third, there could be mutual relationships

among the three constructs. Obviously, longitudinal studies are critically needed to address the direction of causality of these relationships.

In addition, several limitations of the present study shall be further noted. First, the participants were Secondary One students sampled from four schools in Hong Kong. The size and representativeness of the sample limited the generalizability of the findings. The results obtained in this study need to be further tested with a larger and more representative sample of Hong Kong adolescents. It would also be meaningful to investigate the same issue in clinical samples who have demonstrated diagnosable problems related to Internet use. Such findings would have practical implications in guiding the development of treatment or prevention programs on Internet addiction. Second, as mentioned, the present study was based on self-reported data, which may not accurately capture some aspects of one's emotional competence especially when the individual does not have sufficient self-awareness. Objective ability tests should be adopted in future studies to assess participants' competence in recognizing, understanding, regulating, and using emotions in different settings. We also did not include any biological measure of emotional competence in the present study although physical changes in certain brain areas caused by Internet addiction are proposed as a potential explanation for the decreased emotional competence among youth with Internet addiction. It would be meaningful to adopt medical techniques, such as functional neuroimaging technique, in future study to clarify the underlying process of the association between Internet addiction and emotional competence. Third, the role of emotional competence was only examined in the relationship between Internet addiction and negative emotions. As Internet addiction has pervasive negative influence on one's quality of life, more indicators of well-being such as physical health, academic performance, psychopathology, and life satisfaction could be included in future studies to test how emotional competence may contribute to the quality of life of adolescents with Internet addiction.

Despite the limitations, the present study extends prior findings of the impact of Internet addiction on negative emotion by identifying emotional competence as a mediator and providing information about a possible process through which Internet addiction exerts its harmful effects on adolescents. The findings suggest that emotional competence could be an effective entry point to help adolescents with Internet addiction. As literature suggests limited effectiveness of existing treatment programs on Internet addiction, the present study indicates that improving emotional competence while treating Internet addiction can help lessen their negative emotions and improve their quality of life.

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Table 1 Descriptive statistics of variables

	Range	Whole sample (N = 404)		Female (N = 193)		Male (N = 209)		
		M	*SD*	*M*	*SD*	*M*	*SD*	*t*
CIAS	26-104	53.03	13.07	52.83	13.29	53.33	12.84	-0.38
Time management	1-4	1.91	0.59	1.90	0.57	1.93	0.60	-0.39
Withdrawal symptom	1-4	2.18	0.63	2.15	0.64	2.21	0.63	-0.96
Tolerance	1-4	2.20	0.60	2.22	0.60	2.19	0.60	0.58
Interpersonal and health	1-4	1.92	0.54	1.90	0.54	1.95	0.52	-0.96
Compulsive use	1-4	2.07	0.63	2.09	0.66	2.06	0.62	0.44
DASS-Stress	0-3	0.54	0.59	0.75	0.58	0.70	0.58	0.90
DASS-Anxiety	0-3	0.58	0.51	0.61	0.50	0.54	0.50	1.35
DASS-Depression	0-3	0.73	0.58	0.56	0.59	0.51	0.56	0.91
UCLA Loneliness Scale	1-4	2.22	0.52	2.25	0.53	2.19	0.51	-0.38
WLELS	1-5	3.47	0.61	3.48	0.58	3.47	0.62	0.10
Self-emotional appraisal	1-5	3.78	0.73	3.74	0.73	3.83	0.71	-1.21
Regulation of emotion	1-5	3.33	0.86	3.28	0.86	3.39	0.86	-1.30
Use of emotion	1-5	3.20	0.87	3.19	0.88	3.21	0.85	-0.20
Others' emotional appraisal	1-5	3.56	0.91	3.70	0.87	3.44	0.93	2.87**

Note: $^{**}p < .01$

Table 2 Correlations among variables

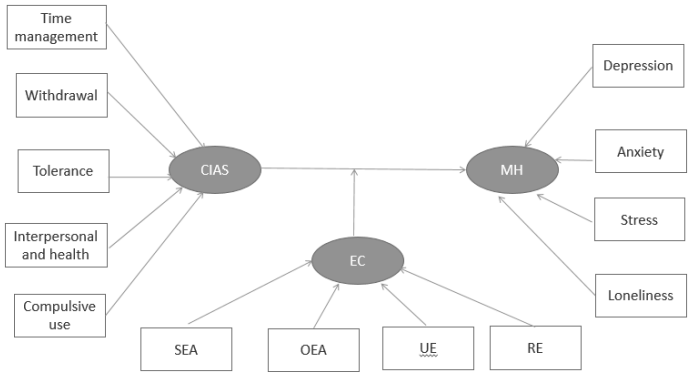
	1	2	3	4	5	6	7	8	9	10	11	12	13	14
1. CIAS	-													
2. Time Management	.80**													
3. Withdrawal symptom	.85**	.57**												
4. Tolerance	.85**	.61**	.73**											
5. Interpersonal and Health	.84**	.62**	.57**	.63**										
6. Compulsive use	.88**	.61**	.76**	.71**	.66**									
7. Loneliness	.19**	.13**	.10*	.13**	.26**	.15**								
8. DASS-Stress	.34**	.29**	.31**	.23**	.27**	.34**	.33**							
9. DASS-Anxiety	.26**	.23**	.21**	.18**	.23**	.23**	.37**	.80**						
10. DASS-Depression	.33**	.34**	.27**	.26**	.25**	.29**	.42**	.76**	.75**					
11. WLELS	-.18**	-.13**	-.14**	-.12*	-.16**	-.17**	-.35**	-.20**	-.15**	-.29**				
12. Self-emotional appraisal	-.08	-.07	-.05	-.04	-.09	-.10*	-.24**	-.06	-.07	-.14**	.71**			
13. Regulation of emotion	-.20**	-.13**	-.21**	-.14**	-.16**	-.19**	-.25**	-.37**	-.27**	-.29**	.74**	.40**		
14. Use of emotion	-.17**	-.16**	-.15**	-.15**	-.10*	-.18**	-.33**	-.13**	-.12*	-.33**	.74**	.39**	.44**	
15. Others' emotional appraisal	-.05	-.02	-.00	-.01	-.12*	-.04	-.20**	-.00	.01	-.10	.70**	.35**	.30**	.32**

Note: $^{**}p < .01$; $^{*}p < .05$

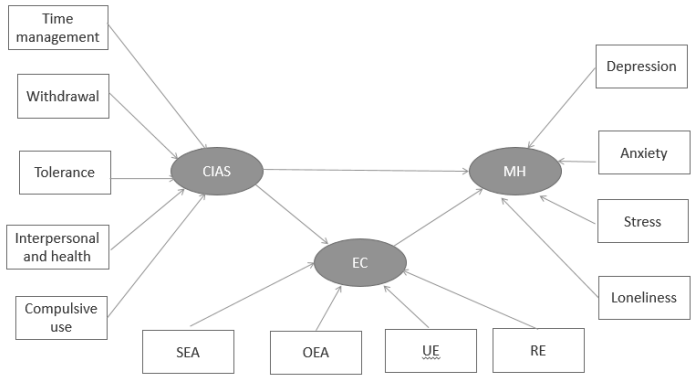
Table 3 Model fit indices of measurement models

	CMIN/DF	*p*	*NFI*	*CFI*	*TLI*	*RMSEA*
M1	7.17	.00	.97	.98	.95	.09
M2	2.05	.12	.99	.99	.98	.05
M3	3.12	.01	.99	.99	.97	.07

Note: M1 = Internet addiction measurement model; M2 = emotional competence measurement model; M3 = negative emotion measurement model.



1a. Hypothesized moderation model



1b. Hypothesized mediation model

Figure 1 Hypothesized models

Note: EC = emotional competence; CIAS = Internet addiction; MH = negative emotion; SEA = self-emotional appraisal; OEA = others' emotional appraisal; UE = use of emotion; RE = regulation of emotion

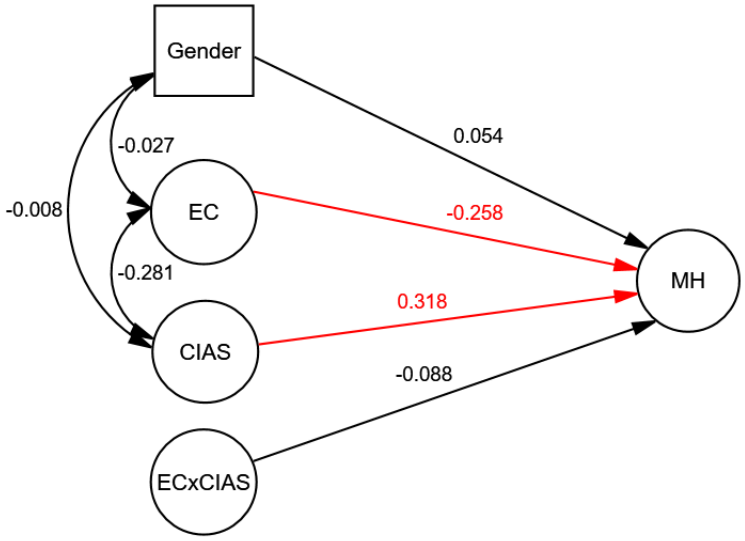


Figure 2 Path coefficients of the moderation model

Note: Gender = gender; EC = emotional competence; CIAS = Internet addiction; EC x CIAS = interactive term (Internet addiction x emotional competence); MH = negative emotion

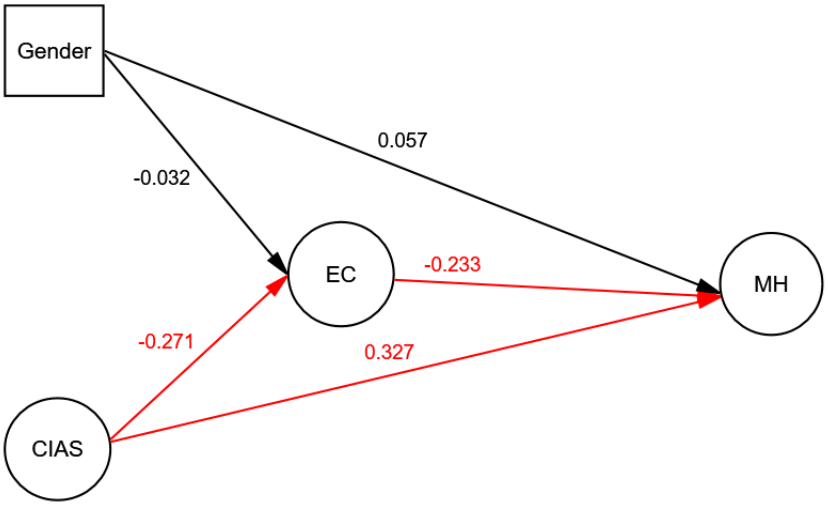


Figure 3 Path coefficients of the mediation model

Note: Gender = gender; EC = emotional competence; CIAS = Internet addiction; MH = negative emotion

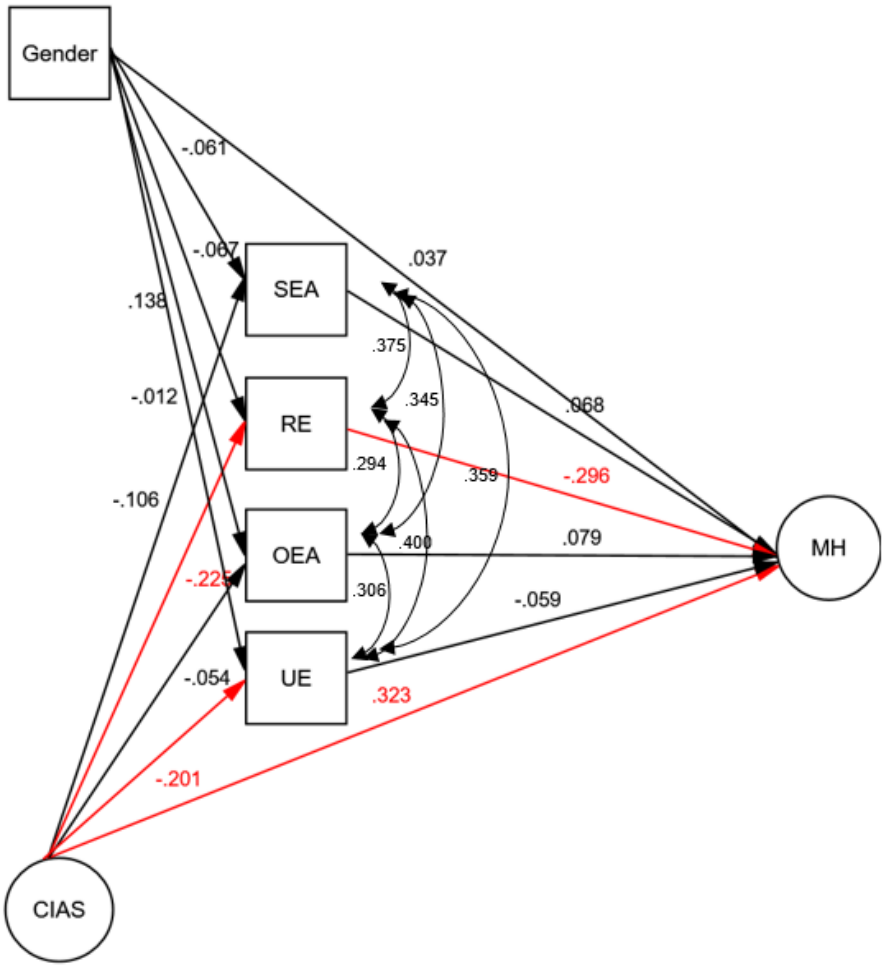


Figure 4 Path coefficients of the revised mediation model

Note: Gender = gender; CIAS = Internet addiction; SEA = self-emotional appraisal; RE = regulation of emotion; OEA = others' emotional appraisal; UE = use of emotion; MH = negative emotion