



Big five personality and adolescent Internet addiction: The mediating role of coping style



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HIGHLIGHTS

- Big five personality have differential roles in adolescent Internet addiction (IA).
- Emotion-focused coping mediated the associations of big five personality with IA.
- Practitioners should attend to the roles of big five personality and coping in IA.

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ABSTRACT

This study examined the unique associations between big five personality traits and adolescent Internet addiction (IA), as well as the mediating role of coping style underlying these relations. Our theoretical model was tested with 998 adolescents. Participants provided self-report data on demographic variables, big five personality traits, coping style, and IA. After controlling for demographic variables, it was found that agreeableness and conscientiousness were negatively associated with IA, whereas extraversion, neuroticism, and openness to experience were positively associated with IA. Mediation analyses further indicated that conscientiousness had an indirect impact on adolescent IA through decreased emotion-focused coping, whereas extraversion, neuroticism, and openness to experience had indirect impacts on adolescent IA through increased emotion-focused coping. In contrast, problem-focused coping had no mediating role. These findings suggest that emotion-focused coping may, in part, account for the association between big five personality and adolescent IA.

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1. Introduction

As the usage of the Internet is growing rapidly each year, adolescent Internet addiction (IA) has become a serious public health concern worldwide (Tsitsika, Janikian, Greydanus, Omar, & Merrick, 2013). IA can be defined as an inability to control one's use of the Internet which lead to psychological, social, school and/or work difficulties in a person's life (Spada, 2014). IA is a unique disorder that is distinguishable from the sheer amount of time that people spend on the Internet or other psychological vulnerabilities such as substance addiction (Baggio et al., 2015; Rumpf et al., 2015). Recent research has indicated that adolescent IA is linked to a variety of maladaptive outcomes, including physical health difficulties, academic failures, and emotional

and behavioral problems (Ko, Yen, Yen, Chen, & Chen, 2012). Therefore, it is important to identify risk factors and mechanisms that place adolescents at increased risk for IA.

Although many factors can contribute to IA (see Kuss, Griffiths, Karila, & Billieux, 2014 for a review), personality characteristics may be particularly relevant. Theorists have proposed that personality traits are closely related to addictive behaviors (Floros & Siomos, 2014). Consistent with this perspective, a recent meta-analysis found that neuroticism was positively associated with IA, whereas extraversion, agreeableness, conscientiousness and openness to experience were negatively associated with IA (Kayaş et al., 2016). However, this review is mainly based on adult samples and the results may not necessarily be generalized to adolescents (Kuss, Shorter, van Rooij, van de Mheen, & Griffiths, 2014), therefore it is necessary to conduct research specifically tailored to adolescents. Meanwhile, from the perspective of intervention, personality traits show greater plasticity during adolescence. Therefore it is more cost-effective to alter Internet addiction through the intervention of personality in adolescence period.

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To date, only a handful of studies have examined the relationship between big five personality and Internet addiction in adolescent samples (Kuss, van Rooij, Shorter, Griffiths, & van de Mheen, 2013; Kuss, Shorter et al., 2014; Zamani, Abedini, & Kheradmand, 2011). For example, Kuss et al. (2013) found that high neuroticism, low agreeableness, low conscientiousness, and high openness to experience were positively associated with IA, whereas extraversion was not related to IA. In addition, Zamani et al. (2011) found that low extraversion, high neuroticism, and low conscientiousness are risk factors of IA, whereas agreeableness and openness to experience were not associated with IA. These findings highlight the important role played by big five personality in adolescent IA. However, except for conscientiousness and neuroticism, the relations between other three personality traits and Internet addiction are mixed. The reasons for the inconsistent findings are not clear, due to the limited number of such studies. More research is needed to replicate and validate previous findings.

In addition, the mediating mechanisms through which big five personality traits impact adolescent IA are still unclear. This kind of research, however, is essential to inform better understanding of how big five personality is related to IA and design effective interventions to reduce IA. Coping style, which has short-term effects on the resolution of the stressors as well as long-term effects on mental and physical well-being, may be one of the mediating variables. Specifically, coping style refers to the strategies people employ to manage their cognition, emotion, and behavior when they contend with stressful events (Skinner, Edge, Altman, & Sherwood, 2003). In general, coping styles include problem-focused coping and emotion-focused coping. Problem-focused coping refers to strategies that deal with the problem that causes emotional distress (e.g., problem solving, use of social support, and cognitive restructuring), and emotion-focused coping refers to strategies that regulate emotions (e.g., wishful thinking, withdrawal, and denial). Personality-coping-outcome theory (Gallagher, 1996) proposes that, when faced with stress, personality may influence one's coping style in several ways, which in turn influences adjustment outcomes that are positive when coping is successful, and negative when coping is unsuccessful. In other words, coping style mediates the relationship between personality and adjustment outcomes. This theoretical model has been verified by some empirical research (Gallagher, 1996; Zanini & Forns, 2014). For example, Zanini and Forns (2014) found that personality can influence internalizing and externalizing problems through emotion-focused coping. However, whether this theory can be applied to the study of adolescent IA, has yet to be determined by empirical investigation.

Some indirect evidence has implied that coping style mediates the relation between big five personality and adolescent IA. On one hand, previous research has documented that personality may impact one's coping style (Carver & Connor-Smith, 2010; Skinner & Zimmer-Gembeck, 2007). In a meta-analytic study, Connor-Smith and Flachsbart (2007) found that big five personality traits were significantly associated with coping style. Specifically, extraversion, conscientiousness, and openness to experience were associated with greater use of problem-focused coping. In addition, conscientiousness and agreeableness were associated with less use of emotion-focused coping, whereas neuroticism was associated with greater use of emotion-focused coping. On the other hand, previous research has demonstrated that coping style may impact one's addictive behaviors (Wills, Sandy, & Yaeger, 2001). For instance, Li and Lei (2005) found that adolescents who used more emotion-focused coping or fewer problem-focused coping strategies were at increased risk for IA. Tang et al. (2014) found that emotion-focused coping style increased the risk of IA, whereas no significant relation was found between problem-focused coping and IA. Taken together, big five personality may be related to coping style, which in turn is related to IA. However, to our knowledge, no published research has directly examined the mediating role of coping style in the relation between big five personality and adolescent IA.

In summary, the purposes of the present study were twofold: (a) to examine the direct associations between big five personality traits and IA among adolescents; and (b) to examine the mediating role of coping style in the relationships between big five personality traits and adolescent IA. We propose the following hypotheses:

Hypothesis 1. Conscientiousness would negatively predict adolescent IA; neuroticism would positively predict adolescent IA. Because previous findings regarding extraversion, agreeableness, openness to experience and IA were inconsistent, we do not propose specific hypotheses about these personality traits.

Hypothesis 2. Neuroticism would be positively associated with IA through increased emotion-focused coping; conscientiousness would be negatively associated with IA through decreased emotion-focused coping/increased problem-focused coping. Because the direct relations between the other three personality traits and IA are mixed, we do not propose specific mediating hypotheses regarding these personality traits.

2. Method

2.1. Participants and procedures

This study was approved by the Research Ethics Committee of the corresponding author's institution. Participants were recruited from five middle schools in Wuhan and Shanghai, China. Informed consent was obtained from school administrators and adolescents before data collection. The survey was conducted in classroom. A total of 998 adolescents participated in this study. Four hundred and seventy (47.1%) of the participants were males. The mean age of the participants was 15.15 years ($SD = 1.57$, range = 12–19). The average daily Internet use time for participants was 2.23 h on weekdays, and 4.58 h on weekends.

2.2. Measures

2.2.1. Demographic information

All adolescents completed questions requesting information about their gender, age, family structure, father's education, mother's education, father's occupation, mother's occupation and family income.

2.2.2. Big five personality

Adolescent personality was measured by the Chinese Big Five Personality Inventory (Zhou, Niu, & Zou, 2000). It consists 50 items assessing five personality dimensions. A sample item of the extraversion dimension was: "I like to play with classmates". Adolescents rated each item on a 5-point scale ranging from 1 = *strongly disagree* to 5 = *strongly agree*. An average score for each dimension was calculated, with higher scores indicating higher levels of that personality dimension. This measure has demonstrated good reliability and validity in Chinese adolescents (Li, Zou, & Yang, 2005; Yang & Lei, 2007). Cronbach's alpha values for the five subscales were 0.85 (95% confidence interval [CI] = [0.84, 0.86]), 0.81 (95% CI = [0.79, 0.83]), 0.85 (95% CI = [0.84, 0.86]), 0.79 (95% CI = [0.77, 0.81]) and 0.79 (95% CI = [0.77, 0.81]), respectively.

2.2.3. Coping style

Adolescent coping style was measured by the Simplified Coping Style Questionnaire, which has been adapted in Chinese culture (Xie, 1999). Problem-focused coping (12 items) refers to strategies that actively resolve the stressful situation, such as "trying to find several different ways to solve the problem". In contrast, emotion-focused coping (8 items) refers to strategies that palliate event-related distress, such as "dreaming that miracles would occur and the status quo could change". All responses were measured on a scale from 1 = *never* to

4 = *always*. The mean score of each dimension was calculated, with higher scores representing more frequent use of the corresponding coping style. This questionnaire has demonstrated good reliability and validity in samples of Chinese adolescents (Sun & Tao, 2005; Zheng et al., 2012). Cronbach's alpha values for the two subscales were 0.79 (95% CI = [0.77, 0.81]) and 0.71 (95% CI = [0.68, 0.74]), respectively.

2.2.4. IA

Adolescent IA was assessed with 10 items adapted from Young's (1996) IA Diagnostic Questionnaire (Li, Zhang, Li, Zhen, & Wang, 2010). A representative item was: "Have you made unsuccessful efforts to control, cut back, or stop Internet use?" Items were rated on a 6-point scale ranging from 1 = *not at all true* to 6 = *always true*. Responses across the 10 items were averaged, with higher scores representing higher levels of Internet addiction. This measure has demonstrated good reliability and validity in Chinese adolescents (Chen, Li, Bao, Yan, & Zhou, 2015; Li et al., 2013). Cronbach's alpha value for this measure was 0.90 (95% CI = [0.89, 0.91]).

2.3. Statistical analysis

Because of the very low proportion of missing data (<1%), mean substitution was used to handle missing data. We first presented descriptive statistics for our variables of interest and control variables, followed by bivariate associations among these variables. Second, we followed Hayes's (2013) procedure to test the direct and mediating effect between personality and IA. Bootstrapping method was used to identify mediation effects. This method produced 95% bias-corrected confidence intervals of these effects from 1000 resamples of the data. Confidence intervals that do not contain zero indicate effects that are significant at $\alpha = 0.05$. Finally, we also performed a path analysis, that is structural equation model for observed variables, to further validate our theoretical model.

3. Results

3.1. Descriptive analyses

According to the criteria of Young (1996), we find the proportion of Internet addiction in the present study was 6.1%, which is close to the incidence of national representative sample (Li, Zhang, Lu, Zhang, &

Wang, 2014). Table 1 presents means, standard deviations, and correlations among all study variables.

3.2. Testing for direct associations

The first aim of this study was to examine the unique relationships between big five personality traits and adolescent IA. To do this, we conducted multiple regression analysis using SPSS 21.0. The results (see Model 1 of Table 2) supported both of our hypotheses. Specifically, after controlling for demographic variables, conscientiousness negatively predicted adolescent IA, whereas neuroticism positively predicted IA. In addition, although the standardized regression coefficients were relatively small, agreeableness negatively predicted IA, while extraversion and openness to experience positively predicted IA.

3.3. Testing for mediated associations

To examine whether coping style mediated the link between big five personality traits and adolescent IA, we followed the two-step procedure proposed by Hayes (2013) to establish this mediation. In the first step, multiple regression analyses (see Models 2 and 3 of Table 2) revealed that extraversion, agreeableness, conscientiousness, and openness to experience predicted problem-focused coping, whereas neuroticism did not significantly predict problem-focused coping. In contrast, conscientiousness, neuroticism, extraversion and openness to experience predicted emotion-focused coping, whereas agreeableness did not significantly predict emotion-focused coping. In the second step, multiple regression analysis (see Model 4 of Table 2) indicated that after controlling for covariates and personality traits, problem-focused coping did not predict IA, while emotion-focused coping predicted IA. Bootstrapping mediation analyses further indicated that emotion-focused coping mediated the link between extraversion and IA ($\beta = 0.02$, 95% CI = [0.01, 0.04]), conscientiousness and IA ($\beta = -0.04$, 95% CI = [-0.06, -0.01]), openness to experience and IA ($\beta = 0.03$, 95% CI = [0.01, 0.05]), neuroticism and IA ($\beta = 0.10$, 95% CI = [0.06, 0.14]). In contrast, problem-focused coping did not mediate the relationship between big five personality traits and IA (all $ps > 0.05$). Therefore, our Hypothesis 2 was partially supported.

To further illustrate the mediational paths between personality traits and adolescent IA, we conducted a path analysis in LISREL 8.72. Multiple fit indices were used to assess model fit, including chi-square with its degrees of freedom, comparative fit index (CFI), goodness of fit index

Table 1
Means, standard deviations, and bivariate correlations of study variables.

Variables	1	2	3	4	5	6	7	8	9	10	11	12
1. Gender	–											
2. Age	-0.03	–										
3. Family structure	0.04	-0.09**	–									
4. Socioeconomic status	-0.07*	0.18***	-0.06	–								
5. Extraversion	0.01	-0.11***	-0.01	0.12***	–							
6. Agreeableness	-0.09**	-0.02	0.01	0.14***	0.57***	–						
7. Conscientiousness	-0.03	-0.08*	0.02	0.12***	0.32***	0.56***	–					
8. Openness to experience	0.03	0.02	-0.04	0.20***	0.54***	0.54***	0.46***	–				
9. Neuroticism	-0.18***	0.08*	-0.05	-0.01	-0.12***	-0.03	-0.11***	-0.06	–			
10. Problem-focused coping	-0.10***	-0.02	0.05	0.15***	0.45***	0.51***	0.51***	0.43***	-0.09**	–		
11. Emotion-focused coping	-0.02	0.07*	-0.00	0.01	0.08**	0.08*	-0.08*	0.10***	0.43***	0.16***	–	
12. IA	0.13***	0.19***	0.04	0.04	-0.07*	-0.22***	-0.35***	-0.07*	0.33***	-0.19***	0.30***	–
M	0.47	15.15	0.87	0.00	3.41	3.94	3.30	3.63	2.88	2.70	2.04	2.36
SD	0.50	1.57	0.34	1.00	0.75	0.59	0.68	0.67	0.78	0.53	0.56	1.04

Note. $N = 998$. Gender was dummy coded such that 1 = *male* and 0 = *female*. Family structure was dummy coded such that 1 = *intact family* and 0 = *nonintact family*. Socioeconomic status was a factor score derived from factor analysis of the father's education, mother's education, father's occupation, mother's occupation and family income, with higher scores indicating higher levels of socioeconomic status. The same below. Multicollinearity was not found.

* $p < 0.05$.

** $p < 0.01$.

*** $p < 0.001$.

Table 2
Testing the mediation effects of personality on adolescent IA.

Predictor variables	Model 1 (IA)			Model 2 (problem-focused coping)			Model 3 (emotion-focused coping)			Model 4 (IA)		
	B	SE B	β	B	SE B	β	B	SE B	β	B	SE B	β
Gender	0.36	0.06	0.17***	-0.09	0.03	-0.09***	0.07	0.03	0.06*	0.33	0.06	0.16***
Age	0.10	0.02	0.15***	0.01	0.01	0.02	0.02	0.01	0.04	0.10	0.02	0.14***
Family structure	0.24	0.08	0.08**	0.08	0.04	0.05	0.04	0.05	0.02	0.24	0.08	0.08**
Socioeconomic status	0.06	0.03	0.05	0.02	0.01	0.04	-0.01	0.02	-0.02	0.06	0.03	0.06*
Extraversion	0.15	0.05	0.11**	0.14	0.02	0.20***	0.07	0.03	0.09*	0.15	0.05	0.11**
Agreeableness	-0.25	0.07	-0.14***	0.15	0.03	0.17***	0.06	0.04	0.07	-0.25	0.07	-0.14***
Conscientiousness	-0.46	0.05	-0.30***	0.23	0.03	0.30***	-0.11	0.03	-0.14***	-0.39	0.06	-0.26***
Openness to experience	0.13	0.06	0.09*	0.08	0.03	0.10**	0.09	0.03	0.11**	0.11	0.06	0.07*
Neuroticism	0.44	0.04	0.33***	-0.03	0.02	-0.04	0.32	0.02	0.44***	0.34	0.04	0.25***
Problem-focused coping										-0.12	0.07	-0.06
Emotion-focused coping										0.31	0.06	0.17***

Note. N = 998. Each column is a regression model that predicts the criterion at the top of the column. Multicollinearity was not found.

- * p < 0.05.
- ** p < 0.01.
- *** p < 0.001.

(GFI), non-normed fit index (NNFI), standardized root mean square residual (SRMR), root mean square error of approximation (RMSEA). Usually, the fit is considered good when $\chi^2/df < 3$, CFI > 0.95, GFI > 0.95, NNFI > 0.95, SRMR < 0.08, RMSEA < 0.06 (Hu & Bentler, 1999). Our model demonstrated sufficient fit to the data, $\chi^2_{(10)} = 21.77$, CFI = 1.00, GFI = 1.00, NNFI = 0.98, SRMR = 0.01, RMSEA = 0.03, 90% CI of RMSEA = [0.01, 0.05]. As shown in Fig. 1, the results were same with the multiple regression.

3.4. Supplementary analyses

We investigated product terms of personality traits and coping styles with adolescent gender (e.g., Extraversion × Gender, Emotion-Focused Coping × Gender) to rule out gender differences in our mediation model. We also constructed product terms among the five personality

traits and the two coping styles (e.g., Extraversion × Problem-Focused Coping) to examine whether personality might act as a moderator in the relations between coping styles and IA (Bolger & Zuckerman, 1995). Results indicated that all the interaction terms were non-significant and our current mediation model was further validated.

4. Discussion

In the present study, we examined the impact of big five personality traits on adolescent Internet addiction, as well as the mediating role of coping style underlying these associations. Our findings contribute to the literature of big five personality and adolescent Internet addiction in several ways.

First, we found that the big five personality traits play an important role in adolescent IA. Specifically, in line with previous research (Kuss et

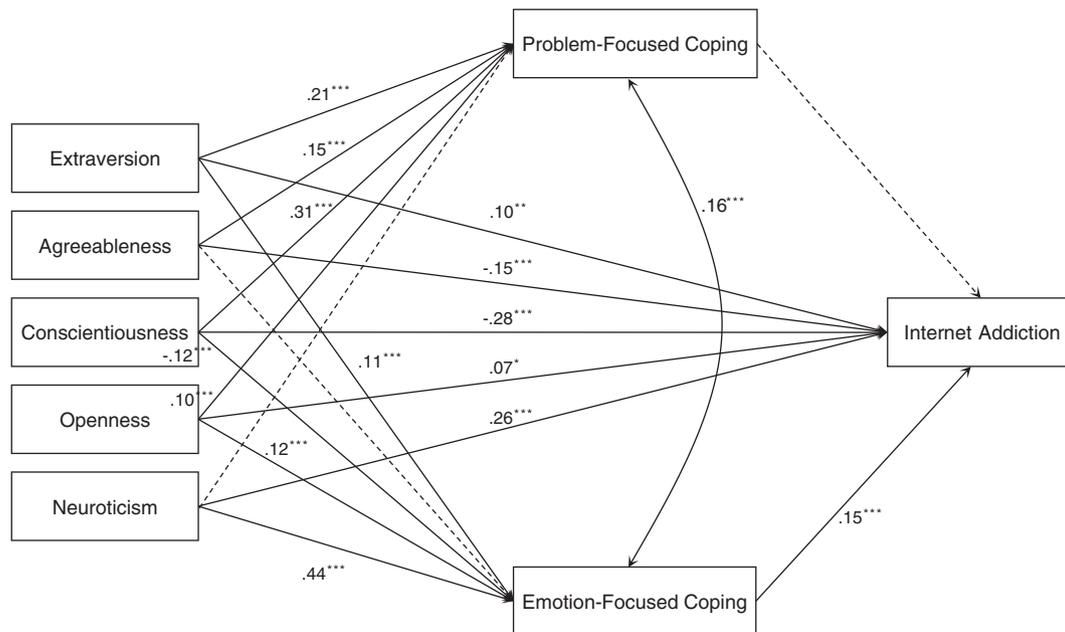


Fig. 1. Path analysis depicting direct and indirect effects of big five personality on IA. Standardized coefficients are presented. Covariates were included in the model but are not presented for simplicity. Solid lines indicate statistically significant associations, whereas dashed lines indicate nonsignificant associations. Note. N = 998. *p < 0.05. **p < 0.01. ***p < 0.001.

al., 2013; Zamani et al., 2011), conscientiousness negatively predicted adolescent IA. Adolescents who score high on conscientiousness often place high priority on academic and educational goals, have better planning and self-control skills, and have sophisticated understanding of the consequence of excessive Internet use. Therefore, they are less inclined to indulge in Internet world and suffer from addiction. Also, consistent with previous research, neuroticism positively predicted adolescent IA (Kuss et al., 2013; Zamani et al., 2011). Individuals with neuroticism experience more troubled relationships and distressed situation. Hence, they are more likely to indulge in Internet to avoid these unpleasant experiences. In addition, low agreeableness individuals usually are more hostile that causes dissatisfactory peer relationships, interpersonal conflict and friendship dissolution in the real world (Ozer & Benet-Martinez, 2006). Consequently, they are more likely to compensate the need of friendship and relatedness in the virtual world, and eventually lose themselves over time.

It is worth noting that in correlation analysis, extraversion and openness to experience were negatively associated with IA. However, in regression analysis, the unique associations of extraversion and openness to experience with IA were positive. Indeed, the relationships of extraversion and openness to experience with adolescent IA were mixed in previous research. Although some researchers found that extraversion and openness to experience are beneficial factors that reduce IA (Chen, 2009), others found that they are risk factors that promote IA (Ozturk, Bektas, Ayar, Oztornaci, & Yagci, 2015). These findings can be explained by the *dual nature* of extraversion and openness to experience. Essentially, extraverted individuals often have good interpersonal relationships and adequate social support in real life, thus they do not need to seek more friends and social support online. On the other hand, these individuals are often impulsive (Eysenck & Eysenck, 1963) and tend to seek out new stimulation (Eysenck, 1967), which makes them more likely to addicted to the Internet. Likewise, adolescents with high openness to experience often have a wide range of interests and spare time activities, which limit their chance of IA. However, these adolescents are also imaginative, curious, attuned to inner feeling and prefer new stimulation and activities, which put them at increased risk for IA (Carver & Connor-Smith, 2010). Nonetheless, the unique associations of extraversion and openness to experience with adolescent IA are relatively small, so these findings should not be overstated and more research is needed to replicate these complex findings.

Second, this study found that emotion-focused coping mediated the relationship between big five personality traits (neuroticism, conscientiousness, extraversion, openness to experience) and adolescent IA. These findings support the personality-coping-outcome theory (Carver & Connor-Smith, 2010; Gallagher, 1996). In addition to the overall mediation results, each of the individual links in our mediation model is noteworthy. In the first stage of the mediation analysis, neuroticism was associated with greater use of emotion-focused coping, whereas conscientiousness was associated with less use of emotion-focused coping. These findings are congruent with previous research (Carver & Connor-Smith, 2010) as well as the biological view of Skinner and Zimmer-Gembeck (2007) which suggests that neuroticism grounded in an avoidance temperament with the tendencies to experience fear, sadness and distress. In contrast, conscientious individuals are persistent, self-disciplined, organized and success-achieved, which may reduce the use of emotion-focused coping (Carver & Connor-Smith, 2010). Interestingly, extraversion and openness to experience were significantly associated with greater use of emotion-focused coping style. These findings may counter to intuition, however, they are congruent with some previous research (Li, Niu, & Zou, 2000; Li & Zhang, 2004). Specifically, individuals with extraversion have distinct characteristics of impulsiveness (Eysenck & Eysenck, 1963) and sensitivity to rewards (Carver & Connor-Smith, 2010), which are risk factors for emotion-focused coping (denial, blaming, and social withdrawal)

(Xue & Liang, 2012). Openness to experience contains the tendency to be imaginative, creative, curious, flexible, attuned to inner feelings, and inclined toward new activities and ideas. It is these tendency that have been found to facilitate emotion-focused coping such as wishful thinking (Carver & Connor-Smith, 2010). In the second stage of the mediation analysis, emotion-focused coping significantly predicted adolescent IA. Emotion-focused coping as a risk factor of IA has been documented in several studies (Li & Lei, 2005; Tang et al., 2014). Our finding and those of others are congruent with the stress-coping theory (Wills et al., 2001). When distressed, emotion-focused coping may lead to undesirable situations which further trigger negative emotions. In this case, individuals are more likely to indulge themselves to the Internet to escape from the negative emotions (Lightsey & Hulsey, 2002).

In contrast, the mediation effect of problem-focused coping was not found in our result. In the first stage of mediation analysis, agreeableness, conscientiousness, extraversion, and openness to experience were associated with greater use of problem-focused coping, whereas neuroticism has no significant relationship with problem-focused coping. Agreeable individuals generally evocate fewer interpersonal conflicts and receive more social support, thus they are more likely to handle stressors with problem-focused coping (Carver & Connor-Smith, 2010). In addition, people with high conscientiousness are persistent, self-disciplined, organized, achievement-oriented, and deliberate. As one can expect, the proactive and disciplined features of this trait may facilitate problem-focused coping. From the biological perspective (Skinner & Zimmer-Gembeck, 2007), extraversion grounded in an approach temperament, strong approach tendency may promote initiation and persistence in problem-focused coping such as problem solving (Vollrath, 2001). Also, characteristics of openness to experience may facilitate problem-focused coping, such as problem solving and cognitive restructuring (Carver & Connor-Smith, 2010). In the second stage of the mediation analysis, no significant relationship was observed between problem-focused coping and adolescent IA. Although some studies have documented that adolescents with IA tend to use less problem-focused coping (Li & Lei, 2005; Wu, Wu, Yuan, Zheng, & Zheng, 2009), we and others have found a non-significant relationship between problem-focused coping and IA (Tang et al., 2014; Wang, Zhang, & Hua, 2012). One possible explanation is that the relation between problem-focused coping and IA is not robust and may partly depend on other yet to be carefully investigated factors such as online incentives or self-control (Wang et al., 2012). This explanation mirrors the view that although emotion-focused coping has a direct impact on psychopathology, the impact of problem-focused coping on psychopathology is often moderated by personal or environmental factors (Aldwin & Revenson, 1987; Zanini & Forns, 2014). Another explanation is that problem-focused coping may play both beneficial and adverse roles in Internet addiction, which cancel out each other. Specifically, problem-focused coping helps reduce or eliminate stressors in one's real life, which reduces the risk of IA. On the other hand, it may promote individuals' online social support seeking, which increases the risk of IA. Further research is needed to disentangle which of these explanations account for the present results.

Several limitations of the present study must be noted. First, our study was cross-sectional and cannot establish causal relationships. Although we were guided by theory and examined the impact of personality on coping and IA, it is also possible that one's coping style will shape the development of personality (Sturrock, Francis, & Carr, 2009). Therefore, future studies should use cross-lagged longitudinal designs to better delineate the relationships among personality, coping style, and IA. Second, all measures in this study were based on adolescent self-report. Although the "problem of shared variance" can be corrected for in multivariate analyses (Luthar, Crossman, & Small, 2015), future studies should use multi-method and multi-informant approaches to better replicate our findings. Third, although the adapted Internet Addiction Diagnostic

Questionnaire has been validated in previous studies (Chen et al., 2015; Li et al., 2013), the original tool (Young, 1996) has been criticized for its lack of a theoretical basis (Kuss, Shorter, et al., 2014). Therefore, future studies in this field should use more theoretically-based tools such as the Generalized Problematic Internet Use Scale 2 (Pontes, Caplan, & Griffiths, 2016) to assess IA. Fourth, although general IA is worthy of studying (because different subtypes of IA share common characteristics), future research should test the links between big five personality and different subtypes of IA. Finally, our study was conducted in Chinese adolescent sample, the generalizability of the findings should be further verified with samples from other countries.

Despite these limitations, our findings have important practical implications. First, parents and teachers should pay attention to the differential roles of big five personality traits on adolescent IA: not only the beneficial impact of conscientiousness and agreeableness, but also the adverse impact of neuroticism. We should also be aware of the complex roles of extraversion and openness to experience in adolescent IA. Second, our findings can help practitioners understand pathways by which big five personality traits impact adolescent IA, suggesting a possible avenue for interventions. For example, reducing adolescent emotion-focused coping style through outreach programs may be an effective way to reduce adolescent IA.

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Contributors

Yueyue Zhou wrote the first draft of the manuscript and conducted literature searches. Dongping Li designed the study, conducted statistical analyses and literature searches. Xian Li revised language and improved the manuscript substantially. Yanhui Wang and Liyan Zhao did vital work for the improvement of manuscript. All authors contributed to and have approved the final manuscript.

Conflict of interest

Authors declare that they have no conflicts of interest.

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