

Specific Virtues as Predictors of Smartphone Addiction among Chinese Undergraduates

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Abstract Smartphones are important communication and technological tools that have become an indispensable part of university students' lives. Although empirical research has evaluated factors that influence Smartphone addiction, few studies have explored positive and potentially protective factors such as virtues that may increase the efficacy of future Smartphone addiction prevention programs. Thus, this study examined the relationship between three key virtues (i.e., relationship, vitality, and conscientiousness) and Smartphone addiction as well as evaluated the specific contributions of these virtues as applied to Smartphone use among Chinese university students. A total of 682 undergraduates (aged 18–24 years) from three universities completed the 96-item Chinese Virtues Questionnaire and Mobile Phone Addiction Index. Results showed that three virtues were significantly correlated with Smartphone addiction. Specifically, conscientiousness and relationship virtues negatively predicted Smartphone addiction and explained 82.61% of addiction-related variance. Vitality positively predicted Smartphone addiction and accounted for the remaining 17.39% variance. Thus, this study demonstrated that conscientiousness and relationship virtues were potential protective factors for Smartphone addiction, while vitality led to increased vulnerability. Gender-related differences were also discovered. Specifically, male students may be more sensitive to the conscientiousness virtue, while female students may show

increased sensitivity to the relationship virtue. Consequently, future efforts to prevent Smartphone addiction could focus on how to enhance conscientiousness and relationship virtues and how to reduce the vitality virtue.

Keywords Virtues · Smartphone addiction · CVQ-96 · MPAI · University students · Prevention

Introduction

Smartphone use has increased dramatically in recent years. According to the International Telecommunications Union, there were more than 7 billion mobile cellular subscriptions at the end of 2015. This data accounts for 97% of the world's population. In China, the total number of Smartphone users reached 1.306 billion in 2015. Although Smartphone use has been growing in the general population, university students are particularly affected and an increasing number feel reliant on and inseparable from their Smartphones (Lepp et al. 2015).

Over time, Smartphone use has resulted in changes to daily routines, habits, social behaviors, emancipative values, family relations, and social interactions (Alt 2016; Samaha and Hawi 2016). A growing number of studies report that uncontrolled Smartphone use is associated with sleep disturbances, work intrusion, depression, dangerous behaviors (e.g., phone use while driving), and pathological symptoms (Thomé et al. 2011; White et al. 2004). In this study, the term Smartphone addiction refers to an inability to control Smartphone use (Walsh et al. 2010). The symptoms of Smartphone addiction include an inability to control cravings, anxiety and feeling lost, withdrawal and escape, and productivity loss (Huang et al. 2014). Therefore, Smartphone addiction is sometimes called *nomophobia*, which is an abbreviation for “no mobile phone phobia.” In other words, it literally refers to

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individuals' feelings of fear related to being unable to use their Smartphones (Emanuel et al. 2015).

In the past decade, the amount of research about Smartphone addiction has grown substantially. For example, the prevalence rate of university student Smartphone addiction is estimated to be between about 10% and 48% (Aljomaa et al. 2016; Billieux et al. 2015). Subsequently, this high proportion and trend toward rapid growth in addiction rates has created urgency for further exploration of the causes and psychological mechanisms underlying Smartphone addiction.

It should be noted that the extremely wide range in estimated Smartphone addiction rates is primarily due to a lack of an appropriate theoretical rationale underlying the majority of studies within the field (Billieux et al. 2015). That is, uncontrolled Smartphone use is too frequently conceptualized as a behavioral addiction. As a result, the screening tools that are developed have been adapted from literature pertaining to substance use and pathological gambling. However, this does not account for the specifics of Smartphone addiction. In other words, most existing studies have focused on descriptions of behaviors and consequences associated with uncontrolled Smartphone use (Yu et al. 2013). Thus far, only a few studies have focused on the causes of Smartphone addiction (Aljomaa et al. 2016; van Deursen et al. 2015). Furthermore, the majority of studies emphasize negative relationship and intrapersonal factors rather than initiating and conducting research from a positive or proactive perspective (Billieux et al. 2015).

Virtues

Virtues are a core concept in positive psychology and refer to “a property of the whole person and the life that person leads” (Peterson and Seligman 2004, p. 87). The virtues system was developed as a 2-tier model, with the first tier including 24 character strengths (e.g., kindness, gratitude, love, zest, and self-regulation) and the second including 6 universal virtues (i.e., knowledge/wisdom, courage, humanity, justice, temperance, and transcendence) (Dahlsgaard et al. 2005). Although abundant studies have consistently shown that these character strengths significantly enhance mental health and reduce unhealthy behaviors in different cultures (Gillham et al. 2011), relatively few have investigated first-tier character strengths as second-tier virtues (Linkins et al. 2015). Perhaps one reason is that this virtue structure does not account for cultural variability. Additionally, existing studies have reported that the virtue structure is uni- or multi-dimensional (i.e., three-, four-, five- and six-factor structures) (Toner et al. 2012).

To address this problem, Duan et al. (2012) applied a combined etic-emic approach to reduce culturally inappropriate items. For instance, when assessing “self-regulation”, “I have no trouble eating healthy foods” is invalid within Chinese culture. Additionally, the item “At least once a day, I stop

and count my blessings” was excluded as a measure of the “gratitude” as the result of its strong religious connotations. Subsequently, a 96-item Chinese Virtues Questionnaire (CVQ-96) was developed. The CVQ-96 items were selected from the Values in Action Inventory of Strengths (VIA-IS), which was originally developed to measure the 24 character strengths. Subsequently, Duan et al.'s (2013) study utilizing exploratory and confirmatory factor analyses suggested three well-established and culturally meaningful virtues: relationship, vitality, and conscientiousness. The relationship virtue reflects the positive cognitions, emotions, and behaviors associated with social interactions. The vitality virtue emphasizes positive qualities such as curiosity, creativity, and zest for a fulfilling life. Finally, the conscientiousness virtue is intrapersonal and involves exhibition of willpower and self-control.

Virtues and Smartphone Addiction

Some theorists assert that virtues are positive traits reflected in thoughts, emotions, and behaviors (Peterson and Seligman 2004). According to problem-behavior theory (Jessor 1987), the personality system is one of three psychosocial systems (i.e., personality, perceived environment, and behavior) that can be used to either explain problem behavior instigation or control against it. The variables in this system are personal beliefs, expectations, values, attitudes, and orientations toward the self and others. Consistently, virtues manifest positive personality traits in social interactions, positive personal qualities, and willpower. Thus, the levels of these traits can significantly affect an individual's degree of Smartphone dependence. Moreover, several past studies indicate that individuals with Smartphone addiction are more likely to report lower degrees of the relationship virtue (Chung 2011; Geser 2006) and a general lack of the conscientiousness virtue (Zhang et al. 2014).

However, there are currently no consistent conclusions about the effects of the vitality virtue on addictive behaviors. Akin (2012) reported that subjective vitality negatively predicted addictive behaviors in university students. Although Zhang et al. (2014) used a different measure of vitality, this study indicated that vitality was instead a positive predictor of addictive behaviors. This inconsistency implies variability in the role of vitality with respect to addictive behaviors, and highlights the inconclusively of previous results. Therefore, it is evident that further study is required to examine the relationship between virtues and addictive behaviors.

Previous studies linking Smartphone addiction to the three key virtues have investigated virtues separately and assessed them as outcome variables. For example, Chiu (2014) found that many students who frequently used Smartphones had poor relationships. However, the complex association

between the roles of the three virtues and Smartphone addiction means that simultaneous investigation may provide more clarity. Past studies also reported that gender influenced levels of certain character strengths, with females tending to score higher than males for specific strengths (e.g., kindness, love, gratitude) (Toner et al. 2012). Thus, the current study could add to existing literature by exploring this issue in more depth. This is not only consistent with past research utilizing different perspectives, but can also guide further research on these constructs.

Study Purpose

As noted, previous Smartphone addiction research has emphasized associated negative factors and outcomes. However, the present study aimed to expand on previous literature by examining virtues as protective factors. To do so, we first explored the association between three virtues (i.e., relationship, vitality, and conscientiousness) and Smartphone addiction. Subsequently, we used dominance analysis to assess the relative importance and specific contributions of these virtues. Finally, we assessed if there were gender differences with respect to levels of the different virtues.

Overall, the purpose of the current study was to clarify how the three key virtues contributed to Smartphone addiction. This exploration could facilitate a virtue-based approach to the issue as well as deepen the theoretical foundation underlying Smartphone addiction. Additionally, it has significant practical implications for the creation of the prevention and intervention programs that are required to address this ever-increasing problem. Therefore, the current study can not only provide insight into future study within this field, but also highlight practical and effective ways to prevent or reduce university students' Smartphone addiction.

Study Hypotheses

In the current study, we proposed the following hypotheses: (1) the conscientiousness virtue will negatively predict Smartphone addiction because addicted individuals are more likely to report decreased conscientiousness. (2) The vitality virtue will positively predict Smartphone addiction because high levels of the vitality are associated with increased addictive behaviors. (3) The relationship virtue will negatively predict Smartphone addiction because it emphasizes positive behaviors, while Smartphone addiction reflects negative behaviors. (4) Male students will score higher than female students on vitality and conscientiousness virtues. However, female students will score higher on relationship virtue than male students because gender influenced levels of certain virtues.

Method

Participants

A total of 682 participants were included (398 males and 284 females). Students were recruited through public notice channels (e.g., the university bulletin board) or via class announcements. All participants were enrolled at one of three universities in western China and were in their first to third year of study. Participants were eligible to participate if they owned a Smartphone for one year or longer. Participants' mean age was 19.34 years ($SD = 1.26$; age range = 18–24 years), and additional information about participant characteristics is provided in Table 1.

Measures

Virtues

Virtues were evaluated using the CVQ-96 (Duan et al. 2012). This questionnaire consists of 96 virtue-related items (32 for relationship, 40 for vitality, and 24 for conscientiousness, respectively). Examples of items are: "I always keep my promises" (relationship), "I have a lot of interests" (vitality), and "I exercise regularly" (conscientiousness). Participants responded on a 5-point Likert-type scale ranging from 1 (*very much unlike me*) to 5 (*very much like me*). The mean virtue scores were calculated, with higher scores reflecting a higher degree of each virtue. The CVQ-96 has been demonstrated to be a reliable and valid measurement for assessing virtues in Chinese populations (Duan et al. 2013). In the present study, the Cronbach's alpha coefficients for the internal consistency of the CVQ-96 were .91 for the overall questionnaire, and .87 for relationship, .89 for vitality, and .84 for conscientiousness subscales.

Table 1 Participant characteristics

	Male		Female	
	<i>n</i>	%	<i>n</i>	%
Average length of time of owning a Smartphone				
1 year	135	33.9	76	26.8
2 years	108	27.1	103	36.3
3 years	104	26.1	62	21.8
4 years or longer	51	12.9	43	15.1
Year in university				
1st year	151	37.9	88	31.0
2nd year	186	46.7	155	54.6
3rd year	61	15.3	41	14.4

Smartphone Addiction

Smartphone addiction was assessed using the Mobile Phone Addiction Index (MPAI) scale (Huang et al. 2014). This scale was developed based on Leung's (2008) Internet Addiction Scale. It assesses 4 factors related to Smartphone addiction including inability to control cravings (7 items), anxiety and feeling lost (4 items), withdrawal and escape (3 items), and productivity loss (3 items). Examples of items are: "You always feel that you do not have enough time to use your Smartphone" (inability to control cravings), "You think it's hard to shut down your Smartphone" (anxiety and feeling lost), "When you feel lonely, you have used your Smartphone to communicate with others" (withdrawal and escape), and "Sometimes you'd rather use a Smartphone than completing a more urgent task" (productivity loss). Participants responded on a 5-point Likert-type scale ranging from 1 (*never*) to 5 (*always*). A mean total score and scores for each dimension were obtained, with higher scores indicating higher addiction severity. The MPAI has been demonstrated to exhibit excellent psychometric properties in Chinese populations (Deng et al. 2015). In the present study, the Cronbach's alpha coefficients for the total index and the 4 dimensions were .89, .80, .82, .82, and .76, respectively.

Procedure

A number of methods were adopted to prevent common methodological biases. Three questionnaire packages (A, B, and C) were prepared for the three universities (i.e., one university received package A, one package B, and one package C). Each package included demographic questions, the CVQ-96, and the MPAI. All participants first completed the demographic questions, followed by the CVQ-96 and MPAI instruments. The ordering of the items in the instruments differed depending on the particular package. Following the provision of informed consent, participants completed the pencil-and-paper questionnaires, which were immediately returned and collected by psychological professionals to ensure appropriate protocol was followed. Students from approximately 8 classes at each university responded, and the questionnaire took approximately 15 min to complete.

Data Analysis

In the preliminary analysis, we calculated mean scores for the total scale and subscale values for virtues and Smartphone addiction. Additionally, we calculated descriptive statistics and performed Pearson correlation analyses. We also performed comparisons of virtues between genders and between High Smartphone Addiction (HA) and Low Smartphone Addiction (LA) groups using *t*-tests. Thereafter, we conducted

multivariate regression and dominance analyses. Data analyses were performed using SPSS version 20.0.

Results

Descriptive Statistics and Difference Analysis

After sorting by the overall mean Smartphone addiction scores, 211 students (those who scored in the highest 27%) were defined as the HA group, and 188 students (those who scored in the lowest 27%) were categorized as the LA group. The descriptive statistics for gender, university year, HA and LA addiction groups, and virtues are shown in Table 2. Results revealed that males scored significantly higher than females on vitality ($t(680) = 2.51, p = .012$) and conscientiousness ($t(680) = 4.17, p < .001$) virtues. However, males scored lower than females on the relationship virtue ($t(680) = -3.01, p = .002$). Additionally, the HA group scored significantly lower than the LA group on relationship ($t(397) = -2.74, p = .003$) and conscientiousness ($t(397) = -5.46, p < .001$) virtues. However, the HA group scored higher than the LA group on the vitality ($t(397) = 2.33, p = .002$) and Smartphone addiction ($t(397) = 48.95, p < .001$).

A one-way analysis of variance (ANOVA) showed significant differences for vitality ($F(2672) = 4.40, p = .013$) and conscientiousness ($F(2672) = 10.94, p < .001$) virtues as well as Smartphone addiction ($F(2672) = 5.44, p = .005$) by university year. Post-hoc tests indicated that first year students scored significantly lower than second ($p = .005$) and third ($p = .026$) year students on Smartphone addiction. However, differences in Smartphone addiction between second and third year students were non-significant ($p = .996$).

Bivariate Correlations and Regression Analyses

Table 3 shows the Pearson correlation coefficients for males and females. For males, relationship ($p = .002$) and conscientiousness ($p < .001$) virtues were negatively correlated with Smartphone addiction, while vitality ($p = .003$) was positively correlated with Smartphone addiction. For females, relationship ($p = .002$) and conscientiousness ($p = .001$) virtues were significantly and negatively correlated with Smartphone addiction.

To protect against multicollinearity, all variables were initially mean centralized. Results of regression analysis indicated that age and gender (step 1) were non-significant predictors of Smartphone addiction. In step 2, it was found that conscientiousness ($\beta = -.20, p < .001$) and relationship ($\beta = -.10, p = .028$) virtues negatively predicted Smartphone addiction, while vitality ($\beta = .11, p = .022$) positively predicted Smartphone addiction.

Table 2 Means and standard deviations for gender, university year, and Smartphone addiction groups *M(SD)*

	Gender		Year in university				Addiction	
	Male	Female	1st	2nd	3rd	High	Low	
Relationship virtue	3.72(.38)	3.80(.39)	3.80(.39)	3.87(.38)	3.82(.38)	3.71(.36)	3.83(.41)	
Vitality virtue	3.45(.41)	3.40(.37)	3.47(.40)	3.39(.34)	3.54(.41)	3.58(.37)	3.48(.43)	
Conscientiousness virtue	3.41(.40)	3.29(.37)	3.38(.39)	3.30(.37)	3.55(.38)	3.32(.41)	3.52(.42)	
Smartphone addiction	2.62(.69)	2.64(.63)	2.53(.61)	2.70(.66)	2.70(.64)	3.40(.34)	1.84(.27)	

Participants responded to scales ranging from 1 (lowest) to 5 (highest).

Dominance Analysis

Dominance analysis was conducted to assess the relative contribution of the three virtues to Smartphone addiction. Johnson (2000) suggested that traditional multiple regression analysis may overestimate or underestimate predictive power. This is consistent with Budesco (1993) proposal that dominance analysis be used to refine current approaches to data analysis.

Based on Johnson (2000) and Budesco (1993) research and similar to Zhang et al.'s (2014) recent study, in the current study, the three virtues were categorized into 7 combinations. Dominance analysis showed that the relative contribution (R^2) of the three virtues was divided by .045 when the relative importance of each predictor was assessed. In this study, the conscientiousness virtue contributed 71.74% of the predicted variance, followed by vitality (17.39%) and relationship virtues (10.87%) (Table 4). Thus, of all virtues, conscientiousness was the most strongly associated with Smartphone addiction.

Discussion

As hypothesized, relationship, vitality, and conscientiousness virtues significantly predicted Smartphone addiction among university students. These findings are consistent with studies that report stable and strong influences of character strengths

and other positive traits on Smartphone addiction as well as other psychological symptoms (Duan et al. 2015; Heaven et al. 2013; Hong et al. 2012). For example, a previous study demonstrated that these three virtues were important in pathological internet use (PIU) (Zhang et al. 2014). This finding may be partially accounted for by problem-behavior theory (Jessor 1987), which implies that different personality traits could be associated with the likelihood of Smartphone-related addictive behaviors. Therefore, virtues can reflect positive traits related to interactions with others, zest for life, and self-regulation, thereby accounting for the significant relationship between Smartphone addiction and virtues.

In this study, an important finding was that the conscientiousness virtue acted as a protective factor, as it contributed 71.74% of the predicted variance. Thus, consistent with previous findings (Zhang et al. 2014), individuals with high conscientiousness are more likely to easily control cravings and withdrawal symptoms associated with Smartphone addiction. Likewise, a recent study indicated that in the Big Five model of personality traits, conscientiousness was negatively associated with impulsivity (Roberts et al. 2015). This is pertinent because impulsivity has been reported to play a potential role in both substance addiction and negative health-related behaviors (Roberts and Pirog 2012). A possible explanation for this finding is that the conscientiousness virtue reflects the traditional Chinese

Table 3 Pearson correlation coefficient analysis of virtue factors and Smartphone addiction dimensions

	1	2	3	4	5	6	7	8
1.Relationship virtue	-	.60**	.59**	-.14**	-.17**	-.01	-.19**	-.17**
2.Vitality virtue	.47**	-	.73**	-.19**	-.05	-.10**	-.09	.15**
3.Conscientiousness virtue	.43**	.63**	-	-.20**	-.09	-.14**	-.20**	-.20**
4.Inability	-.06	-.11*	-.19**	-	.58**	.47**	.53**	-
5.Anxious	-.07	-.07	-.09	.43**	-	.52**	.46**	-
6.Escape	.06	-.08	-.18**	.41**	.53**	-	.49**	-
7.Productivity loss	-.07	-.01	-.12**	.57**	.44**	.34**	-	-
8.Smartphone addiction	-.12**	-.10	-.19**	-	-	-	-	-

Statistics for males are above the diagonal and statistics for females are below the diagonal.

* $p < .05$; ** $p < .01$

Table 4 Dominance analysis of relationship, vitality, and conscientiousness virtues as predictors of Smartphone addiction

	R^2	ΔR^2		
		Relationship	Vitality	Conscientiousness
	-	.011	.017	.041
Relationship	.011	-	.008	.032
Vitality	.017	.002	-	.025
Conscientiousness	.041	.002	.001	-
Relationship and Vitality	.019	-	-	.026
Relationship and Conscientiousness	.043	-	.002	-
Vitality and Conscientiousness	.042	.003	-	-
Relationship, Vitality, and Conscientiousness	.045	-	-	-
Decomposition of R^2		.005	.008	.033
% of the predicted variance		10.87%	17.391%	71.739%

cultural concept of “shendu” (慎獨) (Zhang et al. 2014), which is the idea that a person can control his or her own behavior regardless of the situation. Similarly, Baumeister (2002) indicates that key characteristics of conscientiousness are self-control and self-regulation. Furthermore, a central tenant of social cognitive theory is that self-regulation forms the foundation of personal agency (Bandura 1991). In regard to Smartphone use, it appears that failure to self-regulate can lead to uncontrolled use, resulting in a higher risk of addiction (van Deursen et al. 2015). Thus, students high in conscientiousness show strict self-control and seem to be predisposed toward reasonable Smartphone use. In contrast, students who are low in conscientiousness and have difficulty focusing on a given task are more vulnerable to Smartphone overuse.

Additionally, this study found that high vitality could increase the risk of Smartphone addiction. This is consistent with a recent study reporting that a high degree of vitality was a positive predictor of PIU (Zhang et al. 2014). However, past studies have shown that vitality produces the opposite effect, acting instead as a protective factor against Smartphone addiction or other problematic behaviors. For example, Akin. (2012) defined vitality as the subjective experience of being full of energy and life, and demonstrated that subjective vitality negatively predicted PIU. That said, the current study defined vitality differently. Specifically, the vitality virtue was used to denote a cluster of positive traits or psychological resources (Duan et al. 2015), including elements such as curiosity, bravery, and creativity (Duan et al. 2012). Based on this definition, students with high vitality will likely demonstrate a strong desire to explore Smartphones’ new and complex functions and spend the majority of their time using them to attain pleasurable or new experiences. As a result, they are more likely to have strong attachments to their Smartphones. Thus, it is not surprising that students who depend on Smartphones to satisfy curiosity could be prone to an increased risk of addiction.

The current study also offered preliminary results in regard to the relationship virtue by demonstrating that it could negatively predict Smartphone addiction severity, which is consistent with a recent study reporting that this virtue was negatively associated with PIU (Zhang et al. 2014). Here, the psychological mechanism appears to be that individuals higher in the relationship virtue are less likely to overuse Smartphones. Conversely, individuals extremely low in the relationship virtue have difficulty establishing meaningful social connections, resulting in feelings of unhappiness. Therefore, these individuals might have increased vulnerability to Smartphone overuse as they use them to decrease negative emotions and/or as a way to escape from daily life, and/or increase feelings of belonging (van Deursen et al. 2015). Moreover, the basic functions of Smartphones are to facilitate communication between individuals in different locations, compensate for real life helplessness or loneliness, and eliminate anxiety caused by negative emotions (Jin and Park 2010; Lim and Shim 2016). Consequently, individuals low in the relationship virtue may more frequently overuse Smartphones to alleviate many types of negative emotional experiences.

Consistent with some empirical research, the finding that there were gender differences in degrees of different virtues was equally important. In particular, the current study results suggest that female students were more likely to demonstrate increased concern for others (e.g., kindness, authenticity, and teamwork) and an affinity toward particular elements of relationships (e.g., love, gratitude, forgiveness). In contrast, male students appeared to have an increased level of positive qualities related to acting within the broader world or society as well as adherence to individual regulations (zest, creativity, bravery, belief, judgment, perseverance, self-regulation). Moreover, males tended to manifest comparatively higher vigorousness and willpower within social relationships and as relationship traits. The gender differences in the three virtues may be a reflection of cultural differences (Chemaitelly et al. 2013).

Specifically, in traditional Chinese social role expectations and practices, males pay more attention to and spend more time on career development and attend more to conscientiousness, whereas females spend more time with their families and attend more to relationships (Kong et al. 2015).

Limitations and Future Directions

There were a few limitations to the current study. First, this study only offers a preliminary exploration of the relationships among the three virtues and Smartphone addiction. Thus, future longitudinal studies should be conducted to explore the predictive ability of virtues in Smartphone addiction and potentially reveal causal relationship between the two. Second, the use of self-report and examination of university students limited the extent to which findings can be generalized and increased the potential for response-related biases. Consequently, future research should use multiple methods of evaluation (e.g., peer reports or behavioral criteria) and expand the sampling range (e.g., clinical samples, the public, adolescents). Finally, all study participants owned their Smartphone for a year or longer; consequently, the LA group did not include students who have never owned a Smartphone or who have only owned one for a brief time period. Thus, it would be beneficial to obtain more data to help identify at-risk students who have owned their Smartphone for shorter time periods. It may also be worthwhile to compare those who have never owned Smartphones to those who have.

Conclusions and Practical Implications

Despite these limitations, this study leads to several important conclusions and has a number of key implications. At a theoretical level, it underscores the roles and different functions of the three virtues as they related to Smartphone addiction among Chinese university students. Furthermore, the results suggest that conscientiousness and relationship virtues are potentially protective factors for Smartphone addiction, while vitality increases students' vulnerability.

In practice, these results may help university administrators and educators to identify the students who are at greatest risk for Smartphone addiction (i.e., students with low levels of conscientiousness and relationship virtues or high in the vitality virtue). Following identification of high-risk students, educators could then consider providing further preventative assistance (e.g., a positive psychology intervention program emphasizing daily use of conscientiousness and relationship virtues) (Duan et al. 2014) to improve or cultivate individual virtues. For instance, educators could teach students the meaning of and strategies available to build and utilize virtues as well as methods to savor and attend to ordinary classroom life. Subsequently, they could ask students to attend to when, where, and how they used the three virtues, and write down

their thoughts in a short essay. In other words, educators can incorporate positive virtue-based interventions into the daily teaching, thereby preventing or reducing students' Smartphone dependence.

Moreover, the results imply that gender differences should be taken into account. Consistently, in practice, educators could focus on cultivating male students' conscientiousness virtue (e.g., mindfulness intervention can be used to increase male students' self-control) (Canby et al. 2015) and female students' relationship virtue (e.g., role-playing games can be used to improve female students' interpersonal skills). However, additional research should be conducted to validate study findings and translate cumulative evidence into the development of the most successful prevention and intervention programs.

Compliance with Ethical Standards

Conflict of Interest Author Ling Lian is a teacher at Xi'an Polytechnic University. She has received research grants from the Philosophy and Social Sciences Research Project of Xi'an Polytechnic University (grant number 2015ZXSK02) and the Education Department of Shaanxi Provincial Government (grant number 2013JK0031). Author Xuqun You has received research grants from the 2011 Key Projects of Philosophy and Social Sciences Research, Ministry of Education (grant number 11JZD044), the Specialized Research for the Doctoral Program of Higher Education (grant number 20130202110014), and the Shaanxi Science and Technology Department (grant number 2015KTZDSF02–02). Author Ling Lian declares that she has no conflict of interest. Author Xuqun You declares that he has no conflict of interest.

Ethical Approval All procedures performed in studies involving human participants were in accordance with the ethical standards of the institutional and/or national research committee and with the 1964 Helsinki declaration and its later amendments or comparable ethical standards. This study does not include any studies with animals performed by any of the authors.

Informed Consent Informed consent was obtained from all individual participants included in the study.

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