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ORIGINAL ARTICLE

Alienation as Mediator and Moderator of the Relationship Between Virtues and Smartphone Addiction Among Chinese University Students

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Abstract Research reports that high alienation can increase smartphone addiction; however, few studies have explored potential protective factors such as virtues. Understanding virtues as protective factors may help prevent smartphone addiction and promote effective interventions. This study examined the relationship among virtues (i.e. interpersonal, vitality, and conscientiousness), alienation and smartphone addiction. Seven hundred sixteen Chinese university students (385 males, 331 females) aged 18–24 years completed the 96-item Chinese Virtues Questionnaire, General Alienation Scale, and Mobile Phone Addiction Index. Results indicated that both interpersonal and conscientiousness virtues negatively predicted smartphone addiction. Alienation mediated the relationship between interpersonal and smartphone addiction, whereas conscientiousness directly affected smartphone addiction regardless of alienation level. Moreover, alienation moderated the link between conscientiousness and smartphone addiction. When students reported low alienation, those with high conscientiousness also reported lower smartphone addiction. However, there was no difference in smartphone addiction between high and low conscientiousness groups when alienation was high. This study clarified the positive role of specific virtues in reducing alienation and smartphone addiction. Future smartphone addiction intervention strategies could focus on enhancing interpersonal and conscientiousness virtues and reducing alienation. University administrators and educators should focus on improving low alienation students' conscientiousness.

Keywords Smartphone addiction · Alienation · Interpersonal virtue · Conscientiousness virtue · China

Smartphones are important media tools and an indispensable part of university students' lives. In a positive sense, smartphone use can improve students' interpersonal relationships and daily

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life quality (e.g. online shopping and entertainment). However, problematic or heavy smartphone use can impair individuals' physical, psychological and social functioning (Aljomaa et al. 2016). This study defined smartphone addiction (SA) as the degree of individuals' excessive smartphone use and negative outcomes. SA is sometimes called *nomophobia*, which means 'phobia of lack of smartphone contact' and represents anxiety about the inability to be in contact with others via smartphone (Emanuel et al. 2015).

Yen et al. (2009) assert that smartphone addiction is a new mental health problem. Thus, recent research reports that uncontrolled smartphone use can cause sleep disturbances, work intrusion, depression, anxiety, loneliness, dangerous behaviours (e.g. phone use while driving) and pathological symptoms (Thomée et al. 2011). Similarly, Roberts et al. (2015) report that a person who is moody and introverted may be more likely to be addicted to smartphone use than more emotional stable and extroverted individuals. However, most studies only estimate negative behavioural outcomes and some personality traits among individuals with SA (Samaha and Hawi 2016). Additionally, many studies analyse the causes of individuals' smartphone dependence or focus on measuring risk factors based on addiction symptoms (Billieux et al. 2015; Samaha and Hawi 2016). Conversely, few studies have investigated potential individual protective factors such as virtues, which have implications for future SA interventions.

Virtues and Smartphone Addiction

Virtues are a core concept in positive psychology, referring to 'a property of the whole person and the life that person leads' (Peterson and Seligman 2004, p. 87). Dahlsgaard et al. (2005) proposed a two-tier virtue model including 24 character strengths (first tier) (e.g. teamwork, gratitude, love, curiosity, zest, hope, prudence, self-regulation and perseverance) embedded in 6 virtues (second tier) (i.e. knowledge/wisdom, courage, humanity, justice, temperance and transcendence). The strengths are measured using the 240-item Values in Action Inventory of Strengths (VIA-IS) self-report questionnaire (Peterson and Seligman 2004). Research demonstrates that the 24 strengths are major personal resources for enhancing health and reducing unhealthy behaviours (Peterson and Seligman 2004). Nevertheless, recent research is strongly biased toward evaluation of strengths rather than virtues (Linkins et al. 2015), resulting only in a focus on the function of strengths.

One reason that virtues are rarely examined is that the virtue structure does not account for cultural variability. Existing studies indicate that the virtue structure is unidimensional or multidimensional (i.e. three-, four-, five- and six-factor structures) in different cultures such as Germany, America, India, Croatia, Australia and Africa (Duan et al. 2012). Duan et al. (2012) responded to the finding that some VIA-IS items serve different functions in different cultures by applying a combined etic-emic approach to reduce culturally inappropriate items from the original English VIA-IS. For instance, in Chinese culture, 'I have no trouble eating healthy foods' was invalid when assessing *self-regulation* and 'I stop and count my blessings at least once a day' has strongly inapplicable religious connotations and was excluded when assessing *gratitude*. The final result was the 96-item Chinese Virtues Questionnaire (CVQ-96) (Duan et al. 2012). Exploratory and confirmatory factor analyses suggest three well-established and culturally meaningful virtues: interpersonal, vitality and conscientiousness. Interpersonal includes positive cognitions, emotions and behaviours associated with social interaction (e.g. teamwork, love, gratitude). Vitality reflects positive qualities associated with

the world or society (e.g. curiosity, zest, hope). Finally, conscientiousness is intrapersonal and incorporates high willpower and self-control (e.g. prudence, self-regulation, perseverance) (Duan et al. 2013).

Problem-behaviour theory asserts that personality traits (i.e. personal beliefs, expectations, values, attitudes and character strengths) can either explain the initiation of problem behaviours or act as protective factors (Jessor 1987). Virtues manifest as positive personality traits in social interactions, zest for life and willpower; consequently, they should promote healthier relationships with smartphones. Likewise, Zhang et al. (2014) report that interpersonal and conscientiousness virtues negatively predict pathological Internet use, whereas vitality is a positive predictor. The current study tested whether and how the roles of specific virtues are applicable to smartphone dependence.

Virtues, Alienation, and Smartphone Addiction

We proposed that the relationship between specific virtues and SA would be influenced by alienation, which is a negative sense of social estrangement and absence of social support and meaningful social connections (Mau 1992). According to social skills deficit theory, emotional state is related to an individual's personality and affects cognition and social skills (Valkenburg and Peter 2007). Thus, partially resulting from lack of social support or positive traits, highly alienated individuals are more likely to express negative feelings, thereby exacerbating SA. Research indicates that alienation can result from personality characteristics such as shyness, introversion, neuroticism, low self-esteem or lack of sociability (Newman and Newman 2001). Furthermore, university students with high alienation are more inclined to form negative and hostile external environment attributions, resulting in increased likelihood of excessive smartphone use (Huang et al. 2015). For example, Huang and Leung (2009) report that youth's degree of alienation significantly predicted instant messaging addiction levels. Since specific virtues (i.e. interpersonal, vitality and conscientiousness) theoretically and empirically contribute to alienation (Newman and Newman 2001; Valkenburg and Peter 2007), and alienation theoretically and empirically contributes to SA (Huang and Leung 2009; Valkenburg and Peter 2007), we hypothesised that alienation would mediate the relationship between these virtues and SA. Specifically, *alienation will mediate the relationship between specific virtues and SA* (H1).

Additionally, research indicates that alienation moderates psychological variables (e.g. self-esteem) (Huo and Kong 2014) and deviant behaviours (e.g. violent computer games and websites, aggressive behaviour, instant messaging addiction) (Huang and Leung 2009; Slater 2003). Previous studies report that alienation is a negative emotional state that reflects individual incompetence in social interactions and establishing effective bonds with social groups (Xu and Zhang 2011). For low alienation students, higher strengths (e.g. self-regulation, emotional stability and social engagement) and virtues are associated with lower addictive behaviours. Conversely, for high alienation students, the correlation between virtues and addictive behaviours is non-significant (Bian and Leung 2015; Huo and Kong 2014). Therefore, we explored the moderating effect of alienation on the relationship between specific virtues and SA. We predicted that *alienation will moderate the relationship between specific virtues and SA* (H2).

The Present Study

This study's aim was to examine whether alienation plays a mediating and/or moderating role in the relationship between the three virtues (i.e. interpersonal, vitality and conscientiousness) and SA in a sample of university students in China. To our knowledge, this study is the first to analyse these concepts in a Chinese context. This study will assist with understanding the function of alienation in the relationship between specific virtues and SA and has direct significance for guiding interventions for alienated students with SA. This research deepens the theoretical understanding of SA, particularly the effect of virtues and alienation, and could provide university administrators and educators with strategies for identifying, selecting and implementing SA-related interventions.

Method

Participants

Seven hundred sixteen students from two universities in China participated in this study (385 males, 331 females). Recruitment information was released through public notice channels (e.g. university bulletin boards) or via announcements in class. Students were in their first to third year of study, and their ages ranged from 18 to 24, and averaged 19.62 years (SD = 1.21). Roughly 65% ($n = 468$) were from rural areas and 35% ($n = 248$) from urban areas. Participants were eligible to participate if they owned a smartphone for more than 1 year.

Measurements

Virtues

Duan et al. (2012) developed the Chinese Virtues Questionnaire-96 (CVQ-96), which consists of 96 items assessing the three virtues (32 interpersonal items, 40 vitality items and 24 conscientiousness items). Sample items include, 'I always keep my promises' (interpersonal), 'I have a lot of interests' (vitality) and 'I can control my emotions' (conscientiousness). Participants respond to items on a 5-point Likert scale ranging from 1 (*very much unlike me*) to 5 (*very much like me*). The total mean score and mean scores for each virtue are calculated, and higher scores indicate higher virtue levels. The CVQ-96 is a reliable and valid measure for assessing virtues in Chinese populations (Duan et al. 2013). In our study, the Cronbach's alpha coefficients were 0.93 for the total scale, and 0.88 for interpersonal, 0.89 for vitality and 0.84 for conscientiousness subscales, respectively.

Alienation

The General Alienation Scale (GAS) is a 12-item Chinese scale that measures university students' alienation (Chen et al. 2015). Sample items include, 'I often feel lonely when I am with someone' and 'I often feel I can't get involved in what people are doing'. Participants respond to items on a 4-point Likert scale ranging from 1 (*strongly disagree*) to 4 (*strongly agree*). Mean scores are calculated, and higher scores indicate a higher degree of alienation.

The GAS has good validity and reliability among Chinese university students (Chen et al. 2015). In this study, the Cronbach's alpha coefficient for the total scale was 0.81.

Smartphone Addiction

The Mobile Phone Addiction Index for university students (MPAI) is a 17-item scale that assesses SA severity (Huang et al. 2014). This scale evaluates four factors associated with SA including inability to control cravings (7 items), anxiety and feeling lost (4 items), withdrawal and escape (3 items) and productivity loss (3 items). Sample items include, '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 doing something more urgent' (productivity loss). Respondents rate the extent that they feel each item describes them on a 5-point Likert-type scale ranging from 1 (*never*) to 5 (*always*). Mean scores are calculated, and higher scores indicate higher addiction severity. This scale has excellent psychometric properties in Chinese populations (Huang et al. 2014). In the present study, the Cronbach's alpha coefficients of the total scale and the four dimensions were 0.89, 0.80, 0.82, 0.82 and 0.76, respectively.

Procedure

The procedure was approved by the Human Research Ethics Committee of Xi'an Polytechnic University. Students provided informed consent, participated voluntarily, and anonymity was maintained. After signed consent forms were returned, participants were asked to complete a paper-and-pencil questionnaire package and immediately return the completed questionnaires to the investigators. It took approximately 20 min for participants to complete the questionnaires. The investigators were psychological professionals, thereby ensuring the effectiveness of data collection.

Statistical Analysis

In the preliminary analysis, we calculated the mean scores and standard deviations (SDs) for the total scale and subscale values for the three virtues, alienation, and SA. In order to test hypotheses, firstly, we calculated descriptive statistics and performed Pearson correlation analyses to test the direct relations among main variables. Next, we performed multiple regression analyses to examine the relative effect of the three virtues on alienation and SA. Thereafter, we used AMOS 17.0 software to conduct structural equation modelling (SEM) analyses for the mediation and moderation tests.

We used various goodness-of-fit indices to assess the model's fit. These were chi-square statistic divided by the degrees of freedom (x^2/df), goodness of fit index (GFI), normed fit index (NFI), incremental fit index (IFI), comparative fit index (CFI), Tucker-Lewis index (TLI), root mean square error of approximation (RMSEA) and relative fit index (RFI). The x^2/df ratio must be below 5, the value of GFI, NFI, IFI, CFI, TLI and RFI should be above 0.9, and the values of RMSEA below 0.08 (e.g. Baumgartner and Homburg 1996). Finally, we used bootstrapping analysis to examine the mediating effect and a simple slope test to examine the moderating effect.

Results

Bivariate Analyses

Table 1 presents the means, SDs and correlations for each variable. Interpersonal, vitality and conscientiousness virtues were negatively correlated with alienation ($r = -.24$ to $-.14$) and SA ($r = -.20$ to $-.11$). Alienation was positively correlated with SA ($r = .43$).

Regression Analyses

Multiple regression analyses were conducted to test the relative effects of specific virtues on alienation and SA (Table 2). Results showed that the interpersonal virtue significantly negatively predicted alienation ($\beta = -0.21$, $p < .001$), whereas conscientiousness significantly negatively predicted SA ($\beta = -.22$, $p < .001$). Since vitality was non-significant, it was excluded from subsequent analysis.

Alienation as a Mediator and Moderator

To examine the relationships among the two significant virtues, alienation and SA, SEM was conducted. In our model, we tested interpersonal and conscientiousness virtues as predictors, alienation as the mediator and SA as the dependent variable. Alienation partially mediated the negative association between the interpersonal virtue and SA. Notably, the interpersonal → alienation → SA indirect path was significant, indicating that high interpersonal virtue students were less likely to experience alienation, potentially resulting in low SA. This indirect effect was examined using bootstrapping analysis with 10,000 replications. Analysis showed that the indirect effect was −.160 with a 95% confidence interval (CI) of [−0.229, −0.102], demonstrating a significant mediating effect of alienation. The interpersonal → SA and conscientiousness → SA direct paths were also significant, revealing that students with high interpersonal and conscientiousness virtues were less likely to exhibit smartphone dependence.

To minimise type 1 error and avoid multicollinearity, we centred the variables and created an interaction term for inclusion in the path analysis to determine whether alienation moderated the relationship between specific virtues and SA. The conscientiousness × alienation →SA direct path was significant, suggesting that alienation moderated the link between conscientiousness and SA.

Table 1 Means, standard deviations and correlations among virtues, alienation and smartphone addiction ($N = 716$)

Variable	*M*	SD	1	2	3	4	5
1. Interpersonal	3.81	0.39	–				
2. Vitality	3.46	0.39	.53**	–			
3. Conscientiousness	3.38	0.39	.49**	.63**	–		
4. Alienation	2.04	0.44	−.24**	−.14**	−.16**	–	
5.Smartphone addiction	2.64	0.67	−.11**	−.13**	−.20**	.43**	–

**$p < .01$

Table 2 Multiple regression analysis of alienation and smartphone addiction

Dependent variable	Independent variable (standard β)		
	Interpersonal	Vitality	Conscientiousness
Alienation	$-.21^{***}$	.02	−.07
Smartphone addiction	−.01	.02	$-.22^{***}$

$^{***}p < .001$

This goodness-of-fit of this holistic model was as follows: $x^2/df = 3.42$, GFI = 0.93, NFI = 0.90, IFI = 0.92, CFI = 0.92, TLI = 0.90, RMSEA = 0.06 and RFI = 0.90. These indicators implied that the data were a strong fit to the model (Fig. 1).

We demonstrated this interaction effect by plotting the regression of conscientiousness on SA at low and high alienation levels (Fig. 2). Using Aiken and West's (1991) procedures, SA addiction against conscientiousness for low and high alienation levels were separately plotted (1 SD below the mean and 1 SD above the mean, respectively). A simple slope test indicated that for low alienation students, higher conscientiousness led to lower SA ($\beta = -0.453$, $p < .001$). However, this association was not found for high alienation students ($\beta = -0.001$, $p > .05$). Therefore, for low alienation students, conscientiousness was a significant negative determinant of SA. Conversely, conscientiousness did not influence SA when alienation was high.

Discussion

This study underscores the important roles of specific virtues and alienation in SA among Chinese university students. Results revealed that alienation mediated the relationship between the interpersonal virtue and SA, while conscientiousness directly predicted SA. Furthermore, alienation moderated the relationship between the conscientiousness virtue and SA.

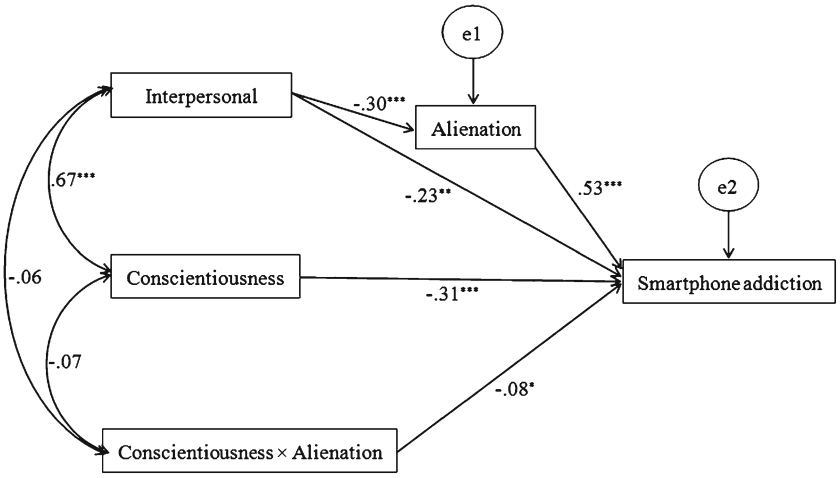

Fig. 1 Standardised regression coefficients for the interpersonal and conscientiousness virtues, alienation and smartphone addiction mediating and moderating model. *$p < .05$; **$p < .01$; ***$p < .001$

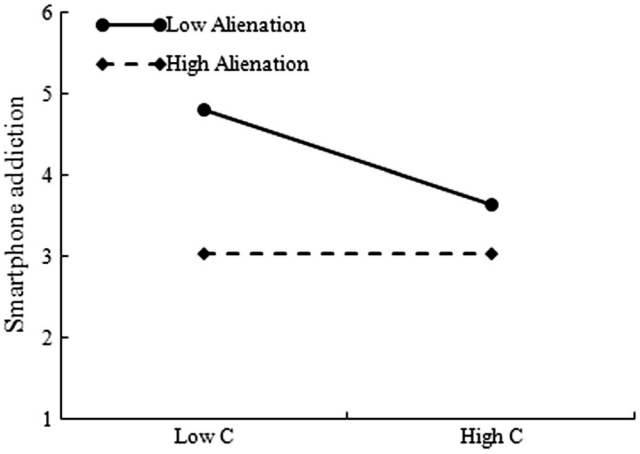

Fig. 2 Smartphone addiction as a function of conscientiousness (C) between high and low alienation

The most significant finding is that alienation acted as a mediator in the association between the interpersonal virtue and SA, which can be viewed as the interpersonal → alienation → SA mediation model. The psychological mechanism underlying this model is that individuals who are higher in the interpersonal virtue are less likely to feel alienated, contributing to decreased SA. This result confirmed H1 and was consistent with studies reporting alienation as a mediator between character strengths and SA (Huang et al. 2015). Thus, the mediating the role of alienation is robust in both the first (character strengths) and second (virtues) tiers (Dahlsgaard et al. 2005). Social skills deficit theory argues that negative emotions are related to virtues and affect smartphone-related addictive behaviours (Valkenburg and Peter 2007). Highly alienated individuals are more likely to express negative feelings, partially resulting from lack of positive psychological resources (e.g. virtues). Therefore, individuals extremely low in the interpersonal virtue have difficulty establishing meaningful social connections, resulting in higher alienation. To decrease negative emotions, smartphones might be used to escape, feel better or increase feelings of belonging (van Deursen et al. 2015), increasing overuse vulnerability. Smartphones' basic functions are to facilitate communication between individuals in different locations, compensate for real-life helplessness or loneliness and eliminate negative emotion-related anxiety (Lim and Shim 2016). It is unsurprising that individuals high in the interpersonal virtue are less likely to feel alienated and to overuse smartphones to alleviate negative emotional experiences.

Additionally, the study shows that interpersonal and conscientiousness virtues could directly predict SA severity, which is consistent with studies reporting a stable and strong influence of character strengths and other positive traits on SA and other psychological symptoms (Duan et al. 2015). This strongly suggests that interpersonal and conscientiousness virtues play important roles in SA by acting as positive psychological resources. These findings may be partially accounted for by problem-behaviour theory (Jessor 1987), which asserts that character strengths and virtues affect interpersonal relationships, self-regulation and behaviours. Specifically, individuals with high virtues have increased interpersonal relationship quality and acquire high self-control; however, users with SA lack social support and self-control (Marder et al. 2016). Consequently, students who have positive social interactions and exhibit strict self-control demonstrate less SA.

This study also shows that alienation moderates the influence of the conscientiousness virtue on SA, which is consistent with H2. Thus, SA could potentially be reduced if students have low alienation and high conscientiousness. However, when students reported high alienation, there were no differences in SA between high versus low conscientiousness students. Consequently, it is unlikely that improving only conscientiousness would prevent highly alienated students' smartphone overuse. This study is the first to report the moderating role of alienation between virtues and SA. One possible explanation is that individuals with lower alienation and higher conscientiousness replace smartphone overuse through participation in other meaningful activities. Conscientiousness relates to the traditional Chinese cultural concept of 'shendu' (慎獨) (Zhang et al. 2014), which is the idea that individuals can control their behaviour in any situation. Therefore, students with low alienation can exercise strict self-control, promoting reasonable smartphone use. Conversely, students with high alienation who feel socially isolated cannot typically identify a confidant, resulting in a lack of external support when feeling unhappy. Consequently, students higher in alienation more frequently overuse smartphones to reduce negative experiences, regardless of conscientiousness virtue level. Overall, students lower in alienation and higher in conscientiousness appear to easily control smartphone-related craving and withdrawal symptoms, while students higher in alienation cannot.

Limitations, Future Research and Practical Implications

There are a number of limitations to this study. First, the examination of university students limited the extent to which findings can be generalised and increased the potential for response-related biases. To account for this, future research should expand the sampling range (e.g. clinical samples, the public, adolescents). Second, it should be noted that the MPAI scale used in the current study examines SA severity rather than providing an SA diagnosis. Therefore, a relative higher MPAI score does not automatically imply clinical SA. Thus, it would be beneficial to use multiple evaluation methods (e.g. peer reports, behavioural criteria) to identify at-risk students. It may also be worthwhile to compare the MPAI scores to diagnostic SA measures. Third, Duan et al. (2012) reported that other strengths such as prudence, perseverance, learning and modesty appear as strengths or virtues. Therefore, to understand this relationship in more depth, future studies should clarify whether virtues uniquely predict SA by controlling for other conceptually related but functionally different variables (e.g. Big Five personality traits or other positive traits) (Roberts et al. 2015). Finally, since little theoretical research exists, this is a preliminary study exploring the relationships among virtues, alienation and SA. Consequently, future studies should examine virtue-related psychological functions using rigorous longitudinal and experimental studies (Duan et al. 2015).

Based on our results and suggested directions for future research, there are some important practical implications to be considered when conducting further studies. In practice, the significant mediation and moderation effects discovered offer practical ways to prevent or reduce university students' SA. Specifically, students with low interpersonal or conscientious virtues or high alienation are at greatest risk for SA. Knowledge about the effects of virtues and alienation may help university administrators and educators identify high-risk students, leading to early SA detection. For example, administrators and educators should consider the negative effects of low virtues and high alienation and provide preventative assistance (e.g. a daily program that builds students' strengths) to improve virtues and decrease alienation. The

moderating model also suggests that university administrators and educators should increase the time spent improving the conscientiousness of students with low alienation. Overall, additional studies need to be conducted to validate the findings as well as further transform the established evidence from the current study into clinical practice.

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Compliance with Ethical Standards

Conflict of Interest The author declares that she has no conflict of interest.

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

Human Rights All procedures followed were in accordance with the ethical standards of the responsible committee on human experimentation (institutional and national) and with the Helsinki Declaration of 1975, as revised in 2000 (5).

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