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Examining the effects of motives and gender differences on smartphone addiction

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ABSTRACT

Smartphones have become increasingly popular in recent years. However, it may be addiction-prone and result in negative outcomes. Given that relevant research remains limited, this study attempts to address two research gaps in the extant information systems literature. First, research on the determinants of smartphone addiction remains scarce. Second, the role of individual characteristics (i.e., gender) in the formation of smartphone addiction is far from clear. To fill these research gaps, this study develops a research model of smartphone addiction from the functionalist perspective and highlights the moderating role of gender with the insight of social orientation. We propose four categories of motives, including enhancement (i.e., perceived enjoyment), social (i.e., social relationship), coping (i.e., mood regulation and pastime), and conformity motives (i.e., conformity). Empirical results from our online survey illustrate that perceived enjoyment, mood regulation, pastime, and conformity positively affect smartphone addiction, whereas social relationship has no significant effect. Moreover, we find that gender moderates the effects of perceived enjoyment, pastime, and conformity on smartphone addiction. We expect that this study can enrich the theoretical understanding of how motives play different roles in the development of smartphone addiction. Implications are offered for both research and practice.

1. Introduction

Smartphones have become globally popular (Lee, Chang, Lin, & Cheng, 2014). The various functions of smartphones have attracted millions of users to switch from regular cell phones (Salehan & Negahban, 2013). Aside from the benefits, using smartphones may also result in unwanted consequences. Some users may use smartphones on-the-go, and lose their control later (Park & Lee, 2011). In such circumstance, addiction-like behaviors may emerge, adversely affect work productivity, and exacerbate personal or social problems. For instance, Turel, Serenko, and Bontis (2008) noted that Blackberry phones enable users to interact with their working environments anytime and anywhere. When users addictively use mobile email in their Blackberry phones, work overload and technology–family conflicts arise, and organizational commitment is reduced. Park and Lee (2014b) also indicated that users with smartphone addiction show higher scores for shyness, depression, and loneliness. Smartphone addiction, a specific form of information technology (IT) addiction, has been reported to be rather prevalent in recent years (King et al., 2013). In the US, half of the mobile customers are smartphone users, and their usage behaviors are fairly intensive (Vaghefi & Lapointe, 2014). Given these concerns, it becomes imperative for researchers to investigate why users become addicted to smartphones.

Despite increasing practical and theoretical concerns, the dark side of IT usage remains a relatively new issue in the information systems (IS) field (Cheung, Lee, & Lee, 2013). A majority of prior studies focus on positive aspects of IT usage (Tarafdar, Gupta, & Turel, 2013). In this respect, research on IT addiction (and certainly on smartphone addiction), continues to be scarce in the IS

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literature. Only a few recent studies shed light on smartphone addiction by showing its symptoms and negative consequences (e.g., Turel et al., 2008), and how it is identified through users' demographics or personal traits (Park & Lee, 2011). Much remains unclear regarding the driving forces behind smartphone addiction (Beranuy, Oberst, Carbonell, & Chamarro, 2009; Lapointe, Boudreau-Pinsonneault, & Vaghefi, 2013; Turel & Serenko, 2010). Consequently, this study attempts to develop a research model to explain smartphone addiction. The proposed model aims to achieve the two research objectives below to enrich the existing IS literature.

The *first* objective is to understand the key determinants of smartphone addiction. Drawing upon the functionalist perspective, we explain smartphone addiction from the influence of the underlying motives. Motives have been suggested as essential factors inducing addictive behavior (Lee & Park, 2014; Park, 2005). More specifically, four categories of motives of drinking (i.e., alcohol use and abuse) are applied to develop a framework of motives for our study. Previous non-IS research demonstrates that motives in these four categories result in both substance and IT addiction (e.g., Cooper, 1994; Hormes, 2016). We further identify specific motives in each category for our study based on prior research on IT addiction. The *second* objective is to highlight that the effects of motives may vary according to gender. Recent anecdotal evidence indicates that gender differences may exist with regard to the degree of addiction (Beranuy et al., 2009; Hong, Chiu, & Huang, 2012; Salehan & Negahban, 2013). However, minimal investigation has been conducted on how the driving forces of smartphone addiction vary across genders. In this respect, gender differences are important concerns given that prior studies have shown a lack of agreement on the effects of motives, such as social motive in Internet addiction (e.g., Khang, Kim, & Kim, 2013; Li & Chung, 2006). Extending this line of studies, we attempt to explicate the roles of gender in a motive-based addiction model, thus augmenting awareness of smartphone addiction. We use the social orientation perspective to explain the moderating role of gender. Such perspective interprets the reason behind the difference of motives across genders. This perspective has been used to explain findings in prior studies which suggest that the impact of motives on IT usage differs based on gender (e.g., Bujarski, Norberg, & Copeland, 2012; Chóliz, 2012). Additionally, gender differences have been reported in smartphone usage (Park & Lee, 2014a). Therefore, gender is likely to moderate the relations between motives and smartphone addiction. In summary, this study addresses two research questions:

1. What are the important motives that may drive users' smartphone addiction?
2. Do the influences of motives on smartphone addiction differ across genders?

To approach these questions, we will draw upon the functionalist and social orientation perspectives to develop our research model. We expect that our study will advance the knowledge of addictive behavior in smartphone usage. Our proposed model also provides insight into what motives trigger smartphone addiction and which ones are relatively more influential for users from both genders. The rest of this study is structured as follows. In the next section, the theoretical background is presented. Afterwards, we propose our research model and develop related hypotheses. Then, we discuss the research design of this study. Finally, we conclude our research with discussions on the findings, implications, limitations, and future opportunities.

2. Theoretical background

2.1. IT addiction

In recent years, IT addiction has begun to attract considerable academic attention. This emerging concept is known as users' maladaptive dependency on the use of ITs and the obsessive–compulsive usage of ITs (Cheung et al., 2013; Vaghefi & Lapointe, 2013). Several forms of IT, such as the Internet and smartphones, provide various functions or services. For instance, smartphone functions vary from making calls to playing games. In such cases, a generalized perspective can be applied to understand one's overall addiction level to an IT (Davis, 2001). The applicability of such perspective is also due to the fact that the pathology often could not exist without the IT media.

Smartphone addiction is a form of generalized IT addiction. Consistent with previous IS research (e.g., Turel, Serenko, & Giles, 2011; Xu, Turel, & Yuan, 2012), we define smartphone addiction building on the general definition of IT addiction. Therefore, the present study refers to smartphone addiction as users' maladaptive dependency on the usage and the obsessive–compulsive use of smartphone devices with the following core symptoms. (1) Conflict: smartphone use clashes with other important tasks such as study and work; (2) reinstatement: smartphone users cannot reduce their usage voluntarily; (3) behavioral salience: users' behaviors are dominated by their smartphones; and (4) withdrawal: negative emotions arise when users cannot use their smartphones (Charlton & Danforth, 2007; Turel, Serenko, & Giles, 2011; Xu et al., 2012; Young, 1998). Recent research has shown some preliminary findings on this emerging phenomenon. Kwon et al. (2013) developed a scale of smartphone addiction by building upon the characteristics of smartphone usage in Korea. Oulasvirta, Rattenbury, Ma, and Raita (2012) found that habit may further intensify smartphone usage. We believe that more research is required to provide further insights and to enrich our understanding of smartphone addiction.

2.2. Functionalist perspective

The functionalist perspective has been employed to define the driving forces behind IT usage (Jung, 2013). The central tenet of the functionalist perspective is that functional motives influence behavioral outcomes (Clary et al., 1998; Xu et al., 2012). It means that people engage in certain behaviors to fulfill their underlying motives (Katz, 1960; Smith, Bruner, & White, 1956; Xu et al., 2012). Moreover, the functionalist perspective has been validated in numerous studies (e.g., Cooper, Russell, & George, 1988; De Cremer & Tyler, 2005). Li and Chung (2006) posited that various needs, including social, informational, leisure, and emotional motives, can influence people to use the Internet.

While it has been applied to the positive aspects of IT usage, the functionalist perspective also provides insight into the addictive behavior related to IT usage. Early research on the functionalist perspective suggests that if an activity provides benefits which meet individuals' motivations, people will continue the activity with a high level of satisfaction (Clary et al., 1998). This perspective presumes calculated decision making. In addition, rational humans attempt to maximize the subjective utility by repeating their usage, which may develop into addiction. This observation means that addicts follow a behavior that serves their motives (Xu et al., 2012). Therefore, it is likely that addictive behavior may emerge when users' motives are satisfied. Recent research also demonstrates that such perspective can be utilized to explain unhealthy technology overuse. Xu et al. (2012) contended that while playing online games, the need for satisfaction promotes the emergence of

addiction. Hong et al. (2012) suggested that perspectives in this direction may serve as useful views to comprehend smartphone addiction. Lee and Park (2014) found that motives of social relationship exert influences on smartphone addiction. In addition, Park (2005) indicated that the pastime motive results in mobile phone addiction. Thus, we may reasonably postulate that the functionalist perspective may help to elucidate the roles of motives in smartphone addiction and to provide insights about how such addiction could be prevented.

2.3. Four categories of drinking motives

Prior research on drinking (i.e., alcohol use and abuse) identifies two basic dimensions of motives: valence and source (Cooper, 1994). Valence describes the type of rewards individuals intend to acquire from drinking. It can be divided into two categories: positive and negative reinforcements. Positive reinforcements highlight positive outcomes from drinking, whereas negative reinforcements indicate the need to avoid negative outcomes. In a similar vein, source emphasizes the origins of the rewards. Sources can also be divided into two categories: internal and external. The internal source captures the individuals' internal psychological rewards, whereas the external source pertains to rewards from external environments.

According to the two dimensions (valence and source), four categories of drinking motives can be developed: (1) internal and positive reinforcement motives, (2) external and positive reinforcement motives, (3) internal and negative reinforcement motives, and (4) external and negative reinforcement motives (Stewart & Devine, 2000). The four categories are often viewed as four more specific motives: enhancement, social, coping, and conformity motives (Stewart, Morris, Mellings, & Komar, 2006). Enhancement motive (internal and positive) suggests that an individual wants to enhance his/her psychological states. Social motive (external and positive) is conceptualized as the individual wanting to achieve positive social benefits. Coping motive (internal and negative) indicates that s/he tries to avoid negative feelings. Finally, conformity motive (external and negative) implies that s/he intends to avoid disapproval from others.

Previous studies demonstrate that this categorical framework facilitates the confirmation and evaluation of the distinctiveness of each motive in terms of their validity in predicting addictive behaviors. For example, Cooper (1994) employed this framework to investigate drinking problems. Her work revealed that enhancement, coping, and conformity motives are more strongly associated with drinking problems in comparison to social motive. Prior non-IS research also finds that motives in these four categories can lead to IT addiction. Hormes (2016) used the four-motive framework (i.e., social, coping, enhancement, and conformity) to identify motives that increase the risks of problematic drinking and excessive use of social networking sites. Their results showed that the coping motive is the shared risk factor for substance and IT addiction. Therefore, the four-motive framework from substance use can be applied to the IT context. Furthermore, Lee and Park (2014) found that social relationship and amusement motives result in smartphone addiction, reflecting that motives in social and enhancement categories exert significant effects. In smartphone addiction, Cho (2014) showed the predicting role of entertainment motives, which belong to the enhancement category. The evidence establishes that the four-category framework helps to identify motives and reveals which motive category is relatively more significant for addictive behaviors (e.g., smartphone addiction). Therefore, the present study assesses motives using this four-category framework for predicting smartphone addiction.

2.4. The role of gender

2.4.1. Gender research in IT addiction

Recent studies on IT addiction attempt to uncover whether the risks of developing addiction vary across genders. However, consistent findings are lacking in this respect. Ray, Sormunen, and Harris (1999) showed that males are more prone to exhibit positive attitudes toward computers. Males are also more likely to be addicted to the Internet, computers, and online games than females (Bianchi & Phillips, 2005). Conversely, Toda, Monden, Kubo, and Morimoto (2006) found a higher potential for females to become addicted to online services. Smahel, Blinka, and Ledabyl (2008) and Teo (2001) found no gender differences in online game addiction. Meanwhile, previous IS research usually adopts a descriptive approach to interpret gender differences with regard to the likelihood of developing IT addiction. In the context of mobile phones, research indicates that the risk of addiction may be higher for females (Hong et al., 2012; Walsh, White, Cox, & Young, 2011). These concerns call for future research to delve into the role of gender in IT addiction.

2.4.2. Gender differences in social orientation

Gender differences exist in various aspects, including biology, cognition, and behavior. They are generally explained under the framework of social orientation (Sun, Lim, Jiang, Peng, & Chen, 2010). Social orientation explains how females and males perceive their social relations, roles, and identification differently. Each gender develops their roles and behavioral patterns under the guidance of social orientation so that they may cater to different social expectations (Zhang, Lee, Cheung, & Chen, 2009). In the orientation of a male-dominated society, males are often identified as dominant, aggressive, independent, and competent; whereas females tend to be characterized as dependent, nurturing, and supportive (Chou & Tsai, 2007; Serenko, Turel, & Yol, 2006; Sun et al., 2010). In such circumstance, the genders may exhibit different propensities for meeting their social expectations. For instance, males have been found to be enthusiastic about establishing and improving their social standing (Gefen & Straub, 1997; Sun et al., 2010). In contrast, females are expected to be less out-going than males (Eckes & Trautner, 2000). They usually behave from the emotional view and are driven by the goal of expression (e.g., enjoyment) (Sun et al., 2010). Compared with males, females are also more likely to cope with higher levels of negative moods (e.g., depression, anxiety, and stress) (Beranuy et al., 2009; Hong et al., 2012). Therefore, males are more likely to emphasize extrinsic motivations, whereas females focus more on intrinsic motivations (Hofstede, Berry, & Lonner, 1980). This speculation, to some extent, has been empirically supported by previous studies on substance abuse. For instance, females with higher depression levels are found to smoke more (Morrell, Cohen, & McChargue, 2010). They desire relief from negative moods, and smoking could be a possible means to help them feel better. Meanwhile, social motives are shown to be essential reasons for males to drink heavily (Cooper, 1994; Kuntsche, Knibbe, Gmel, & Engels, 2006). Simons, Correia, Carey, and Borsari (1998) confirmed that the influence of coping motives for cannabis use is stronger in females than in males. Gender also moderates the effect of coping motives on cannabis-use related problems (Bujarski et al., 2012). Similarly, Norberg, Norton, Olivier, and Zvolensky (2010) verified that the coping motive is associated with problematic substance use, particularly for females. Peirce, Frone, Russell, and Cooper (1994) found that gender moderates the relations between drinking to cope and alcohol problems. Similar to the cases of substance abuse, motives in extrinsic and intrinsic categories also exert different effects on IT

usage across genders. Sheldon (2008) demonstrated that female Facebook users prefer the motives of pastime, entertainment, and maintaining existing relationships, whereas male users are more likely to use Facebook for meeting new people or developing new relationships. In addition, the social interaction motive to play video games is enhanced in males (Sherry, Lucas, Greenberg, & Lachlan, 2006). Males also use Facebook for dating and sharing information motives more than females (Bonds-Raacke & Raacke, 2010). Furthermore, males are more likely to keep social connections via mobile phones (Ji & Skoric, 2013). When IT usage reaches the addictive level, research also indicates gender-specific relations underlying motives. Chóliz (2012) discovered that females have a higher level of mobile phone addiction. They are more likely to use mobile phones for avoiding uncomfortable moods (i.e., intrinsic motives). Gender differences in social orientation are believed to be a valuable explanation for their findings.

In the context of smartphone use, research finds that female and male users use smartphones in different ways (van Deursen, Bolle, Hegner, & Kommers, 2015). For instance, females tend to use camera applications and to maintain bonding relationships, whereas males prefer phone calls for expanding and bridging relationships (Park & Lee, 2014a). In light of gender differences in smartphone use patterns, examining the moderating role of gender on predicting motives for IT addiction appears to be warranted. Evidently, using the social orientation of gender helps to enhance our understanding of why motives in IT usage (e.g., smartphone addiction) differ among users.

3. Research model and hypotheses

Drawing upon the theoretical background of this research, we develop a research model to explicate the determinants of smartphone addiction. We apply the four-category motive framework and identify a total of five smartphone motives from previous studies (Caplan, 2010; Khang et al., 2013; Turel, Serenko, & Bontis, 2011). We specifically use perceived enjoyment to denote the enhancement motive. Social relationship refers to the social motive. Mood regulation and pastime are treated as coping motives, and conformity refers to the conformity motive. We propose that these factors are key determinants of smartphone addiction. Moreover, we examine the moderating role of gender. Fig. 1 illustrates the research model, and the dotted lines indicate the moderating effects.

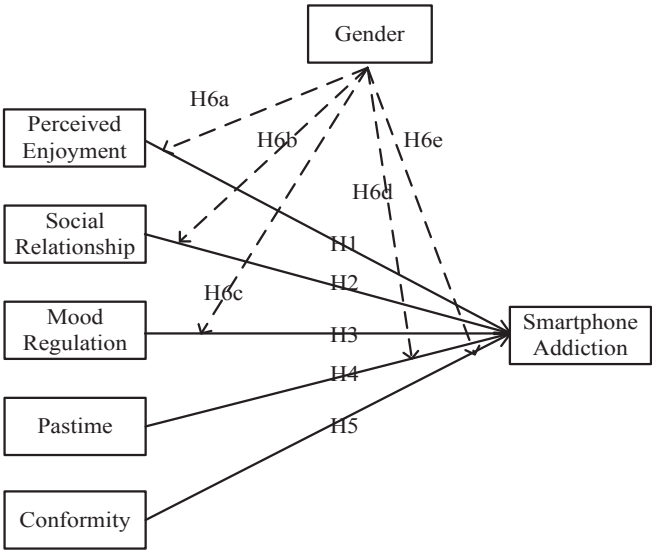

Fig. 1. Research model.

3.1. Perceived enjoyment

Perceived enjoyment, as a positive reinforcement, has been shown to have negative outcomes. That is, it can be a critical driver behind addictive behaviors (Lee, Cheung, & Chen, 2005). Turel and Serenko (2012) investigated the dark side of enjoyment in the context of social networking websites. They found that users who perceive a website as enjoyable may continue to use it and ignore possible adverse outcomes. In the context of smartphones, research indicates that using smartphone is often fun and enjoyable (Chun, Lee, & Kim, 2012). Based on these findings, we expect that if a user experiences a high level of enjoyment when s/he uses a smartphone, then s/he is more likely to be addicted to the device.

H1. Perceived enjoyment is positively related to smartphone addiction.

3.2. Social relationship

The social relationship motive describes the need for interpersonal communication and activities (Yoo, 2011). Research contends that social relationship may affect users and lead to excessive IT usage (Khang et al., 2013). Numerous Internet users who seek social relationships online are found to have pathological symptoms of cyber-relationship addiction (LaRose, Lin, & Eastin, 2003). In this research context, many users are likely to view smartphones as an important tool of interpersonal communication. Therefore, we hypothesize that if a user has a high level of social relationship motive in using a smartphone, then s/he is more prone to become addicted to the device.

H2. Social relationship is positively related to smartphone addiction.

3.3. Mood regulation

Mood regulation is a process that involves mood changes due to the thrill or relief created by using ITs (Turel, Serenko, & Giles, 2011). Research confirms that the need to alleviate dysphoric moods (i.e., a negative reinforcement expectation) is likely to result in excessive IT dependence (Caplan, 2010; Caplan, Williams, & Yee, 2009; Khang et al., 2013). For example, the motive for mood regulation has been demonstrated to predict problematic Internet usage (Caplan, 2010; Caplan et al., 2009). LaRose et al. (2003) verified that some users may suffer from problematic Internet usage because of their attempts to reduce negative feelings, such as loneliness, anxiety, stress, and depression. In the present study, we propose that if a user often has the need for mood regulation when she/he uses a smartphone, then she/he is more likely to have a high level of smartphone addiction.

H3. Mood regulation is positively related to smartphone addiction.

3.4. Pastime

Pastime refers to occupying free time with no productive interest (Yoo, 2011). Boredom inclination also significantly influences game addiction (Chiu, Lee, & Huang, 2004). In a similar vein, Khang et al. (2013) posited that users who have the motive of pastime may

become out of control regarding IT usage. Based on these concerns, the current study proposes that if a user has a strong motive to use a smartphone for pastime, then she/he is more likely to become addicted to the device.

H4. Pastime is positively related to smartphone addiction.

3.5. Conformity

The conformity motive highlights individuals' need to avoid peer disapproval (Stewart & Devine, 2000). Stewart et al. (2006) showed that conformity mediates the relationship between the fear of negative evaluation and problematic drinking behavior. Similarly, Cooper (1994) pointed out the important role of conformity in the development of alcohol addiction. Recent IS research validates that individuals with a high level conformity motive to use social networking sites tend to develop addiction behavior (Kuss & Griffiths, 2011). In the context of smartphones, individuals may also use such popular devices to gain identification and avoid disapproval among their friends (Khang et al., 2013). Therefore, if a smartphone user has a high level of conformity, then she/he will likely to keep using the device and eventually become addicted.

H5. Conformity is positively related to smartphone addiction.

3.6. Gender

Following the social orientation perspective, we attempt to propose that in using smartphones, female addicts are more sensitive to internal motives (i.e., perceived enjoyment, mood regulation, and pastime) and male addicts tend to be more responsive to external motives (i.e., social relationship and conformity).

Previous studies on substance use demonstrate that enjoyment is a primary motivation for females rather than for males with regard to drinking behavior (McCarty & Kaye, 1984). Similarly, IS research contends that females have a higher level of intrinsic reinforcement of entertainment (Kuss & Griffiths, 2011) and care more about their emotions during IT usage (Zhang et al., 2009). Nysveen, Pedersen, and Thorbjørnsen (2005) also verified that with regard to the use of mobile chat services, intrinsic reinforcement, such as enjoyment, is usually predominant in female users. Following this logic, we expect that female users are more sensitive to the motive of enjoyment when developing smartphone addiction. Therefore, we propose the following hypothesis.

H6a. The association between perceived enjoyment and smartphone addiction is stronger for females than for males.

Previous studies on substance use show that gender differences begin to emerge in adolescence. For instance, young males gradually show stronger extrinsic motives (e.g., social motives) for drinking compared with females (Cooper, 1994; Kuntsche et al., 2006). For university students, research shows that most drinkers with social motives are males (Theakston, Stewart, Dawson, Knowlden-Loewen, & Lehman, 2004). In the IS literature, males are similarly regarded as having higher social expectations than females. For example, they prefer to treat computer games as social tools to impress friends and maintain social relationships (Chou & Tsai, 2007). Ji and Skoric (2013) indicated that males are more likely to keep social connections via mobile phones. Based on these findings, we expect that males are more responsive to the social relationship motive. We develop the following hypothesis.

H6b. The association between social relationship and smartphone addiction is stronger for males than for females.

Prior research verifies that females tend to have higher urges to relieve negative moods compared with males (Rubonis et al., 1994). In the context of alcohol drinking, females usually have higher levels of anxiety than males and are found to be more sensitive to the coping motives for drinking (Stewart, Zvolensky, & Eifert, 2001). Similarly, this predisposition of relieving negative moods predominates in female smokers (Morrell et al., 2010). In the IS literature, research shows that females tend to have higher levels of boredom inclination, which can further result in game addiction (Chiu et al., 2004). Pastime is also considered to be a more favored motive to use social networking technologies for females than for males (Kuss & Griffiths, 2011). Therefore, we expect that females may place more emphasis on the coping motives (i.e., mood regulation and pastime). Accordingly, two hypotheses are provided as follows:

H6c. The association between mood regulation and smartphone addiction is stronger for females than for males.

H6d. The association between pastime and smartphone addiction is stronger for females than for males.

In the studies on substance abuse, males generally score higher on antisocial peer conformity compared with females (Santor, Messervey, & Kusumakar, 2000). Research shows that conformity is a principal motive for males to engage in problematic drinking (Mahalik, Talmadge, Locke, & Scott, 2005). They usually drink heavily in the company of other males (i.e., to ensure conformity) and outnumber females in terms of alcohol abuse. Scholars also indicate that gender differences exist with respect to the conformity motive for substance abuse (Borsari & Carey, 2001). In the IS field, similar results are reported recently. Kuss and Griffiths (2011) contended that compared with females, males prefer to share similar characteristics with group members when using social networking technologies. Therefore, we expect that the conformity motive may have a stronger effect for males in the present context. Thus, the following hypothesis is offered.

H6e. The association between conformity and smartphone addiction is stronger for males than for females.

4. Method

The present study aims to understand the predicting effects of motives and how they differ across genders in the context of smartphone addiction. To achieve these objectives, we conducted an empirical survey method to test the proposed hypotheses. Details are discussed as follows.

4.1. Data collection

An online survey was conducted for data collection. In this study, we developed an online questionnaire and distributed flyers and invitation messages with its URL among university students in China who owned smartphones. Prior studies have indicated that university students are relatively more vulnerable to IT addiction compared with other groups (Turel, 2015). Kandell (1998) affirmed that university students have high risks of developing IT addiction because of their relative independence and developmental dynamics. Previous research has also focused on investigating smartphone addiction in university students (e.g., Chiu, 2014; Demirci, Akgönül, & Akpinar, 2015; Im, Hwang, Choi, Seo, & Byun, 2013; Ko, Lee, & Kim, 2012; Lee et al., 2014). The rate of smartphone addiction has been found to increase exponentially among university students (Im et al., 2013). Following this logic, Chinese university students may also have higher risks of using

Table 1
Measures and sources of constructs.

Variable	Item	Measurement
Smartphone addiction (SA)	SA1	My social life has sometimes suffered because of using my smartphone.
(Turel & Serenko, 2012)	SA2	Using my smartphone sometimes interfered with other activities (e.g., work or study).
	SA3	When I am not using my smartphone, I often feel agitated.
	SA4	I have made unsuccessful attempts to reduce the time using my smartphone.
	SA5	I find it difficult to control my smartphone use.
Perceived enjoyment (PE)	PE1	Using my smartphone is enjoyable.
(Turel & Serenko, 2012)	PE2	Using my smartphone is fun.
	PE3	Using my smartphone is interesting.
Social relationship (SR)	SR1	The reason I use my smartphone is to read about other people's lives.
(Khang et al., 2013; Li, Guo, & Sun, 2012)	SR2	The reason I use my smartphone is to socialize with others.
	SR3	I use my smartphone for making my ordinary visible to others.
Mood regulation (MR)	MR1	I have used my smartphone to make myself feel better when I was down.
(Caplan, 2010; Stewart et al., 2006)	MR2	I have used my smartphone to make myself feel better when I've felt upset.
	MR3	I have used my smartphone to forget worries.
	MR4	I have used my smartphone to forget about problems.
Pastime (PT)	PT1	The reason I use my smartphone is to kill time.
(Khang et al., 2013)	PT2	The reason I use my smartphone is to avoid boredom.
Conformity (CO)	CO1	The reason I use my smartphone is to gain identification with others.
(Khang et al., 2013; Stewart et al., 2006)	CO2	The reason I use my smartphone is to be liked by my friends.
	CO3	I use my smartphone so I won't feel left out.

smartphones addictively. Hence, we considered them as an appropriate sample. We carried out a snowball-sampling technique and offered lucky draw prizes to increase the sample size. As our respondents were Chinese smartphone users, we firstly translated the original English instruments in the questionnaire to Chinese. We then translated the Chinese version to English again. To ensure the translation quality, both English versions were compared to resolve any inconsistencies. Finally, 384 usable responses were collected. Of the respondents, 45.6% were female (N = 175), and 54.4% were male (N = 209). Most of the respondents (91.1%) were 18–30 years of age. The population distribution of our collected sample was consistent with the report of Deloitte,[1] which showed that most smartphone addicts in China were 18–34 years of age. The minimum age group was below 18 years old (N = 7, 1.8%), and the maximum age group was over 40 years old (N = 6, 1.6%).

4.2. Measures

Existing items from previous studies were employed with slight modifications to fit the present context. We changed the measuring object into smartphones to assess related factors of using smartphones. All measures used seven-point Likert scales from the degree of 1–7 (i.e., from strongly disagree to strongly agree). Detailed measures of constructs are presented in Table 1.

4.3. Pilot test

Although the employed instruments had been validated by previous research, we adopted a card sorting method to ensure content validity and reliability in our current context. Results from the evaluation of the card sorting test were satisfactory, with an overall accuracy rate of 99.3%. Subsequently, a group of another 30 university students were asked to refine the wording clarity, assess the questionnaire length, and identify improvement areas in our online questionnaire. Of this group, 17 students were male (56.7%), and 13 were female (43.3%). Moreover, 21 students were getting their bachelor's degrees and were 18–25 years old. The remaining nine students were getting their master's degrees and were from 21 to 35 years of age. The pretest respondents were also invited to answer our questionnaire to evaluate its reliability. The values of Cronbach's α ranged from 0.753 to 0.975, indicating a satisfactory reliability level (Jung, Perez-Mira, & Wiley-Patton, 2009). The results of card sorting approach and reliability test suggested that items in our measures achieved sufficient validity and construct reliability.

5. Data analysis and results

This study adopted partial least squares regression (PLS regression) to analyze the research model. PLS regression is a widely used technique for structural equation modeling in IS studies (Ahuja & Thatcher, 2005; Venkatesh & Morris, 2000). It requires a relatively small sample size without restriction on normal distribution (Hsu, Chang, & Chuang, 2015). We employed PLS regression and followed the two-step approach involving the measurement and the structural models (Hair, Tatham, Anderson, & Black, 2009).

Table 2
Descriptive statistics of the constructs.

	CR	AVE	Cronbach's Alpha	Mean	SD
Full					
SA	0.918	0.692	0.888	4.025	1.594
PE	0.953	0.871	0.925	4.793	1.348
SR	0.871	0.693	0.789	5.372	1.073
MR	0.935	0.783	0.907	4.288	1.782
PT	0.965	0.933	0.928	5.068	1.867
CO	0.951	0.867	0.923	4.306	1.875
Female					
SA	0.909	0.666	0.874	4.223	1.53
PE	0.956	0.878	0.930	4.951	1.243
SR	0.903	0.757	0.845	5.613	0.984
MR	0.929	0.765	0.897	4.493	1.625
PT	0.970	0.942	0.938	5.274	1.85
CO	0.956	0.878	0.930	4.392	1.715
Male					
SA	0.923	0.706	0.895	3.859	1.594
PE	0.950	0.863	0.920	4.662	1.404
SR	0.837	0.632	0.730	5.169	1.062
MR	0.938	0.791	0.912	4.117	1.858
PT	0.960	0.923	0.917	4.895	1.825
CO	0.948	0.860	0.918	4.234	2.007

[1] http://news.yesky.com/218/98663718.shtml.

Table 3
Correlations of constructs.

	SA	PE	SR	MR	PT	CO
Full						
SA	**0.832**					
PE	0.496	**0.933**				
SR	0.357	0.389	**0.832**			
MR	0.566	0.621	0.412	**0.885**		
PT	0.385	0.277	0.325	0.423	**0.966**	
CO	0.539	0.599	0.504	0.742	0.337	**0.931**
Female						
SA	**0.816**					
PE	0.550	**0.937**				
SR	0.325	0.357	**0.870**			
MR	0.602	0.655	0.397	**0.875**		
PT	0.440	0.365	0.426	0.456	**0.970**	
CO	0.564	0.552	0.438	0.788	0.420	**0.937**
Male						
SA	**0.840**					
PE	0.440	**0.929**				
SR	0.354	0.389	**0.795**			
MR	0.526	0.586	0.407	**0.890**		
PT	0.324	0.191	0.205	0.380	**0.961**	
CO	0.521	0.562	0.564	0.712	0.267	**0.927**

Note: Diagonal bold values are square roots of AVEs.

5.1. Measurement model

We analyzed the measurement model by calculating the validity of convergence and discrimination in each subgroup. Convergent validity requires high correlation of items of the same construct (Zhang, Cheung, & Lee, 2014). To ensure adequate convergent validity, values of composite reliability (CR) should be higher than 0.7, and average variance extracted (AVE) should be no lower than 0.5. Table 2 shows that the convergent validity of this study was sufficient.

Meanwhile, discriminant validity indicates the extent to which different constructs should vary from each other (Zhang et al., 2014). The values of the square root of AVE for each construct must be greater than its correlations with other constructs (Fornell & Larcker, 1981). Table 3 depicts the results of this AVE test, while Table 4 shows the results of the confirmatory factor analysis. All items in our study had high loadings on their corresponding constructs. Thus, the results confirmed that this study had acceptable discriminant validity.

5.2. Structural model

In the structural model, we examined the predicting effects of motives and the moderating effects of gender. Consequently, we tested three structural models (i.e., full, female, and male groups). We first analyzed the effects of motives on smartphone addiction with a full sample size. Fig. 2 shows the path loadings and associated t values.[2] Perceived enjoyment ($\beta = 0.191$, $t = 3.736$) was demonstrated to be a significant predictor of smartphone addiction. However, no significant effect was found in social relationship ($\beta = 0.042$, $t = 0.844$). Mood regulation ($\beta = 0.216$, $t = 3.538$), pastime ($\beta = 0.161$, $t = 3.274$), and conformity ($\beta = 0.197$, $t = 3.222$) generated positive effects on smartphone addiction. This full model explained 40% of the variance in smartphone addiction. Our results supported the hypotheses that perceived enjoyment (H1), mood regulation (H3), pastime (H4), and conformity (H5) were positively related to smartphone addiction. However, H2 (i.e., influence of social relationship on smartphone addiction) was not supported.

Afterwards, we performed the subgroup analysis. Fig. 3 shows the effects of motives in the female model. Perceived enjoyment ($\beta = 0.242$, $t = 2.83$), mood regulation ($\beta = 0.219$, $t = 2.258$), pastime ($\beta = 0.175$, $t = 2.68$), and conformity ($\beta = 0.186$, $t = 2.033$)

[2] β reflects path coefficient. Path coefficient refers to the standardized regression coefficient indicating the direct influence of an independent variable on the dependent variable in the research model. t value indicates whether the influence of an independent variable is significant. t values > 1.96 denote * significance; t values > 2.58 suggest ** significance; and t values > 3.29 signify *** significance.

Table 4
Confirmatory factor analysis.

	SA	PE	SR	MR	PT	CO
Full						
SA1	**0.734**	0.273	0.291	0.289	0.238	0.249
SA2	**0.846**	0.421	0.343	0.472	0.348	0.465
SA3	**0.904**	0.369	0.256	0.414	0.286	0.398
SA4	**0.841**	0.343	0.228	0.375	0.244	0.377
SA5	**0.804**	0.338	0.193	0.411	0.257	0.371
PE1	0.394	**0.957**	0.349	0.621	0.248	0.569
PE2	0.400	**0.947**	0.347	0.630	0.270	0.556
PE3	0.406	**0.901**	0.363	0.522	0.269	0.470
SR1	0.218	0.265	**0.819**	0.237	0.279	0.300
SR2	0.207	0.276	**0.815**	0.234	0.227	0.283
SR3	0.335	0.372	**0.859**	0.454	0.261	0.552
MR1	0.372	0.478	0.414	**0.846**	0.393	0.583
MR2	0.427	0.572	0.330	**0.861**	0.371	0.650
MR3	0.458	0.572	0.335	**0.914**	0.353	0.715
MR4	0.448	0.611	0.344	**0.927**	0.378	0.702
PT1	0.315	0.235	0.275	0.371	**0.964**	0.290
PT2	0.336	0.305	0.318	0.437	**0.969**	0.346
CO1	0.425	0.546	0.479	0.704	0.291	**0.938**
CO2	0.417	0.516	0.480	0.661	0.313	**0.944**
CO3	0.442	0.527	0.403	0.728	0.319	**0.914**
Female						
SA1	**0.784**	0.374	0.350	0.434	0.411	0.385
SA2	**0.810**	0.558	0.351	0.556	0.453	0.532
SA3	**0.899**	0.494	0.244	0.550	0.315	0.529
SA4	**0.767**	0.398	0.184	0.443	0.239	0.417
SA5	**0.814**	0.381	0.171	0.447	0.351	0.404
PE1	0.511	**0.959**	0.298	0.641	0.346	0.557
PE2	0.506	**0.941**	0.292	0.674	0.339	0.522
PE3	0.529	**0.910**	0.410	0.527	0.339	0.473
SR1	0.267	0.268	**0.884**	0.326	0.388	0.330
SR2	0.202	0.294	**0.861**	0.245	0.329	0.244
SR3	0.342	0.354	**0.865**	0.420	0.382	0.502
MR1	0.495	0.537	0.499	**0.847**	0.399	0.644
MR2	0.550	0.599	0.347	**0.857**	0.367	0.728
MR3	0.537	0.554	0.268	**0.892**	0.399	0.713
MR4	0.522	0.598	0.286	**0.901**	0.432	0.666
PT1	0.445	0.355	0.403	0.433	**0.973**	0.378
PT2	0.407	0.352	0.425	0.454	**0.968**	0.439
CO1	0.545	0.519	0.424	0.746	0.370	**0.938**
CO2	0.516	0.504	0.433	0.704	0.404	**0.945**
CO3	0.523	0.528	0.375	0.764	0.406	**0.928**
Male						
SA1	**0.708**	0.304	0.272	0.321	0.177	0.301
SA2	**0.884**	0.426	0.370	0.544	0.338	0.575
SA3	**0.905**	0.364	0.298	0.432	0.313	0.418
SA4	**0.873**	0.371	0.286	0.410	0.286	0.423
SA5	**0.818**	0.367	0.244	0.463	0.214	0.419
PE1	0.404	**0.954**	0.381	0.579	0.149	0.562
PE2	0.411	**0.946**	0.379	0.574	0.197	0.571
PE3	0.411	**0.885**	0.324	0.479	0.187	0.433
SR1	0.185	0.265	**0.736**	0.173	0.212	0.302
SR2	0.221	0.272	**0.776**	0.230	0.163	0.336
SR3	0.375	0.365	**0.866**	0.466	0.146	0.604
MR1	0.403	0.406	0.372	**0.842**	0.379	0.522
MR2	0.455	0.525	0.322	**0.863**	0.388	0.584
MR3	0.503	0.556	0.384	**0.922**	0.296	0.711
MR4	0.503	0.581	0.374	**0.929**	0.304	0.697
PT1	0.277	0.108	0.156	0.302	**0.952**	0.222
PT2	0.339	0.246	0.230	0.416	**0.969**	0.285
CO1	0.470	0.552	0.563	0.664	0.227	**0.936**
CO2	0.480	0.511	0.568	0.621	0.254	**0.944**
CO3	0.498	0.501	0.442	0.692	0.261	**0.901**

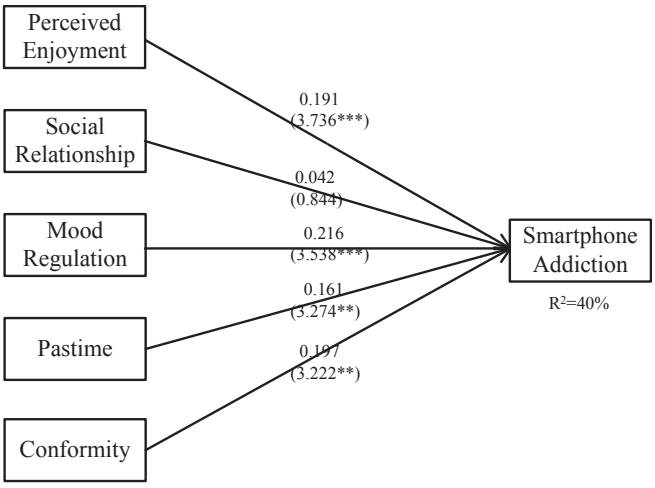

Fig. 2. Structural model of full group. Notes: * denotes $p < 0.05$; ** denotes $p < 0.01$; *** denotes $p < 0.001$.

affected smartphone addiction significantly. However, no significant effect was found in social relationship ($\beta = -0.005$, $t = 0.07$). Finally, the variance explained in smartphone addiction was 44.6% in this model.

For the male model, Fig. 4 indicates that perceived enjoyment ($\beta = 0.145$, $t = 2.129$), mood regulation ($\beta = 0.202$, $t = 2.401$), pastime ($\beta = 0.148$, $t = 2.294$), and conformity ($\beta = 0.223$, $t = 2.25$) predicted smartphone addiction. Social relationship ($\beta = 0.059$, $t = 0.847$) had no significant effect. The variance explained in smartphone addiction was 35.5%.

Subsequently, we used the group comparison method to assess the moderating role of gender. This method focuses on the statistical comparison of path coefficients in subgroups (Keil et al., 2000). We initially obtained the corresponding path coefficients and the standard errors of the paths from the structural models. Then, we computed and assessed the discrepancy of the designated paths between two subgroups (see Appendix A). If the path coefficient in one subgroup is significantly stronger or weaker than the corresponding path coefficient in the other subgroup, then the moderating effect is identified. Table 5 indicates that the moderating effects of gender were supported except for hypotheses H6b and H6c. We further calculated the values of goodness of fit (GoF) for each model. GoF is usually applied to evaluate a model's overall fit (Wetzels, Odekerken-Schröder, & van Oppen, 2009). In our study, we achieved the value of 0.568 for the full model, 0.538 for the female model, and 0.596 for the male model. All these values exceeded the cutting value of 0.36 for GoF. Therefore, each model presented a good fit.

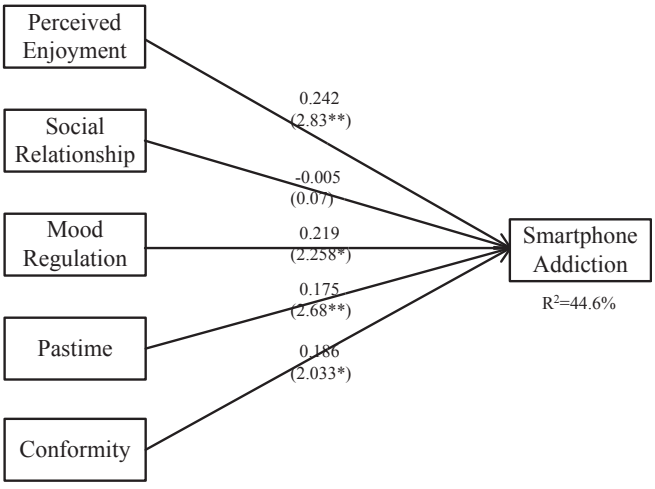

Fig. 3. Structural model of female group. Notes: * denotes $p < 0.05$; ** denotes $p < 0.01$; *** denotes $p < 0.001$.

6. Discussion and conclusion

In this study, we develop a research model to advance our limited knowledge of smartphone addiction. Our proposed model depicts the predicting effects of motives and highlights the interaction effects of gender from the functionalist and social orientation perspectives. Based on the theoretical background, this research model initially presents a four-category motivation framework to analyze motives and then assesses gender differences. An online survey with 384 usable data is administered to test our research model. Our empirical results confirm that if people use smartphones for the motives of enjoyment, mood regulation, pastime, and conformity, then they are likely to develop smartphone addiction. Furthermore, mood regulation exerts the strongest effect on smartphone addiction. No significant effect is found in the social relationship motive. In addition, we investigate how gender may interact with the motives in this IT addiction context. Our results verify that the influences of motives vary across genders. The effects of perceived enjoyment and pastime on smartphone addiction are stronger for female users, whereas conformity exerts a stronger effect for males. These empirical results confirm the view that females may place more emphasis on intrinsic motives, whereas males may focus more on extrinsic motives. The results also provide additional support to the extant research on social orientation and to Hofstede et al. (1980) work. Surprisingly, the moderating effect of gender is not found on mood regulation. A similar result appeared in Morrell et al. (2010), which showed that the relationship between expectations of improving low mood and smoking status is not gender-specific. A possible explanation is that the two subgroups of our sample may have similar levels of depression and negative moods. As most of our respondents are university students in mid China, they share homogeneous backgrounds, implying that they experience similar degrees of academic pressure. Therefore, the moderating effect of gender on mood regulation may become insignificant. Implications and limitations are presented in detail as follows.

6.1. Implications

The current study has several important theoretical implications. First, despite the rising concern on smartphone addiction, theoretical understanding of the subject remains limited. Relevant IS literature remains in an embryonic stage. Therefore, this study aims to fill this research gap to enrich the previous literature. Accordingly, we develop a research model to explain the predictors of smartphone addiction from the functionalist perspective. To the best of our knowledge, our study is among the early ones to propose a four-category motivation framework and confirm its validity. Our results show that the enhancement motive (i.e., perceived enjoyment), coping motives (i.e., mood regulation and pastime), and conformity motive are key antecedents of smartphone addiction. The empirical results of this study help to validate that motives are crucial factors in the development of smartphone addiction.

Second, we provide additional empirical support regarding the finding that negative reinforcements (i.e., coping and conformity motives) are more likely to trigger smartphone addiction compared

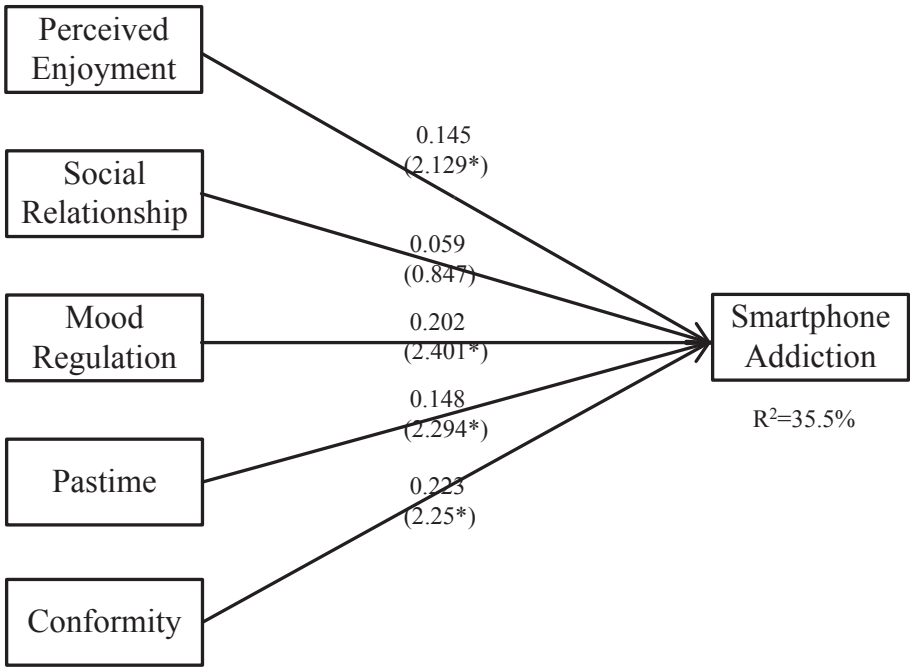

Fig. 4. Structural model of male group. Notes: * denotes $p < 0.05$; ** denotes $p < 0.01$; *** denotes $p < 0.001$.

with positive reinforcements (i.e., enhancement and social motives). This is partially consistent with Cheung et al. (2013), which showed that negative reinforcement is more important for compulsive Facebook usage. Furthermore, our results highlight the distinction between IT addiction and substance addiction, whereas previous studies primarily address their similarities (e.g., Turel, Serenko, & Giles, 2011). In the literature on substance addiction (e.g., excessive drinking and smoking), positive reinforcements have been shown to be more powerful than negative ones. Bradizza, Reifman, and Barnes (1999) confirmed that social motive is a better predictor compared with the coping motive in alcohol misuse behaviors. Positive reinforcements (e.g., social facilitation, mood enhancement, and relaxation) are shown to be more important for cigarette consumption (Copeland & Carney, 2003). In contrast to these findings, we show that negative reinforcements appear to be more important in the formation of IT/smartphone addiction.

Third, the present study examines gender differences to resolve prior inconsistent findings about the effects of motives on IT addiction. Limited IS research has addressed the interaction effects between gender and the predictors of smartphone addiction. In this regard, we complement previous studies by investigating whether female and male users develop IT addiction differently by deriving insights from the social orientation perspective. We demonstrate that females are more sensitive to internal motives, whereas males are more responsive to external motives. This empirical evidence provides a useful view for understanding the effects of motives on smartphone addiction. Our research model depicts a picture to show the adverse effects of motives as well as their relative importance in groups of male and female users. Hence, this study extends prior research on IT addiction and gender literature.

Our results also offer insights into the public awareness of smartphone addiction. With their various functions and high convenience, smartphones have been used extensively in recent years. In this respect, raising the awareness of smartphone addiction and avoiding its potential adverse outcomes are important. Our results verify that when a user has a strong tendency to seek enjoyment, mood regulation and pastime, and avoid peer disapproval, then she/he is more likely to become addicted to smartphone usage. To avoid the occurrence of addiction behaviors, considering gender differences in prevention programs is also important. More specifically, intrinsic motives are more likely to activate addictive behaviors of female users, whereas males focus more on extrinsic motives. Therefore, prevention strategies should consider gender differences to develop more effective approaches. For instance, a treatment program may pay more attention to offering emotional support to females. Conversely, it may be more helpful to provide males with guidance on how to correctly establish and enhance social roles via smartphone use.

Table 5
Analysis of gender differences.

	Construct	PE	SR	MR	PT	CO
Females $R^2 = 44.6\%$	Path coefficient t-value	0.242 2.83**	−0.005 0.07	0.219 2.258*	0.175 2.68**	0.186 2.033*
Males $R^2 = 35.5\%$	Path coefficient t-value	0.145 2.129*	0.059 0.847	0.202 2.401*	0.148 2.294*	0.223 2.250*
Comparison	t-value	12.370***	n/a	1.839	4.062***	3.773***

Note: *p < 0.05, **p < 0.01, ***p < 0.001.

6.2. Limitations and future research

In spite of these implications, we must point out the limitations of this study and possible research opportunities. The first limitation involves the relatively convenient sample used in our study. Most of the respondents are Chinese students. The homogeneous sample may affect the generalizability of our results. Therefore, future work may consider using a larger sample with various backgrounds and examining whether the same findings could be achieved.

The second limitation is related to the effects of gender. As gender differences are usually connected with culture, care should be taken when testing gender's moderating effects in other regions. Scholars are thus encouraged to compare the roles of gender in different cultures to attain a more accurate map of gender's effects.

The third one is about the amount of R-squared values explained in the models. The R-squared value of smartphone addiction explained in the female subgroup is 44.6% and 35.5% in the male subgroup. The relatively small values indicate that future studies may consider incorporating additional factors into the model.

The fourth limitation involves the limited number of items in the pastime scale. Our pastime scale includes only two items. To further enhance validity, future research can consider adding more items in measuring this construct.

Finally, this study does not assess the social desirability bias in the survey study. Given that addiction is a negative phenomenon, respondents may be reluctant to reveal their addiction symptoms or behaviors. Therefore, further work is encouraged to develop a social desirability questionnaire to investigate and control this bias.

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Appendix A. Group comparison method from Keil et al. (2000)

$$S_{pooled} = \sqrt{\left\{\left[\frac{(N_1-1)}{(N_1+N_2-2)}\right]*SE_1^2 + \left[\frac{(N_2-1)}{(N_1+N_2-2)}\right]*SE_2^2\right\}}$$

$$t = \frac{(PC_1 - PC_2)}{\left[S_{pooled}*\sqrt{(1/N_1 + 1/N_2)}\right]}$$

Note: Spooled: the pooled estimator for the variance;

Ni: the sample size of group i;
SEi: the standard error of path of group i;
PCi: the path coefficient of group i;
t: the t-statistic with (N1+N2−2) degrees of freedom.

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