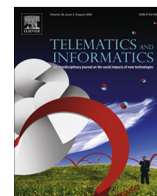




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Are you addicted to Candy Crush Saga? An exploratory study linking psychological factors to mobile social game addiction

Cheng Chen, Louis Leung*

School of Journalism and Communication, The Chinese University of Hong Kong, Hong Kong

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ABSTRACT

The purpose of this study is to explore the relation of psychological factors (including perceived gratifications, loneliness, leisure boredom, and self-control) to mobile social game use and addiction. The study data were gathered from 409 respondents in China. The exploratory factor analysis yielded a gratification structure of five factors (mobility, entertainment, sociability, achievement, and relaxation). According to Young's (1998) classic definition, 7.3% of the participants in the study sample were considered addicts. They were characterized as lonely, leisurely bored, and motivated by the mobile nature of the game. As expected, frequent players had a higher tendency to become addicts. In particular, loneliness and self-control were significant predictors of mobile social game addiction, whereas leisure boredom was linked to the intensity of game use. The limitations of the study and its implications for future research are discussed.

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1. Introduction

Game playing is an ancient behavior. Pre-historic humans may have used bones or pebbles to play games on the floor of a cave, whereas in the 21st century, the modality of game playing has moved from offline to online and from desktop personal computers (PC) to mobile devices. According to an annual report published by the China Internet Network Information Center (CNNIC, 2014), by the end of 2013, the number of online mobile game users in China had reached 215 million, a drastic increase over the 75.94 million reported in 2012. In contrast, the number of Internet game users grew relatively slowly from 335 million in 2012 to 338 million in 2013. These data indicate that online mobile games have the highest potential for growth and may surpass the PC in becoming the preferred game-playing platform in the future. Classic mobile games, such as Fruit Ninja, Angry Birds, Where's My Water, Temple Run, and Cut the Rope, are examples of this shift.

Led by the dramatic rise of social networking sites (SNS) in recent years, the mobile social game has changed the landscape of the game business. Mobile social games are defined as casual games that are created to play on portable devices, and they are integrated in social networking platforms to facilitate the user's interactions (Erturkoglu et al., 2015; Hou, 2011; Wei and Lu, 2014). Compared to console games and PC games, mobile social games can be characterized as easy to play, less time consuming, facilitating social interaction, and focusing on entertaining and casualness (Omori and Felinto, 2012).

Candy Crush Saga is one of the best-known mobile social games. It was launched by King Digital Entertainment on Facebook in the second quarter of 2012 and as a mobile application in the fourth quarter of 2012 (Candy Crush Saga, 2015). Candy Crush Saga became a phenomenon not only because it attracted 93 million daily players and 500 million

* Corresponding author.

E-mail addresses: chencheng0614@hotmail.com (C. Chen), louisleung@cuhk.edu.hk (L. Leung).

installs on mobile devices, but also because it generated a profit of US\$568 million in 2013 (Grubb, 2014). Specifically, Candy Crush Saga is a puzzle match-3 game in which players match candies in combinations of three or more to win points and overcome obstacles. Players progress through a colorful candy world with over 500 levels, each of which offers a different puzzle challenge. When it is integrated with Facebook, Candy Crush Saga shows the progress of Facebook friends on the game's level map, which fosters competition among the player's social network and pushes them to keep engaging in the game, sharing achievements, and requesting extra "lives"¹ and moves. With its guaranteed mobility and portability, Candy Crush Saga can be played on any device anytime and anywhere. Commuters who are immersed in playing Candy Crush Saga are frequently seen on public transit systems.

However, the popularity and prevalence of Candy Crush Saga also triggered many problems. Some players of this game reported that they had left their children stranded at school, abandoned housework, and even injured themselves as they tried to reach new levels (Dockerman, 2013). These anecdotes demonstrate that Candy Crush Saga can be addictive. Moreover, past research has found that excessive game playing may negatively affect the player's health and behavior, leading to poor academic performance (Leung and Lee, 2012), cognitive distortion (Li and Wang, 2013), low quality of interpersonal relationships (Huang et al., 2015), social anxiety (Lo et al., 2005), and sleep disturbances (Thomé et al., 2011).

According to the *Wall Street Journal* (2013), nearly 15 million people in Western countries were addicted to Candy Crush Saga of which 69% were female. This report not only changed the myth that game players are predominantly male but also demonstrated the tendency of Candy Crush Saga players to become addicted to the game (Billieux et al., 2013). Therefore, it is both timely and imperative to know the reasons that so many people become addicted to this game. Since Candy Crush Saga was launched, little research has been done on its effects on the players of this game. Thus, the present study is one of the few empirical investigations that focus on the relationships between psychological factors (i.e., gratification, loneliness, leisure boredom, and self-control) and mobile social game addiction. Based on the case of Candy Crush Saga, this study aims to deepen the understanding of the "at-risk" population and provide information that could be used to develop a program that prevents addiction.

2. Literature review

2.1. Uses and gratifications

According to Rubin (1994, p. 420), uses and gratifications (U&G) theory is grounded in five assumptions: "(1) media selection and use is goal-directed, purposive, and motivated; (2) people take the initiative in selecting and using communication vehicles to satisfy felt needs or desires; (3) a host of social and psychological factors mediate people's communication behavior; (4) media compete with other forms of communication for selection, attention, and use to gratify our needs or wants; and (5) people are typically more influential than the media in the relationship, but not always." Ruggiero (2000) pointed out that U&G theory provides a theoretical approach to gaining insight into the use of new communication technologies, such as cable television (Palmgreen and Rayburn, 1979), remote television control devices (Walker and Bellamy, 1991), VCRs (Lin, 1993), the Internet (Papacharissi and Rubin, 2000), and home computer use (Perse and Dunn, 1998).

With the rapid diffusion of games, scholars have applied the U&G theoretical perspective to examine a variety of games, including computer games (Colwell et al., 1995), video games (Jansz et al., 2010), online games (Li et al., 2015; Wu et al., 2010), online role-playing games (van Reijmersdal et al., 2013), social network site games (Huang et al., 2015; Zhou and Leung, 2012), and mobile social games (Wei and Lu, 2014). Previous studies that used the U&G theoretical perspective pointed out that social and psychological factors may drive people to play games. For instance, enjoyment, companionship, escapism, achievement, tension reduction, challenge, social interaction, killing time, arousal, and competition were gratifications associated with game playing (Chang et al., 2014; Colwell et al., 1995; Engl and Nacke, 2013; Jansz et al., 2010; Kim and Kim, 2010; Wei and Lu, 2014; Zhou and Leung, 2012). Because the mobile social game is a new game genre, one goal of this study is to explore a wide range of motivations for mobile social game playing, which users identify as unique.

2.2. Internet and mobile social game addiction

Traditionally, the concept of "addiction" is based on a medical model, which emphasizes psychological or bodily dependence on a physical substance. In recent years, scholars found that compulsive gambling (Morbilia, 1993), over-eating (Lesieur and Blume, 1993), and compulsive sexual behavior (Goodman, 1993) exhibited similar symptoms of substance dependence, which triggered a heated discussion on whether a broader range of behaviors should be considered "addiction." As a subset of behavioral addiction, the extended concept of "technological addiction," was defined by Griffiths (1996, p. 471) as "non-chemical addictions that involve human-machine interaction."

Young (1996, p. 238) claimed that addictive Internet use is "an impulse control disorder that does not involve an intoxicant" that is similar to pathological gambling. Adapting the criteria for pathological gambling in the Diagnostic and Statistical Manual of Mental Disorders-Fourth Edition (DSM-IV), Young (1996) developed a brief questionnaire that contained eight yes-or-no items that were used to diagnose addicted Internet users: (1) preoccupation with the Internet; (2) tolerance

¹ Lives in Candy Crush Saga context means health point (HP).

(the need to spend an increasing amount of time on the Internet); (3) unsuccessful attempts to control or limit participation; (4) psychological withdrawal symptoms; (5) staying longer than originally intended; (6) jeopardized or lost a relationship, job, or educational opportunity; (7) deceiving family members and/or therapists; and (8) use of the Internet to escape a negative mood. Respondents who answered “yes” to five or more of the eight items were considered addicts.

Today, because of the freedom of high-speed mobile data and Wi-Fi network services, and the growing popularity of mobile devices and apps, mobile social games have become one of the most popular entertainment media. The portability of mobile devices removes the spatial constraints of fixed-line platforms, which allows short breaks for entertainment, and has made mobile social games a popular choice for leisure activities (Wei and Lu, 2014). Moreover, some individuals have manually changed the time on their phones to skip the waiting time between games, and several players have deleted Candy Crush Saga from their mobile devices in the attempt to cut back the playing time but re-installed it later. Therefore, the main goal of this study is to investigate both the severity and the significant predictors of mobile social game addiction in a group of young mobile social game users.

2.3. Loneliness

Loneliness is an unpleasant and distressing problem that almost everyone has experienced at some time in his or her life. Psychological theorists define loneliness as a “relational deficit” (Saklofske et al., 1986), whereby “a person’s network of social relationships is smaller or less satisfying than the person desires” (Peplau and Perlman, 1979, p. 101). Several studies found that people who describe themselves as lonely were inhibited socially (Horowitz and de Sales French, 1979), self-conscious (Solano and Koester, 1989), unwilling to disclose (Berg and Peplau, 1982), and sensitive to rejection (Russell et al., 1980). Moreover, they had difficulty making friends, initiating social activity, participating in groups (Horowitz and de Sales French, 1979), and exhibited poor social skills (Vitkus and Horowitz, 1987).

Although being lonely may have many detrimental effects, changing the way of socializing may alter the state of loneliness. McKenna et al. (2002) pointed out that lonely people were more likely to express themselves on the Internet. Ideally, the online social environment not only provides a vastly expanded social network (Morahan-Martin and Schumacher, 2003) but also has several features (e.g., absence of boundaries, anonymity, and interactivity) that appear to make online interactions easier than in real life (Lo et al., 2005).

Similar to the Internet, mobile social games also provide a mediated communication environment where users can control the intimacy levels of interactions. In addition, a non-face-to-face communication environment could lower the social risk of being embarrassed or disappointed (Leung, 2002), which could facilitate pro-social behavior and enhance the formation of online friendships (Morahan-Martin and Schumacher, 2003). In fact, Candy Crush Saga encourages lonely people to engage in social interaction, such as sharing achievements, requesting lives, and seeking help from Facebook friends. This interactive game setting could modulate the negative moods associated with loneliness, increase the sense of community, and enhance the feelings of belonging. Thus, it is anticipated that for some lonely individuals, this altered social pattern may lead to increased mobile social game use.

Previous studies demonstrated that lonely people were more likely to go online when they felt isolated, depressed, or anxious (Morahan-Martin and Schumacher, 2003) and to use the Internet as an escape to reduce stress and alleviate negative feelings (Booth, 1983). Despite the potential positive effects on those who are lonely, their unhealthy use behaviors may cause disturbances in their real lives, thus leading to academic, work, or interpersonal problems (Lavin et al., 1999; Young, 1996; 1998). Considering the similarity between the use of the Internet and mobile social games, it is assumed that lonely people may be more vulnerable than others are to developing game-related issues such as addiction. Therefore, the following hypotheses are proposed:

H_{1a}. The lonelier that mobile social game players are, the more time they will spend playing mobile social games.

H_{1b}. The lonelier that mobile social game players are, the more likely that they will be addicted to mobile social games.

2.4. Leisure boredom

Boredom, which is a negative mood or state in which individuals lack interest and are unable to concentrate (Fisher, 1993), can also be defined as “the subjective perception that available leisure experiences are not sufficient to instrumentally satisfy needs for optimal arousal” (Iso-Ahola and Weissinger, 1990, p. 4). Leisure behavior must be optimally arousing for it to be psychology rewarding, especially when individuals perceive that they have just the right amount of time for leisure activities (Iso-Ahola and Weissinger, 1990). Thus, leisure boredom is a likely consequence of conflicting perceptions of having too much time available with too little to do (Hill and Perkins, 1985). In fact, Phillips (1993) pointed out that having an abundance of time is central in experiencing leisure boredom. Previous scholars summarized several situations in which adolescents may experience leisure boredom: leisure activities are unsatisfactory or insufficiently challenging, needs are not met by leisure experiences, and skills are lacking to participate in leisure activities (Iso-Ahola and Weissinger, 1987, 1990).

The danger of leisure boredom is that it may lead to various forms of addiction. For example, in Hong Kong, a positive relationship between leisure boredom and mobile phone addiction was found among teenagers and young adults aged

14–20 years (Leung, 2008). Another study, which focused on Happy Farm, an online game, discovered that eliminating emptiness was a possible reason for the addiction of college students to social network sites (SNS)-game (Zhou and Leung, 2012). Additionally, in their investigation of adolescents in Taiwan, Lin et al. (2009) found that leisure boredom increased the probability of Internet addiction. In today's hectic urban lifestyles, "idle time" is often fragmented, such as in long commutes and waiting in line for services. During these times, people may have a strong desire to alleviate boredom by engaging in entertaining and stimulating activities or experiencing the contentment provided by media (Leung, 2015). Because more and more people are now playing mobile social games to fill their brief idle times, it has become increasingly important to examine the relationship among leisure boredom, mobile social game use, and addiction. Therefore, the following hypotheses are proposed:

H_{2a}. The more leisure boredom that players of mobile social game experience, the more they will play mobile social games.

H_{2b}. Players who score high on leisure boredom will exhibit a higher tendency towards addiction to mobile social games.

2.5. Self-control

Traditionally, self-control is widely regarded as the capacity to produce a better, more optimal fit between the self and the world (Rothbaum et al., 1982). Tangney et al. (2004, p. 275) pointed out that self-control is "the ability to override or change one's inner responses, as well as to interrupt undesired behavioral tendencies and refrain from acting on them". Several studies stressed that self-control is a cognitive behavior used to tolerate short-term discomfort to achieve long-term goals (Myrseth and Fishbach, 2009). Individuals who resist immediate pleasure for future benefits are said to be self-controllers (McReynolds et al., 1983). The findings of previous empirical studies indicate that people with high dispositional self-control have better outcomes in various spheres, such as academic performance (Feldman et al., 1995), impulse control (Storey, 1999), and interpersonal relationships (Eisenberg et al., 1997).

It is widely acknowledged that the core criterion of addictive behavior is the loss of self-control. A study conducted in Korea found that students who were classified as addicts showed a weaker ability to control their emotions than average Internet users did (WO, 2003). In addition, impaired self-control was considered a significant risk factor for a broad range of addictive behaviors, including Internet addiction (Lee and Shin, 2004) and online game addiction (Kim et al., 2008).

In playing Candy Crush Sage, player can never be completely satisfied because of the limited number of lives. In the beginning, players are given five full lives. After the game starts, players will get an additional life every 30 min and a set of five lives 2.5 h. Players with a lower capacity for self-control may feel it is too long to wait, especially those who have finally figured out how to clear the latest level of the game. In order to satisfy their immediate need, they may purchase lives or beg Facebook friends for extra lives, and they may even cheat by manually changing the time on their mobile devices to gain unlimited free lives. Undoubtedly, these behaviors will lead to the excessive use of this mobile social game. However, self-controllers who have the ability to suppress immediately gratifying impulses and delay gratification (Baumeister and Vohs, 2003) may stop playing after five losses, thereby controlling the use of the game to a reasonable degree. Therefore, the following hypothesis is proposed:

H_{3a}. The more self-control that players have, the less they will play mobile social games.

H_{3b}. The more self-control that players have, the less likely they are to be addicted to mobile social games.

Considering the lack of research in this area and the increasing phenomenon of mobile social game addiction, this exploratory study uses the psychological predictors of gratifications-sought, loneliness, leisure boredom, and self-control to differentiate addicts and non-addicts and to investigate the factors that influence mobile social game use and addiction. Therefore, the following research questions are proposed:

RQ₁: To what extent are players addicted to mobile social games and what are their profiles in China?

RQ₂: How do demographics, gratification, loneliness, leisure boredom, self-control, and mobile social game addiction influence the use of mobile social games?

RQ₃: How do demographics, gratification, loneliness, leisure boredom, self-control, and mobile social game use predict mobile social game addiction?

3. Methodology

3.1. Sample and data collection

The data were gathered through an online survey using the snowball-sampling technique. The questionnaire was posted on the survey website (Sojump.com) from 16 March to 16 April 2014 after a pilot test was conducted with a group of 12 postgraduate

students. Invitation e-mails with a link to the survey were sent to members of Candy Crush Saga interest groups on Facebook in Hong Kong and in Douban, Mainland China, inviting them to participate in the survey. At the time of the study, there were 194,664 Candy Crush Saga fans on Facebook and 2194 fans in Douban interest groups. Of the 481 respondents, only 409 indicated that they had played Candy Crush Saga using a mobile device such as a smartphone or a tablet. Among the players, 83.1% were female and 16.9% were male. The predominant number of females was consistent with the infographic made by King.com, which documented that 69% of Candy Crush Saga players were women. Of the 409 respondents, 0.2% were younger than 15 years, 10.5% were 15–20 years, 67.2% were 21–25 years, 17.1% were 26–30 years, and only 4.9% were 31 years or older. Of the 409 respondents, 6.8% were under undergraduate level, 59.2% had obtained or were finishing their bachelor's degree, and 34% were holders of master's, doctoral, or postdoctoral degrees. Because students formed the largest occupation group, the responses were recoded as students or non-students at 61.6% and 38.4%, respectively. In terms of family income, the median was US\$1,614 to US\$3,228 a month. Overall, 13.9% earned less than US\$807 a month; 33.7% earned between US\$807 and US\$1,614; 28.9% earned between US\$1,614 and US\$3,228; 12% earned between US\$3,228 and US\$4,842; 4.9% earned between US\$4,842 and US\$6,456; and 6.6% earned more than US\$6,456 per month.

3.2. Measurements

3.2.1. Uses and gratifications

A focus group was conducted with 14 university students who were regular players of Candy Crush Saga in order to understand the kinds of gratification they sought from game playing in general and this mobile social game in particular. Considering that there were no established gratification items for mobile social games, the Motivation to Play in Online Games Questionnaire (MPOGQ), developed by Yee (2006), was partially adopted as a departure point, and the items were adapted to the context of mobile social games in order to measure the players' motives for playing. The findings from the focus group and the items from the MPOGQ were combined to construct the 17-item "gratifications sought" measure. During the integration, some questions were eliminated because they were found to express the same meanings with only slight differences in wording. Some questions were modified because they were ambiguous or irrelevant to the characteristics of mobile social games. The questionnaire then was translated into Chinese and a pilot test was conducted to verify the completeness, wording, and appropriateness of the survey instrument. The sample items included the following: I play mobile social games because (1) I can play anytime; (2) I can play anywhere; and (3) I can play when I am on the move. The respondents were asked to state how much they agreed with 17 gratification items using a five-point Likert scale from 1 = "strongly disagree" to 5 = "strongly agree."

An exploratory factor analysis was performed to determine the principal motivations for using mobile social games, with the aim of locating variable groupings of 17 kinds of gratification that were sought. A varimax rotation was used to minimize the number of items that had high loadings on a factor and to enhance the interpretation of the factors. After four cross-loaded items were eliminated, the analysis generated five factors with eigenvalues greater than 1.0, which explained 72.71% of the total variance (see Table 1).

"Mobility" was the first factor, reflecting that mobile social games can be played anytime anywhere. The Cronbach's alpha of this factor was high at .81, and the mean score was 3.25. "Entertainment" was the second factor (alpha = .70), which reflected the enjoyment gained from the playing of mobile social games; and the mean score was high at 3.71. The third factor, "sociability" (alpha = .92) was composed of two items that indicated mobile social games were used as a channel to maintain and reinforce established interpersonal relationships; the mean score was low at 2.75, which suggests that the blockage of Facebook in Mainland China might be a reason. "Achievement" was the fourth factor (alpha = .67), which characterized mobile social game use as a platform for enjoying the feeling of winning through ranking and scores. The mean score of this factor was also low at 2.95, suggesting that winning and competing in mobile social games may not be as gratifying as the other factors. The fifth factor, "relaxation" (alpha = .61), revealed the motivation that mobile social games were played for relaxation and fun; at 3.93, the mean score was the highest of all five factors.

3.2.2. Mobile social game addiction

With some modifications, Young's Internet Addiction Diagnostic Questionnaire was used to measure the degree of addiction to mobile social games. In addition, the unique characteristics of Candy Crush Saga were also considered and incorporated into the eight-item scale. The participants were given two choices ("yes = 1" and "no = 0") to respond to each statement. Using the classic definition, which is similar to the DSM-IV assessment of gambling addiction,² the respondents who answered "yes" to five or more statements were regarded as "addicts." The eight items included the following: (1) Do you feel preoccupied with Candy Crush Saga? (2) Do you feel the need to increase the amount of time you play Candy Crush Saga in order to achieve satisfaction? (3) Have you repeatedly made unsuccessful efforts to control, cut back, or stop playing Candy Crush Saga? (4) Do you feel restless, moody, depressed, or irritable when you attempt to cut down or stop using Candy Crush Saga? (5) Do you play Candy Crush Saga longer than you originally intended? (6) Have you jeopardized or risked the loss of a significant relationship, job, education, or career opportunity because of Candy Crush Saga? (7) Have you ever lied to family

² DSM-V has been published at the time of this research. However, considering the goal of this study was not to identify the symptoms and Young's Internet Addiction Diagnostic Questionnaire was adapted from DSM-IV from which this study was based, the mobile social game addiction measure largely relied on DSM-IV.

Table 1

Analysis of perceived gratifications of mobile social games use.

I play mobile social game	Mean	SD	Factors				
			1	2	3	4	5
<i>Mobility (factor mean = 3.25)</i>							
1. so I can play anytime	3.48	1.01	.93				
2. so I can play anywhere	3.59	.97	.92				
3. so I can play when I am on the move	2.68	1.11	.68				
<i>Entertainment (factor mean = 3.71)</i>							
4. To enjoy the design of each level	3.71	.78		.86			
5. To enjoy the game's interface	3.92	.77		.74			
6. To enjoy the seemingly endless game	3.50	.96		.73			
<i>Sociability (factor mean = 2.75)</i>							
7. To communicate with friends	2.81	.98			.91		
8. To have a closer relationship with friends	2.69	.96			.90		
<i>Achievement (factor mean = 2.95)</i>							
9. To enjoy the feeling of winning	3.19	1.11				.86	
10. To compete with friends	2.69	1.07				.76	
11. To challenge (or train) my gaming skills	2.97	1.00				.53	
<i>Relaxation (factor mean = 3.93)</i>							
12. To kill time	3.97	.84					.86
13. To relax from gaming	3.90	.78					.80
Eigenvalues			3.15	2.24	1.78	1.25	1.03
Variance explained (%)			17.39	15.24	15.11	13.82	11.16
Cronbach's alpha			.81	.70	.92	.67	.61

Notes: Scale used: 1 = strongly disagree and 5 = strongly agree. Total variance: 72.71%, $N = 409$.

members, a therapist, or others to conceal the extent of your involvement with Candy Crush Saga? (8) Do you use Candy Crush Saga as a way of escaping from problems or relieving a distressed mood (e.g., feelings of helplessness, guilt, anxiety, and depression)? The eight dichotomized items were combined to create an index ranging from "0" to "8," which indicated the degree of addiction to Candy Crush Saga. The reliability alpha was .67.

3.2.3. Loneliness

The 20-item UCLA Loneliness Scale (Version 3; Russell, 1996) was adopted to assess the respondents' subjective feelings of loneliness. Participants were asked to rate their responses on a four-point Likert scale from 1 = "I never feel this way" to 4 = "I often feel this way." The sample items included the following: "How often do you feel alone?" "How often do you feel that you are in tune with the people around you?" and "How often do you feel that you are no longer close to anyone?" After deleting two items, the 18-item scale produced a higher reliability alpha of .92.

3.2.4. Leisure boredom

The Leisure Boredom Scale (LBS) (Iso-Ahola and Weissinger, 1990) was used to examine "individual differences in perceptions of boredom in leisure" (Iso-Ahola and Weissinger, 1990, p. 264). The LBS consisted of 16 items that related to the quality of leisure experiences. A five-point Likert scale from 1 = "strongly disagree" to 5 = "strongly agree" was used. The sample items were as follows: "In my leisure time, I usually don't like what I'm doing, but I don't know what else to do"; "Leisure time gets me aroused and going" (reverse coded); and "Leisure experiences are an important part of my quality of life (reverse coded)." The reliability alpha was high at .82.

3.2.5. Self-control

The present study used the Brief Self-control Scale (BSCS) developed by Tangney et al. (2004), which was designed to reflect the ability of a person to control him- or herself. Thirteen items in the scale were used: habit breaking (e.g., "I have a hard time breaking bad habits" (reverse coded)); temptation resistance (e.g., "I refuse things that are bad for me"); and self-discipline (e.g., "People would say that I have iron self-discipline"). The responses were indicated on a five-point Likert scale from 1 = "Not at all like me" to 5 = "very much like me." This 13-item BSCS scale had a reliability alpha of .82. The reliability and construct validity of the BSCS were verified in past research (Carver et al., 2010).

3.2.6. Mobile social game usage patterns

The respondents were asked seven questions about the patterns of their mobile social game use: (1) Through which platform do you most often play Candy Crush Saga (e.g., mobile phone or tablet)? (2) How frequently do you play Candy Crush Saga on an average day (e.g., less than twice; 2–3 times; 4–5 times; 6–7 times; more than 8 times)? (3) How much time (in minutes) on average do you spend on Candy Crush Saga in each session (e.g., less than 15 min; 15–30 min; 31–45 min; 46–60 min; more than 60 min)? (4) Where do you usually play Candy Crash Saga (e.g., bedroom, public

transportation, restroom, classroom, work places, or libraries)? (5) Have you ever sent or received lives to/from your friends (yes or no)? (6) Have you ever helped friends to unlock requests (yes or no)? (7) Have you ever helped friends by sending extra moves (yes or no)? The level of mobile social game use ($M = 2.45$, $SD = .98$) was assessed by combining the two measures of use intensity, which consisted of the number of times the game was played per day and the length of play in each session.

3.2.7. Demographics

The demographic variables were measured as controls: gender (female = 0), age, occupation, educational background, and family income.

4. Results

4.1. Usage profile

The results showed that 80.4% and 19.6% of the 409 respondents played Candy Crush Saga on their mobile phone and tablet, respectively. Because of the portability of mobile devices, mobile social games can be played almost anywhere. The results showed that bedrooms and public transportation were the main playing sites at 77.8% and 70.9%, respectively. The other popular playing locations were restrooms (46%), classrooms (32.8%), work places (21.5%), and libraries (16.4%). Regarding the intensity of use, most respondents played three to four times per day ($M = 2.74$, $SD = 1.43$) and spent 30–45 min in each session ($M = 2.17$, $SD = 1.01$). The responses to interactivity showed that 47.9% had helped friends to unlock requests; 36.7% responded that they had sent or received lives from friends, and only 23.2% had sent extra moves to others. However, the “social” character of Candy Crush Saga was evident despite the fact that at the time of this study, Facebook was blocked in China. First, some domestic players reported that they had used a private virtual network (VPN) to connect to Facebook. Hence, those individuals could still interact with their friends even though they were in Mainland China. Second, in August 2014, King announced that a localized version of Candy Crush Saga was available via Tencent’s social platform in China, which meant that users in Mainland China could play with their WeChat or QQ friends. Hence, the users of Candy Crush Saga attach great importance to the game’s social attributes.

4.2. Hypotheses testing

According to the results generated from the bivariate correlation shown in Table 2, loneliness was not related to mobile social game use ($r = .05$, $p > .05$), but it was significantly and positively related to addiction ($r = .23$, $p < .001$). The regression analysis shown in Table 3 confirmed these results. Thus, H_{1a} was rejected, and H_{1b} was supported. These findings suggest that the lonelier the players were, the higher the likelihood they would be addicted to mobile social games.

Similarly, positive correlations were found between leisure boredom and mobile social game use ($r = .12$, $p < .05$) as well as addiction ($r = .15$, $p < .01$). However, the regression results shown in Table 3 indicate that leisure boredom significantly predicted mobile social game use but did not significantly predict social mobile game addiction. Therefore, H_{2a} was supported, and H_{2b} was supported only at the bivariate level. The results in Table 2 also showed that self-control had a negative but significant relationship with mobile social game addiction ($r = -.19$, $p < .001$), but there was no significant relationship between self-control and mobile social game use ($r = -.09$, $p > .05$). As indicated in Table 3, the regression analysis found similar results, which suggests that the more self-control the players exhibited, the less likely they would be addicted to a mobile social game. Thus, H_{3a} was rejected, but H_{3b} was strongly supported.

4.3. Profiles of mobile social game addicts

Young’s classic definition of Internet addiction was adopted to assess the extent to which the respondents were addicted to the mobile social game, Candy Crush Saga. The respondents were considered “addicts” if they answered yes to five (or more) “of the eight yes-or-no questions. Based on this definition, 7.3% of respondents ($M = .07$, $SD = .26$) were classified as mobile social game addicts at the time of this study.

To distinguish mobile phone addicts and non-addicts, a canonical discriminant analysis procedure was conducted using the predictors of demographics (gender and occupation),³ perceived gratifications, loneliness, leisure boredom, self-control, and use intensity. As shown in Table 4, the results of the analysis were significant ($p < .05$, Wilk’s Lambda = .95). Specifically, the players addicted to the mobile social game were distinguished by loneliness, leisure boredom, mobility, and use intensity. This finding implies that mobile social game addicts are characterized by loneliness and leisure boredom. Moreover, the addicts tended to be motivated by the mobile nature of the game, which allowed them to spend much more time playing it in several locations. As expected, the addicts tended to play mobile social games at a much higher level of intensity.

³ Only gender and occupation were included in demographics because the players were primarily students and the prior literature suggested that males were most vulnerable to game addiction (Phillips et al., 1995).

Table 2

Inter-correlations among key variables.

		2	3	4	5	6	7	8	9	10
1.	Mobile social game use	.25***	.19***	.13**	-.03	.13*	-.05	.05	.12*	-.09
2.	Mobile social game addiction		.12*	.06	.04	.11*	-.06	.23***	.15**	-.19***
3.	Mobility			.14**	.11*	.09	.25***	.04	.05	-.14**
4.	Entertainment				.11*	.16**	.13**	-.06	-.13*	.12*
5.	Sociability					.48***	.10	-.08	-.06	.03
6.	Achievement						.09	.01	-.09	.10*
7.	Relaxation							-.03	.01	.04
8.	Loneliness								.50***	-.32***
9.	Leisure boredom									-.26***
10.	Self-control									

N = 409.

* $p \leq .05$.** $p \leq .01$.*** $p \leq .001$.**Table 3**

Regression analysis of demographics, gratifications, loneliness, leisure boredom, self-control, and mobile social game use or addiction as predictors of mobile social game use and mobile social game addiction.

Predictors	Mobile social game use	Mobile social game addiction
	β	β
<i>Demographics</i>		
Gender (female = 0)	-.14**	-.04
Occupation (student = 1)	-.07	.14**
<i>Gratifications</i>		
Mobility	.15***	.06
Entertainment	.10*	.06
Sociability	-.07	.04
Achievement	.13**	.09
Relaxation	-.06	-.05
<i>Psychological factors</i>		
Loneliness	-.08	.18***
Leisure Boredom	.15**	.02
Self-control	-.02	-.11*
<i>Mobile social game use</i>	-	.20***
<i>Mobile social game addiction</i>	.20***	-
R^2	.16	.16
Adjusted R^2	.14	.14
F	7.00***	6.90***

N = 409.

* $p \leq .05$.** $p \leq .01$.*** $p \leq .001$.

4.4. Predicting mobile social game use

A regression analysis was performed to assess how demographics (gender and occupation), gratification, loneliness, leisure boredom, self-control, and mobile social game addiction were linked to the level of mobile social game usage. The results reported in Table 3 showed that the use of mobile social games was significantly predicted by the gratifications of mobility ($\beta = .15$, $p < .001$), achievement ($\beta = .13$, $p < .01$), and entertainment ($\beta = .10$, $p < .05$). Additionally, gender ($\beta = -.14$, $p < .01$), leisure boredom ($\beta = .15$, $p < .01$), and mobile social game addiction ($\beta = .20$, $p < .001$) were found to be significantly related to the level of mobile social game use. These findings indicate that mobile social game addicts are more likely to spend much more time playing Candy Crush Saga. The psychological variables showed that the respondents who were bored in leisure activities tended to be frequent users. The more they played, the more they were motivated to enjoy the feelings of winning and enjoyment in playing the game. From the perspective of demographics, being female seemed to indicate the highest propensity for excessive playing.

In summary, the amount of variance was 14%. Mobile social game addiction and mobility were the most influential predictors, followed by leisure boredom, mobility, gender, achievement, and entertainment.

Table 4

Discriminant analysis of mobile social game addiction according to demographics, gratifications, loneliness, leisure boredom, self-control, and usage intensity of mobile social games as predictors.^a

Predictor	Structure coefficients ^b
<i>Demographics</i>	
Gender (female = 0)	-.12
Occupation (student = 1)	.21
<i>Gratifications</i>	
Mobility	.38***
Entertainment	.10
Sociability	.06
Achievement	.21
Relaxation	-.29
<i>Psychological factors</i>	
Loneliness	.72***
Leisure boredom	.47***
Self-control	-.06
<i>Use intensity^c</i>	
	.35***
Eigenvalue	.05
Canonical correlation	.22
Wilk's Lambda	.95
Significance	.04
<i>Group centroids</i>	
Addicts	.81
Non-addicts	-.06

N = 409.

*** $p \leq .001$.

^a Mobile social game addicts were coded "1" and non-addicts were code "0."

^b The structure coefficients reported are analogous to loadings in factor analysis and represent the correlations of a variable with the function. [Pehadzur \(1982\)](#) notes that the square of the loadings indicate the squared variance between the measure and the function and suggests that values of .30 and above be treated as meaningful.

^c Use intensity of mobile social game was the combined measure of frequency of playing mobile social game every day and the length of playing time in each session.

4.5. Predicting mobile social game addiction

A regression analysis was conducted to examine the relationships between mobile social game addiction and demographics (gender and occupation), perceived gratifications, loneliness, leisure boredom, self-control, and level of mobile social game use. The results reported in [Table 3](#) indicate that loneliness ($\beta = .18, p < .001$) and self-control ($\beta = -.11, p < .05$) were significant predictors of mobile social game addiction. Thus, the players who were the most vulnerable or the most likely to become addicted to mobile social games were generally those who scored high in loneliness and had low self-control. In addition to psychological factors, use intensity ($\beta = .20, p < .001$) and occupation ($\beta = .14, p < .01$) were significantly linked to mobile social game addiction, which implies that frequent users are more likely to become addicted and that students tend to exhibit higher tendencies towards becoming addicted to mobile social games. The amount of variance was 14%.

5. Discussion and conclusion

This study focused on the relation of the psychological variables of perceived gratification, loneliness, leisure boredom, and self-control were related to mobile social game use and addiction. First, it is interesting to note that loneliness was significantly linked to mobile social game addiction but was unrelated to the level of mobile social game use. This may be because the results were based on cross-sectional data. It was unclear whether loneliness was the antecedent or the consequence of excessive mobile social game use. There are two opposing scenarios: (1) excessive mobile social game use causes loneliness; (2) lonely individuals are more likely to use mobile social games excessively ([Morahan-Martin and Schumacher, 2003](#)). On one hand, loneliness may lead to increased mobile social game use and game-related problems. On the other hand, it also could be that the excessive use of mobile social games causes loneliness. Furthermore, the large amount of time spent online isolates individuals from the real world and deprives players of the sense of belonging and connection with people in the real world. This viewpoint was supported by a longitudinal study (the HomeNet project), which found that increased Internet use led to increased levels of loneliness but that pre-existing loneliness did not predict increased Internet use

(Kraut et al., 1998). The authors attributed the increase in loneliness to decreases in real-life social interactions. According to Morahan-Martin and Schumacher (2003), the relationship between loneliness and Internet use may be a bi-directional causal effect in which loneliness engendered Internet use and Internet use engendered loneliness. We believe that this vicious circle may also be evident in the results of the present study of excessive mobile social game use: lonely individuals use mobile social games to fill the social voids and emptiness in their lives, but their online time creates voids in their offline social life. However, this dual effect requires further research.

A major aim of this study was to identify the underlying gratifications sought by the players of mobile social games. The exploratory factor analysis successfully yielded five clearly identified factors: mobility, entertainment, sociability, achievement, and relaxation. This finding suggests that mobile social game players are largely motivated by their ability to play the game anytime and anywhere, have fun, socialize with friends through Facebook, enjoy the feeling of winning, and relax or kill time. By linking these gratifications to the intensity of game playing, previous game studies consistently found that “sociability” and “relaxation” were strong motives for game playing (Billieux et al., 2013; Hou, 2011; Z and Author, 2012). However, the results of the present study did not show that these two motivations were significant. One explanation may be that unlike social games that require few mental resources to complete the gaming tasks (Sherry et al., 2006), Candy Crush Saga requires players to reach certain levels of cognitive skill and eye-hand coordination, and the players have to use strategies to move the candies. At other times, players may be under time pressure to accomplish difficult tasks; therefore, instead of relaxation, players may experience moments of anxiety. Regarding sociability, players often compete with Facebook friends for scores and ranks, but they never play with or against another person. Their real rivals are the disordered candies—in other words, the algorithms (Walsh, 2014) that decide the number, color, sequence, and arrangement of the objects used in the game. Mandryk et al. (2006) found that playing against another person or other people led to a greater sense of fun and higher arousal than playing against a computer. Even though Candy Crush Saga emphasizes the social interactions (e.g., send lives, unlock requests, etc.) between Facebook friends, during the course of the game players can neither compete against nor cooperate with other players. Furthermore, because Facebook was blocked in China during the time of the study, only those with access to the virtual public network (VPN) could play mobile social games. Thus, this restriction may have decreased the amounts of interactivity and immersion in Candy Crush Saga. These also might be the reasons that both sociability and relaxation were not significant predictors.

According to DSM-IV’s classic definition of addiction, the present study found that 7.3% of the respondents were addicted to mobile social games. Given that there are 215 million mobile online game users in Mainland China (CNNIC, 2014), 7.3% does not represent a small number of addicts. This percentage could be extrapolated to millions of addicts of Candy Crush Saga, which would be comparable to the 15 million online game addicts reported in Western counties (WSJ, 2013). In terms of perceived gratifications, mobility was a unique dimension that differentiated mobile social games from console games and PC games. Engl and Nacke (2013) pointed out that an “on-the-go” context was typical of mobile game playing, such as waiting for or taking public transportation. The fact that mobile social games can be used ubiquitously could be a primary cause of excessive playing.

With regard to the psychological variables, loneliness and self-control were found to be significant predictors of mobile social game addiction. In our sample, the majority of the respondents belonged to the net-generation (aged 16–29 years). Caused by over-immersion in the technological world, social isolation may be a severe issue facing this generation. The lack of face-to-face social activities may lead to less intimacy in social relationships, especially in busy urban life. Nevertheless, mobile social games may provide an appropriate social platform for lonely individuals to ease the unpleasant feelings caused by social isolation. Through sending lives and helping friends to unlock requests, lonely people may feel closer to those who share the same interests (Morahan-Martin and Schumacher, 2000), thus lessening the degree of loneliness. As expected, this study also found that the more self-control the players had, the less likely they were to become addicted to mobile social games. This finding is consistent with previous studies (Baumeister, 2003; Kim et al., 2008; WO, 2003), suggesting that increased self-control could help keep the use of the game to a reasonable degree, thereby reducing the potential for addiction.

Finally, in terms of predicting the level of mobile social game use, which consists of the frequency of playing per day and the length of playing in each session, the results showed that mobile social game addiction was the most significant predictor. It seems logical that frequent players are more likely to become mobile social game addicts. Society should be aware of the threats that mobile social game playing pose to players. Research on vulnerable groups has shown that children and adolescents are more susceptible to the influence of the media than others are (Gentile and Stone, 2005). Therefore, parents should pay close attention to their children, and teachers should monitor their students. Our findings revealed that people who were lonely and lacked self-control were much more at risk to become victims of mobile social game addiction. Therefore, teachers should arrange engaging interactive activities to encourage participation of students who are bored in their leisure time. For players who lack self-control, stricter rules and regulations may be effective in preventing them from over-indulging. In addition, policy makers should develop appropriate psycho-educational materials to provide guidance in preventing the pathological use of mobile social games.

5.1. Limitations and suggestions for future research

This study has several limitations. First, the non-probability sample consisted mainly of Douban and Facebook users, which reduced the generalizability of the findings. Further studies that use random sampling in other contexts and settings

could validate the measures and findings in this study. Second, it is noteworthy that the percentage of Chinese female mobile game players has increased to 42% in 2014, according to a study by Tencent (2014). These newly emerging players may have different motivations and gaming habits compared to their male counterpart. Therefore, future game study is encouraged to focus on female players. Third, no existing formalized and tested gratification items of mobile social games were available for use in this study. The results indicated that some items used in the questionnaire might not reflect the same motives if they were tested in other countries. Thus, future studies should pay close attention to the context when transplanting measures from other cultures. Fourth, it is important to emphasize that the cross-sectional study described in this paper did not address causality. Thus, longitudinal studies, quasi-experimental designs, and qualitative studies are required to research this factor. Finally, the regression analysis performed in this study revealed that the severity of mobile social game addiction could be predicted by loneliness, self-control, and use intensity. However, only 12% of the variance was explained. Therefore, further research is needed to identify other factors that contribute to mobile social game addiction.

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