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

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ABSTRACT

The purpose of this study was to explore how individual psychological factors (including perceived gratifications, loneliness, leisure boredom, and self-control) were related to mobile social game use and addiction. Data were gathered from 419 respondents in China. Exploratory factor analysis yielded a five-factor gratifications structure (Achievement, Sociability, Entertainment, Relaxation, and Mobility) based on 13 motives obtained from mobile social game playing. In light of the nature of Candy Crush generally being played in mobile devices, sociability, entertainment, and mobility were the unique gratifications. Using Young's (1998) classic definition, 7.2% in the study sample were considered as addicts. They were characterized as being lonely, leisurely bored, and motivated by the mobile nature of games. It was interesting to note that addicts seldom thought they played mobile social game to kill time or relaxation, but instead, it was because they were lonely and leisurely bored. 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 while leisure boredom was linked to intensity of game use. Limitations and implications for future studies were discussed.

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INTRODUCTION

Game, an ancient behavior, has changed its modality from offline to online, from computer to mobile devices. According to an annual report published by China Internet Network Information Center (CNNIC, 2014), by the end of 2013, Chinese mobile online game users had drastically increased by 75.94 million, reaching 215 million. While the number of Internet game user grew relatively slowly, only from 335 million to 338 million in last two years. Such data indicate that mobile phone has the potential to surpass computer to become the preferred game-playing platform in the future. Classical mobile games, such as Fruit Ninja, Angry Birds, Where's My Water, Temple Run, and Cut the Rope, have witnessed this shift.

Led by the dramatic rise of social networking sites (SNSs), mobile social game is changing the game business landscapes in recent years. The core of mobile social game is "social gaming", which is considered a tactic, not a category of games by many game designers. Yamakami (2011) pointed out that it was not uncommon for game companies to use sociability to generate revenues. As a game played on mobile devices (including mobile phones and tablets), mobile social game can be characterized as being mobile, easy to use, less time to be spent on each round, and being able to facilitate social interaction. It seems that mobility, simplicity, and interactivity are distinctive characteristics differentiating mobile social games from console games and PC games.

Candy Crush Saga, launched by a British company King.com in 2012, is one of the most appealing and lucrative mobile social games in the world. It was awarded the title of "Best Social Game" by The 9th International Mobile Gaming Awards (IMGA), the world's largest competition for mobile games (IMGA, 2013). Think Gaming (2014), a gaming analytics company, estimated that candy crush took in US$902,191 per day. By comparison, Angry Birds only took in an estimated US$6,381 daily.

Candy Crush Saga is a typical "match-three" puzzle game. Players can mix and match sweets in a combination of three or more to gain points and other bonuses. After connected to Facebook account, players can find their friends' and their own level progress via a visualized map and reward or help their friends through unlocking requests, sending extra moves and lives. With guaranteed mobility and portability, it is a game that could be played at almost any time and any place. Immersed in Candy Crush Saga, while commuting, is frequently seen on public transits today.

However, the popularity and prevalence of Candy Crush Saga also triggered many problems. Players of Candy Crush Saga reported that they had left their children stranded at school, abandoned housework and even injured themselves as they tried to reach new levels (TIME, 2013). These facts demonstrate that Candy Crush Saga is easy to be addictive. Moreover, past research have found that high frequency game playing may negatively influence players' health and behaviors, such as poor academic performance, cognitive distortion (Li & Wang, 2013), low quality of interpersonal relationships, social anxiety (Lo,

Wang, & Fang, 2005), stress and sleep disturbances (Sara, Annika, & Mats, 2011), and risky behaviors taken (O'Connor et al., 2013).

As previous scholars have consistently reported that psychological factors were related to addictive behaviors, this exploratory study also attempts to identify psychological predictors of mobile social game addiction with a focus on gratifications, loneliness, leisure boredom and self-control. Based on the case of Candy Crush Saga, the purpose of this study is to deepen our understanding of the "at-risk" population and provide basic information to develop a preventive program for addicts.

LITERATURE REVIEW

Uses and Gratifications (U&G)

Ruggiero (2000) pointed out that U&G provided a theoretical approach for gaining insight of new communication technology, such as cable television (Palmgreen & Rayburn, 1979), television remote control devices (Walker & Bellamy, 1991), VCR (Lin, 1993), bulletin board (James, Wotring, & Forrest, 1995), computer and video games (Funk & Buchman, 1996), and home computer use (Perse & Dunn, 1998), etc.

In 1950s, social and psychological factors, which were assumed to be the predictors of different media consumption, started to be investigated (Wimmer & Dominick, 1994). Mendelsohn (1964), for example, found several psychological functions of radio listening, including companionship, changing mood, and counteracting loneliness or boredom. In addition, in a television usage study, Schramm, Lyle, and Parker (1961) pointed out that

social factors such as relationships with parents and peers would affect television usage among children. These studies and others conducted during this period reflected a change from the "traditional effects model" to a more "functionalist perspective" of mass media research (Ruggiero, 2000, p. 6).

In 1970s, the theoretical definition of U&G was proposed by Katz, Blumler, and Gurevitch (1974), who defined the perspective as "(1) the social and psychological origins of (2) needs, which generate (3) expectations of (4) the mass media and other sources, which lead to (5) differential patterns of media exposure (or engagement in other activities), resulting in (6) need gratifications and (7) other consequences, perhaps mostly unintended ones" (p. 20). Subsequently, scholars such as Palmgreen, Wenner, and Rayburn (1980) synthesized previous literatures and developed the Gratifications Sought and Obtained (GS-GO) approach, as a way of applying the expectancy-value theory to media gratifications.

Given these theoretical and conceptual adjustments, contemporary U&G is grounded in the following 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" (Rubin, 1994, p.420)

With the rapid diffusion of games, scholars have been busy applying those assumptions to examine a variety of games, including console game, video game, massively multiplayer

online role-playing game (MMORPG), social network site game (SNS-game), and social games. Past studies derived from the U&G perspective pointed out that social and psychological factor may drive people to game playing. For instance, companionship, escapism, tension-reduction, challenge, enjoyment, social interaction, time killing, arousal, social rewards, and competition were unique gratifications associated with game playing. Different from previous generation of games, mobile social game has some particular characteristics, for example, mobility, simplicity and interactivity. Therefore, one goal of this study is to explore a wide range of motivations in mobile social game playing that user can identify as unique. As a result, the following research question is proposed:

RQ$_1$: What kind of gratifications do players associate with mobile social game playing?

Internet and mobile social game addiction

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

Internet, undoubtedly, is considered as one of the most addictive technologies since the twentieth century. Much of the literature found that when individuals immersed in the virtual world, certain pathways in their head were performing in much the same way as a drug addict's brain. Young (1996) claimed that addictive Internet use is "an impulse control disorder that does not involve an intoxicant" (p. 238) and is similar to pathological gambling. Adapted from the criteria for pathological gambling in the Diagnostic and Statistical Manual of Mental Disorders– Fourth Edition (DSM-IV; American Psychiatric Association, 1994), Young (1996) developed a brief questionnaire which contained eight yes or no items to diagnose addicted Internet users. They are (1) preoccupation with games; (2) tolerance (the need to spend an increasing amount of time playing games); (3) unsuccessful attempts to control or limit game participation; (4) psychological withdrawal symptoms; (5) staying longer than originally intended; (6) has jeopardized or lost a relationship, job, or educational opportunity; (7) deceiving family members and/or therapists; (8) use of Internet games to escape a negative mood.

However, addictive use of the Internet was not identified as a problematic behavior at that time (Young, 1996). After a long debate and discussion, a behavior conducted on the Internet was considered a type of disorder edited in DSM-V. The latest report pointed out that Internet game playing triggered a neurological response linked to pleasant feelings, and the extreme outcome was addictive behavior (American Psychiatric Association, 2013). The criteria for assessing Internet Gaming Disorder were similar to the questionnaire developed

by Young (1996), but two statements was added in the DSM-V, namely "loss of interest in previous hobbies" and "continued use despite knowledge of problem" (APA, 2013).

Today, due to the freedom of mobility and high-speed mobile data services, mobile social game is gaining its popularity overnight. Individuals, especially young people, are becoming more and more dependent or "addicted" to mobile social games. For them, game playing was not only for killing times, but also a tool for improving interpersonal relationship and lessening the degree of anxiety. In terms of Candy Crush Saga, Wall Street Journal (2013) pointed out that nearly 15 million people were addicted to this game and 69% of them were females. These data not only changed the concept that game was only for males (Billieux et al, 2013), but it also demonstrated the addictive tendency of Candy Crush Saga players. Particularly, some individuals had manually changed the time on their phones to skip the waiting time between games, and a number of players had tried to delete Candy Crush Sage to cut back the playing time but re-installed it afterwards. It was even more common that some Candy Crush fans would repeatedly play a fixed level for several months just for passing it. Therefore, the main goal of this study is to investigate the existence of mobile social game addiction.

Loneliness

Loneliness is a distressing problem that nearly everyone has experienced. Psychological theorists defined loneliness as a "relational deficit" (Saklofske, Yackulic, & Kelly, 1986), whereby "a person's network of social relationships is smaller or less satisfying than the

person desires" (Peplau & Perlman, 1979, p. 101). In light of previous studies, the UCLA

Loneliness Scale (Russell, Peplau, & Ferguson, 1978; Russell, Peplau, & Cutrona, 1980;

Russell, 1996) was established as a standard to assess the degree of loneliness.

Based on several studies, people who describe themselves as lonely were inhibited

socially (Horowitz & French, 1979), unwilling to disclose (Berg & Peplau, 1982) and

sensitive to rejection (Russell, Peplau, & Cutrona, 1980). Moreover, loneliness has been

associated with a variety of social and individual problems, including suicide (Jacobs, 1971),

alcoholism (Nerviano & Gross, 1976), and overall levels of happiness and satisfaction

(Franklin, 2010).

Although loneliness has many detrimental effects, past studies showed that changing in

social networks may alleviate the degree of loneliness. McKenna, Greene and Gleason (2002)

found that lonely individuals were more likely to express themselves on the Internet.

Similarly, Lo et al. (2005) pointed out that the Internet had several features, including

anonymity, interactivity, and no boundaries, that made online social interaction easier than

real-life communication. From this perspective, Internet has become a compensation of social

interaction disability for lonely people (Visser, Antheunis, & Schouten, 2013), and most of

them are investing increasingly more time on it, which lead to Internet-related problems, such

as addiction.

Mobile social game provides a mediated communication environment, which allowing

non-face-to-face interaction and lowering social risk of being embarrassed or disappointed

(Leung, 2002). In fact, Candy Crush Saga itself encourages users to interact with their

Facebook friends. Without the help, users cannot unlock the next level immediately unless purchasing game props or waiting for a long time. For lonely players, who have difficulties in maintaining stable friendships and unwilling to self-disclose, Candy Crush Saga "forces" them to connect and react, which may lessen the extent of loneliness and increase the playing time afterwards. Therefore, the present study proposes that:

H_{1a}: The lonelier the mobile social game players are, the more they will play mobile social game.

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

Leisure boredom

Boredom is a negative mood or state in which individuals lack interest and is unable to concentrate (Fisher, 1993). When disposing with leisure activities, if the time is not optimally spent, people may experience leisure boredom, which was defined as "the subjective perception that available leisure experiences are not sufficient to instrumentally satisfy needs for optimal arousal" (Iso-Ahola & Weissinger, 1990, p. 4).

"Optimal arousal" is the key concept of leisure boredom, which theoretically means "too much or too little stimulations are psychologically detrimental" (Berlyne, 1960). Phillips (1993) pointed out that having an abundance of time is central to boredom. Moreover, previous scholars have summarized several situations when adolescents may experience leisure boredom, such as leisure engagements are less than satisfactory, needs are not met by

their leisure experiences, skills are lacking to participate in leisure, and leisure activities are insufficiently challenging (Iso-Ahola & Weissinger, 1990).

A danger with boredom is that it may lead to different forms of addiction. For example, a positive relationship between leisure boredom and mobile phone addiction was found among teenagers and young adults aged 14-20 in Hong Kong (Leung, 2008). Beside, a study focus on Happy Farm discovered that eliminating emptiness is a possible reason for college student's SNS-game addiction (Zhou & Leung, 2013).

Due to lifestyle change, people nowadays have a large amount of fragmented time but with little to do. It cannot be denied that mobile social game has displaced other forms of social activities to become the most inexpensive and stylish way to consume leisure times. Although mobile social game is an emerging entertainment activity, the relationship between leisure boredom and mobile social game use should not be overlooked. Thus, the following hypotheses are proposed:

H_{2a}: The more boredom the mobile social game players experienced, the more they will play mobile social game.

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

Self-control

Traditionally, self-control was defined as a capacity to change the self to fulfill the optimal fit between self and the world (Rothblum et al., 1982). More recently, scholars have

changed the concept to a micro level. Tangney, Baumeister, and Boone (2004) 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 form acting on them" (p.275).

Much of the studies stressed that self-control is a cognitive behavior in tolerating short-term discomfort to achieve long-term goals (Loewenstein, 1996; Myrseth & Fishbach, 2009). Individuals who resist immediate pleasures for greater benefits in the future are said to be self-controllers (McReynolds, Green, & Fisher, 1983). Besides, Tangney, Baumeister, and Boone (2004) argued that the capacity for self-control varies from person to person; therefore, Self-control Scale (SCS) and its brief version Brief Self-control Scale (BSCS) was developed to measure individual differences in self-control. The reliability and construct validity of the BSCS have been verified by several scholars (Carver, Sinclair, & Johnson, 2010; Gailliot, Schemeichel, & Baumeister, 2006; Schmeichel & Zell, 2007).

It is a widespread acknowledgement that the core criterion of addictive behavior is the loss of self-control. A quantitative study conducted in Korea found that students who were classifies as addicts showed a weaker ability to control their emotions than average Internet users (WO, 2003). In addiction, Kim et al. (2008) point out several psychological characteristics such as self-control may predict online game addiction. All these results indicated impaired self-control is a significant risk factor for a broad range of addictive behaviours. Therefore, the following hypothesis is proposed:

H_3: The more self-control the players have, the less likely they will be addicted to mobile social game.

Considering the lack of similar research in this area and the increasing phenomenon of mobile social game addiction, this exploratory study seeks predictors such as loneliness, leisure boredom, and self-control to differentiate the addicts and non-addicts. Therefore, the following research questions are proposed:

RQ_2: To what extent are players addicted to mobile social game and what are their profiles?

RQ_3: How can gratifications, loneliness, leisure boredom, self-control, and demographics influence the use of mobile social game?

RQ_4: How can gratifications, loneliness, leisure boredom, self-control, and demographics predict mobile social game addiction?

METHODOLOGY

Sample and Data Collection

Given time and budget were limited, non-probability sampling method was the main research methodology used in this study. The questionnaire was first piloted on a group of twelve postgraduate students. They are encouraged to comment on clarity, logical flow, and the average length of time required for finishing it. Later, the questionnaire was translated into Chinese and created on survey website Sojump.com to administer to Facebook and Douban users.

Among the 481 respondents gathered at Sojump.com from 18th March to 15th April, 2014, a sample of 419 was effective. The sample consisted of 82.8% females and 17.2%

males. The dominating number of females was consistent with the findings reported by King.com, the parent company of Candy Crush Saga. They announced in their official website that 69% of their players were females (King.com, 2013). Among the 419 respondents, 0.24 % people were younger than 15 years old, 10.7% in 15-20, 67.54% in 21-25, 16.71% in 26-30, and only 4.8% were 31 or older. Of all the respondents, 59.2% had obtained or finishing their bachelor degrees, and 33.7% were master, doctoral and postdoctoral degree holders. Because students formed the largest occupation group, answers were recoded into students and non-students with respective percentages of 61.8% and 38.2%. In terms of family income, the mean fell into the income bracket of 5,000-10,000 HK dollars a month, with 13.6% earning less than 5,000 HK dollars a month, 29.1% between 10,001-20,000 HK dollars, 11.9% between 20,001-30,000 HK dollars, 5.0% between 30,001-40,000 HK dollars, and 6.7 % more than 40,000 HK dollars a month.

In terms of mobile social game playing, 78.52% of the total 419 respondents played Candy Crush Saga on their mobile phone, followed by tablet (19.09%), and desktop or laptop (2.39%). Therefore, mobile devices were the main device to play Candy Crush Saga. Given the mobility of mobile devices, mobile social game can be played almost anywhere. In this study, it was found that bedroom and public transports were the major playing places, accounted for 78.04% and 70.41% respectively. The other popular playing locations were restroom (45.11%), classroom (32.22%), working place (21.72%), and library (16.23%).

As for the use intensity, most of the respondents played 3 to 4 times per day (M= 2.78, SD=1.34), and spent 30 to 45 minutes in each session (M= 2.27, SD=.97). Given Facebook is

blocked in Mainland China, social application of Candy Crush Saga was not significant in our sample. More specifically, 37.71% (N=158) responded that they had sent or received lives from friends. 48.93% (N=205) respondents have helped friends to unlock requests, and only 24.11% (N=101) have sent extra moves to others.

Measurement

Uses and Gratifications: A focus group was conducted among 14 university students who have played Candy Crush Saga to understand the gratifications that players seek from game playing and mobile social game itself. Besides, the Motivation to Play in Online Games Questionnaire (MPOGQ) developed by Yee (2006b) was adapted to measure players' motives to engage in mobile social game playing. Thus, the findings of the focus group study, as well as items from an established questionnaire were used to construct a gratification obtained questionnaire, which contained 17 items in five dimensions. They were Achievement (e.g. "to enjoy the feeling of winning"), Sociability (e.g. "to communicate with friends"), Entertainment (e.g. "to enjoy the game's interface"), Relaxation (e.g. "to kill time"), and Mobility (e.g. "I can play it anywhere and anytime"). This parts adopted a five-point Likert scale with 1= "strongly disagree" and 5= "strongly agree".

Mobile social game addiction: With some necessary modifications, Young's Internet Addiction Diagnostic Questionnaire was used to measure mobile social game addiction. In addition, the unique characteristics of Candy Crush were also considered and incorporated into the eight-item scale. Two choices ("Yes" and "no") were applied to assess each

statement, and respondents who answered five or more "yes" were regarded as "addicts". The

eight questions included (1) Do you feel preoccupied with Candy Crush? (2) Do you feel the

need to play Candy Crush with increasing amounts of time in order to achieve satisfaction? (3)

Have you repeatedly made unsuccessful efforts to control, cut back, or stop Candy Crush

playing? (4) Do you feel restless, moody, depressed, or irritable when attempting to cut down

or stop Candy Crush use? (5) Do you play longer than you originally intended? (6) Have you

jeopardized or risked the loss of a significant relationship, job, educational, or career

opportunity because of Candy Crush? (7) Have you ever lied to family members, a therapist,

or others to conceal the extent of your involvement with Candy Crush? and (8) Do you use

Candy Crush as a way of escaping from problems or of relieving a distressed mood (e.g.

feelings of helplessness, guilt, anxiety, depression)? The eight dichotomy items were

combined to create an index of addiction on Candy Crush Saga.

Loneliness: The UCLA Loneliness Scale (Version 3; Russell, 1996) was partially

adopted to assess respondents' subjective feelings of loneliness. Two items were deleted from

the 20-item to avoid irrelevancy. Participants were asked to rate on a four-point Likert scale

with 1="I never feel this way" to 4="I often feel this way". Sample items included "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?" etc.

Leisure boredom: The Leisure Boredom Scale (LBS: Iso-Ahola & Weissinger, 1990)

was used to examine "individual differences in perceptions of boredom in leisure" (Iso-Ahola

& Weissinger, 1991, p. 264). The LBS consisted of 16 items, which related to the quality of

leisure experiences. A 5-point Likert scale (1="strongly disagree" to 5="strongly agree") was used, and sample items contained "In my leisure, 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," and "Leisure experiences are an important part of my quality of life."

"*Self-control*: The Brief Self-control Scale (BSCS) developed by Tangney et al. (2004) was used in present study, which was designed to reflect the ability of a person to control him or herself. Thirteen items in the scale were used, which were related to habit breaking (e.g. "I have a hard time breaking bad habits"), 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"). Responses were indicated on a five-point Likert scale, ranging from 1="Not at all like me" to 5="very much like me".

Mobile social game usage pattern: Respondents were asked seven questions in terms of the mobile social game usage pattern: (1) Through which platform do you play Candy Crush Saga most often? (2) How frequently do you play Candy Crush Saga on an average day? (3) How much time (in minutes) on average do you spend on Candy Crush Saga in each session? (4) Where do you usually play Candy Crash Saga? (5) Have you ever sent or received lives to/from your friends? (6) Have you ever helped friends to unlock requests?, and (7) Have you ever helped friends by sending extra moves?

Demographics: Demographic variables were measured in this study as control variables, including gender (female=0), age, occupation, educational background, and family income.

FINDINGS

Hypotheses Testing

According to the results generated from the bivariate correlation in Table 1, loneliness was positively related to both mobile social game usage (r=.10, $p<.05$) and addiction (r=.22, $p<.001$), confirming both H_{1a} and H_{1b}. The lonelier the players are, the more they would play and get addicted to mobile social game.

In addition, similar positive correlation was found in leisure boredom and mobile social game usage (r=.17, $p<.001$) as well as addiction (r=.15, $p<.01$). Therefore, H_{2a} and H_{2b} were also supported.

Last but not least, self-control had a significantly negative relationship with mobile social game addiction (r=-.20, $p<.001$). It implied that the more self-control the players have, the less likely they would be addicted to mobile social game. As a result, H_3 received strong support.

(* Insert Table 1 about here *)

Gratifications of Mobile Social Game Usage

To determine the principal motivations for using mobile social game, an exploratory factor analysis procedure was performed with the aim of locating variable groupings of 17 motivation items. Varimax rotation was used to minimize the number of items that had high loadings on a factor and enhance the interpretation of the factors after eliminating four cross-loaded items. The analysis generated five factors with eigenvalues greater than 1.0 explaining 73.9% of total variance (see Table 2).

"Achievement" was the first factor (eigenvalue=1.80, 13.8% of variance), which characterizing mobile social game use as a platform to enjoy the feeling of winning through ranking and scores. The Cronbach' alpha was relatively low at 0.67, indicating that some applications of the mobile social game are not for this gratification while others are.

The second factor, "Sociability" (eigenvalue=1.97, 15.2% of variance), composed of two items indicating mobile social game was used as a channel to maintaining and reinforcing the established interpersonal relationship. Cronbach's alpha was high at 0.92, but the item mean scores were relatively low. Facebook blockage in Mainland China might be one of the reasons.

"Entertainment" was the third factor, reflecting the enjoyment gained from the design of mobile social game. This factor had an eigenvalue of 2.01 and explained 16.0% of the total variance. The reliability of these three items as indicated by Cronbach's alpha was high at 0.73 and the item mean scores were also high.

The fourth factor "Relaxation" revealed the motivation that mobile social game playing was entertaining and a good way to have fun. This factor had an eigenvalue of 1.56 and explained 12.0% of the total variance. The reliability of these five items as indicated by Cronbach's alpha was 0.69, but the item mean scores were the highest among all the five factors.

"Mobility" was the fifth factor (eigenvalue=2.2, 16.95% variance), reflecting that mobile social game can be played anywhere anytime. Cronbach's alpha of this factor was high at 0.80, and the item mean scores were also high.

In summary, "Sociability" and "Entertainment" were strong gratifications obtained from mobile social game use, which was consistent with studies of console game and PC game. In addition, this study found that "mobility" was a unique gratification only associated with mobile social game playing. Although the item mean scores for some of the factors were low to be considered a major motive for mobile social game use, the importance of these gratifications in relation to mobile social game use should not be overlooked.

(* Insert Table 2 about here *)

Profiles of Mobile Social Game Addicts

To assess the extent to which respondents were addicted to the mobile social game, Young's classic definition on Internet addiction was adopted. Respondents were considered as "addicts" when answering five (or more) "yes" to eight "yes" or "no" questions. Based on this measure, 7.2% respondents (M=1.7, SD=1.6) can be classified as mobile social game addicts, meaning that 30 players in our sample were mobile social game dependents.

To further distinguish the mobile phone addicts and non-addicts, a canonical discriminant analysis procedure was ordered. The total analysis was significant ($p < .05$, Wilk's Lambda=.96) and results in Table 3 provided some interesting findings. More specifically, players addicted to the mobile social game were distinguished by loneliness, leisure boredom, mobility, relaxation, and use intensity. This implies that mobile social game addicts are characterized by being lonely and leisurely bored. Moreover, addicts tend to be motivated by the mobile nature of the game, which allowing spending much more time in

mobile social game playing. The most interesting finding was that the more they were motivated to use mobile social game to kill time or relaxation, the less likely they would be addicted.

(* Insert Table 3 about Here*)

Predicting Mobile Social Game Addiction

To examine the relationship between perceived gratifications, loneliness, leisure boredom, self-control and demographics and the mobile social game addiction, a regression analysis was conducted. Results in Table 4 showed that loneliness (β= .16, p<.01) and self-control (β= -.13, p<.01) were the strong predictors in influencing mobile social game addiction. This means that those players who are most vulnerable or easily become addicted to mobile social game are generally those who scored high in loneliness, and had a low self-control. In addition to psychological factors, use intensity (β=.18, p<.001) was also linked to mobile social game addiction, which implies that frequent users are more likely to be addicted. The amount of variance explained equaled 13.3%.

(* Insert Table 4 about Here*)

Predicting Mobile Social Game Usage

Use of mobile social game was assessed by combining the two measures in use intensity, which consisted of the frequency of playing per day and the length of using in each session (M=2.52, SD=. 93). To access how perceived gratifications, loneliness, leisure boredom,

self-control, mobile social game addiction, and demographics influence the mobile social game usage, regression analysis was performed and the results are also shown in Table 4.

Results indicated that the use of mobile social game was significantly predicted by mobility (β=.17, p<.001) and mobile social game addiction (β=.18, p<.001). Additionally, achievement (β=.13, p<.01), gender (β=.14, p<.01), leisure boredom (β=.14, p<.01), and entertainment (β=.11, p<.05) were also found significantly related to level of mobile social game usage. This implies that mobile social game addicts are more likely to spend much more time in Candy Crush Saga playing. Psychologically, respondents who were bored in leisure activities tended to become the frequent user. They had more intention to have fun and enjoy the anytime anywhere playing. Demographically, being male seemed to indicate having the most vulnerability to exhibiting excessive playing.

To sum up, the amount of variance explained was 12.7% with mobility and mobile social game addiction being the most influential predictors, followed by achievement, gender, leisure boredom, and entertainment.

CONCLUSIONS AND DISCUSSIONS

This study primarily focused on exploring individual psychological variables including perceived gratifications, loneliness, leisure boredom and self-control and how these characteristics were related to mobile social game use and addiction. Using quantitative method in this study, the results revealed some interesting patterns.

First and foremost, one of the major aims of this study was to identify the underlying motivations gained from mobile social game playing. Exploratory factor analysis successfully yielded five clearly identifiable factors. Among them, "Sociability", "Entertainment", and "Mobility" were the unique gratifications of mobile social game playing. This implies that individuals who have more intention to interact with friends, have fun and take advantage of the freedom through mobility are more likely to play mobile social game. Previous study consistently found that "Achievement" and "Relaxation" were the motives obtained from game playing (Zhou & Leung, 2013; Billieux et al., 2013). However, these two motives were not significant in present study. In fact, the Cronbach's alphas of "Achievement" and "Relaxation" were very approaching to 0.70, so it is inferred that such undesired outcomes may result from the unrepresentative samples gathered in this study. Since the data were gathered from a non-probability method, it may affect the representativeness and generalization of the results.

Secondly, based on Young's brief questionnaire, present study found that 7.2% respondents were addicted to mobile social game. Given that there are 215 million mobile online game users in Mainland China (CNNIC, 2014), 7.2% addicts are not a small number. It may be translated to 15.48 million online game users, which is comparable to 15 million Candy Crush Saga addicts found in western counties (WSJ, 2013). In terms of the perceived gratifications, mobile social game addicts were largely predicted by "Mobility" and "Relaxation". More specifically, mobility was a unique dimension differentiating mobile social game from console game and PC game. The mobile nature of the cell phone allows

these mobile social games to be accessed almost anywhere and at almost any time, which is easily causing over-involvement. Additionally, it is noteworthy that relaxation was inversely related to mobile social game addiction, which implies that the less players use mobile social game to kill time or relaxation, the more of a tendency to be addicted, which is contrary to previous findings. The tangible explanation may lies in the unique characteristics of Candy Crush Saga. Compared to other similar match-three puzzle games, Candy Crush Saga is a challenging one. It follows the rule of game design to make the playing process from easy to frustrating. A large number of experienced players reported that they had continued playing a particular game level for nearly one month just for passing it. To some extent, it seems that difficulty is an incentive to make people invest more time and money on it. Since difficulty is not associated with relaxed feelings; therefore, for players whose motive is for killing time or relaxation, the less likely they will be addicted to mobile social game. In contrast, for those who play the games to overcome the difficulties, the more vulnerable they will be addicted.

Thirdly, in terms of psychological variables, loneliness and self-control control were found to be significant predictors of mobile social game addiction. In our sample, a majority of the respondents belong to the Net-Generation. Being over-immersed in the technological world, social isolation may be a severe issue faced by this generation. The lack of social activities leads to lower intimacy of social relationship. Thus, they tend to speak less, have difficulties in maintaining long-term relationships. Nevertheless, mobile social game provides an appropriate social platform for lonely individuals to get rid of the unpleasant emotions. Through sending lives and helping friends to unlock requests, lonely people would feel closer

to those who share the same interests with them, thus lessening the extent of loneliness. As for another contributive factor, the data indicated that the more self-control the players have, the less the likelihood they will get addicted to mobile social game. This finding is consistent with previous studies (WO, 2003; Kim et al., 2008; Baumeister, 2003), suggesting that increased self-control would control the use of game to a reasonable degree, thus preventing the addictive tendency.

Finally, in terms of the usage of mobile social game, which consisted of the frequency of playing per day and the length of playing in each session, mobile social game addiction was the most significant predictor. This seems logical that frequent players are more likely to be mobile social game addicts. The whole society should be aware of the threats that mobile social game may bring to players. Anecdotal evidence suggested that the Internet "addict" was a predominantly young teenager. Thus, parents and teachers should pay more attention to their children and students. Findings revealed that people who were lonely and leisurely bored were much easier to become victims of mobile social game addiction. Therefore, for those who are bored in leisure time, teachers should arrange arousing and interactive activities to encourage participation. While for children who feel lonely, companionship and communication are good measures to help kids to get rid of unpleasant emotions.

Given that previous study of mobile social game only focused on technological and design aspects, this study shifts the perspective to probe the relationship between psychological variables and addiction. To some extent, this study has made some contributions. Firstly, using Candy Crush Saga as a case is concrete and tangible to

understand the motives of mobile social game playing. It was found that "Mobility" is a new and unique motive related to mobile social game use. Secondly, since Candy Crush Saga was launched on western context, seldom have scholars examined its use in China. Thus, it is the first study to find out the Candy Crush usage pattern of Chinese players. Last but not least, self-control is a new psychological predictor used in this study to examine mobile social game addiction. The data indicate that the more self-control the player has, the less likely he/she will be addicted to mobile social game. Therefore, it expands the range of psychological variables linked to mobile social game addiction.

LIMITATIONS AND SUGGESTIONS FOR FUTURE RESEARCH

Several limitations of the study are worth noting. Firstly, the non-probability samples mainly came from Douban group and Facebook, which inevitably reduce the generalizability of the findings. Further studies in other contexts and settings with a random sample can further validate the constructs and findings in this study. Secondly, there were no tested gratifications items of mobile social game can follow. The results indicate some items used in the questionnaire may not reflect the motives behind playing. Thus, future studies should pay more attention on the context of translation. Thirdly, the long questionnaire, which contains 85 questions, may influence the accuracy of data. Last but not least, although the results have supported the significant relationships between mobile social game addiction and psychological variables. It is still unclear as to whether loneliness and leisure boredom are a

cause or a consequence of excessive mobile social game usage. Therefore, longitudinal study design and qualitative studies may help answer this question.

In conclusion, further research is encouraged to offer a clear definition of mobile social game, probe the motivations of mobile social game playing, reveal more predictive factors of mobile social game addiction, and provide some directions for parents and educators to prevent addictive use of mobile social game in students.

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Table 1: Correlations between Independent and Dependent variables

Variables	Mobile social game use	Mobile social game addiction
Loneliness	.10*	.22***
Leisure Boredom	.17***	.15**
Self-control	--	-.20***

Notes: # $p \leq .1$, * $p \leq .05$, ** $p \leq .01$, *** $p \leq .001$. N= 419

Table 2: Analysis of Perceived Gratifications of Mobile Social Games Use

I play mobile social game:	Mean	SD	Factors				
			1	2	3	4	5
Achievement							
1. to challenge (or train) my gaming skill	2.97	.93	.54				
2. to enjoy the feeling of winning	3.17	1.03	.86				
3. to compete with friends	2.74	1.01	.77				
Sociability							
1. to communicate with friends	2.84	.92		.91			
2. to have a closer relationship with							
friends	2.74	.91		.91			
Entertainment							
1. to enjoy the game's interface	3.80	.78			.74		
2. to enjoy the level's design	3.62	.76			.87		
3. to enjoy the seemingly endless game	3.44	.91			.76		
Relaxation							
1. to kill time	3.85	.85				.89	
2. to relax from gaming	3.78	.78				.80	
Mobility							
1. I can play it anywhere	3.52	.92					.89
2. I can play it anytime	3.41	.96					.91
3. I can play it when I am on the move	2.71	1.05					.70
Eigenvalues			1.80	1.97	2.01	1.56	2.20
Variance explained (%)			13.78	15.15	16.00	12.00	16.95
Cronbach's alpha			.67	.92	.73	.69	.80

Notes: Scale used: 1= strongly disagree and 5= strongly agree. Total variance: 73.85%, N=419.

Table 3: Discriminant Analysis of Mobile Social Game Addiction with Gratifications, Loneliness, Leisure Boredom, Self-control and Usage Intensity of Mobile Social Game as Predictors [a]

Predictor	Structure Coefficients
Gratifications	
Achievement	.21
Sociability	.05
Entertainment	.11
Relaxation	-.31***
Mobility	.41***
Loneliness	.76***
Leisure Boredom	.50***
Self-control	-.07
Use Intensity [b]	.37***
Eigenvalue	.05
Canonical correlation	.21
Wilk's Lambda	.96
Significance	.03
Group centroids	
Addicts	.77
Non-addicts	-.06

Notes:
a.   Mobile social game addicts were coded 1 and non-addicts were code 0.
b.   Use intensity of mobile social game was the frequency of playing mobile social game everyday and the length of playing time in each session.
c. $\# p \leq .1$, $* p \leq .05$, $** p \leq .01$, $*** p \leq .001$. N= 419

Table 4: Regression Analysis of Gratifications, Loneliness, Leisure Boredom, Self-control, and Demographics as Predictors of Mobile Social Game Addiction and Mobile Social Game Use

Predictors	Mobile Social Game Addiction	Mobile Social Game Use
	β	β
Demographics		
Gender (female=0)	.05	.14**
Age	-.03	.01
Family income	.02	-.05
Gratifications		
Achievement	.09	.13**
Sociability	.03	-.04
Entertainment	.06	.11*
Relaxation	-.05	-.06
Mobility	.05	.17***
Loneliness	.16**	-.06
Leisure Boredom	.03	.14**
Self-control	-.13**	-.01
Mobile Social Game Use	.18***	--
Mobile Social Game Addiction	--	.18***
R^2	.13	.15
Adjusted R^2	.11	.13

Notes: # $p \leq .1$, * $p \leq .05$, ** $p \leq .01$, *** $p \leq .001$. N= 419