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The effects of collective MMORPG (Massively Multiplayer Online Role-Playing Games) play on gamers' online and offline social capital

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ABSTRACT

This study examines the impact of collective MMORPG play on gamers' social capital in both the virtual world and the real world. Collective MMORPG play is conceptualized as the frequency of joint gaming actions and gamers' assessment of the experience in MMORPG guilds and groups. Social capital at the individual level refers to the resources and support provided by bonding and bridging social networks; collective-level social capital refers to people's civic engagement. A two-wave online survey was conducted to collect data from 232 Chinese MMORPG players.

Two structural equation models were developed to test whether collective play influences offline social capital via the mediation of online social capital; the results did not demonstrate the existence of mediation effects. Specifically, collective play positively influences gamers' online bonding social capital, online bridging social capital and online civic engagement. The effect of collective play on offline bonding and bridging social capital is not significant; the effect of online bonding/bridging social capital on offline bonding/bridging social capital is not significant either. The study finds a significantly positive impact of collective play on offline civic engagement. The effect of online civic engagement on offline civic engagement is not significant. In contrast with collective play, the time of gaming is found to negatively influence online and offline social capital.

This study contributes to the knowledge of social capital because it tests the effects of new media on online and offline social capital in the Chinese culture. In addition, this study provides empirical evidence for the positive effects of online games and highlights the social experience in MMORPG play and how it influences gamers' social networks and collective participation.

1. Introduction

Massively Multiplayer Online Role-Playing Game (MMORPG) is a special online game allowing hundreds or thousands of geographically distributed players to simultaneously play on the internet (Barnett & Coulson, 2010; Hsu, Wen, & Wu, 2009). Each player can choose a fictional character which is labeled as avatar, control the avatar's behavior and interact with other players' avatars. MMORPGs are hugely popular worldwide. The subscription-based MMORPG market grew by 22% in 2008 with consumers spending US$1.4 billion in North America and Europe (Screendigest.com, 2009). According to China Internet Network Information Centre (CNNIC), there are 147 million Chinese people playing online games, and 53% of them are playing MMORPGs (CNNIC, 2008).

The popularity of MMORPGs makes it important to investigate how they elicit impact on gamers' lives. Most of the existing studies on MMORPGs are focused on the possible addiction caused by them (e.g. Chuang, 2006; Lee, Yu, & Lin, 2007; Yee, 2002). A few of researchers have paid attention to the social aspects of MMORPGs (e.g. Ducheneaut, Yee, Nickell, & Moore, 2006, 2007; Williams, 2006a). Playing MMORPGs is not a solitary activity but very much a social experience (Caplan, Williams, & Yee, 2009; Ducheneaut & Moore, 2004) because most MMORPGs encourage collective play and other forms of social interactions among the players. Collective MMORPG play involves collaborating with each other to fulfil joint tasks, giving a hand to other players when they are in need of help, joining virtual communities to accomplish collective goals, etc. Some researchers warned that modern society is suffering declined civic engagement, low social trust (e.g. Livingstone & Markham, 2008; Putnam, 1995) and few spaces to meet with people in the real world (Williams, 2006c). With more and more people gathering in the virtual world of MMORPGs, MMORPGs can represent new forms of community, social interactions and collaboration. As Whang and Chang (2004) pointed out, the online game world should not be simply considered as a temporary medium for playing games but as a social place where new types of human relationships are created. Therefore, collective MMORPG play could be linked with social capital which describes an individual's social relationships and collective participation.

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Coleman (1988) noted that social capital contains some aspects of social structure and facilitates the actions of both individual actors and organizational actors. Coleman's definition emphasizes that social capital can be understood as outcome for individuals as well as for groups, organizations, institutions or societies. Social capital is conceptualized to exist at both individual level and collective level. At the individual level, social capital could be seen as the resources embedded in individuals' social networks. Putnam (1995) grouped individual-level social capital into two categories: bonding and bridging. At the collective level, Putnam (1993a) defined social capital as the social networks, the norms of reciprocity and trustworthiness that arise from civic engagement (p. 167).

A small number of studies have explored the relationship between online gaming and social capital (e.g. Ducheneaut et al., 2006; Kahne, Middaugh, & Evans, 2008; Williams, 2006a), but most of them conceptualized online gaming as the duration of game play, ignoring different patterns of game play and the social experience in online games. Moreover, very few studies make a distinction between online social capital and offline social capital. Online social capital is based on computer-mediated communication (CMC), whereas offline social capital is grounded on face-to-face communication (FtF). Compared with FtF, CMC is short of spatial features, personal appearance and actors' nonverbal cues such as facial expression and gesture (Kiesler, Siegel, & McGuire, 1984). Moreover, online civic engagement differs from offline civic engagement in the cost, time/space limit, patterns of participation and the diversity of participants' backgrounds. Hence, the change of communication medium makes it necessary to differentiate online social capital from offline social capital.

Another limit of preceding research is the lack of quantitative analysis on the causal relationship between MMORPG play and social capital. Most of prior game studies are cross-sectional, which can hardly address the direction of causation relationship. A cross-lagged study collects data at multiple time points and controls within-construct correlations, therefore can identify the direction of potential causality (Burkholder & Harlow, 2003).

To address the above-mentioned research gaps, this study employed a two-wave online survey to explore the effects of collective MMORPG play on Chinese gamers' online and offline social capital. This generic research purpose can be unpacked into two parts: how collective play affects online social capital and how collective play influences offline social capital. Whether the internet strengthens or weakens people's social capital is still under debate (Boase, Horrigan, Wellman, & Rainie, 2006; Miyata & Kobayashi, 2008) because the effect is contingent on the nature of online activities (DiMaggio, Hargittai, Neuman, & Robinson, 2001) and the quality of people's relationships (Kraut et al., 2002). Compared with other online social services such as instant messengers, facebook and Twitter, MMORPGs are distinctive because they enable dense social interactions, collaboration and interdependent relationships among gamers, which may facilitate the establishment of online social networks and nurture the norms of reciprocity and general trust in the virtual world. As the internet has become an integral part of people's daily lives, the fundamental purpose of new media research is to find out how internet use affects people's lives in the real world. There are two possibilities that MMORPG play may elicit impact on offline social capital. The first one is a straightforward effect, that is, the social ties established in MMORPGs directly extend to the real world, or, the successful collaboration in MMORPG guilds and groups directly encourages people to participate in offline civic activities. The second possibility is a mediated effect: MMORPG play exerts impact on offline social capital through the mediation of online social capital. To put it more explicitly, gamers first maintain their in-game social relationships in the online world through email, instant messengers, blogs, facebook or other internet services. Over time, the online social ties will be developed into physical settings and become the source of support and information for real life events. As to the collective-level social capital, MMORPG play can first stimulate gamers to engage in other forms of online civic activities, such as discussing civic issues, online voting or joining various virtual communities. Rich virtual civic engagement enhances people's willingness to take active part in offline civic activities. This study will check which possibility is correct by testing the existence of the mediation effect.

2. Conceptualization of collective MMORPG play

Merely measuring the duration or frequency of game play is not enough to depict the whole picture of gaming behavior. Actually, the life in a MMORPG is composed of solo play and collective play (Taylor, 2006). Solo play is the experience that an individual plays all by himself/herself, exploring the virtual land, killing monsters, progressing toward higher positions, without collaborating with other players. Collective play often takes on the forms of guild-play and group-play (Murphy, 2007; Taylor, 2006) in which an individual collaborates or interacts with other players.

'The structure and norms of MMORPGs determine the need for collective play. The occupations of the avatars are designed to depend on each other, so that players can enjoy the benefits of cooperation (Taylor, 2006). Besides, many quests in the games are too difficult for an individual to tackle alone, thereby players have to form a group or a formal guild to increase gaming efficiency (Ducheneaut et al., 2006). Groups serve as transitory social networks and always appear in the context of short-term missions. Gamers group together when there is a difficult quest that they cannot finish alone or guild actions cannot be organized at the specific time. Once the instrumental goal of grouping is reached, the group could be dismissed soon and the members will probably never meet again. Guilds (or clans) are longer-lived player associations which require commitment and responsibility from the members to maintain coherence. Guilds always have formalized memberships and hierarchical ranks (Ang, Zaphiris, & Mahmood, 2007). The leaders of a guild organize collective actions to finish challenging tasks and the fellow members must collaborate with each other to guarantee the success of the joint actions. Guild members often have their own chat channels and broadcast message systems in the games; some guilds even open their own BBS or blogs outside of the games. Guilds thereby work as virtual communities which may give rise to a sense of belonging and serve as an important source of support and meaningful social relationships (Ducheneaut et al., 2006; Ducheneaut et al., 2007).

Collective MMORPG play can be conceptualized by the frequency of collective actions and the quality of the social experience in groups/guilds. Frequent participation in collective actions increases the chance of social interactions. However, it is unavoidable that sometimes online social interactions are accompanied with selfish, deceptive or ulterior motivations (Bagozzi, Dholakia, & Pearo, 2007); uncooperative behaviors, such as cheating and free-riding, also exist in the process of collective play. Uncooperative performance of guild/group mates may provoke other members' disobliging behaviors and lead to the failure of collective actions, which will reduce one's trust toward the playing partners and damage the expectation for reciprocity and long-term relationships. Therefore the quality of the social life in MMORPGs affects whether the impact of collective play is negative or positive. The quality of collective play can be measured by the sense of belonging to the groups/guilds, gamers' evaluation of the groups/guilds and their evaluation of the playing partners in the groups/guilds. The identity of being a member of an in-game community and the sense of belonging to the community make social interactions meaningful to the gamers (Chen, 2007) and make the team a united social entity. Otherwise, a group/guild is just a loose

connection of individuals and the members are very likely to leave. The quality of group/guild life is also affected by the cooperative performance of other fellow members and the leader gamers. If most of the people in the guild/group act in a positive way, the collaboration will give birth to sort of social rules that stimulate other members to act cooperatively; as a result, the quality of players' guild/group experiences will remain high. Otherwise, the social life in MMORPG groups/guilds will be miserable.

To sum up, collective MMORPG play can be composed by the frequency of collective actions, a player's sense of belonging to the community and his/her assessment of the guild/group, the leader gamers and other fellow members of the guild/group. The duration of gaming and the behavior of collective play are distinct but correlated indicators of MMORPG play. The former emphasizes the depth of game involvement; the latter highlights the social experiences in online games. It is the part of collective play that has the potential to benefit gamers' social capital. Only considering the amount of game play may oversimplify the behavior of game play and lead to totally different results regarding the relationship with social capital.

3. Conceptualization of social capital

Social capital theory has been criticized for being inconsistently defined and conceptualized. For example, Fischer (2005) pointed out that the term of "social capital" covers a wide range of individual behaviors, but the coherence among these behaviors is not satisfactory because people who are doing one thing (e.g. voting) do not necessarily do another thing (e.g. socializing with neighbors).

Although there may be conceptual vagueness of social capital, Portes (1998) noted that the term of social capital focuses on the positive consequences of sociability. Son and Lin (2008) summarized that the studies on social capital have emerged in two research traditions. One highlights how individuals invest in social relations and capture resources embedded in the social networks to attain personal goals (e.g. Flap & Volker, 2001; Granovetter, 1983). The other research tradition concentrates on how participation in groups enhances the accomplishment of collective goals and how such collective asset improves the qualities of group members' lives (e.g. Putnam, 1993a; Putnam, 2000). Therefore, social capital can be discussed at both individual level and collective level.

Individual-level social capital roots in individuals' social ties. A tie between two individuals can be strong or weak, differing in "the amount of time, the emotional intensity, the intimacy, and the reciprocal services which characterize the tie" (Granovetter, 1973, p. 1361). Putnam (1995) made a distinction between two types of social capital which are respectively rooted from strong ties and weak ties: bonding social capital and bridging social capital. Bonding social capital occurs to strongly tied or homogeneous groups who often exchange emotional or substantial support. Bridging social capital happens to weakly tied people from socially heterogeneous backgrounds; they help each other to broaden social horizons and worldviews, or open up opportunities for new information and new resources (Williams, 2006b). Williams (2006b) summarized that the criteria of bonding social capital should be: "emotional support, access to scarce or limited resources, ability to mobilize solidarity and out-group antagonism". The criteria of bridging social capital should be: "outward looking, contacting with a broader range of people, a view of oneself as part of a broader group and diffusing reciprocity with a broader community" (Williams, 2006b). In the context of MMORPG, bridging social capital can be understood as the weak ties that are generated during grouping and guild-play. As discussed before, groups work as transitory teams which provide rich opportunities for gamers to know new people and to be exposed to wide worldviews. Bridging social capital can also be embedded in the weakly tied members of guilds who know each other but do not necessarily exchange emotional or substantial support. Bonding social capital in MMORPGs inheres in the strongly-tied guild members who establish friendly relationships through successful cooperation and desirable social interac tions.

At the collective level, social capital can be conceptualized as the depth of "civicness" in various communities (Portes, 1998). Putnam (2000) viewed the networks of civic engagement to be at the very core of social capital and warned not to underestimate the importance of collective efforts. Civic engagement refers to "people's connections with the life of their communities" (Putnam, 1995, p. 665). Civic engagement takes on various forms: memberships in voluntary organizations, raising money for charity, voting, religious participation, etc. (Son & Lin, 2008). The corresponding examples of civic engagement in the virtual world include online voting, online donating or engagement in online interest groups and online communities (Blanchard & Horan, 1998). Frequent civic participation leads to a tight web of social interactions and inculcates skills of cooperation, the norms of reciprocity and a sense of shared responsibility for collective endeavors (Brehm & Rahn, 1997; Putnam, 1993b), educating the whole community to reduce incentives for opportunism and malfeasance (Stolle, 2000). Social capital at the collective level therefore increases the efficiency of the communities and helps people to achieve collective goals that cannot be accomplished by individuals alone (Winnie et al., 2007). In the context of MMORPG, collective-level social capital can be understood as the participation in groups or guilds. Putnam (2000) claimed that the norm of reciprocity is the most important behavior that composes social capital. Collaboration in groups/guilds trains skills of social interactions and teamwork, cultivates shared responsibility and fosters sturdy norms of generalized reciprocity: I will help now, expecting that you or someone else will return the favor to me (Putnam, 1993b).

The presence or absence of the internet during the process of communication changes the pattern of communication and recasts the whole social networks (Haythornthwaite, 2002). Online bridging social capital refers to social capital growing out of online weak social ties. Online bonding social capital inheres in online strong ties formed by people who meet and keep close contact on the internet. Some studies have reported that offline social relationships are longer, closer, stronger or more personal than online ones (e.g. Haythornthwaite, 2002; Mesch & Talmud, 2006); online friends tend to discuss fewer topics and participate in fewer shared activities (Mesch & Talmud, 2006). Some other studies, however, have found that some people would discuss sensitive issues with their online gaming friends because of the anonymity of online interactions (e.g. Cole & Griffiths, 2007), and perceive greater closeness to their online friends than to their offline friends (McKenna, Green, & Gleason, 2002). For collective-level social capital, online civic engagement differs from offline civic engagement in decreased cost, various backgrounds of the participants and diverse patterns of participation. Therefore it is necessary to make a distinction between online and offline social capital.

4. Hypotheses and research questions

4.1. Effects of collective MMORPG play on online bridging and online bonding social capital

A variety of studies (e.g. Constant, Kiesler, & Sproull, 1996; Rice, 1999; Turkle, 1995) have found that CMC provides access to a vast range of weak ties because the internet allows people with different backgrounds to gather together in the virtual world. Frequent participation in group/guild actions makes it possible for gamers to get in touch with people from different ethnic, socioeconomic, and cultural backgrounds. An individual gamer can keep contact

with these new weak ties on the internet and broaden his/her online social networks.

Social interactions in MMORPGs are based on the communication between avatars. The appearance, behavior, reputation and hierarchical positions of the avatars provide reliable cues for mutual understanding among gamers; moreover, avatars can accurately convey players' affection, emotion and even personality, thereby decrease the uncertainty caused by the lack of social cues and make it easy to begin a relationship (Bente, Ruggenberg, Kramer, & Eschenburg, 2008). To begin with, the relationship is kind of weak tie that works to expose the participants to different worldviews and serves as bridging social capital.

Besides, the forging of cooperation among weakly tied people can foster trust and reciprocity because it reminds that people from different backgrounds or even people who do not know each other well can enjoy reciprocal exchanges (Gaertner, Rust, Dovidio, Bachman, & Anastasio, 1996). Coffe and Geys (2007) claimed that the experiences of desirable cooperation in a diverse group can be easily transferred to the heterogeneous outside world. Hence, it is reasonable to predict that MMORPG players who have enjoyed successful collaboration with strangers are more inclined to believe that people in the virtual world could be trustworthy. As a result, they may feel willing to know more people on the internet, with an expectation for further desirable social experiences.

Due to the great reach of contacts, reduced uncertainty in CMC and the ability to bolster general trust and reciprocity, MMORPG play can become an ideal means to initiate new weak ties that produce online bridging social capital. Therefore, it is hypothesized that:

H1a. Collective MMORPG play will have a positive impact on gamers' online bridging social capital.

Most MMORPGs are designed to enhance the building of long term relationships by supporting the formation of in-game communities such as groups or guilds (Ang et al., 2007). Guild members are more likely to establish strong ties than group members because shared guild identity and frequent cooperation can bolster reciprocal contact and breed substantial relationships (Hiltz & Turoff, 1993). During the process of collaboration, gamers are able to assess who is possible to be a friend and who is just a temporary play-partner. After log out from the game, those who tend to make new friends can gather in other virtual communities to share resources and exchange emotional or substantial support.

Social presence theory (Short, Williams, & Christie, 1976) notes that the sense of being together with other people in a shared environment implies mutual awareness, psychological involvement and behavior engagement, which are positively correlated with the feeling of intimacy and immediacy (Biocca, Harms, & Burgoon, 2001). The existence of avatars in the same guilds/groups can generate the feeling of being together in the same community and give birth to the sense of closeness which enhances the production of online bonding social capital, or helps to transfer bridging social ties into bonding social ties. Therefore, the following prediction is posited:

H1b. Collective MMORPG play will have a positive impact on gamers' online bonding social capital.

4.2. Effects of online bonding/bridging social capital on offline bonding/bridging social capital

For the sake of enjoyable social network, people are inclined to make their online relationships a social reality. Social identity theory (e.g. Spears, Postmes, Lea, & Wolbert, 2002) suggests that people tend to define themselves by incorporating their important relationships into the self-concepts. Therefore, people are motivated to integrate their important online relationships into the offline world because those relationships are crucial components of their self identities. In the context of online games, Yee (2001) found that almost half (46.1%, $N = 1237$) of *EverQuest* players would not mind meeting their online friends in real life. Grabowski and Kruszewska (2007) examined a large social network consisting of 30,000 MMORPG players and revealed that most of the friendship networks in the game world were developed after the players started to play MMORPGs, and nearly all of the contacts from the virtual world were maintained in real life. Hence, it is not surprising that people who form meaningful relationships in the game world want to pursue them offline. Based on this line of reasoning, the next set of hypotheses is:

H2a. The online bridging social capital will have a positive impact on the offline bridging social capital.

H2b. The online bonding social capital will have a positive impact on the offline bonding social capital.

4.3. Effects of collective MMORPG play on online civic engagement

Social identity model of deindividuation effects (SIDE) (Reicher, Spears, & Postmes, 1995) proposes that visual anonymity depersonalizes social perception of others and the self, enhances group salience and consequently leads to a focus on group identity (Postmes, Spears, Sakhel, & de Groot, 2001). It is very easy for a MMORPG player to find a group or guild when he/she is in need of help and coordination. Everybody in the group or guild should contribute appropriately to the community, not only taking his/her own obligation, but also helping fellow members and giving voice to the management of the group or guild. Moreover, every guild member has a guild tag displaying group affiliations and he/she can keep track of the progression and vital statistics of the guild (Ruggles, Wadley, & Gibbs, 2005). The anonymity during game play, the commitment in groups/guilds and shared guild identity intensify the feeling of belonging to a group/guild and depersonalize the perception of individual self. Collective play in MMORPGs therefore generates psychological sense of community and the sense of group/guild identity, both of which work as a catalyst for community participation.

Besides, the collaborative participation in MMORPGs can spread trust and the norms of reciprocity in the whole community. As the costs in helping other players are very low, people tend to give a handy help and a single friendly action can be easily watched by the entire group (Wellman & Gulia, 1999). Fellow members' actions of helping will educate and encourage other members of the group/guild to be supportive (Blanchard & Horan, 1998) and consequently produce a perception of reciprocity and a sense of social responsibility which may stimulate gamers to take part in other virtual communities. Therefore, the next hypothesis is formulated:

H3a. Collective MMORPG play will have a positive impact on gamers' online civic engagement.

4.4. Effects of online civic engagement on offline civic engagement

Green and Brock (2008) predicted that social activities in the virtual world can bolster skills and abilities that are needed to nurture social capital, such as teamwork, leadership, negotiation, public speaking and assertiveness in community. For example, gamers in *World of Warcraft* are very likely to encounter situations of

recruiting people to build a group/guild, organizing a raid that requires the coordinated efforts of the participants, managing a large guild in which members have different personalities and dealing with the free-riding behaviors of guild members. The sophistication attained in handling MMORPG community affairs thereby helps to build civic capabilities and leads to civic activism in the real world. Gentile and colleagues (2009) elaborated that, to teach transferral from the virtual world to the real world is to provide multiple contexts with similar solutions. If cooperation and engagement is the best solution in MMORPGs, gamers will adopt the solution and transfer it to the real world when they are called for offline participation. The last hypothesis is:

H3b. Online civic engagement will have a positive impact on offline civic engagement.

4.5. Research questions

The hypotheses outlined above constitute a mediation model in which online social capital functions as a mediator between collective MMORPG play and offline social capital. To test whether the indirect effects are complete mediation or partial mediation (Baron & Kenny, 1986; Holbert & Stephenson, 2003), the link between collective play and offline social capital should be included in the model. If the direct effects become to zero, the indirect effects are complete mediations; otherwise, the indirect effects are partial mediations. In order to explore the relation between collective play and offline social capital, one set of research questions are posed:

RQ1: How will collective play influence gamers' offline bridging social capital?
RQ2: How will collective play influence gamers' offline bonding social capital?
RQ3: How will collective play influence gamers' offline civic engagement?

As the time of gaming reflects the extent to which an individual devotes to MMORPGs, gaming time will be involved in the model as a control variable. Fig. 1 shows the complete conceptual framework including all hypotheses, research questions and the effects of the control variable (indicated by dashed lines).

5. Method

5.1. Measurement

Collective play was measured by the average frequency of guild/group actions in a week, individual's evaluation of the guilds/groups as a whole, evaluation of the leaders of the guild and evaluation of other members of the guild/group, with "1" referring to "satisfied very much", "5" referring to "not satisfied at all". Gaming time was measured by asking how many hours the respondents played certain MMORPGs in a week and how many hours they played MMORPGs in a typical gaming session.

This study took Williams' (2006b) five-point Internet Social Capital Scales (ISCS) to measure individual-level bonding and bridging social capital in both the virtual world and the real world. The online and offline subscales were almost the same, differing only by one word (online/offline) to ensure comparability (Williams, 2006b). Cronbach's α was calculated for each construct that contained all of the items of Williams' scale; then Cronbach's α was recomputed by deleting one item at each time until the "α if item deleted" was equal or smaller than the overall α. For some items, "the α if deleted" was higher than the overall α. These items were dropped because deleting them improved the reliability of the construct.

To measure civic engagement, organizations (both online and offline) that were familiar to Chinese people were listed and the respondents were asked whether they belonged to these organizations, with 1 representing "yes" and 0 representing "no"; the aggregated results of organization memberships became an indicator of the diversity of online or offline civic engagement. Then the respondents were asked how often they attended the activities held by these online/offline organizations in the past two months, with 1 representing "one or two times" and 6 representing "more than ten times". Since volunteerism is an important indicator of offline civic engagement, the respondents were asked how often they did voluntary work in the past 2 months.

Before the formal survey started, a pilot study was done by sending the questionnaire to convenience samples that were playing certain MMORPGs and they were suggested to invite their gamer friends to fill in the questionnaire. The sample size of the pilot study was 45; the Cronbach's α for each construct was bigger than .60. Some respondents provided suggestions about the wording of some questions. After revised these questions, the questionnaire was used in the formal survey.

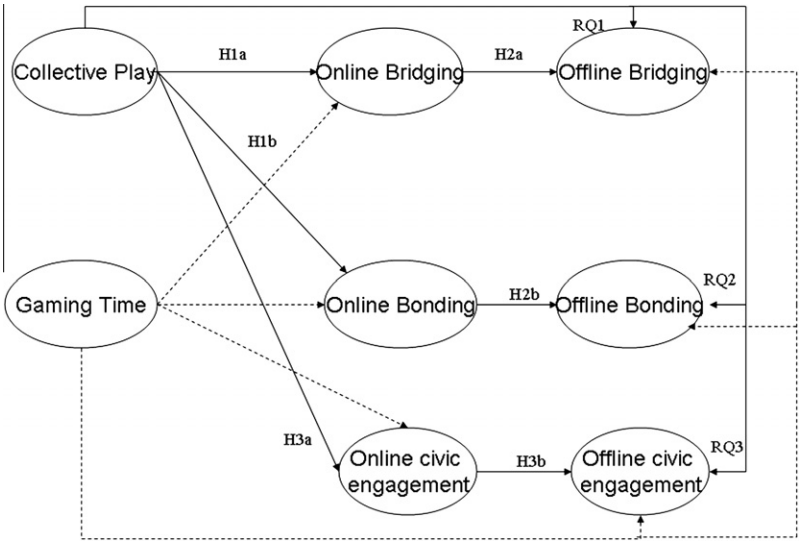

Fig. 1. Conceptual framework.

Table 1
Description of guild size, frequency of guild-play, group size and frequency of grouping.

Characteristics of guild-play and group-play	1st wave (%)	2nd wave (%)
Guild size		
Less than 50 members	14.2	14.8
51–150 Members	34.1	40.3
151–300 Members	33.5	28.4
More than 301 members	18.2	16.5
No. of subjects	223	222
Frequency of guild actions in a week		
1–4 Times	74.4	65.7
4–10 Times	18.8	27.5
More than 10 times	6.8	6.7
No. of subjects	223	224
Group size		
Less than 10 members	64.8	60
11–50 Members	23.6	29.4
More than 50 members	11.5	10.6
No. of subjects	229	225
Frequency of group actions in a week		
Less than 10	58.2	57
11–30 Times	24.2	30.8
More than 30 times	17.6	12.2
No. of subjects	229	227

5.2. Sample

A cross-lagged model allows to estimate the stability of constructs by tracking their changes over time and makes it possible to identify the directions of potential causality that are more difficult to test in a cross-sectional design (Burkholder & Harlow, 2003). To detect the causal dynamics of collective MMORPG play on social capital, this study administered a two-wave online survey. The URL link of the questionnaire was posted on the forums of popular MMORPGs in Chinese market (e.g. *World of Warcraft, Western Journey, Mir,* etc.) and other websites that Chinese gamers often visited; gamers were invited to take part in the study. The respondents were told that this was a two-wave survey, if they could fill in both waves of questionnaires, they would be rewarded a souvenir valued at 30 Chinese dollars (about 5 US dollars). The respondents were required to leave their email addresses so that they could be invited to participate in the second-wave survey. The first-wave survey had lasted for about two months; 510 MMORPG gamers filled in the questionnaire. Four months later, an email was sent to these 510 respondents, inviting them to attend the second-wave survey. The questionnaire was almost the same as the first one except that demographic questions were excluded. Two-hundred and thirty two gamers participated in both waves of surveys; 85.7% of them were males and 13.8% of them were females, 4% of them did not report the gender. The mean age of the subjects was 22.82 (SD = 3.36, maximum = 38, minimum = 18); 50.9% of the subjects had at least a college diploma; 88% of them reported that they had played MMORPGs for more than 1 year. In both waves, more than 79% of the subjects belonged to certain guilds; more than 75% of them had grouping experiences. Table 1 gives a description of the size of MMORPG groups/guilds and the frequency of grouping and guild actions in a week. More than 65% of players engaged in guild actions for 1–4 times a week. More than 57% of the players grouped with other players for less than ten times a week, about 43% of them grouped with others for more than ten times a week. Table 2 reports players' assessments of guild lives and grouping experiences at two measurement occasions. More than half of the players were satisfied with their guilds, and about half of the players were satisfied with their groups.

Since this study did not employ a random sampling strategy, the samples were not representative. But we could compare the subjects of this study to those of other similar studies to obtain some information about the characteristics of Chinese gamers. IResearch.com had been conducting annual online surveys on Chinese gamers for several years. Although its samples were also self-selected, the huge sample size can to some extent verify the informative reference of its results. According to the annual report of iResearch.com in 2006, the average age of Chinese gamers (N = 119,591) was 23.6 (iResearch.com, 2006). The data from 2008 shows that 80.2% of Chinese gamers (N = 504,471) were males; 33% of them had at least a college degree; 91.5% of them had played online games for more than 1 year; 41.9% of them played online games more than 5 h per day (iResearch.com, 2008). The age and gender distribution of the subjects in the current study were generally similar with the subjects in the iResearch.com survey, therefore could to some extent reduce the influence of extraneous factors and serve the purpose of testing the theoretical links between MMORPG play and social capital.

Table 3
Reliabilities for dependent variables and independent variables.

	1st wave	2nd wave
Collective-play	.61	.60
Gaming time	.77	.85
Online bonding	.65	.65
Online bridging	.73	.75
Online civic engagement	.55	.57
Offline bonding	.71	.80
Offline bridging	.75	.78
Offline civic engagement	.70	.76

6. Data analysis

The reliability of each construct was checked based on Fornell and Larcker's (1981) article on the evaluation of structural equation modeling (SEM). Table 3 presents the reliability for dependent variables and independent variables in both waves of surveys. The reliabilities for online civic engagement in both waves were not satisfactory, which might be caused by the fewer items in the scales. Analyses using measures with low reliability coefficients will result in deflated estimates of effect. However, structural equation modeling automatically extracts the measurement errors to analyze the true relationships between latent variables, which

Table 2
Subjects' assessment to guild lives and grouping experiences.

	1st wave (%, N = 228)			2nd wave (%, N = 225)		
	Satisfied	Neutral	Unsatisfied	Satisfied	Neutral	Unsatisfied
Satisfaction with the guild	56.3	28.2	15.5	62.0	26.9	11.1
Satisfaction with the guild leader	57.5	29.1	13.4	56.4	29.1	14.5
Satisfaction with the guild members	47.2	46.6	6.2	53.4	39.2	7.4
Satisfaction with grouping experiences	51.4	45.8	5.6	51.7	40.5	7.6
Satisfaction with group members	47.5	46.4	6.1	51.8	40.6	7.6

Table 4
Mean, standard deviation, standardized factor loadings of measurement models.

Construct/Item	1st wave				2nd wave			
	Mean	S.D. of means	Factor loadings	S.E. of factor loadings	Mean	S.D. of means	Factor loadings	S.E. of factor loadings
Collective-play								
Average frequency of collective actions in a week	5.94	3.43	.72***		5.9	3.36	.72***	
Evaluation to the life in guilds	12.37	4.88	.57***	.18	12.57	4.92	.53***	.17
Evaluation to the life in temporary teams	6.29	2.26	.45***	.08	6.27	2.27	.48***	.08
Gaming time								
How many hours do you play MMORPGs in a week	4.63	2.04	.86***		4.02	1.69	.97***	
How many hours do you play MMORPGs once a time	4.03	1.68	.71***	.11	4.51	2.02	.73***	.08
Virtual bonding social capital								
I interact with someone online that would put their reputation on the line for me.	2.93	1.05	.61***		2.91	.93	.59***	
I interact with someone online that would share their last dollar with me.	3.02	1.10	.56***	.16	3.03	1.07	.54***	.17
I interact with someone online that would help me fight an injustice.	3.72	.91	.69***	.14	3.6	.93	.71***	.17
Virtual bridging social capital								
Interacting with people online makes me feel like part of a larger community.	3.39	.88	.52***		3.64	.91	.69***	
I come in contact with new people online all the time.	3.75	.92	.68***	.21	3.72	.93	.62***	.11
Interacting with people online makes me interested in what people unlike me are thinking.	3.63	.87	.65***	.19	3.69	.94	.72***	.12
Interacting with people online makes me want to try new things.	3.78	.79	.70***	.18	3.78	.85	.57***	.1
Online civic engagement								
Membership of online organizations	2.96	2.01	.75***		3.31	2.16	.59***	
How often do you attend the activities held by these organizations	2.77	2.17	.47***	.03	3.19	2.11	.67***	.06
Offline bonding social capital								
There is someone offline that I can turn to for advice about making very important decisions.	3.91	.89	.54***		3.67	.97	.75***	
If I needed an emergency loan of $500, I know someone offline that I can turn to.	4.25	.93	.60***	.18	4.03	.98	.64***	.09
There is someone offline that would be good job references for me.	4.00	.92	.71***	.19	3.94	.97	.82***	.09
I interact with someone offline that would share their last dollar with me.	3.93	.99	.60***	.19	3.86	1.00	.63***	.09
Offline bridging social capital								
Talking with people offline makes me curious about other places in the world.	3.84	.91	.57***		3.56	.93	.69***	
I come in contact with new people offline all the time.	3.47	.98	.68***	.17	3.47	.97	.66***	.11
Interacting with people offline makes me interested in what people unlike me are thinking.	3.85	.91	.68***	.16	3.67	.87	.69***	.10
Interacting with people offline makes me want to try new things.	3.94	.81	.69***	.15	3.77	.82	.70***	.09
Offline civic engagement								
Membership of offline organizations	2.88	1.94	.76***		3.25	2.13	.74***	
How often do you attend the activities held by these organizations	2.48	1.56	.56***	.03	2.71	1.63	.75***	.03
How often did you do voluntary work in the past two months	1.64	1.07	.65***	.02	1.88	1.06	.67***	.02

*** $p < .001$.

adjusts the attenuated effect size caused by low reliability and derives unbiased estimates for the tested relations (Holbert & Stephenson, 2002; Medsker, Williams, & Holahan, 1994; Ullman, 2006).

Before doing further data analysis, the normality of all variables was checked. Some of the variables were seriously skewed (skewness/[standard error of skewness] > 1.96). SEM is originally developed on the assumption that the variables are normally distributed; violation of this assumption distorts the standard errors of the path coefficients between latent variables and the test statistics (Andreassen, Lorentzen, & Olsson, 2006). Therefore the following variables with seriously skewed distribution were normalized: online civic participation and offline civic participation in both waves.

Confirmatory factor analyses (CFA) were employed to test the measurement models. Lisrel 8.7 was used to do CFA. The model fitness for the first wave data was acceptable ($\chi^2 = 398.18$, $df = 247$, $p < .001$, CFI = .95, NNFI = .94, RMSEA = .05, SRMR = .06) (Hu & Bentler, 1999). All factor loadings were significant and bigger than .45. The model fitness for the second wave data was also acceptable ($\chi^2 = 465.43$, $df = 247$, $p < .001$, CFI = .95, NNFI = .93, RMSEA = .06, SRMR = .06). All factor loadings were significant and bigger than .48. Table 4 presents the detailed measurement items of each construct and reports the mean, standard deviation, standardized factor loadings of the measurement models in both waves.

An important concern for a panel study is whether a given construct is constant over time. Tests of measurement equivalence/invariance examine "whether or not, under different conditions of observing and studying phenomena, measurement operations yield measures of the same attribute" (Horn & McArdle, 1992, p. 117). Tests of measurement equivalence/invariance (ME/I) are based on confirmative factor analysis, with a statistically nonsignificant Chi-square value indicating the failure to reject the null hypothesis that measurement equivalence/invariance exists

(Cheung & Rensvold, 1999). The results of ME/I tests showed that partial scalar (factor loading) equivalence could be established ($\Delta\chi^2 = 34.73$, $\Delta df = 26$, $p = .12$), displaying partially identical item intercepts; hence further data analysis was allowed.

Before ran the cross-lagged models, the correlations between the independent variables were checked. Gaming time and collective play were significantly correlated with each other ($r = .49$, $p < .001$). The moderate correlation demonstrated discriminant validity for the measures of these two constructs. However, the correlation between offline bonding social capital and offline bridging social capital was bigger than .80 ($p < .001$), implying a problem of multi-collinearity. Hence, the conceptual framework was modified by converging offline bonding and offline bridging as one construct in both waves.

Two cross-lagged models were developed to answer the research questions and test the hypotheses. The first model investigated the effects of MMORPG play in time 1 on gamers' offline social capital in time 2 through the mediation of online social capital in time 2, without testing the direct effects of collective play in time 1 on offline social capital in time 2. Regression paths between time 1 and time 2 measurements of the same latent variables were included in the model. The model controlled the correlation coefficients between MMORPG play (including collective play and gaming time) and social capital in the same wave. Online bonding and online bridging were correlated in both waves. The correlations between online and offline social capital in both waves were also included in the model.

Since the same subject group filled out the survey twice, repeated measurements of identical items may lead to common variance overtime and often result in correlated measurement errors (Kessler & Greenberg, 1981). Therefore, the measurement errors associated with a latent factor item at time 1 was allowed to correlate with the measurement errors associated with its like item at time 2.

To test whether online social capital is a full mediator or a partial mediator, the second model was developed by adding the regression paths between MMORPG play (both collective play and gaming time) in time 1 and offline social capital in time 2. Model 1 and model 2 were nested models because the second model had less degrees of freedom and was less parsimonious than the first one. The difference of Chi-square values allows to decide whether a given model fits significantly better than a competing model. If the difference of Chi-square value is significant, the model with less degrees of freedom fits the data better than the one with more degrees of freedom.

7. Results

The goodness of fit indices shows that the first cross-lagged model was marginally acceptable ($\chi^2 = 1364.51$, $df = 891$, $p < .001$, CFI = .95, NNFI = .95, RMSEA = .04, SRMR = .084). The second cross-lagged model was tested by adding the direct effects of MMORPG play on offline social capital; the model displayed an acceptable fit of the data ($\chi^2 = 1352.98$, $df = 887$, $p < .001$, CFI = .95, NNFI = .95, RMSEA = .04, SRMR = .078). A significant Chi-square difference ($\Delta\chi^2 = 11.53$, $\Delta df = 4$, $p = .02$) indicated that model 2 fitted the data significantly better than model 1 did, therefore model 2 was retained. However, the results of model 2 did not demonstrate the existence of mediation effects because the regression coefficients between online social capital in time 1 and offline social capital in time 2 were not significant.

Fig. 2 and Table 5 present the path coefficients, the standard errors and significant levels of the coefficients for the second cross-lagged model.

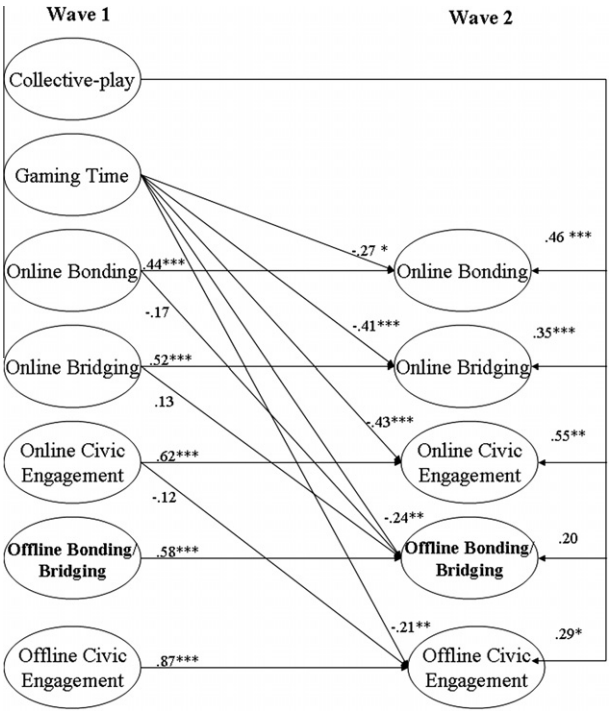

Fig. 2. Results of the second cross-lagged model (completely standardized solution). *Note*: $\chi^2 = 1352.98$, $df = 887$, $p < .001$, CFI = .95, NNFI = .95, RMSEA = .04, SRMR = .078. * $p < .05$. ** $p < .01$. *** $p < .001$.

H1a and H1b predict positive effects of collective play on online bonding and bridging social capital. The results supported the hypotheses. On the one hand, avatar-based collaboration in collective MMORPG play helps to decrease the uncertainty in computer-mediated communication and gives birth to general trust, as a result, initiates new weak ties that produce bridging social capital. On the other hand, enjoyable collaboration in MMORPGs and the feeling of being together in the same community facilitate the establishment of strong social relationships and the production of online bonding social capital.

H2a and H2b propose that, online bonding/bridging social capital in time 1 positively influences corresponding offline social capital constructs in time 2. However, the data did not support the hypotheses.

H3a predicts a positive effect of collective play on online civic engagement. The data supported this hypothesis and verified the proposal of SIDE model (Reicher et al., 1995) that the lack of non-verbal cues and social identity in CMC depersonalizes individuals' self identity but manifests the salience of group/guild identity, thereby fostering a psychological sense of community. Furthermore, the collaboration in guilds/groups of MMORPGs can educate the whole community and instil the norms of reciprocity and shared responsibility in fellow members' mind, as a result, produces incentive for further online civic engagement. However, the data did not support H3b that online civic engagement enhances offline civic engagement.

Research questions 1a, 1b and 1c ask whether collective play in the virtual world directly benefits social capital in the real world. This study did not find a significant causal relationship between collective play and offline bonding/bridging social capital. An interesting finding was the significantly positive effect of collective play on offline civic engagement. This outcome confirmed the possibility that collective MMORPG play could offer experiences with civic actions which function as civic education. Frequent engagement in guild/group actions can also reinforce the decision of community participation. In the offline settings, when communities require

Table 5
Standardized regression coefficients of the second cross-lagged model.

Independent variables	Dependent variables				
	Online bonding in time 2	Online bridging in time 2	Online civic engagement in time 2	Offline bonding and bridging in time 2	Offline civic engagement in time 2
Collective-play in time 1	.46*** (.04)[a]	.35*** (.04)	.55** (.15)	.20 (.04)	.29* (.12)
Gaming time in time 1	−.27* (.05)	−.41*** (.05)	−.43*** (.13)	−.24** (.04)	−.21** (.10)
Online bonding in time 1	.44*** (.09)	N.A.[b]	N.A.	−.17 (.18)	N.A.
Online bridging in time 1	N.A.	.52*** (.14)	N.A.	.13 (.28)	N.A.
Online civic engagement in time 1	N.A.	N.A.	.62*** (.19)	N.A.	−.12 (.17)
Offline bonding and bridging in time 1	N.A.	N.A.	N.A.	.58*** (.20)	N.A.
Offline civic engagement in time 1	N.A.	N.A.	N.A.	N.A.	.87*** (.12)

[a] The number in parenthesis is the standard error of the estimate.
[b] N.A. = not applicable.
* $p < .05$.
** $p < .01$.
*** $p < .001$.

people to get involved, those who already have qualitative experiences in collective online actions are inclined to take active part in.

The control variable, gaming time, was found to negatively influence one's online/offline bridging social capital, online/offline bonding social capital and online/offline civic engagement.

8. Conclusions and discussions

This study finds that frequent in-game social interactions and enjoyable social experience in MMORPGs are beneficial to gamers' social networks in the virtual world. This finding confirms Steinkuehler and William's (2006) claim that online games appear to serve best as "third places" for informal sociability, where people are able to establish and maintain social ties by interacting and collaborating with strangers. Some of the in-game relationships may remain as online weak ties and move from the in-game communities to other virtual communities, such as online hobby clubs, social network sites or instant messengers, exposing gamers to a broad range of worldviews. Some of the in-game relationships may develop into online friendships. Different from other online friendships that are created merely by online communication, these newly established strong ties in MMORPGs are based on collaboration and shared gaming experiences, thus the actors are more likely to exchange emotional or substantial support.

Collective play is found to positively affect online civic engagement. Guilds and groups function as virtual communities in which the members are interdependent on one another and are encouraged to accomplish collective goals. The collaboration in MMORPGs can instil community responsibility, give rise to the norms of reciprocity and nourish common interest. These elements motivate gamers to take part in other virtual community activities.

This study provides empirical support for the positive effects of collective play on offline civic engagement. The outcome is consistent with Chen and Lu's (2007) conclusion that involvement in voluntary social networks can provide opportunities to acquire or improve organizational or communication skills and stimulate self-efficacy that makes one feel more confident in influencing public affairs, thus leading to political and civic activism (Verba, Schlozman, & Brady, 1995).

Gaming time was found to negatively influence bonding social capital, bridging social capital and civic engagement, both online and offline. The outcome could be explained by the theory of displacement. The variable of gaming time only gives a description of the duration of game play, without containing the social nature of MMORPG play or reflecting gamers' collective behaviors. The different effects of gaming time and collective play on social capital imply that, controlled the time of game play, the more a player attends cooperative collective play, the more likely his/her social capital will be improved; or, the more a player chooses soloing, the more likely his/her time spent with social ties will be replaced by gaming time and the worse his/her social capital will be.

This study does not find a significant causal relationship between online social capital at time 1 and offline social capital at time 2, indicating that the mediation effect of online social capital between collective play and offline social capital does not exist. Neither does this study find significant effects of collective play on offline bonding/bridging social capital. The possible explanation for these two non-significant relationships might be the same. Some players have to keep their relationships (either bonding or bridging) with peer-players online because it is difficult for them to meet face to face. Some other players may get used to online social interactions and prefer to contact their in-game friends online because the internet offers abundant communication channels. Furthermore, as McKenna et al. (2002) pointed out, those who are able to find friends easily and who are sophisticated in socializing have little need to express inner selves on the internet or move their online relationships to the physical settings. In other words, although MMORPGs can provide a platform for establishing new social ties, whether people expand their online relationships to the offline world depends on specific social context and individuals' social skills.

The non-significant relationship between online civic engagement and offline civic engagement may attribute to the possible effects of displacement. In the questionnaire of this study, listed online organizations and offline organizations are exactly the same. Those who were active in online communities may avoid duplication of efforts for the same organizations in the real world. Moreover, civic engagement in real life settings requires that participants find a physical place to meet up, whereas online civic engagement breaks the barriers of place and does not require any traveling cost. Hence, online communities are more convenient for people to take part in civic activities than offline communities are. Or, the finding of this study echoes Quan-Haase and Wellman's (2004) note that "observed decline in organizational participation may not reflect actual disengagement from community but rather community becoming embedded in digital networks rather than in traditional, geographically bounded groups" (p. 5).

9. Implications and limitations

This study conveys important academic implications to the body of knowledge of social capital, computer-mediated communication

and online games. First of all, although some studies (e.g. Lin, 1995; Lin, Ensel, & Vaughn, 1981) have explored how Chinese people's social capital affects their job-hunting and social status, little empirical research has been carried out to investigate the relationship between new media and social capital in the context of Chinese culture. Chinese culture values interpersonal relationships (Guanxi), a harmonious society and active participation in politics or public affairs. The large number of Chinese gamers are affected by collectivistic Chinese culture and may play MMORPGs in a different way from western gamers. The findings of this study have the potential for cross-cultural comparison.

The second academic implication of this study is the contribution to the knowledge of the motivation of online social interactions and the outcome of internet-mediated cooperation. The positive effects of collective MMORPG play on online bonding/bridging social capital suggest that the goal to make new contacts may be another motivation of internet-mediated cooperation. Moreover, the interdependency among players makes it easier for MMORPG communities than for other online communities to activate cooperation and membership participation. Hence, MMORPGs could be an effective channel to explore how to employ interactive and emulative technologies to facilitate internet-mediated group communication and initiate cooperation in groups.

Thirdly, this study provides a unique insight on how to measure game play. The long lasting debate on whether the internet benefits or undermines social capital may be caused by the diverse patterns of internet use and oversimplified conceptualization of internet use as online time. The emergence of the internet has changed the way of media consumption because users are no longer passive audiences but active participants. Users of interactive media are capable of influencing the properties of the media message, changing the communication setting and individualizing the media consumption process (Klimmt, Vorderer, & Ritterfeld, 2007; Vorderer, 2000). Online game is an extremely interactive medium because different people can play the same game in completely different ways. Although MMORPGs encourage collective-play and social interactions, people differ from each other in the frequency and quality of collective play. Collective play facilitates interdependent relationships, cultivates gamers' skills of communication, social interactions and teamwork, all of which are beneficial for gamers' social capital. In contrast, solo play is less likely to be linked with the improvement of social capital due to the lack of social interactions. The conflicting impact of gaming time and collective play on social capital sheds light on the paradox of social impact of new media, as well as demonstrates the importance to investigate how different people play online games in different ways.

The fourth theoretical implication lies in the findings of the positive social impact of MMORPGs. Ferguson's (2007) meta-analysis revealed that publication bias does exist for the studies about the effects of video games on aggressive behavior and aggressive thoughts. Indeed, the image of online games in mass media and academia is invariably negative. However, this study confirms that MMORPG is a double-edged sword (Zhong, 2009); whether the effects of MMORPG play is anti-social or pro-social depends on how people play the game. Those who take active part in frequent collective play and engage in successful cooperation will enjoy better social capital.

Apart from the theoretical implications, this study also conveys valuable implications to game designers and educators. The positive social effects of collective MMORPG play suggest game designers to provide more opportunities for social interactions and collective play, rather than merely stimulate gamers to pursue endless virtual rewards. MMORPGs could be used to promote civic learning and help people to develop capacity for active citizenship. As Kahne and colleagues (2008) suggested, teachers might incorporate games with explicit civic content into their curriculum; game designers could create more games that provide civic and political content.

One limitation of the paper is the self-selected sample. Non-probability sampling methods of online survey may have attracted those who are interested in discussing the effects of online games, but have ignored people who did not want to give a voice and people who did not visit the websites on which the hyperlink of the survey was posted. Future study of more representative samples to strengthen the findings of this study is called for.

Longitudinal estimates of the influence of one variable on another are time-specific (Kessler & Greenberg, 1981). Venter, Maxwell, and Bolig (2002) advocated at least three time points for testing true meditational models. To examine the mediation effect of online social capital on the relationships between MMORPG play and offline social capital, an ideal design is to do a three-wave survey. Limited by time and financial budget, this study only conducted a two-wave survey.

This study does not find a significant influence of online social capital on offline social capital, nor does the study detect a significant effect of collective play on offline bonding/bridging social capital. The research on how the internet influences people's real life social networks needs more theoretical elaboration as well as more representative data support. Future research may need to explore the fundamental social and psychological mechanisms that determine why people extend their online social networks into the offline world.

Besides, the boundary of bonding social capital and bridging social capital may not be as clear as a cut-off. Putnam (2000) admitted that to his knowledge, "there is no reliable, comprehensive, nationwide measure of bonding social capital and bridging social capital. But it is a must to recognize that bridging and bonding social capital are not interchangeable" (p. 24). In this study, the high correlation among offline bonding and offline bridging makes it necessary to combine them as a single construct. However, a more valid and reliable approach is needed to measure these two constructs.

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