



Research Report

The impacts of social interactions in MMORPGs on older adults' social capital



Fan Zhang*, David Kaufman

Faculty of Education, Simon Fraser University, 8888 University Drive, Burnaby, BC V5A 1S6, Canada

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ABSTRACT

Massively Multiplayer Online Role-Playing Games (MMORPGs) can offer older adults many opportunities to maintain current and develop meaningful and supportive relationships. Social capital plays an important role in later life. This study analyzed the relationships between older adults' social interactions in MMORPGs and their online social capital. A Web questionnaire was published to eight World of Warcraft (WoW, a popular MMORPG) player forums. A total of 222 older adults who were aged 55+ and mainly living in North America completed the questionnaire and became the participants of this study. To answer the research questions and test the four hypotheses, hierarchical multiple regression analysis was applied, and Cohen's f^2 was computed to compare effect sizes. It is found that enjoyment of relationships has deep impacts on older adults' social capital. The positive effects of gameplay on older adults are much dependent on the context of gameplay and enjoyment of relationships.

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1. Introduction

1.1. Social capital overview

1.1.1. Definition of social capital

Social capital has become a key concept in analyzing personal interactions and relationships in social science research since the early 1990s (Woolcock & Narayan, 2000, cited in Huvila, Holmberg, Ek, & Widen-Wulff, 2010). It was popularized by some sociologists (Coleman, 1988) and Putnam's (2000) work *Bowling Alone: The Collapse and Revival of American Community* (Lee & Lee, 2010; Trepte, Reinecke, & Juechems, 2012). There are many definitions of social capital. The most accessible one used in social science is defined by Putnam as the "features of social life such as networks, norms, and social trust that facilitate coordination and co-operation for mutual benefit" (Putnam, 1995, p. 67). Bridging and bonding are two forms of social capital. Bridging social capital refers to weak social ties in which individuals with different backgrounds make connections between social networks. As a result, bridging may broaden social horizons or world views, or open up opportunities for information or new resources, and are not restricted to one's social identity such as age, ethnicity and profession (Trepte et al., 2012). It functions to get together of disparate members of the community and is marked by tentative

relationships. Conversely, bonding social capital is marked by close-knit networks among people sharing similar backgrounds and beliefs and having stronger personal connections. It provides continued reciprocity among individuals who exchange strong emotional and substantive support. Steinkuehler and Williams (2006) indicated that there is an implicit bias toward bonding social capital over bridging social capital. Actually, they are two different types of social capital and overemphasizing one over another is harmful. Without bridging social capital, individuals will be sheltered from newness and alternative viewpoints and opportunities; without bonding social capital, individuals are widely connected but unsupported (Steinkuehler & Williams, 2006).

While Putnam (2000) claimed that social capital as a collective good is created through active participation of citizens in organizations and groups, others (Bourdieu, 1986; Coleman, 1988) maintained that social capital is inherent in an individual's social networks and comprises social resources accessible through membership in those social networks. Thus, social capital can be conceptualized as an individual resource residing in relationships between individuals or as a collective resource produced through interactions in larger social structures or societies (e.g., civic engagement). The discrepancy between the two facets of social capital – the individual and the collective – has resulted in the persistent conceptual confusion (Rostila, 2011). However, no matter whether social capital resides in the individual or collective level and no matter whether it should be seen as private good or public good, the bottom line is that it has benefits for individuals. In this

* Corresponding author. Tel.: +1 604 353 3968.

E-mail addresses: fza26@sfu.ca (F. Zhang), dkaufman@sfu.ca (D. Kaufman).

study, social capital is seen as social resources, which are available to individuals and groups through their social connections to the communities and can be used to obtain information and assistance of various kinds. It is applied to those features of a community which promote cohesion and a sense of belonging, and which enable its members to cooperate for mutual benefit (Cooper, Arber, Fee, & Ginn, 1999).

1.1.2. Social capital and Internet use

The Internet has changed the way in which people communicate with others. The development of social web and virtual worlds has transformed traditional communities into online communities which are not formed around neighbourhoods, but around social networks comprising family, friends, and people with similar interest (Wellman & Gulia, 1999). Online communities (e.g., virtual learning communities and social networking sites) provide seamless forms of informal socializing, and thus suggest new ways of conceptualizing the relationship between “place” and communities (Shen, 2014). As a result of this, a great amount of attention has been paid to the relationship between the production of social capital and online community usage. There are debates about whether online communities foster and nurture social capital. Computer-mediated communication accelerates the ways in which people connect with others, particularly for those who are homogeneous with respect to interests and values. Anonymity and the absence of social clues inhibit social control, which makes online activities less hierarchical, but more participatory. Nevertheless, face-to-face communication provides a depth and speed of feedback that is impossible in computer-mediated communication. Lee and Lee (2010) indicated that the underlying assumption on both sides is that all Internet activities are relatively equivalent. However, individuals have a position in these social structures, which can either benefit or harm them. Therefore, it would be more empirically rigorous to investigate how and the extent to which individuals' social capital is impacted by specific forms of Internet activity (Lee & Lee, 2010).

1.1.3. Social capital and successful aging

Social connection to one's social networks can result in positive affective bonds, which in turn yields positive outcomes such as emotional support or the ability to mobilize others (Williams, 2006b). Cannuscio, Block, and Kawachi (2003) described two ways in which social capital is relevant to successful aging. On the one hand, older adults are much dependent on social capital within their communities due to the decrease of their social ties as they age. On the other hand, the levels of social capital within U.S. communities appear to decline as the population continues to age. Previous study has found that social capital is associated with health outcomes such as mental health (Scheffler, Brown, & Rice, 2007), obesity and diabetes (Holtgrave & Crosby, 2006), and cancer (Beaudoin & Tao, 2007). Rostila (2011) argued that social resources can reduce both physical and psychological health problems by serving as a physiological triggering mechanism, strengthening people's immune system to fight disease and buffer stress. Recent studies have suggested that social capital plays an important role in later life (Forsman, 2012; Forsman, Nyqvist, & Wahlbeck, 2011). It affects the health of older adults more strongly than younger individuals (Muckenhuber, Stronegger, & Freidl, 2012). Forsman (2012) examined the associations between psychological health and social capital among older adults. Based on both quantitative and qualitative data, the findings consolidated the effectiveness and subjective importance of social activities for the maintenance of mental health and well-being among older adults. The social activities are important health resources for older adults due to “the accompanied sense of belonging to a social

group, as well as feelings of purpose with regard to everyday life and hope for the future” (Forsman, 2012, p. 4).

1.2. Social interactions in MMORPGs

Massively Multiplayer Online Role-Playing Games (MMORPGs) allows millions of gamers play simultaneously in the same online world. To enter the game world, players first create a character (also referred as avatar) from a set of classes and races as digital representations of themselves. Each character has a specific set of skills and abilities that define that character's role. Players begin the game as low-level member. During game-play, the development of the player's character is the primary goal. Over the course of a character's life, the character will brave thousands of quests while exploring the game environment, learn new and powerful abilities, and find hundreds of powerful weapons and more. MMORPGs have functional constructs (e.g., unique attributes of each character and challenging quests that cannot be addressed by a single player) that encourage players to group with others and complete a same quest for mutual benefits. These functional constructs facilitate some social groups, known as guilds. A guild is an organized group of players that regularly play together, and formed to make collective actions easier and more rewarding, as well as to form a social atmosphere. A MMORPG community is as dynamic and complex as the real world. A typical group requires players to fulfill a number of roles, which are summarized as kill, irritate, and preserve. A good group needs an appropriate balance of all three roles and successful team cooperation and coordination in order to stand a realistic chance of success. Players form contacts and develop relationships of trust and accountability based on their characters' attributions, actions, and the network of affiliations (Dickey, 2007).

Since MMORPGs are virtual communities where players interact with each other through their characters, a challenge facing proponents of MMORPGs as a social intervention is whether MMORPGs are socially meaningful in a positive way. Cole and Griffiths (2007) reported that 26.3% of MMORPGs users played with family and real-life friends, among which 81% playing the same game with them. Approximately 76.2% of male players and 74.75% of female players had made good friends within the game, and the mean number of “good friends” was seven. In addition, 67% of participants believed that they developed positive relationships with whom they played in the game. What is more, 42.8% of participants had physically met with game friends in real-life situations. Schiano, Nardi, Debeauvais, Ducheneaut, and Yee (2011) found 41–71% of World of Warcraft (WoW, a popular MMORPG) players met some game friends who eventually became a real-life friend. Yee (2006c) reported that 22.9% of male players and 32.0% of female players had told personal issues or secrets to their game friends which they have never told their real-life friends. Some 40% of male players and 53% of female players felt that their MMORPG friends were comparable or better than their real-life friends. In Whippey's (2011) study, 54% of participants felt that their game friends were comparable to their real-life friends. It seems that MMORPGs are places populated with a range of social experiences with varying depth, ranging from superficial in-game relationships to sustained and deep relationships extended to real life.

1.3. Social capital in MMORPGs

The huge amount of social interactions occurring in MMORPGs leads to the research interest of the nature and extent of social capital generated in MMORPGs. Huvila et al. (2010) indicated that social capital in MMORPGs is created in the process in which players form different social networks to reach their goals (either individual or collective). A few empirical studies have explored the

relationship between online gaming and social capital. It is widely agreed that playing MMORPGs leads to bridging social capital. However, there are mixed results in terms of bonding social capital. For example, [Zhong \(2011\)](#) examined the impact of collective MMORPG play on Chinese gamers' social capital at both individual and collective levels and in both the virtual and the real world. Collective MMORPG play is conceptualized as the frequency of joint guild actions and gamers' assessment of the experience in guilds and groups. Individual-level bridging and bonding social capital in both the virtual world and the real world was measured by [Williams' \(2006b\)](#) Internet Social Capital Scales (ISCSs). Civic engagement was measured by online and offline organization memberships. This study found that frequent in-game social interactions and enjoyable social experiences in MMORPGs positively influence gamers' online bridging and bonding social capital. [Williams \(2006a\)](#) conducted an experiment to test the social impact of Asheron's Call II (a MMORPG). Social capital was also measured by Williams's ISCSs and tested on both bridging and bonding dimensions and for both online and offline contexts. It was found that bridging social capital was positively affected in all contexts, but bonding social capital was negatively affected both online and offline. One possible problem that results in the different findings on online bonding social capital is the different measures of social interactions in MMORPGs. In Zhong's study, social interactions were measured by the frequency of joint guild actions and gamers' assessment of their experiences in guilds and group (i.e., guild organization, leadership and guild mates). However, in Williams's study, social interactions were measured by the frequency which participants played alone or with others in strategic fellowship groups.

1.4. Research purpose and hypotheses

[Griffiths, Davies, and Chappell \(2004\)](#) found that over 60% of EverQuest players were older than 19, about 5% aged between 40 and 60, and 2% aged 60 and older. [Yee's \(2006b\)](#) study found that the mean age of MMORPG was 26.57, with a range from 11 to 68. So, older adults have become the customers of MMORPGs. Playing MMORPGs can provide them many opportunities for social interactions. What is more, social capital has become a key concept in analyzing personal interactions and relationships in online communities, and plays an important role in later life. Whether the Internet strengthens or weakens individuals' social capital is still under debate because its effect is dependent on the nature of specific online activities and the quality of social interactions. In the context of MMORPGs, the question is whether older adults' social interactions within MMORPGs relate to their online social capital. Therefore, the purpose of this study is to understand the relationships between older adults' social interactions in MMORPGs and their online social capital.

As discussed above, there are controversial results regarding how well MMORPG playing is related to online bonding social capital. It is argued that the inconsistencies result from the inappropriate definition and measure of social activities in MMORPGs as predictors of social capital ([Trepte et al., 2012; Zhong, 2011](#)). Most of previous researches conceptualized online gaming as the frequency, duration or intensity of game playing, ignoring different patterns of gameplay and the quality of social experiences in MMORPGs. Therefore, before drawing any conclusions about the impacts of MMORPGs as a whole, it should be determined which underlying variables are involved in older adults' social interactions in MMORPGs and older adults' social capital in MMORPGs.

1.4.1. Conceptualization of social interaction in MMORPGs

At present, there are few shared theories and common practices of describing the human social experiences in virtual worlds as

research about virtual worlds is still at its infant stage ([Williams, 2010](#)). To support research progress in virtual worlds, Williams developed a research framework to map behaviors in virtual worlds. Based on this framework and findings in previous MMORPGs studies, this study conceptualizes social interactions in MMORPGs as follows (see [Table 1](#)):

1.4.1.1. Communication methods. Communication is the most important aspect of players' interactions in MMORPGs ([Shen & Williams, 2011](#)). MMORPGs players communicate with each other through a wide variety of tools ranging from in-game general chat, group chat, private chat, voice chat to out-game social media (e.g., email, phone and forum) and face-to-face meeting. The frequency of using these communication tools is an indicator of the intensity of interactions. For most players, the purpose of participating in constant conversation through myriad chat channels is not only to overcome the challenges but to develop and maintain relationships of status and solidarity and, in-game community and cultural norms ([Steinkuehler & Williams, 2006](#)). [Nardi and Harris's \(2006\)](#) study found that chatting is a key aspect of socializing in WoW, which takes place not only when grouping and fighting, but also when players are soloing or traveling in WoW.

1.4.1.2. Network level. Network level refers to the position of players in their social network. It is another key variable when understanding the outcomes of MMORPG playing ([Williams, 2010](#)). Position within social networks has great predictive power for understanding motivations, group behaviours, information flows, and many other outcomes ([Monge & Contractor, 2003](#)). [Shen, Monge, and Williams \(2012\)](#) indicated that the measure of network level is essentially the same as centrality. Based on the graph theory, individuals who are in central positions within a network are usually more accessible than other more distant interaction partners ([Freeman, 1978/79](#)). In the context of MMORPGs, research has shown that players may play with family, real-life friends, game friends (people who meet in a MMORPG) or other players. So, in this study, centrality refers to the frequency of playing with these persons. The more central older players are in their social networks, the more frequently they play with these persons.

1.4.1.3. Enjoyment of relationships. Enjoyment of relationships refers to the quality of interactions with family, real-life friends and game friends. The enjoyment of relationships affects how much social support players can exchange by playing together. The depth of relationships in MMORPGs varied widely. Gameplay is constituted not only by joint in-game activities but also overwhelmingly by constant conversation about the game and topics well beyond it, ranging from debates about the mechanics of the game and intimate personal problems. Some players trust their game friends and see them as important as real-life friends, while others see their game friends as not particularly important to them

Table 1

The constructs of social interactions in MMORPGs and indicators.

Communication methods	Network level	Enjoyment of relationships	Quality of guild play
Public chat	Family	Talking about the game with family and real-life friends	Amount of guild play
Group chat	Real-life friends	Closeness to family and real-life friends	Assessment of guild
Private chat	Game friends	Depth of relationships with game friends	
Voice chat	Other players		
Social media			
Face-to-face meeting			

(Williams et al., 2006). So, the indicators of enjoyment of relationship include (a) talking about the game with family and real-life friends; (b) closeness to family and real-life friends, and (c) depth of relationships with game friends (i.e., sharing personal problem with game friends, trusting game friends and game friends as important as real-life friends).

1.4.1.4. Quality of guild play. In MMORPGs, guild is a place where deep relationship occurs (Steinkuehler & Williams, 2006; Williams et al., 2006). Social interactions in MMORPGs are accompanied with conflicts and selfish motivations. In Williams et al.'s (2006) study of social life of guilds, the important reasons for leaving guilds are dissatisfaction with the guild's objectives, elitism, social distance, poor leadership, a lack of players at their level to play with. Williams et al. found that players in formally structured guilds tend to have more social experiences than others. This positively affects the quality of their time in the game. So, quality of guild play determines whether its impact on social interactions is positive or negative. In this study, quality of guild play refers to the amount of guild play and assessment of guild (including assessment of guild organization, leadership and guild mates).

1.4.2. Conceptualization of social capital in MMORPGs

The purpose of conceptualizing bridging and bonding social capital in MMORPGs is not to draw a line between them. Norris (2002) claimed that the conceptual distinction between bridging and bonding social capital should be seen as "a continuum rather than a dichotomy, since in practice many groups serve both bridging and bonding functions, but networks can be classified as falling closer to one end of this spectrum or the other" (p. 3). Social interactions in MMORPGs are dynamic and complex and are a mixture of bridging and bonding relationships. Steinkuehler and Williams (2006) claimed that "the question for scholars researching virtual communities such as MMORPGs, then, is to what extent such environments shift the existing balance between bridging and bonding" (p. 904).

In this study, the criteria of pure bridging social capital in MMORPGs should be contacting with a broader range of people from diverse social backgrounds and beliefs. It can be understood as the weak ties that are generated during grouping and guild-play, and embedded in the game friends who know each other but do not necessarily exchange emotional and substantial support. In contrast, the criteria of pure bonding social capital in MMORPGs should be deepening networks among people sharing similar backgrounds and beliefs and providing emotional support. It inheres in family and real-life friends, or strongly-tied game friends who establish friendly relationships and trust through desirable social interactions and personal problem sharing.

1.4.3. Research hypotheses

MMORPGs are a wholly new form of community, social interaction and social phenomenon. Playing MMORPGs links people from all over the world as they engaged in a shared virtual world and collective play experience. Social interaction is a primary driving force for players to continue to play MMORPGs, and contributes a considerable part to the enjoyment of playing (Yee, 2006a). It can maintain real-life relationships and facilitate new relationships, and thus provides more opportunities to obtain social resources. A social group with high level of social capital is more likely to be cohesive and to have well-developed networks of communication and mutual support. Brack et al. (2013) indicate that MMORPG playing can promote social capital. Therefore, the author proposed the following four hypotheses:

Hypothesis 1. Higher level of using different communication methods is positively associated with higher levels of bridging and bonding social capital.

Hypothesis 2. Network level is positively associated with bridging and bonding social capital.

Hypothesis 3. Higher level of enjoyment of relationships is associated with higher levels of bridging and bonding social capital.

Hypothesis 4. Higher level of quality of guild play is associated with higher levels of bridging and bonding social capital.

2. Methodology

2.1. Intervention tool

WoW was selected as the intervention tool in this study for two reasons. On the one hand, games are quite different, and therefore lead to different effects (Williams, 2010). For example, some games encourage conflict through "player versus player" mechanics, whereas others encourage players to work together. WoW belongs to the latter. With different types of games, it is unrealistic to assume that all games have uniform effects (Shen & Williams, 2011). Therefore, examining all MMORPGs rather than just one game will hinder the generalizability of the results. On the other hand, WoW is one of the most popular MMORPGs (the current North American MMORPG leader). Essentially, the core gameplay of WoW revolves around fighting monsters and completing quests. Every quest is unique and involves different levels of challenge. Group quests are more challenging than normal quests and can only be conquered by groups of players working together as a team.

2.2. Study sample and recruitment

Participants were older adults who were aged 55 and over, English speakers and WoW players, and were recruited through a Web questionnaire. Since MMORPGs players are geographically dispersed all over the world, using the Internet to distribute surveys is effective to get appropriately large amount of responses from different places and cultures. Invitation messages including the URL to the Web questionnaire were posted on 8 WoW player forums. By beginning the survey, they signified that they had read and understood the study purposes, thus satisfying ethics protocols. Totally, 222 older WoW players (from North America) finished the survey, and were the participants of this study.

2.3. Measurements

Amount of gameplay was measured as weekly gameplay. Motivations for playing MMORPGs were measured using Online Gaming Motivations Scale (Yee, Ducheneaut, & Nelson, 2012). The scale items loaded onto 3 factors that correspond to Social, Immersion, and Achievement motivation. Each of the 3 factors has 4 items and has Cronbach's α above .70. The response options are identical for all items: a 5 point Likert scale ranging from 1 (Not important at all) to 5 (Extremely important). Communication methods were measured by asking how frequently (1 = Never, 5 = All the time) older adults communicate with others via public chat, group chat, private chat, in-game voice chat, social media and face-to-face meeting. Network level was measured by asking how frequently (1 = Never, 5 = All the time) older adults play with family, real-life friends, game friends and other players. For the measure of enjoyment of relationships, respondents were asked to indicate on a 5-point scale (1 = Strongly disagree, 5 = Strongly agree) to what extent they agree with these statements: (a) Playing with family members makes me feel closer to them; (b)

Playing with real-life friends makes me feel closer to them; (c) I trust my game friends; (d) My game friends are as important to me as my real-life friends. They were also asked to indicate on a 5-point scale (1 = Never, 5 = All the time) how often they engage in these actions: (a) Talk about WoW with my family; (b) Talk about WoW with my real-life friends; (c) Share my personal problems with game friends. These statements were selected from Steinkuehler and Williams (2006) and Williams et al.'s (2006) study in which they were identified as deep relationships. Quality of guild play was measured by time of guild play (weekly guild play) and satisfaction with guild play. Satisfaction with guild play was measured by asking respondents to indicate how satisfied they are with the organization of the guild, guild leadership and guild members with "1" referring to "Very dissatisfied" and "5" referring to "Very satisfied". In order to have a better understanding of older adults' guild activities, information about guild size was also collected.

In academic research, there are three ways to measure bridging and bonding social capital. The first way measures multiple elements of social capital (e.g., trust, family and friends connections and participation in the community) by different sets of items or scales. The second type uses one scale to measure the different elements of social capital as a whole. For example, elements of social capital measured in Huvila et al.'s (2010) study include participation in the community, feelings of trust and safety, family and friends connections and so on. The common criticism for these two types of measure is that what they measure is the components rather than the outcomes of social capital. The third type uses Williams' ISCSs (2006b) to measure the outcomes/benefits of people's social network rather than the network itself. Williams pointed that this does not preclude network analysts' use of the measures, but simply suggests that "the networks are the causal agents or moderators of the social capital measured by the scales" (p. 594). ISCSs were used in this study to measure older adults' social capital in MMORPGs because social capital is seen as social resources existing in one's social networks and that can be used to obtain information and assistance of various kinds. This can bridge the individual and collective facets of social capital. In addition, Williams' ISCSs have been successfully used in previous MMORPGs studies to measure social capital in MMORPGs (Trepte et al., 2012; Zhong, 2011). ISCSs measure two types of social capital (i.e., bridging and bonding). Each scale has 10 items and rated on a 5-point scale ranging from 1 (Strongly disagree) to 5 (Strongly agree) with higher scores indicating higher levels of social capital.

2.4. Data analysis

One objective of this study is to examine the relationship of older adults' online social capital with their social interactions in MMORPGs. So, multiple regression was used as data analysis method because it implies prediction. Amount of gameplay and Social motivation for gameplay are important factors that affect the level of social capital in MMORPGs. Time spent in the game necessarily takes away from time spent in other things such as contact with family and real-life friends and institution activities. Also, gameplay will likely be more social for some than for others (Bartle, 2004). So, controlling for amount of gameplay and Social motivation, a series of two-stage hierarchical regression analyses were performed, using bridging or bonding social capital as outcome variable, and the factors in each social interaction component as independent variables. Numerous rules-of-thumb have been suggested for determining the minimum number of subjects required to conduct multiple regression analyses. Meyers, Gamst, and Guarino (2013) pointed that researchers must accept pragmatic compromises to get the research done. Griffiths et al.'s (2004) study used an online questionnaire to recruit a total of 540

participants who played EverQuest, of which only 27 participants were aged between 40 and 60, and 11 aged 60 and older. Schiano et al. (2011) conducted a large online survey and collected data from 2865 WoW players from the US, Europe, Hong Kong and Taiwan. However, only about 29 of the 2865 WoW players were retiree. So, based on Meyers et al.'s recommendation and findings in previous studies, the sample size of this study ($N = 222$) was acceptable to conduct multiple regression analysis.

To compare the effect size of each social interaction component on each outcome measure (e.g., for communication methods, network level, enjoyment of relationships and quality of guild play, which one generated the biggest effect size on bridging social capital?), Cohen's f^2 was calculated for each individual hierarchical regression analyses. By convention, f^2 effect sizes of .02, .15 and .35 are termed small, medium, and large, respectively (Cohen, 1988). Due to the high frequency of multiple regression analyses used, all regression analyses were carried out with an alpha level of .01.

3. Results

First of all, older adults have developed higher level of bridging social capital (3.389(.847)) in WoW, but lower level of bonding social capital (2.673 (1.101)). The mean of bonding social capital was smaller than the neutral 3 on the 5-item Likert-type scale. Then, to test the hypotheses and predict the level of social capital among older adults, a series of two-stage hierarchical linear regression analyses were used. For each social interaction component, the amount of gameplay and Social motivation were entered to the first block as covariates; in the second block, the factors in each component were simultaneously entered.

3.1. Communication methods

For bridging and bonding social capital, the amount of gameplay and Social motivation were significant covariates. When the six variables of communication methods were added to the block, both the second prediction model of bridging and bonding were statistically significant. For bridging social capital, the R^2 change was statistically significant, $F_c(6, 213) = 4.861$, $p_c < .001$, $R^2_c = .084$, and the six variables of communication methods accounted for 8.4% of the variance of bridging social capital. The squared semi-partial correlations in Table 2 indicate that bridging social capital was most predicted by Social motivation, second by communicating with other players through social media. For bonding social capital, the R^2 change was also statistically significant, $F_c(6, 213) = 4.715$, $p_c < .001$, $R^2_c = .087$, and the six variables explained 8.7% of the variance of bonding social capital, which was most predicted by the amount of gameplay and using social media as communicational tool (see Table 3).

3.2. Network level

When the four variables of network level were added to the block, all of the second prediction modes were statistically significant. The R^2 changes of bridging and bonding social capital were also statistically different from zero. The four variables of network level accounted for 13.4% of the variance of bridging social capital, $F_c(4, 215) = 12.861$, $p_c < .001$, $R^2_c = .134$. Examining Table 4 indicates that bridging social capital was most predicted by Social motivation, to a lesser extent by playing with game friends. Some 8.2% of the variance of bonding social capital was explained by network level, $F_c(4, 215) = 6.658$, $p_c < .001$, $R^2_c = .082$. Bonding social capital was mostly predicted by playing with game friends (see Table 5).

Table 2
Hierarchical regression results for bridging social capital ($N = 222$).

Block	R^2	Model	b	SE- b	Beta	r	sr^2	sc
1	.305	Constant	1.701	.193				
		Amount of play	.018	.026	.039	.069	.002	.125
		Motivation ^a	.473	.049	.549	.551	.300	.998
2	.389	Constant	1.632	.196				
		Amount of play	-.003	.026	-.006	.069	<.001	.111
		Motivation ^a	.266	.070	.309	.551	.042	.884
		Public chat	.089	.046	.121	.367	.011	.589
		Group chat ^a	.138	.055	.199	.522	.018	.838
		Private chat	-.002	.043	-.003	.325	<.001	.522
		Voice chat	.020	.041	.033	.359	.001	.576
		Social media ^a	.129	.044	.194	.315	.025	.506
		Face-to-face meeting ^a	-.177	.046	-.158	.011	.018	.018

Note: sr^2 = squared semi-partial correlation; sc = structure coefficient.

^a $p < .01$.

Table 3
Hierarchical regression results for bonding social capital ($N = 222$).

Block	R^2	Model	b	SE- b	Beta	r	sr^2	sc
1	.257	Constant	.490	.259				
		Amount of play ^a	.135	.035	.222	.247	.049	.487
		Motivation ^a	.497	.065	.443	.456	.196	.899
2	.344	Constant	.231	.263				
		Amount of play ^a	.114	.035	.188	.247	.033	.422
		Motivation	.193	.094	.172	.456	.013	.778
		Public chat	.018	.062	.019	.264	.0003	.451
		Group chat	.132	.074	.147	.435	.010	.742
		Private chat	.073	.057	.087	.332	.005	.567
		Voice chat	.046	.055	.059	.343	.002	.585
		Social media ^a	.203	.059	.235	.411	.037	.701
		Face-to-face meeting	.022	.062	.022	.208	.0004	.355

Note: sr^2 = squared semi-partial correlation; sc = structure coefficient.

^a $p < .01$.

Table 4
Hierarchical regression results for bridging social capital ($N = 222$).

Block	R^2	Model	b	SE- b	Beta	r	sr^2	sc
1	.305	Constant	1.701	.193				
		Amount of play	.018	.026	.039	.069	.002	.125
		Motivation ^a	.473	.049	.549	.551	.300	.998
2	.439	Constant	1.277	.190				
		Amount of play	.010	.024	.021	.069	.0004	.104
		Motivation ^a	.268	.062	.311	.551	.049	.832
		Family ^a	.109	.032	.179	.256	.030	.387
		Real-life friends	-.070	.038	-.107	.181	.009	.273
		Game friends ^a	.179	.046	.274	.564	.040	.852
		Other players ^a	.134	.045	.182	.468	.023	.707

Note: sr^2 = squared semi-partial correlation; sc = structure coefficient.

^a $p < .01$.

3.3. Enjoyment of relationships

The amount of gameplay and Social motivation were significant covariates for bridging and bonding social capital. When the seven variables of enjoyment of relationships were added to the block, the second prediction modes of bridging and bonding social capital

Table 5
Hierarchical regression results for bonding social capital ($N = 222$).

Block	R^2	Model	b	SE- b	Beta	r	sr^2	sc
1	.257	Constant	.490	.259				
		Amount of play ^a	.135	.035	.222	.247	.049	.487
		Motivation ^a	.497	.065	.443	.456	.196	.899
2	.339	Constant	.134	.268				
		Amount of play ^a	.130	.034	.214	.247	.045	.424
		Motivation ^a	.217	.087	.194	.456	.019	.784
		Family	.089	.046	.112	.203	.011	.349
		Real-life friends	.077	.054	.090	.284	.006	.488
		Game friends ^a	.256	.065	.300	.485	.048	.833
		Other players	.012	.064	.013	.309	<.001	.531

Note: sr^2 = squared semi-partial correlation; sc = structure coefficient;

^a $p < .01$.

Table 6
Hierarchical Regression Results for Bridging Social Capital ($N = 201$).

Block	R^2	Model	b	SE- b	Beta	r	sr^2	sc
1	.266	Constant	1.801	.209				
		Amount of play	.023	.028	.049	.083		
		Motivation ^a	.443	.053	.510	.513		
2	.453	Constant	1.030	.232				
		Amount of play	.009	.026	.019	.083	.0003	.123
		Motivation ^a	.230	.056	.264	.513	.048	.762
		Talk WoW with family	-.027	.045	-.040	.193	.001	.287
		Talk WoW with RL friends	.024	.049	.035	.299	.001	.443
		Share personal story with GF	.098	.049	.137	.431	.011	.640
		Close to family ^a	.200	.050	.286	.444	.046	.660
		Close to RL friends	<.001	.056	<.001	.389	<.001	.578
		Trust GFs	.111	.065	.133	.494	.008	.734
		GFs as important as RL friends	.094	.048	.142	.429	.011	.637

Note: sr^2 = squared semi-partial correlation; sc = structure coefficient; GF = Game Friends; RL = Real-Life.

^a $p < .01$.

were statistically significant, and their R^2 changes were also statistically different from zero. For bridging social capital, the seven variables of enjoyment of relationships accounted for 18.7% of its variance, $F_c(7, 191) = 9.338$, $p_c < .001$, $R^2_c = .184$. According to the squared semi-partial correlations in Table 6, bridging social capital was mostly predicted by Social motivation and feeling close to family. Approximate 24% of the variance of bonding social capital was explained by the seven variables, $F_c(7, 191) = 12.722$, $p_c < .001$, $R^2_c = .244$. To a large extent, bonding social capital was predicted by sharing personal stories with game friends (see Table 7).

3.4. Quality of guild play

The amount of gameplay and Social motivation were significant covariates for bridging and bonding social capital. When the four variables of quality of guild play were entered to the model, all of the second prediction modes were statistically significant. However, the R^2 changes of bridging ($F_c(4, 215) = 1.422$, $p_c = .228$, $R^2_c = .023$) and bonding social capital ($F_c(4,$

Table 7
Hierarchical regression results for bonding social capital ($N = 201$).

Block	R^2	Model	b	SE- b	Beta	r	sr^2	sc
1	.234	Constant	.539	.285				
		Amount of play ^a	.138	.038	.226	.253		
		Motivation ^a	.479	.072	.413	.428		
2	.477	Constant	-.472	.304				
		Amount of play ^a	.092	.034	.151	.253	.020	.366
		Motivation	.157	.074	.135	.428	.012	.619
		Talk WoW with family	.046	.058	.052	.255	.002	.369
		Talk WoW with RL friends	.052	.064	.057	.351	.002	.508
		Close to family	.057	.065	.061	.263	.002	.381
		Close to RL friends	<.001	.073	<.001	-.002	<.001	.425
		Share personal story with GF ^a	.192	.063	.206	.537	.025	.777
		Trust GFs ^a	.277	.085	.247	.552	.029	.799
		GFs as important as RL friends	.144	.063	.162	.523	.014	.757

Note: sr^2 = squared semi-partial correlation; sc = structure coefficient; GF = Game Friends; RL = Real-Life.

^a $p < .01$.

Table 8
Cohen's f^2 of outcome measures.

Outcome measure	Communication methods	Network level	Enjoyment of relationships	Quality of guild play
Bridging	.137	.239	.342	.031
Bonding	.133	.124	.465	.043

215) = 1.979, $p_c = .100$, $R^2_c = .032$) were not statistically different from zero. Therefore, the fourth hypothesis was not supported.

3.5. Cohen's f^2

Table 8 presents Cohen's f^2 of all outcome measures. The biggest effect sizes on bridging social capital ($f^2 = .342$) and bonding social capital ($f^2 = .465$) were both generated by enjoyment of relationships. Based on Cohen's (1988) rule, they were large effect sizes. In addition, the smallest effect sizes of bridging and bonding social capital were both generated by quality of guild play. What is more, communication methods and network level generated bigger effect size on bridging social capital than the effect size they generated on bonding social capital.

4. Discussion

By comparing the similarities in descriptive characteristics between MMORPGs and real-world third place, Steinkuehler and Williams (2006) concluded that MMORPGs serve best as a new form of "third place" for informal sociability much like the pubs, coffee shops, and other hangouts of old, where people are able to establish and maintain social ties beyond the workplace and home by interacting and collaborating with strangers. They argued that MMORPGs are particularly conducive for the development of weak connections with diverse populations, or bridging ties, but strong and substantive relationships, or bonding ties, can be rare.

William et al.'s (2006) study indicated that playing MMORPGs was an entrée to bridging social capital for those without previous real-life ties; but bonding social capital is rare and usually occurs in those who knew each other beforehand, meet face-to-face and use VoIP for communication. Compatible with their arguments, this study found that older adults have developed higher level of bridging social capital in WoW, but the level of bonding social capital was lower.

It was found that the biggest effect sizes on bridging and bonding social capital were associated with enjoyment of relationships. Based on Cohen's (1988) rule, both of the effect sizes were large. This is consistent with the conceptualization of social capital as an individual resource residing in relationships between individuals. Thus, this study found supporting evidence for the hypothesis that higher level of enjoyment of relationships is related to higher levels of bridging and bonding social capital. In addition, scrutiny of Tables 2–7 indicates that amount of gameplay contributed a significant part to all of the second models associated with bonding social capital. This finding is encouraging. Shen's (2014) study suggested that time spent in MMORPGs had a very small impact on players' psychosocial well-being, but this study found that time spent in the game could generate bonding ties. In combination with the finding that the biggest effect size of bonding social capital was generated by enjoyment of relationships, the author argued that the issue is not only how much time older adults spend playing MMORPGs, but how they spend their time in the game. Social impacts of playing MMORPGs on older adults are very much dependent on the contexts of gameplay (e.g., who they play with) and enjoyment of the relationships. Time spent in the game engenders deep interpersonal relationships if playing MMORPG is not only about mindlessly killing monsters but also about engagement in meaningful social activities. It was also found that bridging social capital was mostly predicted by Social motivation and closeness to family, while bonding social capital was mostly predicted by sharing personal stories with game friends. This finding differs from the conceptualization of bridging and bonding social capital in MMORPGs. In this study, pure bonding social capital inheres in family and real-life friends, or strongly-tied game friends. So, feeling close to family should be seen as bonding social capital rather than bridging social capital. Norris (2002) suggested seeing the distinction between bridging and bonding social capital as a continuum rather than a dichotomy. The findings of this study indicate that social interactions in MMORPGs are a mixture of bridging and bonding relationships. However, we definitely need more clarification on the conceptualization of bridging and bonding social capital in online communities in order to analyze how these communities shift the balance between bridging and bonding.

In a MMORPG, some dedicated groups (such as guilds) have formal recruitments procedures. Membership in a guild is monitored and regulated. A player who creates a good impression and performs a role well will have good reputation and become a well-respected and experienced member in the game community. So, building positive social skills is a necessity if a player wishes to either participate in communities or successfully complete the harder challenges of the game. Steinkuehler and Williams (2006) indicated that bridging social capital is more likely to occur in guilds than in temporary "pick up" groups that band together for short-term goals, and bonding social capital is most likely to exist in guild. However, this study found higher level of quality of guild play was not related to higher level of bridging and bonding social capital. Quality of guild play generated small effect sizes on bridging and bonding social capital. These findings contradict Zhong's (2011) finding that collective play (measured by time of group/guild play and assessment of group/guild as did in this study) was positively related to bridging and bonding social capital. Players join or create guilds for their pragmatic or social needs

(Williams et al., 2006). The most common reason to join a particular guild is to use their membership as a resource to meet their game goals, such as having access to the game's most challenging content. Some players are more likely to play with those who share similar personality, real-life demographics, or even sense of humour. Since previous studies in MMORPGs areas predominately focused on young adults, one possibility for the contradiction is that older adults and young adults might have different expectations regarding guild play. According to socioemotional selectivity theory, when time in life is limited, older adults prefer emotionally gratifying social contacts over contacts with novel social partners (Carstensen, 1992). They increasingly emphasize focusing on familiar social partners and emotionally meaningful aspects of relationship. So, it is possible that older adults might be satisfied with their guilds, but they drew a distinction between real-life friendship and relationships with guild members. Another possibility for the contradiction is related to the nature and structure of guilds. Ducheneaut and Yee's (2008) study revealed that players know at most 1 out of 4 members of their guilds, and play only with 1 out of 10. Therefore, guilds are sparsely knit networks. Actually, small guilds represent the strongest bonding social capital found within MMORPGs, but with more members, there is a higher chance of a conflict in styles or ethics. This study found that the average size of the guild in which older adults played most often was 199 ($SD = 244.530$). Approximately 40% of these guilds had more than 150 members. Although the majority of older adults were satisfied with guild play, it was very difficult for them to know every guild member. In addition, it was found by this study that in 16.6% of guilds only a small number (usually about 10) of members were active players even though the guild sizes were huge. Huge guilds are slightly less sociability, and they need more formal organization (Williams et al., 2006). The sparsely knit networks formed in guilds might be an obstacle for older adults to develop in-depth relationship and exchange advice for personal issues and emotional support. However, further qualitative studies are needed to understand older adults' social experiences in guilds.

There are several limitations to this study that deserve discussion. First, all the data collected for this study were self-reports. As such, issues of social desirability and accuracy of response need to be taken into account. Second, the inclusion criteria were older adults who were aged 55 and over, and have played WoW. However, it is unclear whether those unfitted people filled out the questionnaire as it is a Web survey. Third, the self-select sampling strategy might result in overestimating the population.

5. Conclusion

This study analyzed the relationships between older adults' social interactions in MMORPGs and their online social capital. Instead of the gross measure of playing time in MMORPGs, this study categorized social interactions into four components: communication methods, network level, enjoyment of relationships and quality of guild play. It is found that the biggest effect sizes of bring and bonding social capital were associated with enjoyment of relationships. Bridging social capital was mostly predicted by Social motivation and feeling close to family, while bonding social capital, to a larger degree, was predicted by sharing personal stories with game friends. Playing MMORPGs is an alternative way to enjoy family life, and also provides opportunities to form meaningful relationships with game friends. So, enjoyment of relationships has deep impacts on older adults' social capital. In addition, the regression analyses revealed that the positive effects of game-play on older adults are closely related to who they play with and how they spend time in the game. Further qualitative studies are needed to understand older adults' social experiences in guilds,

the networks they form and the meanings they make, and identify cases in which deeper and more substantive relationships are formed. Social interactions in MMORPGs are a mixture of bridging and bonding relationships, but further clarification on the conceptualization of bridging and bonding social capital in online communities is necessary. What is more, previous empirical studies revealed the effectiveness and subjective importance of social capital for the maintenance of mental health and well-being among older adults. A more interesting study would be to examine whether social capital within MMORPGs is related to some social and emotional factors such as loneliness, depression and lack of social support, and whether social capital mediates the relationships between social interactions within MMORPGs and these social-emotional factors. The rise of online games comes at a particular historical moment for social reasons (i.e., the steady decay of real-world civic and social institutions experience) as well as technological ones and prompts a wide array of questions (Williams, 2006c). Understanding the opportunities and effects that participation in the virtual game world has on older adult' online social capital is imperative as society strives to improve the quality of life and long-term independence for older adults.

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