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Effects of Playing Massively Multiplayer Online Role-Playing Game on the Interpersonal Networks of Players : An Experimental Study Targeting New Players

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Abstract

There are growing concerns about the lack of sociality in children, and the playing of video games is often discussed as being one of the factors that contributes to this. However, previous studies that analyzed the causal relationship between playing video games and sociality suggested almost no evidence to support the view that video games have a negative effect on sociality. Unlike conventional video games, online games could encourage social interaction, since many players can communicate over the Internet. This study aims to discuss the causal relationships regarding effects of playing online games, especially MMORPGs (Massively Multiplayer Online Role-Playing Games), on the sociality of the players. We focused on the sizes of interpersonal network as a sociality index. The network size was measured 2, 4, and 6 weeks after the initiation of the study, and a comparison of the experimental group (n = 34) and the control group (n = 36) showed no significant difference between the groups. A structural equation model analysis on the experimental group data, the MMORPG, "Ragnarok Online," showed that play had no effect on interpersonal network size; conversely, large interpersonal networks promoted group actions in playing the MMORPG.

Key words: interpersonal network, sociality, online game, MMORPG, structural equation modeling

Introduction

Video Games and Sociality

In recent years, there has been concern around the lack of sociality of children in Japan. In the background, it has been suggested that places that are critical for children to learn sociality, such as families, schools, and communities, are no longer conducive environments to their development (e.g., Meeting of the Collaborators for the Study on Problematic Actions of the Youth, 2001; Takahashi, 1996). Sociality has previously been naturally acquired through experiences in various interpersonal relationships. However, due to a decrease in the number of children, and a trend towards nuclear families and urbanization, children now have fewer opportunities to interact with people of different ages and generations in their families, schools, and communities. As a result, it has been assumed that it must be difficult for children to learn sociality.

Moreover, the playing of video games is often discussed as being one of the factors that contributes to insufficient sociality in children (Meeting of the Collaborators for the Study on Problematic Actions of the Youth, 2001). The reasoning behind this is that "video games lessened children's opportunities to experience group play with friends. Therefore, children have fewer chances to develop their skills to construct good friendships, so that they decreased their social adjustability (Kimura, 2003)." However, research that analyzed the relationship between playing video games and sociality or social maladjustment suggested no negative correlation (Kimura, 2003). In addition, some longitudinal studies have analyzed the casual relationship (e.g., Kimura, Sakamoto, Sagara, Sakamoto, & Inaba, 2000; Sakamoto, 1994; Umehara, Sakamoto, Ide, & Kobayashi, 2002) and have found almost no evidence to support the view that video games negatively affect sociality. Sakamoto (2004) also suggested that previous studies did not provide evidence to support the possibility that social maladjustment in children is affected by video games, at least with regard to psychology (especially social psychology). If anything, Sakamoto suggested a reverse effect that "could make children, who suffer social maladjustment by their nature,

start playing video games." Moreover, these longitudinal studies suggested some positive effects from playing video games, such as high sociality and empathy, and a decrease in the level of social anxiety (Tajima, 2007). The reasons for these positive effects were because children did not play video games alone, but played with friends or members of their family (Lee, & Peng, 2006), and because video games provide opportunities for children to interact with friends (Kimura, Sakamoto, Sagara, Sakamoto, & Inaba, 2000). Furthermore, it was considered that playing not only face-to-face style games, but also online games, allowed children to share game experiences with friends, and could be one of the factors that prevented them from suffering social maladjustment (Lee, & Peng, 2006). Overall, these empirical studies did not provide sufficient evidence for us to conclude that video games have a negative effect on sociality.

Online Games and Sociality

Online games have different characteristics from those of conventional video games, so there is a high level of interest surrounding their effect on the players. MMORPGs (Massively Multiplayer Online Role-Playing Games) are examples of online games that have recently been rapidly growing in the market. MMORPGs allow hundreds and thousands of players to simultaneously access a single server, to play characters using avatars in the virtual world of the games, and to complete their missions, while interacting with other players. Most MMORPGs are designed to promote social interactions, so that it is almost impossible for the players to accomplish their goals without forming in-game communities (Ang, Zaphiris, & Mahmood, 2007). The games are created not only to promote long-term relationships between the players, through the features that support the formation of in-game communities, but also to provide many opportunities to experience short-term relationships. For example, a player could team up with other players to kill monsters in order to raise the level of abilities of their avatars, or some more expert players could help novice players to get through the game (Ang, Zaphiris, & Mahmood, 2007). Positive social interactions are paramount in MMORPGs because they require a large number of players to cooperate and work as a team at the same time (Cole, & Griffiths, 2007). The most popular characteristic of the MMORPG was the social interactions it allowed between players, such as connecting with other players, helping one another and becoming a member of a "guild" (this will be explained in a later section) (Griffiths, Davies, & Chappell, 2004). In addition, Cole and Griffiths (2007) found that over 70% of the MMORPG players studied (912 from 45 countries) actually made friends through MMORPGs; approximately 40% had actually met their online friends in the real world; and 67.4% considered that MMORPGs exerted positive effects on inter-player relationships. The players consequently determined that online games can be an extremely sociable environment.

Conversely, Griffiths, Davies and Chappell (2004) suggested that approximately 80% of the MMORPG players in their study had to make a sacrifice in order to play the games. The results showed that 12.5% of the adolescent players and 20.8% of the adult players had to sacrifice relationships with their friends, families, and partners. Lo, Wang and Fang (2005) divided their study participants into groups, based on the amount of time they spent in, and the frequency of, playing the online games, and found that "heavy" players had a poorer quality of interpersonal relationships in their real life. It is also anticipated more serious adverse effects, such as MMORPG addiction. Interactive real-time services proved to be the most addictive among online applications (Young, 1998). Not only do MMORPGs contain all of the addictive factors related to interactive real-time services (Lo, Wang, & Fang, 2005; Ng, & Wiemer-Hastings, 2005), but they also make players keep playing the same game by regular updates of the contents. It was generally found that younger players tended to view themselves as addicted. Moreover, the younger players agreed that they tend to play games intensively (Griffiths, Davies, & Chappell, 2004; Smahel, Blinka, & Ledaby, 2008). According to Kim, Namkoong, Ku and Kim (2008), the quality of the interpersonal relationships that the players have with friends and family also tend to correlate negatively with the online fame addiction scales.

Purposes of This Study

To summarize previous research of online games, MMORPGs in particular provide players with an environment for their social activities; many players want to commit to social activities and in many cases have actually made friends through playing games. Conversely, it has been suggested that they sacrifice interpersonal relationships, and that such relationships that they do have are of poor quality in their real life outside games. And MMORPGs contain many characteristics that could easily result in MMORPG addiction, which negatively correlates with interpersonal relationships. However, no previous study has suggested anything more than correlations between variables or has investigated causal relationships. Therefore, this study aims to discuss causal relationships regarding the effects of playing MMORPGs on the sociality of the players.

We used size of interpersonal network as an index of sociality. Previous studies confirmed an effect of reduction of a sense of loneliness with interpersonal networks of sufficient size and degree of satisfaction acquired through playing online games (Shimura, & Ikeda, 2004). It has also been confirmed that online usage of synchronous tools, including online games, increases

number of online friends. A high number of online friends of the opposite sex had a mediating effect, in that this increased the level of satisfaction with life in players (Ando, Sakamoto, Suzuki, Kobayashi, Kashibuchi, & Kimura, 2004). Therefore, the size of interpersonal network and network transitions can provide variables that reflect sociality and provide an important perspective for investigating their subsequent effects on psychological variables. Previous research into playing games and changes in number of friends suggested that, in the light of a comparison between playing MMORPGs and playing conventional games (arcade, console and solo computer games) for a month, the former games players could make a larger number of new friends than could players of the latter games (Smyth, 2007). However, this study did not have a control group for comparison, resulting in missing data on new friends acquired through playing online games, in terms of what kind of individuals they are. Therefore, this study aimed to consider the following two points to examine in detail the effects of MMORPGs on interpersonal network sizes.

We shall first consider the matter of quality of interpersonal networks, which are divided on the basis of two viewpoints; "places" for communications and "depth" in the contents of communications. Regarding the former, previous studies (e.g., Shimura, & Ikeda, 2004) often differentiated online from offline. However, since the Internet and mobile phones are generally used in daily life, it has become widely accepted that interpersonal networks, conventionally seen as "offline," can be online interactions in the form of emailing and chatting. Therefore, this study differentiates three interpersonal network styles: "Online only," "offline only," and "both online and offline." The depth of interpersonal networks is measured on the basis of the following three levels of self-disclosure: "Close friends," "good friends," and "just friends." This study examined nine types of interpersonal networks using a combination of network styles and self-disclosure levels.

Next, we consider duration of playing MMORPGs. Previous studies did not consider the duration of game-playing in an analysis of the relationship between online games and sociality. In general, it is expected that players with less experience in playing MMORPGs are affected by interferences from these games in their everyday life, in terms of hours spent outside of game-playing and interpersonal relationships. Conversely, it is expected that those players with much experience will be consistently affected by MMORPGs in their everyday life to a certain degree, in terms of hours spent outside of game-playing and psychological effects. It is also expected that changes in the ways they play the games will be observed. For example, the players with less experience need to improve the level of game they are at, so that after reaching a certain level, they can increase the variety of actions in the games. These different ways of playing games provide a possible way in which the effects of MMORPGs on sociality could also be different. Therefore, this study aimed to select players new to MMORPGs and control the duration for which they played in order to examine how beginning to play MMORPGs affects sociality.

We primarily aimed to examine how beginning to play MMORPGs affected nine types of interpersonal networks, by comparing a participant group to a control group. It has also been suggested that there should not be excessive focus on quantitative aspects, such as playing hours or frequency, when considering the effects of online game usage. Rather, it is important to focus on the online actions of the players and the contexts of the games (Fuji, & Yoshida, 2007). Therefore, this study focuses on group actions in MMORPGs, assuming that they could have a particular effect on sociality. Moreover, we aimed to examine how sociality could be affected by increasing the number of certain play styles, in which the players interacted with other players and conducted group actions.

Method

Subject Game

We used a kind of MMORPG called "Ragnarok Online," which has the highest number of registrants in Japan, based on *Online Game Hakusho* (*The Annual On-line Game Industry Report*) in 2007 (Media Create, 2007). This game was designed to provide various plays, such as developing the abilities of avatars, shopping with online currencies gathered through playing games, and communicating with other players and fighting against monsters. It has no concept of final accomplishment of goals or completion of the game. In addition, this game is designed to provide various playing styles, such as "solo," in which a single player proceeds with the game, "party" in which multiple players gather to play (with a maximum of 12 in a party), and a "guild" developed by multiple players to play (an extended version of a party).

Participants

The participating players were recruited from colleges and professional schools in the metropolitan and suburban areas of Tokyo. The recruitment conditions were (1) Persons who were not currently playing "Ragnarok Online"; (2) persons who were able to access the Internet at home; (3) persons who owned a personal computer with sufficient specifications for playing "Ragnarok Online"; and (4) persons who had free time of 2 hours a day and 3 days a week, and were able to access the Internet with the computer(s) under the condition of (3) during the free time. Among the applicants, 70 players who fulfilled all of these conditions were randomly

selected, carefully adjusting variances in gender and duration of playing MMORPGs for impartiality. They were then divided into experimental and control groups (n = 35 in both groups). The experimental group contained one player who could not continue, so there were finally 69 participants in this experiment. Table 1 show the attributes of the participants, who were financially rewarded on completion of the experiment.

Table 1. Attributes of the participants in each group.

	Sex		Age	Duration of playing (month)	
	Male	Female		RPG	MMORPG
Experimental group	15	19	19.97	74.18 (58.57)	6.03 (11.58)
Control group	15	20	19.94	72.09 (62.13)	7.65 (15.70)

Note: Numeric values in prentices indicate standard deviations

Questionnaires

The questionnaires used in this study were composed of several items in addition to questions about age and school year.

Size of Interpersonal Network The participants were asked about the number of friends they had at the following three levels of friendship for each interpersonal relationship style, i.e., "limited online," "limited offline," and "extended to both online and offline": (1) "Close" enough to talk about very private matters, such as worries and romantic relationships; (2) "Good" enough to talk about private matters, such as hobbies and interests; and (3) "Just" enough to greet each other and have conversations on non-committal matters. "Relationships limited online" meant interactions carried out only online through emailing, chatting, playing online games and posting comments on the bulletin boards, without having a face-to-face meeting. "Relationships limited offline" meant interactions conducted only through face-to-face meetings in school, office and the neighborhood, with the exception of online relationships through emailing, for example, with no chance of actually meeting. "Relationships extended to both online and offline" meant interactions in both of the above styles. This interpersonal relationship style is assumed to be the most general in modern societies, in which Internet connections are widely diffused through mobile phones and personal computers. To answer the question about number of friends, the participants selected one of these options: (1) 0 friends, (2) 1, (3) 2-3, (4) 4-6, (5) 7-10, (6) 11-20, (7) 21-30, (8) 31-50 and (9) 51 or more friends.

Contents of Playing "Ragnarok Online" An action checklist to record the contents of playing "Ragnarok Online" was created by dividing the list developed by Yee (2005) to measure the reasons for playing MMORPGs. The participants were particularly asked to recall the contents of their play, during a period from the time of answer to 2 weeks previously, which related to actions carried out in a group (hereafter called "group actions"), such as communicating with other players in the game. The levels of intensity of group actions were given from "(1) None" to "(5) Very often." The points obtained for all 13 items were added to determine the total points for group actions in the MMORPG. Table 2 shows the contents in detail. This checklist was answered by the experimental group only.

Procedure

This experiment was conducted from November 12 to December 26, 2007, under two different titles: "Research on Online Games" for the experimental group and "Research on the Daily Life of Adolescents" for the control group. First, the entire group of participants was asked to come to our university to answer the questionnaires; then, they were asked to come to the university three times every 2 weeks to answer the questionnaires in the same way. During this period, the experimental group was asked to play "Ragnarok Online" for more than 6 hours a week, a timeframe that was decided on the basis of the average amount of time that online players spend playing games (Media Create, 2007)[1]. They were asked to manage their playing time by self-reporting and using time management software. The participants were not restricted from playing other video or online games during the experimental period. The control group was assigned to come to the university and answer the questionnaires once every 2 weeks, and was instructed to continue their normal daily life with no restrictions on playing video or online games.

In addition, since "Ragnarok Online" is a fee-based online game, we purchased 60-day play tickets, item tickets and starter packs with DVD-ROM for new client online guidance. These packages were handed out to the participants in the experimental group at no extra cost to them.

Results

Changes in the Numbers of Friends

The numbers of friends were compared between the groups over a 6-week period. This comparison examined the effects of playing "Ragnarok Online" on the

Table 2. The item contents of the list of group actions in "Ragnarok Online," and the average and standard deviation at each time point (N = 34).

		2 weeks after		4 weeks after		6 weeks after	
		M	*SD*	*M*	*SD*	*M*	*SD*
1	Act as a member of a group (guild, party, etc.).	1.85	1.35	2.24	1.63	2.24	1.60
2	Greet and chat with other players.	2.65	1.41	3.24	1.37	3.18	1.36
3	Tell other players about your personal information (age, hobbies, etc.) in the real world.	1.26	0.79	1.50	0.96	1.65	1.04
4	Tell other players about your personal problems (worries, etc.) in the real world.	1.12	0.48	1.29	0.72	1.50	0.90
5	Tell other players about your personal information (your guild, etc.) in the game world.	1.59	1.05	1.88	1.30	1.94	1.10
6	Tell other players about your personal problems (worries, etc.) in the virtual world.	1.79	1.20	1.97	1.36	2.26	1.38
7	Negotiate with strange players over prices and fighting strategies.	1.68	1.15	1.59	0.86	1.74	1.11
8	Help other players, if they need help or are in trouble.	1.32	0.77	1.56	0.93	1.56	0.96
9	Cooperate with other players.	1.76	1.18	1.97	1.22	2.32	1.27
10	Take leadership in group actions.	1.06	0.24	1.09	0.29	1.09	0.38
11	Take leadership in adjusting or organizing your group's opinions.	1.06	0.34	1.09	0.29	1.09	0.38
12	Act as a group to accomplish a quest and goals.	1.24	0.61	1.15	0.50	1.18	0.46
13	Attach as a group to cause physical damages on NPC (Non-Player Characters) (though it is restricted in the game).	1.59	1.18	1.79	1.32	1.88	1.25
	Total	19.97	8.49	22.35	8.66	23.82	9.82

interpersonal networks of the players. Table 3 shows the average and standard deviations of the numbers of friends for each group at different time points, starting at the beginning of the experiment, and then at the second week, the fourth week and the sixth week[2]. Analysis of covariance (ANCOVA) was conducted for each of nine types of interpersonal networks, applying the experimental conditions for independent variables, the numbers of friends at the beginning of this experiment for covariates, and the change in the numbers at different time points, the second, fourth, and sixth weeks, for dependent variables.

The results showed a marginally significant relationship for the main effects of the conditions related to the number of "good" friends limited online in the second week, the number of "just" friends both online and offline, and the average number of friends in nine types of interpersonal networks (in an order corresponding to the above: $F(1, 66) = 3.13$, $p < .10$; $F(1, 66) = 3.07$, $p < .10$; and $F(1, 66) = 3.07$, $p < .10$). However, other relationships showed no significant difference.

Effects of Group Actions in "Ragnarok Online" on the Number of Friends

This study used a structural equation model to analyze causal relationships to explain how the contents of playing "Ragnarok Online" affected the interpersonal network sizes of the players. In the experimental group (N = 34) amount of group actions in "Ragnarok Online" was analyzed. Table 2 shows the average and standard deviations of the group action points for the second week, fourth week and sixth week. In this analysis, the total points of the 13 items in this chart were considered as the group action points in the MMORPG.

Examination of Analysis Models This study collected data at three time points every 2 weeks from the start of the experiment. We examined a cross-lagged effect model based on Omi et al., (2006) and Takahira, Ando and Sakamoto (2006), which is shown in Figure 1. This model assumes a causal relationship, in which the implementation of group actions in the MMORPG increases the number of friends in the case of significant positive effects through a path from group actions in the second week, to the number of friends in the fourth week (Path *a* in Figure 1); and through a path from group actions in the fourth week to the number of friends in the sixth week (Path *b* in Figure 1). Moreover, this model assumes a reverse causal relationship, in which an increase in the number of friends promotes group actions in the MMORPG in the case of significant positive effects through a path from the number of friends in the second week to group actions in the fourth week (Path *c* in Figure 1); and through a path from the number of friends in the fourth week to group actions in the sixth week (Path *d* in Figure 1). Furthermore, in this model, while the second-fourth week and fourth-sixth week paths are assumed to be short-term causal relationships, the second-sixth week path is assumed to be a mid-term causal relationship.

In structural equation modeling analyses solutions generally become more robust as the number of estimated paths becomes smaller (Omi, et al., 2006). Therefore, before examining causal relationships, we examined restrictions in this model in the following

Table 3. Average and standard deviation of interpersonal network size at the beginning of the experiment and in the second week, fourth week and sixth week (N = 69)

			starting the experiment		2 weeks after			4 weeks after		6 weeks after	
			Control group	Experimental group	Control group	Experimental group		Control group	Experimental group	Control group	Experimental group
Limited online	Close friends	*M*	1.74	1.12	1.86	1.24		1.94	1.32	1.91	1.44
		SD	1.34	0.33	1.35	0.55		1.14	0.73	1.36	0.82
	Good friends	*M*	2.49	1.79	2.77	1.82	†	3.09	2.35	3.03	2.26
		SD	1.92	1.41	1.91	1.14		1.92	1.70	1.95	1.48
	Just friends	*M*	3.03	2.15	3.34	2.85		3.40	3.21	3.69	3.38
		SD	2.44	1.65	2.44	1.78		2.42	1.87	2.54	2.03
	Average	*M*	2.42	1.69	2.66	1.97		2.81	2.29	2.88	2.36
		SD	1.69	0.94	1.81	1.00		1.72	1.27	1.83	1.27
Limited offline	Close friends	*M*	2.31	2.03	2.54	2.26		2.23	2.38	2.46	2.50
		SD	1.51	1.55	1.65	1.46		1.48	1.48	1.46	1.46
	Good friends	*M*	3.26	3.79	3.91	3.91		3.97	4.09	4.17	4.18
		SD	2.01	2.04	1.76	1.75		1.84	1.82	1.79	1.73
	Just friends	*M*	5.54	5.85	5.89	5.82		5.91	6.06	6.03	5.91
		SD	2.27	2.18	1.69	1.78		1.80	1.89	1.62	1.86
	Average	*M*	3.70	3.89	4.11	4.00		4.04	4.18	4.22	4.20
		SD	1.61	1.54	1.44	1.38		1.42	1.51	1.28	1.39
Both of them	Close friends	*M*	3.89	3.74	3.83	3.62		3.71	3.85	3.89	3.94
		SD	1.13	1.24	1.42	1.30		1.18	1.18	1.05	1.61
	Good friends	*M*	5.14	5.18	5.20	4.65		5.26	5.32	5.26	5.21
		SD	1.40	1.71	1.62	1.82		1.52	1.53	1.40	1.72
	Just friends	*M*	6.37	6.03	6.14	5.12	†	6.17	5.91	6.11	6.00
		SD	2.16	2.34	2.13	2.52		1.99	2.26	1.81	2.55
	Average	*M*	5.13	4.98	5.06	4.46		5.05	5.03	5.09	5.05
		SD	1.12	1.54	1.38	1.65		1.28	1.41	1.14	1.62
Total	Average	*M*	3.75	3.52	3.94	3.48	†	3.97	3.83	4.06	3.87
		SD	0.92	0.94	1.11	0.88		1.06	1.08	1.06	1.07

Note: Marks indicate the results of ANCOVA setting covariance at the time of starting the experiment († p<.10)

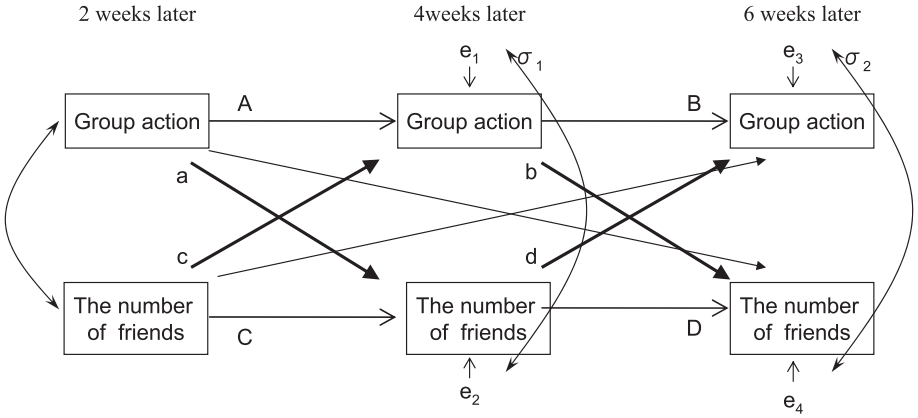


Figure 1. Three-wave cross-lagged effect model used in the present study

procedure, according to Omi et al., (2006) and Takahira, Ando and Sakamoto (2006).

As Figure 1 shows, in the three-wave cross-lagged effect model, the following quality constraints could be assigned: The scales of cross-lagged effects from the first time point to the second time point (Path *a* or *c*) and from the second time point to the third time point (Path *b* or *d*) are identical; and the scales of stabilizing effects from the first time point to the second time point (Path *A* or *C*) and from the second time point and the third time point (Path *B* or *D*) are identical (Takahira, Ando, & Sakamoto, 2006). Therefore, goodness of fit was measured for each of the following four models: Model 1 with a constraint of equal effects for Path *a* and *b*; Model 2 with a constraint of equal effects for Path *c* and *d*; Model 3 with a constraint of equal effects for Path *A* and *B*; and Model 4 with a constraints of equal effects for Path *C* and *D*. The results of the measurements were subsequently compared to a model in which these four Paths remained open (Open Model). Since these constrained and unconstrained models are nested, the chi-square value difference test can be applied for the comparison of goodness of fit for these models (Murohashi, 2003). As a result, the model with the highest number of constraints was selected from the models for which there was no significant result in the test.

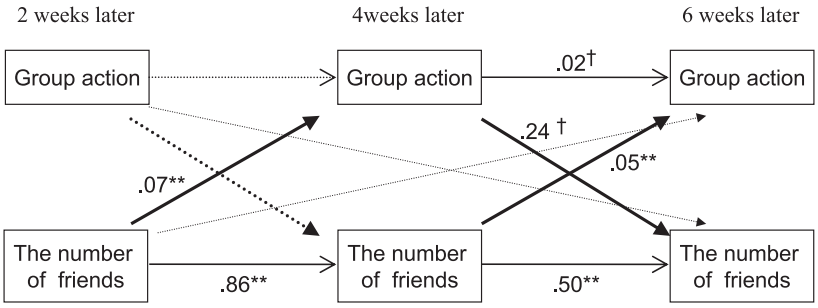
This study subsequently examined constraints regarding the covariance ($\sigma 1$) between the error ($e1$) in group actions in MMORPGs and the error ($e2$) in the number of friends in the fourth week, and the covariance ($\sigma 2$) between the error ($e3$) in group actions in MMORPGs and the error ($e4$) in the number of friends in the sixth week. In addition to the model selected through the earlier examination of constraints (Model 1-4 and Open Model), goodness of fit was measured for each of the following additional four models: Model 5 with a fixed $\sigma 1$ of 0; Model 6 with a fixed $\sigma 2$ of 0; Model 7 with a constraint of equal covariance of $\sigma 1$ and 2; and Model 8 with fixed $\sigma 1$ and 2 of 0. The results of the measurements were subsequently compared to a model with no covariance constraint. Table 4 shows selected models for each examination.

Causal Relationships between Group Action in "Ragnarok Online" and the Size of Interpersonal Network Table 4 shows the standard coefficient as an analytical result, and Figure 2 shows an example of the results from analysis of "close" friends limited online. These table and figure are designed to show the results in numeric values only if the effects are considered to exceed the level of marginal significance.

Table 4. Causal relationship between group actions in the MMORPG and size of interpersonal network.

		2 weeks later → 4 weeks later		4 weeks later → 6 weeks later		2 weeks later → 6 weeks later	
	model	group action → the number of friends	the number of friends → group action	group action → the number of friends	the number of friends → group action	group action → the number of friends	the number of friends → group action
Limited online							
Close friends	8		.07**	.24 †	.05**		
Good friends	5	.22 †	.14**		.14**		
Just friends	3・6		.16**		.18**		.26 †
average	3・8		.12**		.12**		
Limited offline							
Close friends	3・6		.14**		.14**		
Good friends	6		.15**		.14**		
Just friends	3・6		.18**		.18**		
average	3・6		.15**		.13**		
Bothe of them							
Close friends	3・6		.08**		.05*		
Good friends	3・6		.12**			.22 †	
Just friends	3・6	.16 †	.16**	.14**			
average	3・6	.14 †	.11**	.12 †			
All friends	3・7		.11**		.10**		

Note: $^{**}p<.01$, $^{*}p<.05$, † $p<.10$



Note: The paths in solid lines are significant and the remaining paths in dashed lines are nonsignificant (**$p < .01$, †$p < .10$)

Figure 2. Results of analysis of "close" friends limited online.

(1) Effects of Group Actions on the Number of Friends

The examination of the short-term effects of group actions in "Ragnarok Online" during an initial period after starting the MMORPG from the second week to the fourth week indicated positive effects on the numbers of "good" friends limited online and "just" friends both online and offline, as well as on the average number of friends both online and offline (but $p < .10$ for all cases). Moreover, the examination of short-term effects of the group actions during a period from the fourth week to the sixth week indicates positive effects on the numbers of "close" friends limited online and "just" friends both online and offline, as well as on the average number of friends both online and offline (respectively, $p < .10$, $p < .01$ and $p < .10$). The examination of mid-term effects of the group actions during a period from the second week to the sixth week indicates that positive effects are limited to the number of "good" friends both online and offline (however, $p < .10$). These results repeatedly confirm short-term positive effects, including those that were marginally significant, of group actions in "Ragnarok Online," on the number of "just" friends both online and offline. However, a more comprehensive assessment of the results confirms that the effects of the group action in the game on the number of friends are not as significant as first though, since few paths showed significant effects.

(2) Effects of the Number of Friends on Group Actions The examination of short-term effects from the second week to the fourth week indicated significant positive effects on the number of friends at all levels of friendship, such as "close," "good" and "just," throughout the fields, that is, limited online, limited offline, and both online and offline ($p < .01$ for all cases). Moreover, the examination of short-term effects from the fourth week to the sixth week indicated significant positive effects on the numbers of limited online and limited offline friends ($p < .01$ for all cases); and also on the number of "close" friends only both online and offline ($p < .05$). Significant positive effects were indicated for all numbers of friends ($p < .01$). The examination of mid-term effects of the group actions from the second week to the sixth week indicated positive effects on the number of "just" friends limited online only ($p < .10$). These results generally confirm short-term positive effects, in which higher numbers of friends promote group actions in "Ragnarok Online" in each case of limited online, limited offline, and both online and offline. However, mid-term effects are not shown in these results.

Discussion

The relationship between playing MMORPGs and sociality of the players has been partially explained by a correlation of variables in previous studies. In the present study, we examined the causal relationships, referring to an index based on interpersonal network size. We also considered the possibilities of different effects, depending on the contents of play, to examine the effects of group actions in the MMORPG "Ragnarok Online" on interpersonal network size.

With regard to the effects of playing MMORPGs on interpersonal network size, marginally significant differences were examined, comparing the results at the time of starting the experiment and in the second week, in the values related to the following groups: The number of "good" friends limited online, the number of "just" friends both online and offline, and the average number of friends of each of nine interpersonal network types. Since the differences were not significant and no effects were confirmed on the numbers of friends of other groups, this study found almost no effect on interpersonal network size. Interviews conducted with the experimental group revealed that after they started playing "Ragnarok Online," they began to have conversations about the game with experienced players living close to them in the real world; and in the middle of the game, if a player found that members of the experimental group were in trouble, the player asked if they needed any help, and let them join his or her guild. Therefore, the interpersonal network size was expanded in some individual cases. However, in general, interpersonal network size was not changed by allowing "Ragnarok Online" into the lives of the players.

To examine group actions in the MMORPG on interpersonal network size, short-term positive effects were shown for the number of "close" and "good" friends limited online, and the number of "just" friends both online and offline. Mid-term positive effects were also demonstrated for the number of "good" friends both online and offline, and short-term effects were repeatedly confirmed for the number of "just" friends both online and offline both from the second week to the fourth week and from the fourth week to the sixth week. This result suggests that the online social activities in MMORPGs exert positive effects on interpersonal networks in the real world. However, since the results were primarily marginally significant ($p < .10$), and indicate no significant difference for most of the paths analyzed, group actions in the game are not so influential for the number of friends. Conversely, a reverse causal relationship between the number of friends and group actions in the MMORPG was repeatedly confirmed with every interpersonal network field and relationship. Consequently, in the relationship between group actions in MMORPGs and interpersonal network size, an increase in frequency of the former does not increase the latter. However, the relationship originally contained an influential effect in which an increase in the number of friends promoted group actions in MMORPGs.

It has been a concern that social interactions and communications, such as MMORPGs and online chats, could result in addictive Internet and MMORPGs use (Ng, & Wiemer-Hastings, 2005; Young, 1998), and that their over-use could be detrimental to their social activities in the real world. However, this study did not find such negative effects, but rather found directional effects in the relationship between the two worlds from "virtual to real" and "real to virtual." The number of friends in real life can affect social skills in the virtual life of MMORPGs and promote social activities. This finding is in accordance with the "rich get richer" model, which assumes that highly sociable people would gain greater social benefit from using the Internet (Kraut, Kiesler, Boneva, Cummings, Helgeson, & Crawford, 2002). Moreover, regarding social maladjustment in the virtual societies, such as cyber bullying, which has become a concern in recent years, it is observed that the Internet does not directly cause problems related to the Internet in many cases and does not actually provide a stage for "the incidents." From this perspective, it is rather the real societies that provide the stage (Yamaguchi, 2008). Therefore, it is indicated that social actions in the virtual world are determined by sociality in the real world with regard to not only the negative aspect of Internet use, as described, but also the positive aspect, such as promotion of social actions.

There are some limitations in the present study. First, although it examines the effects of MMORPGs on interpersonal networks using "Ragnarok Online," which has the highest number of registered users among MMORPGs in Japan, it does not assess the effects of other MMORPGs. This should be addressed in the future, considering different systems and play styles, depending on games. Moreover, our study examines the effects of playing "Ragnarok Online" for the first time, targeting new players order to control the game experiences of the players. However, we should also investigate the effects of differences in the history of the game experiences of the players in the future, because generally, the higher the abilities of the avatars become in MMORPGs (in other words, the longer the gaming history of the players becomes), the wider the variety of options in the games, allowing the players to enjoy various plays. Therefore, playing experiences in games can be different depending on the game experiences history of the players. Moreover, although this study focused on interpersonal network size as an index of sociality, other variables such as sociability, social anxiety, social skills, and social adjustability should be focused on in future study. This is because the concept of sociality may contain a variety of factors and because other studies assessing conventional video games have focused on these other variables (Tajima, 2007).

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Note:

1. For the players with less than two years of experiences in playing online games, the average frequency of playing online games was 3.63 days per week, and the average time of playing online games was 105.97 minutes per weekday and 174.89 minutes per weekend (Media Create, 2007).
2. The scales of interpersonal networks used in this study did not have equally spaced labeling for the grades. Hence, this study converted the numeric values to ranking variables based on the ratio estimate using the Blom method in order to make scale values closer to a normal distribution. Correlation of the scale values before and after the conversion showed extremely highly significant correlation for every interpersonal network scale in all four time points as shown in Table 3 ($.90 \leqq r \leqq .99$, average of .97 and standard deviation of .02). Therefore, the scales can be sufficient enough to be applied for the later analysis.

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