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The effect of cyber-friends on loneliness and social anxiety: Differences between high and low self-evaluated physical attractiveness groups

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Available online 7 May 2007

Abstract

This study examined the causal relationships between the number of cyber-friends participants had and their social anxiety or loneliness. We predicted that participants who gave low self-evaluations of physical attractiveness would be able to lower their social anxiety or reduce their loneliness through Internet-based interpersonal relationships. Also, such effects would be more prominent if the cyber-friends were of the opposite sex. A two-wave panel study was conducted with 178 Japanese undergraduate students (63 men and 115 women; mean age was 20.29). Results showed that for those who gave a low evaluation of their physical attractiveness, having a large number of cyber-friends lowered their social anxiety and reduced the loneliness felt in friendships. These effects differed by gender of the cyber-friends. In particular, for those who gave a low evaluation of their physical attractiveness, having a large number of cyber-friends of the same sex had a positive effect on social anxiety. In contrast, cyber-friends of the opposite sex had no effect on social anxiety, but had a complex effect upon loneliness. Namely, while a large number of cyber-friends of the opposite sex reduced the loneliness felt in friendships, it also heightened the loneliness felt in family relationships. Implications of these results for further research and practice are provided.

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Keywords: Cyber-relationships; Social anxiety; Loneliness; Physical attractiveness; Causal relationships

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1. Introduction

As the use of the Internet has spread, there are now more ways to establish interpersonal relationships. People who have never met each other can “meet” on the Internet and deepen their relationship through communication via Internet tools such as e-mail and chat rooms. These Internet-based friends are called “cyber-friends”. Although there are some argument about the quality of relationships with these cyber-friends (Cummings, Butler, & Kraut, 2002; McKenna & Bargh, 2000), there have been several studies suggesting positive effects of cyber-friends. Such as a panel study suggesting that the number of cyber-friends has an effect on subjective well-being and social efficacy (Ando et al., 2004), and an experimental study which confirmed that interaction with cyber-friends had an effect of elevating the sociality of shy individuals (Sakamoto et al., 2002).

In this study, we examined what sort of people exhibited more conspicuous effects on their psychological health due to interaction with cyber-friends as evidenced in such prior studies. Below we will conduct a review of the prior studies regarding what sorts of people more easily reap the benefits of cyber-friendship, various theories on the properties of cyber-friendship, and the effects of cyber-friendship on psychological health and sociality.

1.1. The effect of cyber-friends on psychological health and sociality

Some have raised questions about the quality of cyber-friendships. For example, Kraut et al. (1998) conducted a longitudinal study and pointed out that a larger amount of Internet use caused heightened loneliness or depression. They speculated that such a negative consequence was indicated because the larger amount of Internet use caused an increase in the amount of time that the individuals spent on weak and low-quality interpersonal relationships with cyber-friends, and this in turn led to a decrease in the amount of quality face-to-face (FtF) communication with close family members or friends. However, in the follow-up study, Kraut et al. changed their opinion, stating that this negative effect disappeared as individuals got used to the Internet or as the operability of Internet tools improved. They then claimed that the Internet was an effective tool for maintaining and deepening relationships with family members, friends, and faraway relatives, and also had positive effects on individuals' psychological health (Kraut et al., 2002). Nevertheless, they maintained their pessimistic view toward the quality of cyber-relationships (Cummings et al., 2002).

Meanwhile, there have been some studies that reported that cyber-relationships sometimes develop into sound and intimate relationships, such as best friends or boyfriends/girlfriends (McKenna & Bargh, 2000; Parks & Floyd, 1996). Also, some have pointed out that it is easier to find friends of the opposite sex on the Internet than in real life (Parks & Roberts, 1998), and that more than a few Internet romances or Internet-generated romances have been reported (Gwinnell, 1998).

Furthermore, it has been indicated that cyber-relationships improve the skills necessary to maintain FtF interpersonal relationships. For example, Sakamoto et al. (2002) used an online game called a MUD (multi-user dungeon) to show that the Internet was an effective sociality training tool for shy individuals when they were forced to act as sociable individuals. In other words, the participants learned effective techniques and gained social efficacy through experiencing such relationships in Internet-based virtual space, and this experience was effective in improving their sociality in FtF situations.

In general, individuals function differently in interpersonal relationships depending on the gender of the friend (Argyle, 1987), and it is believed that friends of different genders have different psychological effects on individuals. Similarly, it has been suggested that individuals show such functional differences in interpersonal relationships depending on the gender of cyber-friends (Ando et al., 2004). Ando et al. conducted a panel study with male students from IT colleges and reported that having a large number of cyber-friends of the same sex increased their social efficacy, while having a large number of cyber-friends of the opposite sex heightened their happiness or had a positive effect on psychological health. Note, however, that this study was conducted only with young male participants, and it is therefore not clear whether similar results can be obtained with both male and female participants, which must be examined.

As described above, cyber-relationships cannot be generalized as being weak and low quality, and it appears that these relationships have a sufficient level of quality to improve users' psychological health and their confidence in interpersonal relationships. Consequently, we will consider our impressions of various theories that have significance in thinking about the characteristics of cyber-relationships.

1.2. Theories of cyber-relationships

The characteristics of cyber-relationships have been much discussed in studies on Computer-Mediated Communication (CMC). According to Walther and Parks (2002), who did a review of CMC studies, CMC theory was developed from the standpoint of saying that the scarcity of nonverbal social cues in CMC, which is poor in audiovisual information, has some sort of an effect on mutual interactions between people.

First, according to the initial approaches such as social presence theory (Short, Williams, & Christie, 1976) or reduced social cues approach (Kiesler, Siegel, & McGuire, 1984), as a consequence of the scarcity of these social cues, an individual's social presence declines in CMC and they enter into task oriented communication. When placed in a state of anonymity in these sorts of groups, an individual's self-perception is reduced, deindividuation is encouraged, and they will take impulsive anti-normative behavior (Diener, Fraser, Beaman, & Kelem, 1976) or become aggressive (Siegel, Dubrovsky, Kiesler, & McGuire, 1986). Other negative aspects have also been pointed out, such as how in CMC, where social presence has declined, group polarization gains ground, and actions or opinions become more extreme (Sia, Tan, & Wei, 2002).

However, these theories cannot explain the beneficial aspects of interpersonal relationships that are actually formed online (McKenna & Bargh, 2000; Parks & Floyd, 1996). This is why social information processing theory (Walther, 1992), or the Social identity and deindividuation (SIDE) model (Lea & Spears, 1991) has emerged to explain how in CMC one has a favorable impression of one's partner.

Regarding this social information processing theory, when there are future expectations in interpersonal relationships, so that motivation is granted to develop impressions or relationships, self-disclosure or personal questioning proceeds (Tidwell & Walther, 2002), and if there is sufficient time, relationships as deep as FtF one, or even more so, will form (Walther, 1994). It is also shown that in the SIDE model, even at times of deindividuation in a state of anonymity, when a social identity is exteriorized one gives a high evaluation of one's resemblance to the other group members and gives a positive evaluation of one's partner (Spears, Postmes, & Lea, 2001; Tanis & Postmes, 2003).

Next, the hyperpersonal model that developed these theories further pointed out that the lack of nonverbal social cues which had until then been thought to be a demerit in CMC was rather a factor in stimulating the formation of positive impressions (Walther, 1996). This theory explained the online context as (1) sender of messages, (2) receiver of messages, (3) channel of messages, and (4) feedback of messages. That is to say, (1) due to the lack of nonverbal social cues, the sender is able to control their personal information and it becomes easy to do selective self-presentation. (2) While motivating the construction of new interpersonal relationships and future mutual relationships, the receiver idealizes the other party. (3) Because it is possible to edit or deliberate on the contents of the message, CMC messages are thought to be composed after deep and concentrated deliberation, and those contents are excessively vested with the individuality of the sender. (4) They idealize each other, and in the exaggerated retorts to each others messages there manifest self-fulfilling prophecies and behavioral affirmation, and the level of affection towards one another rises in a spiral fashion (Walther, 1996; Walther & Parks, 2002).

Hancock and Dunham (2001) write about this hyperpersonal model that impressions formed in CMC are narrow of range, but extreme, and people evaluate their partner more highly than under FtF conditions.

It appears that this theory can explain the formation of good relationships in CMC. Nevertheless, good relations based on impressions formed by the projection of an ideal friend-image and selective self-presentation appear to strengthen negative impressions of cyber-relationships that sound like they are basically brimming with fraud and make-believe. However, there are indications that CMC, more so than FtF communication, allows one to easily and directly express one's concerns or thoughts (Baker, 1998). There is also an indication that the self-concepts of "true self" can be more easily activated in CMC than "actual self", and that being able to easily express one's "true self" in CMC also has an effect of generating mutual understanding with a friendly spirit (Bargh, McKenna, & Fitzsimons, 2002). According to this, it appears that if the goal is not to deceive one's partner but to construct positive interpersonal relationships, cyber-relationships in which it is possible to discuss one's true feelings have a place as a form of interpersonal relationships.

1.3. What sort of people derive benefit from cyber-relationships?

In this way, recent CMC studies have shown that the formation of interpersonal relationships with a scarcity of nonverbal social cues actually has a possibility of working beneficially, and it seems that there are some people who derive more of a benefit from this property of there being few nonverbal social cues. For example, there have been cases in which individuals who were not confident of their physical attractiveness and hardly talked in front of others, thus having little presence, became much respected for their witty conversations on the Internet. These individuals, as a result, became confident in FtF interpersonal relationships (Wallace, 1999).

Physical attractiveness is something that greatly affects impressions and evaluations (Berscheid & Walster, 1974) and is believed to be an important factor in interpersonal relationships in FtF situations. Individuals who give a low evaluation of their own physical attractiveness tend to feel awkward when in public or when expressing themselves. They then become passive since they are too worried about how others evaluate or judge them. This process may become the cause of social anxiety in these individuals (Leary,

1983). Also, such social anxiety may cause a negative spiral because social anxiety prohibits positive interpersonal relationships from forming and thus leads to heightened loneliness.

However, because there is little visual information in an online environment, having similar interests and such becomes more important than actual physical characteristics (Baker, 1998). For example, when the amount of time spent interacting in CMC is long, the lack of a photograph actually raises the level of affection towards one's partner (Walther, Slovacek, & Tidwell, 2001). Couples who developed into a romantic relationship on the Internet found each other attractive due to sense of humor, response time, interests, values, and style of expression (Baker, 1998). Even in the poor in nonverbal social cues Internet, it is possible to express those things in text. For example, in cyber-flirting, expressions using nonverbal signals such as emoticons or acronyms like LOL (laughing out loud) are emphasized more than physical attractiveness (Whitty, 2004).

Therefore, for those who gave themselves a low evaluation of physical attractiveness and were uncomfortable communicating FtF, the Internet could provide an ideal social opportunity in which to casually participate without worrying about how others view them. Thus, for them, there is the possibility that their relationships with cyber-friends would contribute to gaining interpersonal skills or confidence, which would lead to lowered social anxiety.

Furthermore, it is easier to establish new interpersonal relationships on the Internet than in FtF situations (McKenna & Bargh, 2000; Parks & Floyd, 1996). Also, such expansion of cyber-friendships may be more meaningful and effective in reducing loneliness for those who give low evaluations of their own physical attractiveness and have little confidence in establishing interpersonal relationships in FtF situations than for those who evaluate their own physical attractiveness highly and have no difficulty making new friends.

Additionally, it is easier to make friends of the opposite sex on the Internet than in FtF situations (Parks & Roberts, 1998). Ando et al. (2004) showed that cyber-friends of the opposite sex had a positive effect on psychological health but did not have any effect on social efficacy. However, for those who gave low self-evaluations of physical attractiveness, the findings of Ando et al. (2004) would not necessarily be supported. This is because for those who gave themselves low evaluations of physical attractiveness and who had little confidence in establishing interpersonal relationships in FtF situations, making friends of the opposite sex probably requires much effort. The participants in this study were young individuals around 20 years of age who would in general have a strong interest in romantic relationships. So, having cyber-friends of the opposite sex was considered to be especially meaningful to these individuals. Therefore, for them, the existence of cyber-friends of the opposite sex may have a strong impact on both the result of social efficacy and on psychological health.

For these reasons, we predicted that the positive effects of cyber-relationships on social anxiety or loneliness would be prominent in the participants who gave low evaluations of their own physical attractiveness, and that such effects would be more prominent if the cyber-friends were of the opposite sex. How we here limited our examination to not all cyber-relationships, but only cyber-friends, is because we wanted to verify the effect of cyber-relationships that are close enough to call each other friends, and have had a good relationship that has been continuing for a certain amount of time.

1.4. Purpose of the research

The purpose of this study was to examine if the effects of the number of cyber-friends on social anxiety and loneliness were prominent in participants who gave low evaluations of their own physical attractiveness. More specifically, we conducted a panel study with Japanese undergraduate students and measured the number of cyber-friends they had, as well as the amount of social anxiety and loneliness that they were feeling. Generally, causal relationships cannot be estimated if a survey is conducted only once, but by analyzing panel data taken two or more times using structural equation modeling, the existence of causal relationships can be estimated (Finkel, 1995). Therefore, we conducted a two-wave panel study. The participants were then divided into the high self-evaluated attractiveness group and the low self-evaluated attractiveness group. Then multi-group analysis using structural equation modeling was done to examine the differences in causal relationships between the groups in terms of Hypotheses A and B, listed below:

Hypothesis A: Having a large number of cyber-friends would lower social anxiety felt by the low self-evaluated attractiveness group. Also, such effects would be more prominent if the cyber-friends were of the opposite sex.

Hypothesis B: Having a large number of cyber-friends would reduce the loneliness felt by the low self-evaluated attractiveness group. Also, such effects would be more prominent if the cyber-friends were of the opposite sex.

Note that in this study, we examined three types of loneliness: loneliness felt in friendships, loneliness felt in family relationships, and loneliness felt in society. The purpose of this was to examine what kind of loneliness would be influenced by the existence of cyber-friends, for those who gave low self-evaluations of physical attractiveness.

In this study, we also examined the inverse causal relationship of the level of loneliness and social anxiety collaterally exerting an influence on the number of cyber-friends. By looking at the inverse causal relationship, we are able to study possibility of a spiral process of people with high levels of loneliness or social anxiety improving their social anxiety or loneliness by increasing interaction with cyber-friends in a less stressful environment than FtF, in the both the high and low self-evaluated physical attractiveness groups.

2. Method

2.1. Participants

One hundred and seventy eight undergraduate students (63 men and 115 women) from two universities in Tokyo and Kyoto participated in a two-wave panel study. Ages ranged from 18 to 35 ($M = 20.29$, $SD = 1.84$). The first survey was conducted in October 2000, and the second survey was conducted in January 2001. Both surveys were conducted on students enrolled in a psychology class, all together during class time. As rewards for their participation, we provided a brief feedback of the study, and considered their participation in the study in their class participation. Incidentally, the history of Internet usage of participants during the first survey were: 1 year or less 28.1%, 1 year ~3 years 44.4%, 3 years or more 15.7%.

2.2. Survey contents

Number of cyber-friends: Participants were asked how many friends and close friends of the same sex and the opposite sex they had made through the Internet. In the analyses, the number of friends and close friends were totaled for the same sex and the opposite sex and were treated as the “number of friends of the same sex” and the “number of friends of the opposite sex”.

Self-evaluation of physical attractiveness: Based on the Physical Self-Description Questionnaire (PSDQ) (Marsh, Richards, Johnson, Roche, & Tremayne, 1994), we developed a new measurement scale in Japanese. More specifically, we created 10 test statements regarding, for example, simple self-evaluation of the respondents' own physical attractiveness, self-evaluation of their own physical attractiveness when compared against their friends' physical attractiveness, and evaluation of the respondents' physical attractiveness that they think others would give. The participants responded to each item such as “I am attractive for my age” on a 7-point scale. The response options ranged from 1 (strongly disagree) to 7 (strongly agree). In both surveys, the α coefficient was .93, and the test–retest reliability coefficient was .79.

Social anxiety: In this study, the definition of “social anxiety” was based on the definition by Buss (1986), the “uncomfortable feeling that individuals feel when they are in front of others”. Kobayashi (1991) had created five items based on the self-consciousness inventory developed by Buss (1986) and Fenigstein et al. (1975). These items were, for example, about uncomfortable feelings such as uneasiness, nervousness, and worry that individuals would feel when they were with someone else or when they were in front of an audience. The participants responded to each item such as “I feel nervous when I am in a big crowd” on a 7-point scale. Response options ranged from 1 (strongly disagree) to 7 (strongly agree). The α coefficients were .82 and .86, and the test–retest reliability coefficient was .81.

Loneliness: There are opinions that the characteristics of loneliness that individuals experience differ with relationships with others or situations that they are in. Based on this belief, Schmidt and Sermat (1983) developed the Differential Loneliness Scale (DLS), and a Japanese version, the Multidimensional Scaling of Loneliness in Different Human Relations, was also developed (Hirosawa & Tanaka, 1984). In this study, we used 10 items regarding loneliness felt in family relationships and another 10 items regarding loneliness felt in friendships taken from the Japanese version of the scale. “I don't think anyone in my family really understands me” was an example of the items regarding loneliness felt in family relationships, and “I don't have many friends who can go to each other for help when in trouble” was an example of the items regarding loneliness felt in friendships. Then, based on the UCLA Loneliness Scale and the Subjective Well-Being Inventory (SUBI), we created an additional five items to measure loneliness felt in society. “I find myself being isolated from the rest of the world” was one of the examples. The participants responded to each item on a 7-point scale. The response options ranged from 1 (strongly disagree) to 7 (strongly agree). For loneliness felt in family relationships, the α coefficients were .86 and .88. For loneliness felt in friendships, the α coefficients were .88 and .88. For loneliness felt in the society, the α coefficients were .73 and .77. The test–retest reliability coefficient was .83, .80 and .63, respectively.

Demographical data: Age and gender.

3. Results

3.1. Mean and standard deviation for each variable

Based on the mean score, the participants were divided into the high and low self-evaluated physical attractiveness groups; 83 participants were assigned to the high self-evaluation group, and 94 to the low self-evaluation group. Table 1 lists the mean and standard deviations for each variable measured in the first survey for both the high and low self-evaluation groups. As a result, the low self-evaluation group showed significantly higher scores for loneliness felt in friendships, family relationships, and society compared to the high self-evaluation group ($p < .001$); however, no significant differences were observed for social anxiety and the number of cyber-friends of the same/opposite sex.

3.2. Analysis model

In this study, a two-wave panel study was conducted to examine the causal relationship between the number of cyber-friends, and loneliness and social anxiety. Then we used structural equation modeling to examine the cross-lagged effect model shown in Fig. 1. This model was created for estimating causal relationships between variables from panel data (Finkel, 1995). For example, if Path E, which was the path from the number of cyber-friends measured in the first survey to the degree of social anxiety measured in the second survey, indicated statistically significant negative effects, then it would be estimated that a large number of cyber-friends would lower social anxiety. Conversely, if Path F, which was the path from the degree of social anxiety measured in the first survey to the number of cyber-friends measured in the second survey, indicated statistically significant negative effects, then it would be estimated that a high degree of social anxiety would decrease the number of cyber-friends.

We then used a multi-group analysis technique to examine if such causal relationships would differ between high and low self-evaluated physical attractiveness groups. When comparing the characteristics of different groups using structural equation modeling, if the analysis model is employed for each group, it is assumed that estimated parameter values of the groups are all different even though they are analyzed with exactly the same

Table 1
Means and standard deviations of variables in first survey

	Self-evaluated attractiveness			
	High ($n = 83$)		Low ($n = 94$)	
	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>
Total number of cyber-friends	4.0a	7.3	2.8a	4.2
Number of opposite sex	2.3a	3.9	1.3a	2.8
Number of same sex	1.6a	3.7	1.5a	2.6
Social anxiety	21.5a	6.4	24.7a	6.3
<i>Loneliness</i>				
Friend relationships	26.5a	9.0	31.9 b	12.0
Family relationships	26.3a	10.7	29.2 b	10.2
Society	16.3a	4.5	20.0 b	5.8

Note: Means with different alphabet differ significantly ($p < .001$).

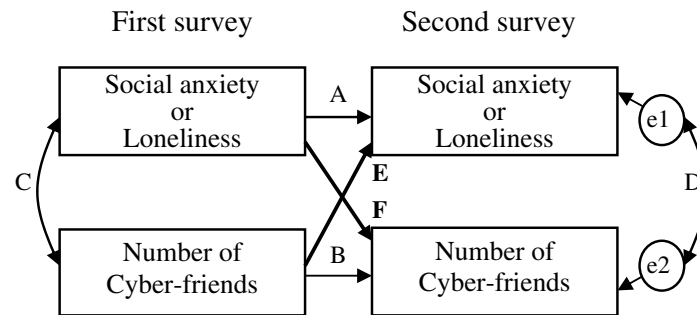


Fig. 1. The cross-lagged effect model.

analysis model. Note that it is possible to obtain more robust comparison results if the comparison can be made simpler by applying an equivalence restriction in which characteristics common to the groups are equivalent in parameter values. By applying such an equivalence restriction, the groups would have fewer parameters to estimate, which would thus lead to a robust outcome with a higher degree of freedom. In the multi-group analysis technique using structural equation modeling, an equivalence restriction in which the regression weight and covariance are equivalent among the groups can be applied, and then the groups can be analyzed simultaneously. This will allow inter-group comparisons by using the best-fit model without rejected equivalence restrictions. Therefore, application of an equivalence restriction is useful when comparing the characteristics of groups.

To examine the fitness of the analysis model, the χ^2 value, GFI (goodness of fit index), CFI (comparative fit index), RMSEA (root mean square error of approximation), and AIC (Akaike's information criterion) were used. Conventionally, the model is considered to be well fit to the given data when the GFI or CFI value is .90 or higher, the RMSEA value is .05 or lower (a value of .08 or lower is considered acceptable), and the AIC value is the lowest.

3.3. Selection of an analysis model

For high and low self-evaluated attractiveness groups, causal relationships between the number of cyber-friends, and loneliness and social anxiety (Path E and Path F in Fig. 1) were examined. To apply the multi-group analysis technique, equivalent restrictions were eliminated one by one from Model 1 to Model 10. In Model 1, all the relationships shown as Paths A–F in Fig. 1 were assumed to be equivalent between the high and low self-evaluated attractiveness groups. Model 10 is a saturated model in which all relationships shown as the same path were different between the two groups (Table 2). Then, based on the fit indices, the model that was considered the most appropriate in predicting causal relationships between variables was selected. Table 3 shows each fit index value for the selected model. According to each of the indices, each set of the model and data can be judged to have sufficient degrees of fitness.

3.4. Causal relationship

The result of examination of the four hypotheses is as follows.

Hypothesis A: From the number of cyber-friends to social anxiety (Path E). The results showed that: for the low self-evaluated attractiveness group, having a large number of cyber-friends lowered social anxiety; and for the high self-evaluated attractiveness group, having a large number of cyber-friends heightened social anxiety (Table 4).

Table 2
Equivalent restrictions

Model	Equivalent restrictions	<i>df</i>
Model 1	A, B, C, D, E, F	6
Model 2	A, B, C, D, F	5
Model 3	A, B, C, D, E	5
Model 4	A, B, C, D	4
Model 5	A, B, C	3
Model 6	A, B, D	3
Model 7	A, B	2
Model 8	A	1
Model 9	B	1
Model 10	None (saturated model)	0

Note: Letters shown in Table 1 correspond to the path labels in Fig. 1. Equivalent restrictions were eliminated one-by-one from Model 1 to Model 10. In Model 1, all relationships shown as the same path were assumed to be the same between groups. Model 10 is a saturated model in which all relationships shown as the same path were different between groups.

Next, the effects of the gender of cyber-friends were examined. For the low self-evaluated attractiveness group, having a large number of cyber-friends of the same sex lowered social anxiety; and for the high self-evaluated attractiveness group, having a large number of cyber-friends of the same sex heightened social anxiety. The number of cyber-friends of the opposite sex in particular did not result in any changes to the degrees of social anxiety in either group (Table 4).

Hence, Hypothesis A “Having a large number of cyber-friends would lower social anxiety felt by the low self-evaluated attractiveness group. Also, such effects would be prom-

Table 3
Fit index values for the selected models

	Models	χ^2	<i>df</i>	GFI	CFI	RMSEA	AIC
<i>Cyber-friends: total</i>							
Social anxiety	Model 8	2.16	1	.99	.99	.08	40.16
Loneliness							
Friend relationships	Model 10	.00	0	1.00	1.00		40.00
Family relationships	Model 2	9.60	5	.97	.98	.07	39.60
Society	Model 10	.00	0	1.00	1.00		40.00
<i>Cyber-friends: opposite sex</i>							
Social anxiety	Model 88	1.24	1	1.00	1.00	.04	39.24
Loneliness							
Friend relationships	Model 55	6.61	3	.98	.98	.08	40.61
Family relationships	Model 88	.25	1	.99	1.00	.00	38.25
Society	Model 10	.00	0	1.00	1.00		40.00
<i>Cyber-friends: same sex</i>							
Social anxiety	Model 10	.00	0	1.00	1.00		40.00
Loneliness							
Friend relationships	Model 10	.00	0	1.00	1.00		40.00
Family relationships	Model 88	1.04	1	.99	1.00	.02	39.04
Society	Model 10	.00	0	1.00	1.00		40.00

Note: For the equivalent restrictions of each model, see Table 2.

GFI, CFI, RMSEA and AIC are Fit indexes.

Table 4

Causal relationship between number of cyber-friends and social anxiety

	Social anxiety	
	Path E	Path F
<i>Low attractiveness group</i>		
Cyber-friends: total	-.26***	
Cyber-friends: opposite sex		
Cyber-friends: same sex	-.37***	
<i>High attractiveness group</i>		
Cyber-friends: total	.16**	
Cyber-friends: opposite sex		
Cyber-friends: same sex	.19**	

Note: Results of the cross-lagged effect model analysis are shown in Fig. 1. Only significant standardized path coefficients are shown.

** $p < .01$.

*** $p < .001$.

inent if the cyber-friends were of the opposite sex,” was partially supported since the positive effects on social anxiety of having a large number of cyber-friends of the same sex were significant for the low self-evaluated attractiveness group, but there were no such effects when the cyber-friends were of the opposite sex.

We next examined the inverse causal relationship (Path F). The results were that social anxiety showed no significant effects on the number of cyber-friends (Table 4).

Hypothesis B: From the number of cyber-friends to loneliness (Path E). For the low self-evaluated attractiveness group, having a large number of cyber-friends reduced the loneliness felt in friendships. However, no significant causal relationship was found between the number of cyber-friends and loneliness felt in family relationships or society (Table 5). On the other hand, for the high self-evaluated attractiveness group, having a large number of cyber-friends heightened the loneliness felt in society. However, no significant causal relationship was found between the number of cyber-friends and loneliness felt in friendships or family relationships (Table 5).

Next, the effects of the gender of cyber-friends were examined. For the low self-evaluated attractiveness group, having a large number of cyber-friends of the opposite sex reduced the loneliness felt in friendships, while having a large number of cyber-friends of the opposite sex heightened the loneliness felt in family relationships. No significant causal relationship was found between the number of cyber-friends of the same sex and these three types of loneliness (Table 5). On the other hand, for the participants of the high self-evaluated attractiveness group, having a large number of cyber-friends of the opposite sex heightened the loneliness felt in society. However, no causal relationship was found between the number of cyber-friends of both sex and the loneliness felt in friendships or family relationships (Table 5).

Therefore, Hypothesis B, “Having a large number of cyber-friends would reduce loneliness felt by the low self-evaluated attractiveness group. Also, such effects would be prominent if the cyber-friends were of the opposite sex,” was supported only in terms of the loneliness felt in friendships.

We next conducted examination of the inverse causal relationship (Path F). The results of that for the low self-evaluated attractiveness group were that a high degree of loneliness

Table 5
Causal relationship between number of cyber-friends and loneliness

	Loneliness					
	Friends		Family		Society	
	Path E	Path F	Path E	Path F	Path E	Path F
<i>Low attractiveness group</i>						
Cyber-friends: total	−.13 [*]	.18 [†]	.10 [†]	.25 ^{**}		.29 ^{***}
Cyber-friends: opposite sex	−.12 [*]		.16 ^{**}	.38 ^{***}		.41 ^{***}
Cyber-friends: same sex	−.11 [†]	.21 ^{***}				.19 ^{***}
<i>High attractiveness group</i>						
Cyber-friends: total		−.34 ^{***}		.15 ^{**}	.21 ^{**}	−.22 [*]
Cyber-friends: opposite sex		−.26 [*]		.25 [*]	.23 ^{**}	
Cyber-friends: same sex		−.28 ^{**}			.15 [†]	−.23 [*]

Note: Results of the cross-lagged effect model analysis are shown in Fig. 1. Only significant standardized path coefficients are shown.

* $p < .05$.

** $p < .01$.

*** $p < .001$.

† $p < .10$.

felt in family relationships or society caused an increase in the number of cyber-friends. On the other hand, for the high self-evaluated attractiveness group: a high degree of loneliness felt in family relationships caused an increase in the number of cyber-friends as well, but a high degree of loneliness felt in friendships or society caused a decrease in the number of cyber-friends (Table 5).

Next, the effects of the gender of cyber-friends were examined. For the low self-evaluated attractiveness group, a high degree of loneliness felt in family relationships or society caused an increase in the number of cyber-friends of the opposite sex. Also, a high degree of loneliness felt in friendships or society caused an increase in the number of cyber-friends of the same sex. On the other hand, for the high self-evaluated attractiveness group, a high degree of loneliness felt in family relationships caused an increase in the number of cyber-friends of the opposite sex. However, a high degree of loneliness felt in friendships caused a decrease in the number of cyber-friends of the opposite sex. Also, a high degree of loneliness felt in friendships or society caused a decrease in the number of cyber-friends of the same sex (Table 5).

4. Discussion

4.1. The effect of the number of cyber-friends on social anxiety

Hypothesis A was partially supported; positive effects of having a large number of cyber-friends on social anxiety were more clearly indicated in the low self-evaluated attractiveness group than in the high self-evaluated attractiveness group. It appears that they were able to acquire techniques or confidence in interpersonal relationships through cyber-relationships because low self-evaluation of physical attractiveness was not a handicap to them on the Internet. Therefore, they were able to do things more proactively and act with less trepidation. However, the positive effects of having a large number of cyber-friends were observed only when they were of the same sex. Therefore, the hypothesis that

cyber-friends of the opposite sex would have more prominent effects on social anxiety than cyber-friends of the same sex was not supported.

The social anxiety examined in this study comprised feelings of discomfort such as uneasiness, nervousness, and worry that individuals felt when they were with someone else or in front of an audience. However, relationships with cyber-friends of the opposite sex would not have a sufficient effect to cast aside such social anxieties. Therefore, the results of this study indicated that the findings of Ando et al. (2004)—that having a large number of cyber-friends of the opposite sex did not have an effect on confidence in interpersonal relationships – were supported for both male and female participants, regardless of their self-evaluation of physical attractiveness. Also, in this study, the participants who gave a low evaluation of their own physical attractiveness were able to lower their social anxiety through communicating or establishing interpersonal relationships with cyber-friends of the same sex. This result may indicate that the findings of Ando et al. (2004)—that having a large number of cyber-friends of the same sex would have positive effects on confidence in interpersonal relationships – were supported for the participants who gave a low evaluation of their own physical attractiveness.

To reduce social anxiety, it is important to have many interpersonal experiences, and accumulate successful experiences. For people with a low self-evaluation of physical attractiveness, in same-sex interaction, where physical attractiveness is not very important, the threshold is low online, as compared with opposite-sex interaction, and the possibility of enjoying oneself freely is high. Due to that, it appears that, in the experience of constructing many good interpersonal relationships, interaction with cyber-friends of the same sex, more than with the opposite sex, had an effect of reducing social anxiety. It is also necessary to establish interpersonal trust in reducing social anxiety. Feeling that one can talk about one's true feelings without restraint in CMC environments that make it easy to access the “true self” of one's self concept (Bargh et al., 2002) increases one's interpersonal trust, while contributing to intimate relationships (McKenna, Green, & Gleason, 2002). Due to the heightened motivation to try to portray oneself well when one's partner is of the opposite sex, an impression differing from this sort of genuine socialization will likely be born. In the future, it will be necessary to study in what way interaction with cyber-friends of the same sex has an effect on improving sociality, and to also study whether or not there is any influence on FtF or online interactions with the opposite sex due to the improvement of social anxiety from interaction with cyber-friends of the same sex, and also why relationships with cyber-friends of the opposite sex has no effect on social anxiety.

The effect of cyber-friends of the same sex on social anxiety, seen in this study in the low self-evaluated physical attractiveness group, had a reverse influence from as in the high self-evaluated physical attractiveness group. One reason is that in the group which does not feel much stress in FtF interpersonal relationships, there is a possibility that as a consequence of their proactiveness in interpersonal relationships, they more frequently has interpersonal experiences that worsen social anxiety, such as fighting, flaming, or losing relationships. This is one topic that must be studied in the future.

4.2. Possibility of a spiral process between number of cyber-friends and social anxiety

In this study, we examined the inverse causal relationship, and also made studying the possibility of “the spiral of how the higher social anxiety is, increasing interaction with

cyber-friends that have lower interpersonal stress than FtF will reduce that social anxiety” into a research objective. The result of the analysis was that no significant causal relationship was found between social anxiety and the number of cyber-friends. Consequently, we were not able to verify the process that is the origin of high social anxiety. Regardless of how participants evaluated their physical attractiveness, they may have little motivation to establish new interpersonal relationships when they have strong social anxiety. They probably feel troubled, nervous, or uneasy about interpersonal relationships regardless of the availability of social cues. Therefore, even if they initially felt like establishing some new interpersonal relationships on the Internet, where forming relationships seemed to be easier than in FtF situations, such a feeling would be canceled out by their nervousness or uneasiness, preventing them from actually taking action.

4.3. The effect of the number of cyber-friends on loneliness

Hypothesis B was supported only in the loneliness felt in friendships. The positive effect of having a large number of cyber-friends on the loneliness felt in friendships was more clearly indicated in the low self-evaluated attractiveness group than in the high self-evaluated attractiveness group. Also, such effects were slightly more prominent when the cyber-friends were of the opposite sex. Therefore, this result may indicate that [Ando et al.'s findings \(2004\)](#) were supported for loneliness felt in friendships by the participants of the low self-evaluated attractiveness group. Loneliness felt in friendships is reduced by feeling that one has friends who will understand, love, and accept one with warmth. The results of this study suggest that for people with low physical attractiveness who easily feel timid in FtF interactions, they can more easily discover people with matching interests and concerns on Internet ([McKenna & Bargh, 2000](#)). And online interaction, in which sense of humor, interests, values, and style of expression are emphasized more than audiovisual information ([Baker, 1998](#)) and one's “real self” is easier to express ([Bargh et al., 2002](#)), this may fulfill a function of alleviating loneliness felt in friendships. Investigating the process of these results must be noted as a topic for future study.

However, while having a large number of cyber-friends of the opposite sex reduced the loneliness felt in friendships, it also heightened the loneliness felt in family relationships. This complicated result can be interpreted by the theory by [Kraut et al. \(1998\)](#) that the participants spent less time with their family as they spent more time with cyber-friends. This is because communicating with cyber-friends of the opposite sex was fun to the participants since it allowed the participants to anticipate that the relationship could grow into an intimate relationship.

Meanwhile, having a large number of cyber-friends did not indicate any positive effects on the high self-evaluated attractiveness group. Only a negative effect was found for the loneliness felt in society. Explanations of this result must be discussed in the future.

4.4. Possibility of a spiral process between number of cyber-friends and loneliness

Next, when examining the inverse causal relationship, several interesting causal relationships were found. By first combining these results with the causal relationship of cyber-friends to loneliness, we can speculate on the possibility of the “spiral process of how the higher loneliness is, increasing interaction with cyber-friends will reduce that loneliness”.

From the results shown as Path E and Path F of in Table 5, the possibility of the a spiral process like the one describes about can be seen in the low self-evaluated attractiveness group. That is, it shows the possibility that in the low self-evaluated attractiveness group, the higher loneliness felt in friendships the more the number of overall cyber-friends and cyber-friends of the same sex increases, and due to this loneliness felt in friendships is reduced.

How in the low self-evaluated attractiveness group, high loneliness felt in friendships did not have an effect on the number of cyber-friends of the opposite sex, but only on the number of cyber-friends of the same sex may be due to how for those wanting to increase the number of friends who understand and accept them and reduce their loneliness felt in friendships, it requires less effort to increase the number of cyber-friends of the same sex.

In this study, we also observed an unexpected negative loop in the relationship between loneliness felt in family and cyber-friends in the low self-evaluated attractiveness group. That is, when they felt a high degree of loneliness in family relationships, they tried to gain cyber-friends of the opposite sex. Also between these two variables, there was shown a causal relationship that the more cyber-friends of the opposite sex, the higher the loneliness felt in family. Thus, for this group, the number of cyber-friends of the opposite sex and the loneliness felt in family relationships may have a synergistic negative effect that causes them to amplify each other.

This result is probably partially due to the fact that the participants of this study were young adults of around 20 years of age. It is possible to interpret this as indicating that when the participants did not feel loved by their family, their attention was directed towards communication with cyber-friends of the opposite sex, as such communication allowed the participants to anticipate that the relationship might grow into intimate relationships. Therefore, a vicious circle of loneliness felt in family gradually increasing as time passes, due to a strong inclination towards interacting with cyber-friends of the opposite sex.

Meanwhile, in the high self-evaluated attractiveness group we could see a spiral process of how the more overall cyber-friends and cyber-friends of the same sex, the more loneliness felt in society increases, but the higher loneliness felt in society gets, the more the number of cyber-friends ends up decreasing. This result might imply that individuals who evaluated their own physical attractiveness highly may try to reduce the loneliness felt in society caused by cyber-friendships by improving FtF interpersonal relationships; therefore, they intentionally tried to decrease the number of cyber-friends they had as a way of limiting their resources used to maintain cyber-relationships. Such opposing results must be noted as a topic for future study.

5. Conclusions and future directions

In contrast to several findings of negative effects in the high self-evaluated attractiveness group, some positive effects were found in the low self-evaluated attractiveness group. Namely, for those who gave themselves a low evaluation of physical attractiveness, having a large number of cyber-friends had positive effects on social anxiety and loneliness felt in friendships. These results imply that for these individuals, experiences of interpersonal relationships with cyber-friends could help them acquire social skills. Also, for them, cyber-friends functioned as a means of reducing the loneliness felt in friendships.

Furthermore, the findings clarify prior research indicating that the effects of cyber-friends on confidence in interpersonal relationships or psychological health differ by gen-

der of the cyber-friends (Ando et al., 2004). In particular, the findings of Ando et al. (2004) are only supported for individuals who gave a low evaluation of their own physical attractiveness. For these individuals, having a large number of cyber-friends of the same sex had a positive effect on social anxiety, but had little effect on loneliness. Cyber-friends of the opposite sex had no effect on social anxiety, but had a complex effect upon loneliness. Namely, having a large number of cyber-friends of the opposite sex had a positive effect on the loneliness felt in friendships, but it also had a negative effect on the loneliness felt in family relationships. Future studies should examine these complicated results to offer sufficient explanation.

As for the causal relationships in the opposite direction, this study has indicated that individuals who gave a low evaluation of their own physical attractiveness tried to make more cyber-friends when they felt a high degree of loneliness.

To summarize these findings, we can reach the conclusion that individuals who gave low evaluations of their own physical attractiveness benefited more from cyber-relationships than individuals who gave high evaluations of their own physical attractiveness. Also, the findings showed that for these individuals, cyber-friends can be valuable human resources for reducing loneliness.

It should be noted that the participants of this study were around 20 years old, and in general, the gender of cyber-friends was particularly important to them. Therefore, for future studies, the age range of the participant group must be expanded. Also, the findings regarding those who gave high evaluations of their own physical attractiveness must be further studied and interpreted in the future.

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