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The Effects of Internet Use on Junior High School Students' Loneliness and Social Support

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The Effects of Internet Use on Junior High School Students' Loneliness and Social Support[1]

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Abstract

Previous studies have shown that the Internet can have both negative and positive effects on psychological health, such as negative effects on loneliness and positive ones on social support. However, these studies have so far been conducted on adults, and there have been few studies on children. To examine the effects of Internet use on children's loneliness in friendship groups, and the social support they receive from significant persons such as family or friends, we conducted a two-wave panel study of 298 lower secondary school students. The data obtained was then analyzed using structural equation modeling. The effects of Internet use were examined with respect to each Internet tool and each purpose. For Internet use by tool, the participants were asked about the levels of their Internet use for: 1) email; 2) browsing web sites, BBS, or reading e-mail magazines; 3) making web pages; 4) posting messages on BBS or mailing lists; 5) chatting; and 6) playing online games. For Internet use by objective, the participants were asked about their levels of Internet use for: 1) classes; 2) homework or study; 3) hobbies or other favorite activities; 4) interpersonal exchange with cyber friends; 5) interpersonal exchange with family or offline friends; and 6) making new friends. As a result, Internet use was found to have positive effects on the students' loneliness in friendships and social support from their friends. More specifically, frequent email use reduced loneliness in friendships, and longer Internet use increased social support from their cyber friends and offline friends. To describe the result of social support in more detail, frequent use of email increased social support from their offline friends. Meanwhile, the results indicated that frequent use of chat, BBS, website browsing, and web page making increased social support from their cyber friends. Similarly, frequent use of the Internet for communicating amongst their cyber relationships notably contributed to increased social support from their cyber friends. The implications of these results for further research and practice have also been provided.

Key words : Internet use, social support, loneliness, junior high school students, causal relationships

Introduction

As of March 2004, 100% of elementary and junior high schools in Japan had computer facilities, and 99.8% were connected to the Internet. Of these, 71.6% had access to a high speed Internet connection, and it is clear that the educational environmental for children is rapidly embracing IT (Counsellor for Elementary and Secondary Education Bureau, 2004). Moreover, according to a government white paper on Information and Communications, 60.6% of the Japanese population were making use of the Internet by the end of 2003, with 61.9% of children aged 6 to 12, and 91.6% of children aged 13 to 19 regularly using the Internet (Ministry of Internal Affairs and Communications, 2004). With the opportunities for Japanese children to access the Internet increasing thus rapidly, it is only natural that interest in the psychological effect of this new medium is having on our children is also increasing.

Studies focusing on adults and their use of the Internet have shown its negative influence on feelings of loneliness and depression (Kraut, Patterson, Lundmark, Kiesler, Mukophadhyay, & Scherlis, 1998; Engelberg & Sjoberg, 2004). However, other studies have reported on the positive influence of Internet usage, such as how it can decrease feelings of loneliness and depression, whilst increasing access to peer social support (Shaw & Gant, 2002; Modayil, Thompson, Varnhagen, & Wilson, 2003), decrease feelings of anxiety about interpersonal communication (Ando, Sakamoto, Suzuki, & Mori, 2003), and how making new friends over the Internet can serve to improve

feelings of life satisfaction and social efficacy (Ando, Sakamoto, Suzuki, Kobayashi, Kashibuchi, & Kimura, 2004). As such, the results of these studies show that opinions on the influence of Internet usage are not in accordance. Moreover, despite the fact that there is concern about how the Internet, as a new media, might be having a potentially negative influence of children in the developmental stage, most of the studies thus far on children's usage of the Internet and its influence upon them have focus on how it affects their skill to practically use information (so-called "information literacy") (Takahira, Sakamoto, Kobayashi, Kashibuchi, Adachi, Sakamoto, Mori, Suzuki, Kimura, & Sakamoto, 2002; Ando, Takahira, & Sakamoto, 2004), and their motivation for learning (Mori, Sakamoto, Kashibuchi, Kobayashi, Katsuya, Suzuki, Ibe, Adachi, Takahira, Sakamoto, Hatano, & Sakamoto, 1999). There has been, therefore, a clear bias towards examination of educational effects, and research on the impact of the Internet on children's psychological health, such as feelings of loneliness and isolation, have not yet been satisfactorily developed. Today, however, with the Internet have become an everyday medium for our children, further research into the influence of the Internet on children's psychological wellbeing must surely be an important factor in considering the most appropriate way for children to use the Internet.

In terms of research into the influence of Internet usage on the psychological health of children, some panel studies working with elementary school children have been carried out (Takahira, Ando, & Sakamoto, 2003; Ando, Takahira, & Sakamoto, 2003). The results of these, which considered Internet usage in terms of the various Internet tools, have shown that feelings of loneliness in friendships decrease amongst elementary school children who spend considerable time building web pages (Takahira et al., 2003). Moreover, a study looking at how effects differ according to the various objectives behind Internet usage showed that elementary school children who frequently use the Internet for study and for homework experience a decline in feelings of loneliness in friendship (Ando, Takahira, & Sakamoto, 2003).

This study will, taking into account the results of such previous research, endeavor to examine the influence of Internet usage on feeling of loneliness amongst junior high school students, considering that such usage has been shown to have positive effects on elementary school children. In terms of feelings of loneliness within friendships, a previous panel survey conducted within university students has reported on the negative influence of email usage (Ando, Sakamoto, Suzuki, & Mori, 2001; Ando et al., 2003), which is incongruent with the results for elementary school children. As such, there seems to be a clear need to survey junior high school students, who are entering maturity, in order to consider the developmental issues connected with Internet usage.

Moreover, this study will also consider, in addition to the influence of the Internet on feelings of loneliness within friendship groups, the potential expansion of social support from significant persons in the social lives of children, such as family, teachers and friends that Internet usage may engender. The Internet has been shown to contribute to the maintenance and expansion of relationships with family and with friendships, in parallel with increased operability of Internet tools and increased familiarity with the Internet (Kraut, Kiesler, Boneva, Cummings, Helgeson, & Crawford, 2002). In this way, then, the Internet, which has few temporal or spatial restrictions, is a highly effective communicative tool. It can be surmised that this attribute could function extremely well in terms of gleaning social support from other persons close to the user, when he or she may feel the need for it.

Research thus far on the effects of Internet usage and social support on children has primarily focused on support groups for children with disabilities, or have other health or social problems (e.g. Tichon & Yellowlees, 2003), and there is a distinct lack of such research on the social support that 'normal' children can gain from frequent use of the Internet. Further examination of this issue, therefore, is needed.

Furthermore, this study will consider the various categories of friendship that can be a source of social support, namely friends that have been made through the Internet (hereinafter, cyber friends) and friends that have been met directly at school and at cram schools (hereinafter, offline friends[2]). Studies that consider the sources of social support in terms of both cyber friends and offline friends have been, so far, few and far between. However, in parallel with the ever growing dissemination of the Internet, the Internet now represents a forum through which relationships can be built in addition to, and perhaps more easily than, conventional face-to-face interpersonal relationships (Parks & Floyd, 1996). Opinions vary with regard to these online interpersonal relationships, however, with some negative reports suggesting that the quality of these relationships are lesser than those enjoyed with offline interpersonal relations (Cummings, Butler, & Kraut, 2002), and still others positing that they can be of a quality that has a positive effect on psychological health and social skills (Ando et al., 2004). As such, opinion remains divided as to whether these online relationships should and can be considered in the same manner as traditional offline social relationships. There seems to be, therefore, a clear need to examine the role of children's cyber friendships separately to offline relationships.

In addition to examining the influence that Internet usage can have on social support and feelings of loneliness in friendships, this study will also consider the same issue from the other direction, namely the influence that social support and feelings of loneliness can exert upon Internet usage. We believe that examination of these casual relationships from both directions will be meaningful in the estimation of the synergy effect between the two. In other words if, for example, the results of the analysis were to show that that there was a true casual relationship in both directions between Internet usage and social support, then the casual relationship between both sets of variables would be functioning synergistically, and it would be possible to suggest that the greater the level of Internet usage, the more social support could be gleaned, intimating the highly positive effect of Internet usage.

Moreover, in addition to an analysis of the various Internet tools that have conventionally been the participant of research, this study will endeavor to evaluate Internet usage according to the objectives for usage, and consider the effects of these. This is due to the fact that there is potentially a difference in the psychological effects of Internet usage according to the objectives held in usage of the various Internet tools.

Method

Participants

We conducted a two-wave panel study at two public junior high schools in Kanagawa Prefecture, Japan, in October 2003 and again in March 2004. Each survey questioned 298 second grade junior high school students (155 boys, 143 girls). The schools participating in the study had no special measures in place regarding utilization of the Internet.

Survey contents

Internet Usage Participants were asked to respond about their Internet usage in terms of the tools used and the objectives for usage by a seven-point scale, based on the format of similar surveys (Ando et al., 2001; Takahira et al., 2003). Namely, out of The total time spent at school and at home, whether their total Internet usage for one week was: none, less than ten minutes, between ten and thirty minutes, between thirty minutes and one hour, between one and two hours, between two and three hours, and more than three hours. For the purposes of the resulting analysis, the answers received were converted into figures between 0 and 6, and the aggregate scores were used for total levels of usage for each tool and objective. Moreover, we asked the participants not to include within their answers time spent accessing the Internet from mobile telephones.

1. We asked about levels of Internet usage per week for each of the following tools : 1) email, 2) browsing websites and BBS, 2) posting messages on BBS and mailing lists, 4) making web pages, 5) chatting, 6) playing online games.
2. We asked about levels of Internet usage per week for each of the following objectives : 1) school classes, 2) homework or study, 3) hobbies or other favorite activities, 4) interpersonal exchange with family or offline friends, 5) interpersonal exchange with cyber friends and 6) making new friends.

loneliness felt in friendships Our survey utilized the "Multidimensional scaling of loneliness in different human relations" by Hirosawa & Tanaka (2004), which was based on the Differential Loneliness Scale (Schmidt & Sermet, 1983), and uses 10 different friendship questions. Participants were then asked to respond to questions such as "I have virtually no friends who understand how I think and how I feel" with one of four options, such as "strongly disagree" and "strongly agree." The alpha coefficient was .80. Moreover, according to Hirosawa & Tanaka (1984), this particular scale correlates significantly to the revised UCLA Loneliness Scale, and as such has a high level of validity.

Social support According to the 'Scale of Student Social Support', drawn up by Hisata, Miguichi, & Senda (1989), which measures the emotional support gained from close relationships, we took 13 items which junior high school students might be likely to experience (for example, "they make me feel better when I'm feeling depressed"), and added 2 items about instrumental support towards questions that arise during study, which we considered to constitute important social support for junior high school students - "they will help me when there's something I don't understand in my studies," and "they teach me about what I want to know." We then asked participants to indicate the frequency of support received for each of the 15 items according to one of four levels, including "almost never" and "regularly," for four distinct sources of support, namely family, school and cram school teachers, cyber friends and offline friends.

This scale, developed by Hisata et al. (1989) shows significant correlation with the shortened version of the Social Support Questionnaire (Sarason, Shearin, Pierce, & Sarason, 1987), and as such has a high level of validity. It should be noted, however, that this scale conventionally asks the participant about the level of support he or she can expect from 5 differing support sources, namely his or her father, mother, siblings, school teachers and friends/acquaintances, according to one of four responses, ranging from "probably" to "absolutely." In today's school environment, however, questions about the specifics of family make-up are not encouraged, and as such we altered the support sources

to the categories of family, teachers and friends (cyber and offline). Moreover, in order to examine the actual levels of support being obtained from each support source, the scale was taken as an event scale, and participants were questioned as to the frequency with which they had experienced support from each of the support sources indicated.

Results

Means and standard deviations of variables

The mean and standard deviation for levels of Internet usage by tool and by objective recorded at each survey point, and loneliness felt in friendships and social support, are shown in Table 1 below.

Analysis model

This study examined the casual relationship between levels of Internet usage and feelings of loneliness in friendships and social support sources using structural equation modeling. For the analysis model, we used the cross-lagged effect model, as shown in figure 1 below, and examined both path A and path B. Using this model, if, for example, levels of Internet usage as reported in the first survey had a significant negative influence on path A, namely on feelings of loneliness felt in friendship as reported in the second survey, then it could be surmised that there was a casual relationship from an increase in email usage, to a decrease in feelings of loneliness in friendships.

Moreover, this study used both a restricted model (model 1) which took the covariance between the error margins (e 1 and e 2) of the second survey as 0, and a saturated model with no such restrictions (model 2). The χ^2 figures between the two were to be compared, and if a significant difference were to be found in the χ^2 figures, then model 2 would be adopted, and, equally, if no significant difference were found, then model 1, which has less presumable parameters, would be adopted.

Furthermore, in order to examine the goodness of fit of the model adopted, the Goodness of Fit Index (GFI), the Comparative Fit Index (CFI) and the Root Mean Square Error of Approximation (RMSEA) were used. Conventionally, if the figures in the GFI and CFI are more than .90, and the RMSEA figures less than .05, then the model is determined to be extremely well adapted to the data used. The goodness of fit shown in the model used in this study were GFI = .99, CFI = .99-1.00, and RMSEA = .00 - .07 (for RMSEA, figures under 0.08 are determined to be within the acceptable

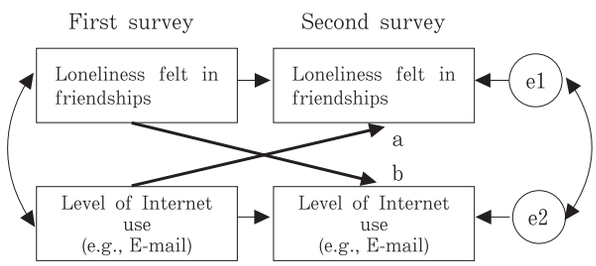

Figure 1 The Cross-lagged Effect Model

Table 1 Means and standard deviations of variables in the first & second surveys

	First survey		Second survey	
	M	*SD*	*M*	*SD*
Total level of Internet use by tool	4.93	5.56	4.91	5.49
Email	2.13	2.26	2.15	2.22
Website or BBS browsing	1.06	1.67	1.22	1.78
Posting messages to BBS	0.32	0.89	0.33	1.04
Web page making	0.16	0.86	0.16	0.81
Chat	0.78	1.61	0.67	1.53
Online gaming	0.50	1.37	0.41	1.24
Total level of Internet use by objective	4.57	4.98	4.66	5.01
For classes	1.26	1.51	1.08	1.56
For homework or studying	0.64	1.13	0.59	1.08
For hobbies or other favorite activities	1.86	1.89	1.97	2.02
For communication with cyber friends	0.33	1.14	0.37	1.21
For communication with family or offline friends	0.33	1.04	0.42	1.22
For making new friends	0.20	0.90	0.24	0.96
Loneliness felt in friendships	1.89	0.50	1.88	0.48
Social support				
Family	2.58	0.81	2.66	0.75
Teacher	2.02	0.70	2.17	0.77
Cyber friends	1.28	0.55	1.26	0.58
Offline friends	2.24	0.99	2.46	0.97

range), and as such the goodness of fit can be considered as satisfactorily high.

Estimations of Casual Relationships

We will now report on our findings on the results of the analysis on the influence the Internet usage has on loneliness felt in friendships and social support, as gleaned using the analysis model shown in Figure 1[3, 4]. Moreover, paths (a) and (b) indicated in Tables 1 and 2 correspond with paths (a) and (b) as shown in Figure 1.

The influence of Internet usage on loneliness felt in friendships

Examination of Internet usage by tool Firstly, we analyzed levels of Internet usage by tool. The results, as shown in Table 2, showed a positive effect, in that loneliness felt in friendships decreased in inverse proportion to levels of email usage. However, no such positive effect was found for any of the other Internet tools.

With regard to influence working in the opposite direction, no significant influence was seen upon the levels of usage of any of the tools by loneliness felt in friendships.

Examination of Internet usage by objective Next, we analyzed levels of Internet usage according to objective. As a result, no significant influence was found in either direction, in terms of causal relationships between levels of Internet usage and loneliness felt in friendships (Table 2).

Table 2 Causal relationships between levels of Internet use and loneliness felt in friendships

		Loneliness felt in friendships	
		Path a	Path b
Total level of Internet use by tool	ß (R^2)		
Email	ß (R^2)	−.10* (.42)	
Website or BBS browsing	ß (R^2)		
Posting messages to BBS	ß (R^2)		
Web page making	ß (R^2)		
Chat	ß (R^2)		
Online gaming	ß (R^2)		
Total level of Internet use by objective	ß (R^2)		.07† (.49)
For classes	ß (R^2)		
For homework or studying	ß (R^2)		
For hobbies or other favorite activities	ß (R^2)		
For communication with cyber friends	ß (R^2)		
For communication with family or offline friends	ß (R^2)		
For making new friends	ß (R^2)		

Note : Figures have only been included in the table where a significant effect or trend was noted, as the standardized coefficient (β) and the determination coefficient (R^2). The R^2 for path (a) is the feeling of loneliness in friendship relations at the second survey, and the R^2 for path (b) is the R^2 for the level of internet usage at the second survey. Moreover, it is important to bear in mind that these R^2 figures could have an influence on paths other than paths (a) and (b) as identified.
*p<.05, †p<.10

The influence of the Internet usage on social support

Using the same analysis model, we examined the influence of Internet usage on social support. Below, we have summarized the findings of our analysis on the influence shown on each source of social support, according to levels of Internet use by tool and by objective.

The influence of the Internet usage on social support from the family

In terms of the causal relationship between levels of Internet usage and the family, no significant influence was found in either direction, for any of the tools or objectives considered (See Table 3).

The influence of the Internet usage on social support from teachers

In terms of the casual relationship between levels of Internet usage and teachers from school or cram schools, no significant influence was found in either direction, for any of the tools or objectives considered (See Table 3).

The influence of the Internet usage on social support from cyber friends

Examination of Internet Usage by Tool Having examined levels of Internet usage by tool, the results showed that the level of social support from cyber friends increased in proportion to higher levels of usage of the Internet overall, such as browsing web pages,

Table 3 Causal Relationships between Levels of Internet Usage and Social Support

		Social support							
		Family		Teacher		Cyber-friends		Off-line friends	
		Path a	Path b	Path a	Path b	Path a	Path b	Path a	Path b
Total level of the Internet use by tool	ß (R^2)					.23*** (.23)		.15* (.17)	
Email	ß (R^2)							.15** (.17)	.10† (.25)
Website or BBS browsing	ß (R^2)					.14** (.21)		.19*** (.17)	
Posting messages to BBS	ß (R^2)	.07† (.59)		.09† (.41)		.17** (.22)		.09† (.15)	
Web page making	ß (R^2)					.17** (.21)			
Chat	ß (R^2)					.23*** (.23)			
On-line game	ß (R^2)								
Total level of the Internet use by objectve	ß (R^2)				.08† (.49)	.24*** (.23)	.14** (.50)	.10† (.15)	.10* (.49)
For classes	ß (R^2)	.07† (.59)							
For homework or studying	ß (R^2)					.15** (.21)			.12* (.24)
For hobbies or other favorite activities	ß (R^2)					.10† (.20)	.08† (.44)	.13* (.16)	.08† (.44)
For communication with cyber friends	ß (R^2)			.08† (.41)		.33*** (.28)	.20*** (.43)		
For communication with family or offline friends	ß (R^2)				.08† (.30)		.13** (.31)		.08† (.30)
For making new friends	ß (R^2)			.07† (.41)	.08† (.41)	.37*** (.31)	.15*** (.43)		.09† (.42)

Note : Figures have only been included in the table where a significant effect or trend was noted, as the standardized coefficient (β) in the top cell, and the determination coefficient (R^2) in the bottom cell (the figures in brackets). Moreover, the R^2 for path (a) is the social support at the second survey, as shown in Figure 1, and the R^2 for path (b) is the R^2 of the level of internet usage at the second survey. Furthermore, it is important to bear in mind that these R^2 figures could have an influence on paths other than paths (a) and (b) as identified.
***p<.001, **p<.01, *p<.05, †p<.10

posting messages on BBS, making web pages and chatting online (See Table 3).

In terms of a casual relationship in the other direction, no significant influence was found in levels of usage for any of the tools considered.

Examination of Internet Usage by Objective Next, we analyzed the effects of usage levels according to objective. The results showed that higher levels of usage of the Internet overall, such as chatting with cyber friends, and using the Internet in order to make friends and acquaintances, meant that levels of social support received from cyber friends increased (See Table 3).

In terms of a casual relationship in the other direction, levels of Internet usage would increase the more students were found to be receiving social support from cyber friends, and Internet usage in order to chat with cyber friends, interact with family and offline friends, and make new friends and acquaintances increased.

The influence of the Internet usage on social support from offline friends

Examination of Internet Usage by Tool Having investigated levels of Internet usage by tool, our results showed that the greater overall levels of Internet usage, and the higher the levels of email and website browsing, the greater the levels of social support received from offline friends (See Table 3).

In terms of a casual relationship in the other direction, however, no significant influence was found for any of the tools considered.

Examination of Internet Usage by Objective Next, we analyzed the levels of Internet usage according to objective. The results showed that the more students used the Internet to find out about hobbies and other interests, the more social support they received from their offline friends (See Table 3).

In terms of a causal relationship in the other direction, our results showed that the greater the levels of social support enjoyed from offline friends, the higher the levels of Internet usage overall, and in particular usage of the Internet for homework and study increased.

Discussions

The influence of Internet usage on loneliness felt in friendships

This study considered the influence of levels of Internet usage on junior high school students in Japan. In our analysis of Internet usage by tools, only email usage demonstrated a positive effect, namely a decrease in loneliness felt in friendships. Other, previous studies, focusing on university students, have shown the use of email to have a negative effect, namely a negative influence on loneliness felt in friendships (Ando et al., 2003), results which are incongruous with the outcome of this study. In general, it is thought that misunderstandings can easily arise when communication is carried out via email, due to the fact that it can be difficult to convey specific nuance in meaning through this text-based medium. For this reason, it might have been thought that interpersonal exchange through email amongst junior high school students, whose social skills are less developed than those of university students, and whose vocabulary is more limited, could easily lead to social and interpersonal trouble. Therefore, it may be more helpful to think of this result as being due not to developmental factors, but to environmental factors, especially when considered in parallel with the fact that our results showed a positive effect on the social support gained from offline friends through email.

In other words, face-to-face interpersonal relationship amongst junior high school students are often conducted in environments close to the home, such as school or cram school, and the geographic scope of these friendships is much more limited than that of university students. Furthermore, junior high school students go to classes in school and cram school much more regularly than university students. For this reason, junior high school students have frequent opportunities to interact with their friends, and even if a misunderstanding were to arise as a result of communication through email, it is most likely comparatively easy to mend those relationships through actual face-to-face contact. For junior high school students, therefore, email may well be a communicative tool that they are able to utilize well in order to deepen their friendships with their offline friends, with whom they also frequently meet face-to-face.

Next, incongruous with the results of research on elementary school children, this study did not reveal any positive effects on feelings of loneliness amongst friendships through either web page building (Takahira, et al., 2003) or Internet usage for study and homework (Ando, et al., 2003). The discrepancy in these results may be due to differences in the circumstances under which the Internet is being made. For example, building a web page in order to transmit information over the Internet is a fairly difficult task for an elementary school child, compared to other possible uses. For this reason, it may be the case that elementary school children work together with friends in order to succeed in building a web page, whilst the older junior high school children are more likely to attempt the task alone. Moreover, junior high school students have more restrictions on their free time, such as mandatory school club activities and commuting to cram schools, and trips to friends' homes become more infrequent (Cultural Affairs Division of Osaka Prefectural

Government, 2004). We can also surmise, then, that junior high school students also have fewer opportunities to access the Internet with friends outside of school. It may well be that Internet usage amongst junior high students for study and homework is conducted without the actual physical presence of study partners (friends) at their side, and could also be a method of self study impossible without Internet use; as such, there is no effect on loneliness felt in friendships. This suggests a clear need for further examination of the circumstances under which children use the Internet.

Moreover, despite the fact that using the Internet for social purposes might be thought of as being an effective method for reducing feelings of loneliness in friendships if used well, no such influence has been found, either in this study, or in other research that has focused on elementary school children. There is also a need for further research on this issue.

The influence of Internet usage on social support

The results of our analysis for levels of Internet usage both by tool and by objective imply that the higher the levels of Internet usage amongst junior high school students, the greater the levels of social support received from both cyber and offline friends.

In particular, the influence of Internet usage on social support from cyber friends was especially strong, and apart from email and online gaming, all of the Internet tools considered served to increase levels of social support from cyber friends, with the effects of proactive usage of the Internet for interaction with cyber friends and making new friends online being particularly strong.

These results show that cyber friends function effectively as sources of social support for junior high school students, and furthermore we can say that this implies that the Internet is being used proactively in order to glean greater social support from cyber friends. Of all the students surveyed for this study, around 30% of students claimed to have cyber friends (27.5% at the first survey, 31.9% at the second survey), and it can be reasonably assumed that if building interpersonal relationships through the Internet becomes more common, growing in tandem with the further dissemination of the Internet, then the significance of the role of cyber friends as a source of social support will only increase. Next, we would like to make several observations about the differences seen in the tools used and objectives in Internet usage, in terms of social support from both cyber and offline friends.

In terms of Internet tools, email, which is often used as a means of private interaction with a specific partner, has been shown as effective in increasing the levels of social support from offline friends. Despite this, it has not been shown as similarly effective with cyber friends. Equally, use of the Internet to post messages on BBS, and Internet chatting, which are conducted with multiple unspecified persons, has been shown as effective in increasing social support from cyber friends, whilst being ineffective in bringing about a similar increase in support from offline friends. Furthermore, looking at Internet usage by objective, whilst using the Internet to find out about hobbies and other favorite activities was shown to be effective in increasing social support from offline friends, no such increase was shown amongst cyber friends. Moreover, Internet usage for homework and study was only effective in increasing levels of social support from cyber friends.

These results seem to imply that the way in which junior high school students make use of the Internet varies according to their objective and to their communicative partners. In other words, with close offline friends who share the same interests and hobbies, students will use email, which is a private communication tool, to deepen their personal exchanges, and thus gain emotional support. Equally, with their cyber friends, they receive emotional support by enjoying the exchange and new encounters with multiple people that public web spaces, open to multiple unspecified persons, allow them access to (Ando, 2003). At the same time, in addition to the proactive support that these students can gain from their cyber friends, who are likely to have more varied backgrounds than their school friends and possess a range of diverse knowledge, by talking about their worries about school and study paths, they may also be able to expect instrumental support, such as help when they have problems with their study or homework. In order to further clarify the differences in the roles between children's cyber and offline friends, there is a need for a more detailed examination of exactly what kind of social support children are received via the Internet, and from whom.

In addition, this study showed that Internet usage for the purpose of interaction with friends and offline friends did not serve to increase the social support received from offline friends. We need to consider the possibility that this result may be due to the fact that this study limited itself to considering only that Internet usage conducted via computers. In parallel with the increasing popularization of mobile telephones, it is likely that junior high school students use their mobile telephones to communicate with their family and offline friends (Cultural Affairs Division of Osaka Prefectural Government, 2004). There is a need for further consideration of this issue.

As the above implies, a significant standardized solution (β) of .13-.37 was shown in terms of the social support received from cyber friends and offline friends via various Internet usage, and if we compare this to the fact that, in terms of having an effect on feelings of

loneliness within friendships, a significant standardized coefficient of -.10 was demonstrated with email usage only, then it is clear that we can reasonably consider the influence of Internet usage is stronger in terms of gaining social support than in mitigating loneliness. However, looking at the determination coefficients (R^2), which determine to what level the social support variable can be explained by exogenous variables, our study showed it to be .17-.23 for Internet usage by tool, and .16-.31 for Internet usage by objective. If we consider that, in the cross-lagged effect model adopted for this study, the endogenous variables also contain, in addition to the exogenous variables subject to the survey, individual data at the time of the first survey as a further exogenous variable, we can then show how a significant part of these determination coefficients can be explain by other factors affecting fluctuations in social support from cyber and offline friends, such as other exogenous factors and measurement errors. Future research should, therefore, consider these elements, and we need to work towards developing a more sophisticated model.

The Synergy Effect

By also examining casual relationships from an inverse direction, this study aimed to investigate whether or not the influence that Internet usage exerts on feelings of loneliness in friendships, and on social supports, also serves to amplify a synergistic effect in the other direction.

The results of the analysis did not show any casual relationship that might allow us to predict a synergistic influence between feelings of loneliness amongst friendships and Internet usage. At the same time, however, a reciprocal and significant positive casual relationship was shown to exist between usage of the Internet for all objectives, including interaction with cyber friends and making new friends and acquaintances, and the social support received from cyber friends. As such, the effect that Internet usage, undertaken with the objectives set out above, has in terms of engendering greater social support from cyber friends, also implies the possibility a synergistic amplification.

Moreover, use of email and use of the Internet to find out about hobbies and other interests, were shown to have a positive casual relationship on social support from offline friends, showing either significance or significant trends in the bidirectional path. Consequently, this implies the possibility of a synergistic amplification of the demonstrated effect that by using the Internet for email and to find out more about hobbies and interests, junior high school children are able to glean more social support from offline friends.

Conclusions

This study aimed to examination what kind of influence Internet usage had on loneliness felt in friendships, and the social support that junior high school students received from persons close to them. The results do not show the kind of negative influence that is often apportioned to Internet usage, demonstrating instead a positive influence on both loneliness felt in friendships and social support.

The results on the positive influence on loneliness garnered through Internet usage matched the results of similar research focusing on elementary school students. The tools which produced the results, however, differed from those shown as effective in the elementary school student studies, with email shown to help mitigate feelings of loneliness in friendships amongst junior high school students. Moreover, social Internet usage, which would instinctively be thought most likely to be effective in reducing feelings of loneliness amongst friendships, was not demonstrated to have any such influence, either in this study or in preceding conventional research. This result, however, may have been different had we included within the scope of our study Internet usage via mobile telephones, which are a more private Internet access tool than computers. Further research is needed in this area, including a focus on this role of mobile telephones.

The influence of Internet usage on social support was comparatively more pronounced than its influence on loneliness in friendships. Many of the Internet tools considered, together with the diverse objectives for Internet usage, were demonstrated to be effective in increasing the levels of social support received from friends. In particular, we need to focus on both the possibilities implied by the results, namely that junior high school students' usage of the Internet differs according to their specific objectives and the persons with whom they would like to make, and that cyber friends are currently functioning efficiently as sources of social support for junior high school students.

In order to clarify the differences in the roles that both offline and cyber friends play in children's lives, future research needs to focus on a more detailed examination of the social support that children receive via that Internet, and also investigate other factors that may have an influence on social support. Moreover, there is also a clear need to consider that psychological repercussions of Internet usage through mobile telephones, which are rapidly becoming part of our children's daily lives.

References

Ando, R. (2003) The relationships between Internet-based interpersonal relationships and the psychological health : Findings from an interview research. Research monograph 2002 : Studies of human development from birth to death. Ochanomizu University 21 st Century COE Program. Pp. 3-14.

Ando, R., Sakamoto, A., Suzuki, K., Kobayashi, K., Kashibuchi, M., & Kimura, F. (2004) Effects of the Internet use on life satisfaction and social efficacy : A panel study of male students in a vocational college of information technology. *The Japanese Journal of Personality*, 13, 21-33.

Ando, R., Sakamoto, A., Suzuki, K., & Mori, T. (2001) The Causal relationships between the Internet use and subjective well-being : Mediated effects of loneliness and social anxiety. Proceedings of the Japan Society of Personality Psychology 10 th Annual Meeting, Pp. 48- 49. (Originally in Japanese)

Ando, R., Sakamoto, A., Suzuki, K., & Mori, T. (2003) The relationships among communication medium, loneliness, and social anxiety. Proceedings of the 67 th Annual Convention of the Japanese Psychological Association, Pp. 207. (Originally in Japanese)

Ando, R., Takahira M., & Sakamoto, A. (2003) Effects of the Internet use on psychological health and social maladjustment Ⅱ. Proceedings of the 44 th Annual Meeting of the Japanese Society of Social Psychology, Pp. 622-623. (Originally in Japanese)

Ando, R., Takahira M., & Sakamoto, A. (2004) Causal relationships between the Internet use and skills of practical use of information in elementary school students. *Japan Journal of Educational Technology*, **28**, 65-68.

Cooper, H. M. (1989) Integrating research : A guide for literature reviews, Newbury Park, CA : Sage Publications.

Counsellor for Elementary and Secondary Education Bureau (2004) Maintenance of personal computer and Internet access in elementary and secondary schools. Ministry of Education, Culture, Sports, Science and Technology, Japan (Originally in Japanese), URL:http://www.mext.go.jp/a_menu/shotou/zyouhou/04120301.htm, (Jan. 18. 2008)

Cultural Affairs Division of Osaka Prefectural Government (2004) *Research reports of hypermedia environment in juvenile.* Osaka Prefectural Government, Japan (Originally in Japanese), URL:http://www.pref.osaka.jp/koseishonen/sonota/media/index.html (Jan.18.2008)

Cummings, J., Butler, B., & Kraut, R. (2002) The quality of online social relationships. *Communications of the ACM*, **45**, 103-108.

Engelberg, E., & Sjöberg, L. (2004) Internet use, social skills, and adjustment. *CyberPsychology and Behavior*, **7**, 41-47.

Hirosawa, T., & Tanaka, K. (1984). Multidimensional scaling of loneliness in different human relations. *Annual Studies of the School of Sociology* (Kwansei Gakuin University), **49**, 179-188. (Originally in Japanese)

Hisata, M., Miguchi, M., & Senda, S. (1989) Development of the social support questionnaire for students I. Proceedings of the 30 th Annual Meeting of the Japanese Society of Social Psychology, Pp. 143-144. (Originally in Japanese)

Kraut, R., Kiesler, S., Boneva, B., Cummings, J., Helgeson, V., & Crawford, A. (2002) Internet paradox revisited. *Journal of Social Issues*, **58**, 49-74.

Kraut, R., Patterson, M., Lundmark, V., Kiesler, S., Mukophadhyay, T., & Scherlis, W. (1998) Internet paradox : A social technology that reduces social involvement and psychological well-being? *American Psychologist*, **53**, 1017-1031.

Modayil, M. V., Thompson, A. H., Varnhagen, S., & Wilson, D. R. (2003) Internet users' prior psychological and social difficulties. *CyberPsychology and Behavior*, **6**. 585-590.

Mori, T., Sakamoto, A., Kashibuchi, M., Kobayashi, K., Katsuya, N., Suzuki, K., Ibe, N., Adachi, N., Takahira, M., Sakamoto, K., Hatano, K., & Sakamoto, T. (1999) Causal relationships among the use of the Internet, information literacy and the motive for study : A panel survey of secondary school students. *Japan Journal of Educational Technology*, **23**, 79-84.

Parks, M. R., & Floyd, K. (1996) Making friends in cyberspace. *Journal of Communication*, **46**, 80-97.

Sarason, B. R., Shearin, E. N., Pierce, G. R., & Sarason, I. G. (1987) Interrelations of social support measures : Theoretical and practical implications. *Journal of Personality and Social Psychology*, **52**, 813-832.

Schmidt, N., & Sermat, V. (1983) Measuring loneliness in different relationships. *Journal of Personality and Social Psychology*, **44**, 1038-1047.

Shaw, L. H., & Gant, L. M. (2002) In defense of the Internet : The relationship between Internet communication and depression, loneliness, self-esteem, and perceived social support. *CyberPsychology and Behavior*, **5**, 157-171.

Ministry of Internal Affairs and Communications (2004) White Paper 2004 Information and Communications in Japan. Ministry of Internal Affairs and Communications, Japan, URL:http://www.johotsusintokei.soumu.go.jp/whitepaper/eng/WP 2004/2004-index.html (Jan.18.2008)

Takahira M., Ando, R., & Sakamoto, A. (2003) Effects of Internet use on psychological health and social maladjustment I : Effects of each Internet tools in elementary school children. Proceedings of the 44 th Annual Meeting of the Japanese Society of Social Psychology, Pp. 620-621. (Originally in Japanese)

Takahira, M., Sakamoto, A., Kobayashi, K., Kashibuchi, M., Adachi, N., Sakamoto, K., Mori, T., Suzuki, K., Kimura, F., & Sakamoto, T. (2002) The effect of Internet use in non-class time on high school students' information literacy. *Journal of Japanese Society for Information and Systems in Education*, **19**, 212-217.

Tichon, J., & Yellowlees, P. (2003) Internet social support for children and adolescents. *Journal of Telemedicine and Telecare*, **9**, 238-240.

(Notes)

1 Parts of this paper were presented at the 17 th Meeting of the Japanese Association of Health Psychology, and the 13 th Meeting of the Japanese Society of Personality Psychology.

2 Whilst friendships over the Internet may be considered "online" relationships, friendships unrelated to Internet usage may therefore be considered "offline." As such, we have used the terms "offline friendships" for relationships unrelated to the Internet.

3 In order to examine the influence of distortion on distribution for those parts of the levels of Internet usage for which the mean figures were low, in addition to the maximum likelihood estimation method, we carried out an evaluation of population parameters using the generalized least-squares method (GLS). However, both of these methods showed similar trends in results. Furthermore, even having conducted a logarithmic transformation on the raw data, and running it with these estimation methods, there was no significant change in the results.

4 Amongst the estimated values on casual relationships obtained from this study, there were those which appeared too small to argue an operational relationship of around .10. However, because the fields of personality psychology, social psychology and clinical psychology are subject to the influence of uncontrollable exogenous variables, effect sizes of more than $r = .10$ are not considered small (Cooper, 1989). As such, significant effects can be argued to have been shown in this study. The operational relationships, therefore, of estimated values of casual relationships of more than .10 are therefore posited in this study.

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