

## Effect of E-Mail Use on Self-Disclosure: A Panel Study of Japanese High School Students

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We collected longitudinal data from Japanese high-school students ( $n=525$ ) to examine what kind of self-disclosure is promoted with the use of PC-based e-mail or cellular-phone-based e-mail. We used a cross-lagged panel design to estimate the causal relationship between e-mail use and self-disclosure. Results indicated that PC-based e-mail use increased self-disclosure of a wide range of topics to on-line friends met through the Internet, but it did not have any effect on self-disclosure to off-line friends in friendships made elsewhere, such as at their school or in their neighborhood. However, cellular-phone-based e-mail use increased self-disclosure of certain restricted topics to both on-line and off-line friends. Therefore, the results suggested that both PC-based e-mail use as well as cellular-phone-based e-mail use increased teenagers' self-disclosure. At the same time, the results suggested that PC-based e-mail use and cellular-phone-based e-mail use had different effects on self-disclosure.

**Key words:** e-mail use, self-disclosure, causal relationships

### 1. Introduction

A number of researchers have pointed out that friendships serve as the foundation of social adaptation and development of socialization (e.g., Hartup, 1992). During teenage years in particular, friendships are important; and teenagers communicate with their friends frequently.

Meanwhile, the advancement of technology has rapidly increased the opportunities for teenagers to use the Internet to communicate with friends. According to a study conducted by the Japanese Ministry of Internal Affairs and Communications in 2007, 94.7% of Japanese teenagers (ages 13 to 19) used the Internet via either PC or cellular phone, or both; and 66.8% used cellular phones to access the Internet at least once a day. This rate was much higher than that of other age groups (Japanese Ministry of Internal Affairs and Communications, 2008). While Internet use has become a part of

many teenagers' daily lives, parents and teachers are concerned that it may have harmful effects on the communication of teenagers who are still developing socially (e.g., Turow & Nir, 2000), since the nature of Internet-based communication is different from that of face-to-face (FtF) communication.

#### 1.1 Characteristics of Internet-based communication

One frequently mentioned factor that makes Internet-based communication different from FtF communication is that the former provides fewer social cues, due to visual anonymity (e.g., Kiesler, Siegal, & McGuire, 1984; Kiesler & Sproull, 1992). Since text exchange is the main activity in Internet communication, social cues that are naturally obtained in FtF communication (e.g., physical appearance and gestures) are not likely to be available. Thus, individuals become less worried about how others

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evaluate them or become less compelled to behave in accordance with social rules. As a result, Internet-based communication becomes more uninhibited than FtF communication.

A recent study revealed that whether or not uninhibited behavior occurred is moderated by the situation or personality of individuals (e.g., Lea & Spears, 1991). Therefore, uninhibited behavior is not necessarily present in all Internet-based communication. However, visual anonymity, which is a primary characteristic of Internet-based communication, remains as a risk factor promoting uninhibited behavior in interpersonal communication. Most uninhibited behaviors exhibited in Internet-based communication are considered to be antisocial (e.g., flaming). However, lowered inhibition does not necessarily induce only antisocial behavior; for example, self-disclosure may become easier.

A large number of studies have indicated that self-disclosure may have desirable effects on physical health and psychological well-being (e.g., Frisina, Borod, & Lepore, 2004). Self-disclosure also plays an important role in the establishment of close relationships with others (e.g., Derlega, Metts, Petronio, & Margulis, 1993). Therefore, if Internet-based communication promotes self-disclosure, it may have desirable effects on the formation of friendships and the social adaptation of teenagers.

### 1.2 Self-disclosure in Internet-based communication

Does Internet-based communication really promote self-disclosure? This question has been examined for a long time as part of a series of computer-mediated communication (CMC) studies.

For example, in a meta-analysis of 39 studies conducted between 1969 and 1994, Weisband & Kiesler (1996) found that individuals self-disclosed more often when they used computers to respond to a questionnaire than when they answered questions in FtF interviews or with the use of paper and pen-

cil. This tendency was even more prominent when respondents answered questions about sensitive or personal topics. A similar result was reported in a study that compared responses provided in Internet surveys and those provided in paper-and-pencil surveys (e.g., Barak, 2002).

Furthermore, Joinson (2001) conducted a series of experiments to analyze self-disclosure during CMC and FtF discussions. They found that when the participants were visually anonymous in CMC discussions, the level of disclosure was higher than during FtF discussions. Additionally, field studies that examined actual discourse in bulletin board system (BBS) and chat programs found a greater level of self-disclosure in these forms of discourse (e.g., Winezelberg, 1997).

### 1.3 Present study

Since Internet-based communication seems to promote self-disclosure, more frequent Internet-based communication may lead to a higher possibility of self-disclosure. Therefore, the primary goal of this study was to examine the effect of daily Internet-based communication on teen self-disclosure. More specifically, we focused on e-mail, the Internet-based communication tool most preferred by teenagers, and examined the causal relationships between amount of e-mail use and amount of self-disclosure.

We conducted a two-wave panel study to examine causal relationships. A panel study allows a more direct estimation of causal relationships than a cross-sectional study, because a panel study can measure individual changes in a set of variables (Finkel, 1995). In an experiment study, it is usually necessary to manipulate variables in order to estimate causal relationships; however, in a panel study, it was not necessary to do so. Therefore, a panel study enabled the examination of the effect of daily e-mail use on self-disclosure in as natural environment as possible, providing the flexible examination of various questions raised in real-life situations. In addition, a panel study in this research enabled the examination of bi-

directional causal relationships. Thus, we were able to examine whether or not participants who were more likely to self-disclose used e-mail more than those who were less likely to self-disclose.

The secondary goal of this study was to examine whether PC-based e-mail use and cellular-phone-based email use had different effects on self-disclosure. Although both PC-based e-mail and cellular-phone-based e-mail are categorized as "e-mail," they are different in several ways. First, a cellular phone has higher mobility than a PC, allowing messages to be sent more immediately and more easily. As replies from recipients tend to be sent relatively quickly via a cellular phone, short and simple messages tend to be exchanged frequently. Moreover, the target of self-disclosure in cellular-phone-based e-mail may be different than that in PC-based email. Therefore, we separately examined the causal relationship between PC-based e-mail use and self-disclosure, and cellular-phone-based e-mail use and self-disclosure.

## 2. Method

### 2.1 Participants and procedure

We conducted a two-wave panel study with first-year students (15- and 16-year-olds) at two high schools in the Tokyo metropolitan area in Japan. In a panel study, the same questionnaire is administered more than once to the same participants within a certain time interval. By analyzing the longitudinal data using structural equation modeling (SEM), causal relationships can be examined (for details, refer to the section on the analysis model for the study results).

The first survey (Time 1) was conducted in October 2004, and the second (Time 2) was conducted in February 2005. The same questionnaire was administered both times while students were in a school class. The data gathered from the 525 students (392 males and 133 females) were then analyzed.

### 2.2 Measurements

(1) *E-mail use.* The participants estimated the amount of time they spent in a

week (a) using PC-based e-mail (PC-based e-mail sending/receiving) and (b) using cellular-phone-based e-mail (cellular-phone-based e-mail sending/receiving). The amounts were scored using a seven-point Likert scale: no use (0 points), less than 10 minutes (1 point), 10 to 30 minutes (2 points), 30 minutes to 1 hour (3 points), 1 to 2 hours (4 points), 2 to 3 hours (5 points), and longer than 3 hours (6 points).

(2) *Self-disclosure.* From the "Emotional Self-Disclosure Scale" developed by Enomoto (1987), 11 sub-scales that were relevant to topics about self were used: (a-1) topic of psychological self 1, intelligence; (a-2) topic of psychological self 2, emotion; (a-3) topic of psychological self 3, personal goal; (b-1) topic of physical self 1, physical appearance; (b-2) topic of physical self 2, physical condition; (b-3) topic of physical self 3, sexuality; (c-1) topic of social self 1, private relationship; (c-2) topic of social self 2, public relationship; (d) topic of material self; (e) topic of kinship-related self; and (f) topic of existential self.

We selected one representative item from each of these 11 sub-scales, and the participants used a six-point Likert scale to indicate how often they talked with their friends about each topic. The scale ranged from "I never talk about it (0 points)" to "I often talk about it (6 points)." In the later analysis, the average score for (a-1) to (a-3) was defined as the "topic of psychological self" score, the average score for (b-1) to (b-3) was defined as the "topic of physical self" score, and the average score for (c-1) and (c-2) was defined as the "topic of social self" score.

When responding to each item, the participants were asked to separate their answers about talking to "on-line friends" they had come to know through the Internet from those about talking to "off-line friends" they had come to know elsewhere (e.g., at their school or in their neighbourhood).

## 3. Results

### 3.1 Descriptive statistics

Table 1 presents the means and standard

**Table 1** Means and standard deviations of the amount of e-mail use and self-disclosure

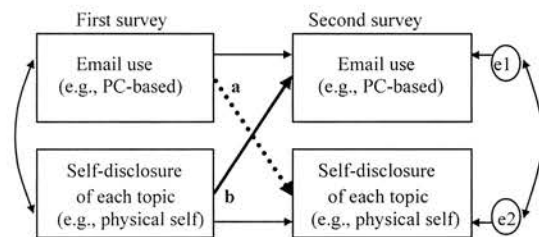
|   | First survey              | Second survey             |
|---|---------------------------|---------------------------|
| Amount of e-mail use  |                           |                           |
| (a) Using PC-based e-mail                                       | 1.70 (1.42)               | 1.72 (1.42)               |
| (b) Using cellular-phone-based e-mail                           | 4.54 (1.95)               | 4.59 (1.96)               |
| Amount of self-disclosure (to on-line friends/off-line friends) |                           |                           |
| (a) Topic of psychological self                                 | 1.35 (0.90) / 2.99 (1.24) | 1.34 (0.85) / 2.99 (1.31) |
| (b) Topic of physical self                                      | 1.25 (0.69) / 2.67 (1.25) | 1.30 (0.74) / 2.73 (1.24) |
| (c) Topic of social self  | 1.34 (0.87) / 3.05 (1.35) | 1.37 (0.86) / 3.12 (1.33) |
| (d) Topic of material self                                      | 1.34 (0.99) / 3.20 (1.73) | 1.38 (1.02) / 3.35 (1.71) |
| (e) Topic of kinship-related self                               | 1.28 (0.91) / 2.72 (1.59) | 1.31 (0.91) / 2.89 (1.60) |
| (f) Topic of existential self                                   | 1.24 (0.78) / 1.20 (1.29) | 1.26 (0.79) / 2.10 (1.30) |

deviations for the amount of PC-based and cellular-phone-based e-mail use reported in the two surveys. The amount of PC-based e-mail use per week was less than 30 minutes, and the amount of cellular-phone-based e-mail use per week was 1 to 3 hours; therefore, the high school students who participated in this study used cellular-phone-based e-mail more than PC-based e-mail. Table 1 also indicates the means and standard deviations for self-disclosure.

### 3.2 Analysis models

To examine the causal relationship between e-mail use and self-disclosure, we analyzed the gathered data by SEM using a "cross-lagged effect model" (Fig. 1). This model is commonly used to analyze two-wave panel data (Finkel, 1995). We compared the  $\chi^2$  values between Model 1, in which the covariance between errors in the second survey was restricted to zero, and Model 2, in which no such restriction was applied. If we found no significant difference between the  $\chi^2$  values, we selected Model 1, which had fewer free parameters to be estimated. To examine the goodness of fit of the selected model, we used the goodness of fit index (GFI), the comparative fit index (CFI), and the root mean square error of approximation (RMSEA). For the model we used, GFI=.99-1.00, CFI=.99-1.00, and RMSEA=.00-.07; therefore, the fit was good.

In this model, if path "a" (dotted line in Fig. 1) indicated a significant positive coefficient, a causal relationship existed in which a



Note: e1 and e2 represent errors.

**Figure 1** Cross-lagged effect model

larger amount of e-mail use resulted in an increase in level of self-disclosure. If path "a" indicated a significant negative coefficient, a causal relationship existed in which a larger amount of e-mail use resulted in a decrease in the level of self-disclosure. Path "b" (solid line in Fig. 1) was used to examine the causal effect of self-disclosure on e-mail use.

#### Effect of PC-based e-mail use (Table 2)

(1) *Effect of PC-based e-mail use on self-disclosure (path a).* When the participants self-disclosed to their on-line friends, PC-based e-mail use had significant positive effects on self-disclosure related to all types of topics. In other words, PC-based e-mail use increased overall self-disclosure to on-line friends. However, when the participants self-disclosed to their off-line friends, PC-based e-mail use had no significant effect on self-disclosure.

(2) *Effect of self-disclosure on PC-based e-mail use (path b).* When the targets of self-disclosure were on-line friends, disclosure of social self, material self, and kinship-related

**Table 2** *Causal relationship between e-mail use and self-disclosure*

| Amount of e-mail use |                     | Self-disclosure    |          |        |          |                     |             |
|----------------------|---------------------|--------------------|----------|--------|----------|---------------------|-------------|
|                      |                     | Psycho-<br>logical | Physical | Social | Material | Kinship-<br>related | Existential |
| PC-based             | to on-line friends  | Path a             | .16**    | .15**  | .18**    | .14**               | .10**       |
|                      |                     | Path b             | —        | —      | .10*     | .09*                | —           |
|                      | to off-line friends | Path a             | —        | —      | —        | —                   | —           |
|                      |                     | Path b             | —        | —      | —        | —                   | —           |
| Cellular-phone-based | to on-line friends  | Path a             | —        | .09*   | —        | .10**               | —           |
|                      |                     | Path b             | —        | —      | —        | —                   | —           |
|                      | to off-line friends | Path a             | —        | .11**  | —        | .16**               | —           |
|                      |                     | Path b             | —        | —      | —        | —                   | —           |

*Note.* Values in this table are significant causal coefficients (standardized coefficients). \*\* $p < .01$ , \* $p < .05$ .  
Path a = The effects of e-mail use on self-disclosure. Path b = The effects of self-disclosure on e-mail use.

self had significant positive effects on the use of PC-based e-mail.

In contrast, when the targets of self-disclosure were off-line friends, disclosure of any topic of self had no significant effect on the use of PC-based e-mail.

#### **Effect of cellular-phone-based e-mail use (Table 2)**

(1) *Effect of cellular phone-based e-mail use on self-disclosure (path a).* When the participants self-disclosed to their on-line friends, cellular phone-based e-mail use had significant positive effects on self-disclosure of physical and material topics. The same significant positive effects on self-disclosure of these topics were observed when the participants self-disclosed to their off-line friends.

(2) *Effect of self-disclosure on cellular-phone-based e-mail use (path b).* Regardless of the target, disclosure of any topic of self had no significant effect on the use of cellular-phone-based e-mail.

#### **4. Discussion**

We conducted a two-wave panel study to examine whether teens who communicated often using a PC or cellular phone were likely to self-disclose. The results indicated that those who had more opportunities to communicate using PC-based e-mail became

more likely to self-disclose to their on-line friends. Furthermore, this disclosure included all topics: psychological self, physical self, social self, material self, kinship-related self, and existential self.

This effect was, however, limited to self-disclosure to on-line friends: PC-based e-mail use did not have any effect on self-disclosure to off-line friends. It is possible that the participants did not use PC-based e-mail for self-disclosure when they could meet their friends at school or elsewhere. This issue requires future examination through interviews or experiment study.

Meanwhile, use of cellular-phone-based e-mail increased the level of self-disclosure to both on-line and off-line friends, but regarding only physical and material topics. In other words, regardless of the target, cellular-phone-based e-mail use increased participants' disclosure regarding their physical self (e.g., appearance, physical health, sexuality) and their material self (e.g., taste in clothing).

In their examination of the content of communication via cellular-phone-based e-mail, Furutani & Sakata (2006) found that it contained more light content (e.g., casual chatting with no particular goals) than content associated with problems or deep emotions. Likewise, the present study revealed



that disclosure via cellular-phone-based e-mail tended to be about lighter topics (e.g., material self).

Additionally, individuals may find it easier to communicate about such topics as their physical self and material self in short sentences because they can be expressed with high concreteness, than about topics regarding their psychological, social, or existential selves. In other words, the exchange of cellular-phone-based e-mail messages may promote self-disclosure only to the extent that the content can be expressed in short sentences that can be easily exchanged via cellular phones.

This study revealed large differences between the use of PC-based e-mail and that of cellular-phone-based e-mail, in terms of the target and the topics of self-disclosure. Future study should examine the relationship between communication by teenagers and the media used in their communication, on the basis of the media's characteristics. Also, it is important to take into account the issue of gender differences.

In this study, we also examined the effect of self-disclosure on e-mail use, in order to determine whether those who were likely to self-disclose used PC-based or cellular-phone-based Internet more than others did. The results indicated that the amount of PC-based e-mail use was greater for those who tended to disclose their social self, material self, and kinship-related self to their on-line friends. Generally speaking, however, the effect of e-mail use on self-disclosure was stronger than the effect of self-disclosure on e-mail use; therefore, use of e-mail was more likely to promote self-disclosure than the preference to self-disclose was likely to increase e-mail use.

Finally, the fact that our study involved only teenagers may have affected the results. Further discussion is necessary to determine if these results apply to only teenagers or if they can be generalized to adults. Also, the term "teenager" includes junior high school students, senior high school students, and university students; and the lev-

els of development are quite different for each age group. Therefore, it is important to examine in further detail the differences in effect, based on the differences attributed to the developmental stages.

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