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Mobile voice communication and loneliness: Cell phone use and the social skills deficit hypothesis

Borae Jin and Namkee Park
Yonsei University, South Korea

Abstract
This study developed a research model of mobile voice communication on the basis of the social skills deficit hypothesis. In the model, poor social skills were related to less face-to-face and mobile voice communication, which was linked to greater loneliness. Structural equation modeling analyses of survey responses from 374 adults supported the social skills deficit hypothesis in that poor social skills were related to less involvement in face-to-face communication and greater loneliness. Also, as expected, more face-to-face interactions were associated with lower levels of loneliness; however, more cell phone calling was associated with greater loneliness. Additional regression analyses revealed that the positive relationship between mobile voice communication and loneliness was more pronounced for those who have more friends than those who have fewer friends.

Keywords
Cell phones, loneliness, mobile communication, social skills deficit hypothesis

Social media, such as emails, social networking sites, and cell phones, are now indispensable for our social life. People develop, maintain, and even terminate their social and personal relationships through these media (Gibbs et al., 2006; Ling and Yttri, 2002; Stafford et al., 1999). Among various social media, cell phones may be the most

Corresponding author:
Namkee Park, School of Communication, Yonsei University, 50 Yonsei-ro, Seodaemun-gu, Seoul 120-749, South Korea.
Email: parknamk@gmail.com
pervasive medium across different populations. A recent national survey indicated that 83% of American adults have a cell phone, while 74% use the Internet (Pew Internet, 2010). Thanks to cell phones’ portability, people can satisfy their communication needs anytime and anywhere. In a study, respondents reported that cell phones gratified various relational needs (e.g. companionship, closeness, and care) better than other media including emails and instant messaging (Ramirez et al., 2008). Cell phones appear to play an important role in fulfilling people’s social needs. As Licoppe (2004) viewed, carrying a cell phone means being connected and ready to communicate with others.

Indeed, cell phone communication (i.e. voice calling or text messaging, hereafter mobile communication) tends to occur within close relationships, strengthening established social networks rather than extending them with new relationships (Axelsson, 2010; Ishii, 2006; Kim et al., 2007; Ling and Yttri, 2002). People enhance their family bonds (Wei and Lo, 2006), facilitate friendships and romantic relationships (Ishii, 2006; Jin and Peña, 2010), and build mutual support (Campbell and Kelley, 2006) through mobile communication. Ling (2008) claimed that mobile communication between people in close relationships creates an “intimate sphere” (p. 159), which Habuchi (2005) called a “telecocoon” (p. 167). Within this sphere, or cocoon, people engage in ritualized interactions without restriction of location and time. As such, mobile communication is deeply embedded in our everyday social interactions with the people we meet and talk to in person. Because face-to-face and mobile communication occurs in similar contexts, how people communicate in person should be similar to how they communicate through cell phones. This may be a distinct feature of cell phones as compared to other social media. People have more opportunities to meet new people and present themselves in different ways on the Internet (Ellison et al., 2006; Whitty, 2007), but cell phones seem less likely to serve this function. Thus, we could better understand how people use cell phones by considering their social and personal relationships.

In the current study, we focus exclusively on voice calling rather than on text messaging. We acknowledge that text messaging is an important part of people’s social interactions, and in fact a number of studies have focused on text messaging (e.g. Harper et al., 2005; Ling, 2010). However, we believe mobile voice calling also deserves its own research attention because it is a pervasive part of daily communication across all age groups. The present study aims to incorporate mobile voice communication into an existing interpersonal communication model of loneliness by investigating the association between mobile voice calling, face-to-face communication, and loneliness.

**Loneliness and poor social skills**

Loneliness is defined as perceived deficiencies in one’s ongoing relationships (Peplau et al., 1979; Perlman and Peplau, 1981). Such deficiencies can occur when “a person’s network of relationships is either smaller or less satisfying than the person desires” (Peplau et al., 1979: 55). Studies have consistently found that lonely people have problems with interpersonal communication and relationships (e.g. Jones et al., 1982; Spitzberg and Canary, 1985). For instance, in terms of social perceptions, lonely people
tend to view themselves and other people more negatively (e.g. less friendly) than non-lonely people do. Furthermore, other people (i.e. conversational partners) view the lonely more negatively than their non-lonely counterparts (Tsai and Reis, 2009). Behaviorally, lonely people tend to talk less, show lower levels of attention and involvement, and engage in inappropriately high or low levels of self-disclosure during conversations (Sloan and Solano, 1984). These findings indicate that lonely people may be less capable of managing social interactions.

The social skills deficit hypothesis states that lonely people lack social skills appropriate for establishing intimate and lasting relationships, which makes it harder to reduce their loneliness (Jones et al., 1982; Segrin, 1998). Studies have found that loneliness is positively associated with shyness (Cheek and Busch, 1981), communication apprehension (Zakahi and Duran, 1985), and social anxiety (Segrin and Kinney, 1995). Many studies further provided evidence indicating that skill deficits precede loneliness. For instance, Jones et al. (1982) found that lonely people tended to give less attention to conversational partners, but when they were able to give more attention to the partners, their loneliness significantly decreased. Similarly, Spitzberg and Hurt (1989) showed that communication incompetency was a better predictor of loneliness over time rather than vice versa. Also, in a one-year longitudinal study, children’s withdrawn social behavior (e.g. avoidance, lack of leadership) significantly predicted higher levels of concurrent and future loneliness (Renshaw and Brown, 1993). Interestingly, the negative impact of skill deficits on loneliness became drastic with the increase of stressful incidents (Segrin and Flora, 2000). Thus, Segrin and Flora (2000) claimed that people with better social skills would have larger social networks and be better able to utilize resources (e.g. support) from the networks to cope with difficulties. Along similar lines, lonely people spend more time being alone, do fewer social activities, have fewer close friends, and receive less social support from their social networks (Cacioppo et al., 2006; Kraus et al., 1993; Russell et al., 1980). This may be because lonely people’s lack of social skills prevents them from creating and engaging in social contacts that can protect against developing psychosocial problems.

In terms of social skills, anxious people are less likely to talk, talk in a less vivid way, and end conversations more quickly (DePaulo et al., 1990). Similarly, shy people tend to inhibit verbal and non-verbal behaviors and avoid social interaction (Buss, 1997). Studies show that socially anxious or shy children are viewed as less socially skillful by peers and teachers, and thus are more likely to experience peer rejection and have difficulties in forming close friendships (Beidel et al., 1999; Greco and Morris, 2005; Inderbitzen et al., 1997; Spence et al., 1999). Beidel et al. (1985) also found that socially anxious adults were rated as less skillful in dyadic conversation by themselves as well as observers. Further, Schroeder (1995) demonstrated that shy and anxious people have difficulty in social information processing tasks, particularly in decoding non-verbal behaviors.

To summarize, studies consistently indicate that poor social skills are related to communication incompetence and difficulties in building intimate and satisfying relationships, which are also related to loneliness. This is the key claim of the social skills deficit hypothesis. Because previous studies reviewed thus far generally assumed face-to-face contexts, the current study examines whether the social skills deficit hypothesis for loneliness holds true for mobile voice communication.
**Mobile communication and loneliness**

*Mediated communication and loneliness*

Within the domains of interpersonal communication and social psychology, studies have paid more attention to the Internet than to mobile communication. Since the HomeNet study reported increases in Internet users’ loneliness over time (Kraut et al., 1998), there is a growing body of research focusing on the relationships between psychosocial orientations and Internet use (e.g. Caplan, 2005; Morahan-Martin and Schumacher, 2003). Caplan (2005) found that college students with more psychosocial distress (i.e. loneliness, depression) preferred online social interaction to face-to-face social activities because they felt safer, more comfortable, and less threatened in online environments. The Internet may be useful for lonely people to compensate for the lack of intimacy and satisfaction in their in-person social networks. Similarly, Morahan-Martin and Schumacher (2003) demonstrated that, as compared to non-lonely people, lonely people used the Internet and emails more and were more likely to go online when they felt lonely or depressed. Also, in online environments, lonely people made more friends, received more emotional support from them, and were more satisfied with those friendships.

As such, online environments can help lonely people establish close social networks with greater ease because mediated social interactions – particularly text-based asynchronous conversations – may not require the same levels of social skills as face-to-face settings. Certain characteristics of online communication, such as anonymity and physical separation, may also encourage lonely people to enjoy mediated communication without fear or inhibition. Therefore, shy individuals in face-to-face contexts tend to show decreases in shyness and increases in interpersonal competence in online contexts (Roberts et al., 2000; Stritzke et al., 2004). In a similar vein, Caplan (2007) found that social anxiety fully mediated the positive relationship between loneliness and preference for online social interaction. These studies indicate that individuals who are less capable of managing face-to-face social interactions (and thus may be lonely) tend to prefer mediated communication and exhibit better performances in communication and relationship formation in mediated environments.

*Mobile communication as interpersonal communication*

Given what researchers have learned about the relationship between loneliness and mediated social interaction, how would lonely people use their cell phones? Would they call more than non-lonely people because they want to relieve their loneliness? Or, would they call less to avoid social interaction, just as they do in face-to-face contexts? As indicated earlier, we argue that one’s face-to-face and mobile communications would have similar patterns. Unlike Internet communication which lonely people seem to prefer, we posit that lonely people would be just as uncomfortable with mobile voice communication as they are with face-to-face communication. This prediction is based on the fact that mobile voice communication usually occurs within social relations previously formed in person (Ishii, 2006; Kim et al., 2007). We also expect that face-to-face and mobile communication would be similarly associated with social skills and loneliness. In particular,
mobile communication would be negatively related to loneliness, as is face-to-face communication.

Although there is insufficient evidence in the literature to support our view, a few studies have investigated cell phone use and its relation to social skills, loneliness, or face-to-face interactions. For instance, Wei and Lo (2006) regarded the lonely as those who are less able to make connections with others and assumed that these characteristics would also affect mobile communication. The researchers found a significant relationship between greater loneliness and less frequent use of cell phones and a similar relationship between shyness and cell phone use. Furthermore, lonely people were less motivated to use cell phones for affective and social purposes (Wei and Lo, 2006). With respect to motivations, Jin and Park (2010) showed that interpersonal motives (e.g., affection, control, pleasure, etc.) were strong predictors of cell phone use. However, in their path model with interpersonal motives and face-to-face interactions being controlled, loneliness did not directly influence cell phone use. Instead, face-to-face interaction and interpersonal motives mediated the relationship between loneliness and cell phone use. Although these studies considered loneliness as a predictor of face-to-face and mobile communications, their findings of negative relationships between loneliness and face-to-face and mobile communication are consistent in broad terms with the social skills deficit hypothesis and our claim of the similarity between face-to-face and mobile communication.

From the sociological perspective, Campbell and Kwak (2010) held that cell phones would increase individuals’ social capital by encouraging them to contact other people. In this study, mobile communication was related to higher levels of social activities (e.g., spending leisure time with others). In addition, the positive relationship between cell phone use and social activities was stronger for people communicating mostly with those who were geographically close, supporting our claim that people’s mobile communication is analogous to their face-to-face communication in close relationship contexts.

The current study examines how mobile communication is related to loneliness within the theoretical frame of the social skills deficit hypothesis. Figure 1 presents the proposed research model. In this model, as the social skills deficit hypothesis posited, social

![Figure 1. Hypothesized research model.](image-url)
skills influence loneliness directly, as well as indirectly, by influencing the amount of in-person contact. Thus, the following hypotheses are posed:

- **H1**: Poor social skills are associated with less face-to-face interactions.
- **H2**: Poor social skills are associated with higher loneliness.
- **H3**: More face-to-face interactions are associated with less loneliness.

Regarding mobile voice communication, we expect that social skills and face-to-face social activities are positively related to mobile voice communication. Also, the amount of cell phone use would be negatively related to loneliness. Thus,

- **H4**: Poor social skills are associated with less mobile voice calling.
- **H5**: More face-to-face interactions are associated with more mobile voice calling.
- **H6**: More mobile voice calling is associated with lower loneliness.

**Method**

**Participants and procedure**

Participants were recruited from an online panel operated by the Media Research Lab at a Southwestern university in the United States. The panel is composed of more than 20,000 respondents who regularly participate in web-based research (see Daugherty et al., 2005). According to the Media Research Lab, panel members are those who agreed to become members of the panel via online banner advertisements posted at high traffic commercial websites (Personal communication with Professor Wei-Na Lee, 2011). The panel members could withdraw participation any time they wanted. Upon participation, the panel members became eligible for a monthly drawing of $150 provided by the Media Research Lab, as well as for incentives provided by the study researchers. The selection of survey participation from the panel is monitored to keep panel members from taking part in the surveys too frequently. The selected panel members for a given study receive an email invitation with a survey link. The panel members are randomly selected from the entire pool of members unless researchers request a different method.

Data were collected through an online survey service (Qualtrics.com). The online survey included four sections in addition to a consent form, but only three of them were used in the current study: (a) demographics, (b) cell phone use and face-to-face communication, and (c) psychosocial variables. The survey was started by 521 people, and 406 completed or mostly completed it. Among these people, 32 did not have a cell phone, resulting in a final sample size of 374. In this sample, 112 (29.9%) were male, 252 were female, and 10 did not report their sex. The mean age was 46.1 (SD = 12.4), ranging from 18 to 84. The majority of participants were Caucasian/White (n = 308, 82.4%); 24 (6.4%) were African-American or Black; 22 (5.9%) were Hispanic or Latino/a; 11 (2.9%) were Asian or Pacific Islander; 8 (2.1%) reported other ethnicities; and one person did not report ethnicity.

Education levels were measured with six ordinal categories. About a half of the participants (53.2%) had earned a college (n = 103) or an advanced (n = 96) degree, and
44.4% had at least a high school degree (high school degree, \( n = 58 \); some college, \( n = 80 \); AA or vocational degree, \( n = 28 \)). Seven people (1.9%) reported having some high school, and two did not report their education levels. Annual income was measured in increments of $10,000 from $0 to $100,000 (11 ordinal levels). Of the participants, 21% (\( n = 80 \)) reported their income as $100,000 or higher per year; 22.7% (\( n = 85 \)) as between $60,000 and $100,000; 31.8% (\( n = 119 \)) as between $30,000 and $60,000; 23.5% (\( n = 88 \)) as $30,000 or lower; and two people did not report their income levels. Finally, participants had owned their cell phones for almost nine years on average (\( M = 8.92 \) years, SD = 5.10) at the time of the survey.

**Measures**

**Cell phone use.** Participants were asked to estimate the amount of time they spent making voice calls via cell phones in a day. They also reported the numerical estimates of the frequency of sending and receiving voice calls, respectively, in a day. Because the frequencies of making and receiving calls were highly correlated with each other (\( r = .69, n = 374 \)), they were summed to create the composite variable of calling frequency.

The average time that participants spent calling was approximately one hour and 24 minutes (\( M = 84.1 \) minutes, SD = 32.25, Median = 30), and the average frequency of making and receiving voice calls was about 10 times per day (\( M = 10.1, SD = 13.0, Median = 5 \)). As the large standard deviation values for these variables indicate, their distributions were highly skewed in a positive direction. Thus, log transformations were performed on these variables, which resulted in a significant improvement in the normality of the data (for calling time, \( M = 3.40, SD = 1.46 \); for calling frequency, \( M = 1.76, SD = 1.05 \)). These transformed variables were used in the subsequent analyses.

**Face-to-face interaction.** The amount of face-to-face interaction was measured with three questions, asking participants to estimate the time spent on face-to-face communication with other people in a day (\( M = 5.6 \) hours, SD = 5.5, Median = 5), the average number of people they communicate with face-to-face in a day (\( M = 15.3, SD = 27.2, Median = 7 \)), and the number of friends they regularly see and talk to (\( M = 5.7, SD = 7.7, Median = 4 \)). These three variables were also transformed to normalize their distribution: a square-root transform was performed for the time spent communicating with people (\( M = 16.64, SD = 7.67 \)), and a log-transform was performed for the number of people communicated with (\( M = 2.04, SD = 1.11 \)) and the number of friends (\( M = 1.32, SD = 0.91 \)).

**Loneliness.** The UCLA Loneliness Scale (version 3) (Russell, 1996) was included in the survey, which consisted of 20 questions such as “How often do you feel that you are ‘in tune’ with the people around you?” and “How often do you feel that there is no one you can turn to?” The response format was a four-point Likert-type scale, ranging from 1 (never) to 4 (always), and the responses were recoded and combined so that higher scores indicated greater feelings of loneliness (\( M = 2.12, SD = 0.61, \alpha = .95 \)).

**Social skills.** As indicators of social skills, the Interaction Anxiousness Scale (Leary, 1983) and the Shyness Scale (Cheek and Buss, 1981) were used. The former included 15

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Note: The text excerpted here is a summary of the first paragraph of the document. For a comprehensive understanding, please refer to the full document.
items such as “I often feel nervous even in casual get-togethers,” while the latter included nine items such as “I am socially somewhat awkward.” For these items, participants reported the degree of their agreement on a five-point Likert-type format (1 = strongly disagree, 5 = strongly agree). These scales were also computed so that higher scores indicate higher anxiousness (M = 2.87, SD = 0.89, $\alpha = .93$) or shyness (M = 2.61, SD = 0.96, $\alpha = .91$).

**Data analysis**

We tested our research model with structural equation modeling (SEM), using AMOS16 with maximum likelihood estimation. The mean scores of interaction anxiousness and shyness were used as indicators of social skills, and the three face-to-face items – the time spent on face-to-face communication, the number of people interacted with, and the number of friends – served as indicators of face-to-face interactions. Frequency and time of calling were used as indicators of cell phone use in the hypothesized model. As for loneliness, 20 items were parceled into three indicators of the latent construct of loneliness. Little et al. (2002) argued that item parceling can be beneficial when a construct is unidimensional and the relations among the latent variables, rather than the individual items, are of interest. Because Russell (1996) demonstrated the unidimensionality of the UCLA Loneliness Scale, a random assignment technique was employed to create the three parcels (see Little et al., 2002).

**Results**

**Preliminary analyses**

Some demographic variables were significantly related to the study variables. Age was significantly negatively related to all the variables of interest, ranging from $r = -.13$ to $r = -.26$, except for the number of friends ($r = -.04$). Generally, older people tended to engage in mobile and face-to-face communications less and feel higher loneliness, interpersonal anxiousness, and shyness. Education was negatively related to calling time (Spearman’s $\rho = -.12, p = .022$), and education and income were significantly correlated with two of the face-to-face interaction indicators and the three psychosocial variables at the significance level of .01. People with higher education and income levels reported more people interacted with in-person (with education, $\rho = .20$; with income, $\rho = .17$), more friends (with education, $\rho = .25$; with income, $\rho = .21$), and lower levels of loneliness (with education, $\rho = -.17$; with income, $\rho = -.33$), interaction anxiousness (with education, $\rho = -.15$; with income $\rho = -.23$), and shyness (with education, $\rho = -.16$; with income $\rho = -.25$). Because education and income were strongly correlated with each other ($\rho = .51$), and the effects of education disappeared after controlling for income, income – not education – was considered as a covariate in the following analyses. Finally, cell phone use experience (reported in years above, hereafter square-root transformed) was positively related to calling time ($r = .13, p = .012$) and frequency ($r = .23, p < .001$). Sex was not related to any of the variables. Thus, age, income, and cell phone use experience were controlled for in the following analyses.
Hypotheses tests

Table 1 includes correlation coefficients among the observed variables used in the SEM analyses. Figure 2 presents a more specified research model. For this model, model fit indices indicated an acceptable fit: $\chi^2(47) = 161.58$, $p < .001$, Comparative Fit Index (CFI) = .961, Tucker-Lewis Index (TLI) = .935, Root Mean Square Error of Approximation (RMSEA) = .081 (90% confidence interval: .067–.095), Standardized Root Mean Squared Residual (SRMR) = .044. This model was used to test our hypotheses.

Poor social skills were posited to be negatively related to face-to-face interaction (H1) and positively to loneliness (H2). These hypotheses were supported ($\beta = −.25$, $p < .001$ for H1, $\beta = .51$, $p < .001$ for H2). These results indicate that people with poor social skills tend to engage in face-to-face interaction less and feel more loneliness. Hypothesis 3 concerns face-to-face interaction and its relation to loneliness. The SEM analysis indicates face-to-face interaction and is a significant, negative predictor of loneliness ($\beta = −.18$, $p = .016$), supporting H3. The more face-to-face interaction people have, the lower the level of loneliness they feel.

As for mobile voice communication, poor social skills were linked to lower levels of mobile voice calling (H4), which was confirmed ($\beta = −.19$, $p = .001$). Hypothesis 5 posited that more face-to-face interaction would be associated with more mobile voice calling, which was also supported ($\beta = .36$, $p < .001$). Face-to-face interaction was significantly positively related to mobile voice calling. Finally, more mobile voice calling was hypothesized to be negatively related to the level of loneliness (H6). Voice call use was significantly associated with loneliness, but the relationship was positive instead of negative ($\beta = .11$, $p = .040$). That is, people using more voice calls reported higher levels of loneliness, thus disconfirming H6.

Supplemental analyses

The positive relationship between cell phone use and loneliness was an interesting yet unexpected finding. Therefore, additional regression analyses were conducted to see the effects of cell phone use on loneliness at a more specific level. In the regression model, loneliness was the dependent variable. In order to avoid multicollinearity and increase statistical power, shyness among the social skill variables, the number of friends among the face-to-face variables, and calling frequency were selected as independent variables. These variables were added in a sequential manner, following a demographic block of age and income in the regression model. Addition of each block resulted in a significant increase in the variance explained ($R^2$) at the level of .05. In a final model including all the predictors ($R^2 = .37$), shyness ($\beta = .50$, $p < .001$) and calling frequency ($\beta = .12$, $p = .012$) were positive predictors, and income ($\beta = −.18$, $p < .001$) and the number of friends ($\beta = −.17$, $p < .001$) were negative predictors of loneliness. Age was not a significant predictor. These results also confirm the positive relationship between voice calling and loneliness.

In an attempt to explain this relationship, an interaction effect was detected between voice call frequency and the number of friends on loneliness. With the same regression model as above, adding the interaction term between calling frequency and the number of friends increased significantly the variance explained ($\Delta R^2 = .01$, $\beta = .09$, $p = .040$).
Table 1. Zero-order correlations of the variables for the research model (n = 374).

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<td>(12.38)</td>
<td>(3.28)</td>
<td>(3.31)</td>
<td>(1.46)</td>
<td>(1.05)</td>
<td>(7.66)</td>
<td>(1.11)</td>
<td>(0.91)</td>
<td>(0.86)</td>
<td>(0.93)</td>
<td>(0.61)</td>
<td>(0.65)</td>
<td>(0.61)</td>
</tr>
</tbody>
</table>

*aThree parcels of the loneliness scale.
* p < .05, ** p < .01.
FtF: Face-to-face.
Thus, participants were grouped as few or many friends using median split, and separate regression analyses were performed for each group. In each analysis, age, income, shyness, the number of friends, and calling frequency were entered as independent variables. Age was not a significant predictor of loneliness for either group. Income predicted loneliness significantly in the few friends group ($\beta = -0.24, p < .001$), but not in the many friends group ($\beta = -0.10, p = .138$). Shyness was a significant positive predictor in both groups (for few friends group, $\beta = 0.38, p < .001$; for many friends group, $\beta = 0.67, p < .001$). The number of friends negatively predicted loneliness of people having few friends ($\beta = -0.18, p = .006$), whereas it did not significantly predict loneliness of those with many friends ($\beta = -0.11, p = .107$). On the contrary, calling frequency was a positive predictor of loneliness for the many friends group ($\beta = 0.24, p < .001$), yet not a significant predictor for the few friends group ($\beta = 0.01, p = .840$). The variances explained ($R^2$) for the few and many friends groups were .32 and .45, respectively.

To summarize, for participants who reported having few friends, the number of friends was a significant negative predictor of their loneliness but calling frequency was not. However, for those who reported having many friends, the number of friends was not a significant predictor of their loneliness, yet calling frequency was a positive predictor of loneliness. That is, those who have many friends tend to use voice calls more frequently and feel greater loneliness. These findings contradict our hypothesis that the increased use of cell phones is related to less lonely feelings. This invites us to take a new
perspective on the relationship between mobile voice communication and loneliness, which is discussed in more detail in the following section.

Discussion

Social skills deficit hypothesis

This study examined how mobile voice communication is related to the social skills deficit hypothesis in explaining individuals’ loneliness. Drawn from the reasoning of the social skills deficit hypothesis, we assumed that the quantitative aspect of a person’s face-to-face interaction would be influenced by his or her social skills, and this would lead to the person’s feeling of loneliness. In addition, we regarded cell phone use as a prevalent mode of interpersonal communication, thus affecting loneliness much like face-to-face interaction does. The results generally supported the social skills deficit hypothesis. Poor social skills were significantly associated with less face-to-face interaction and higher loneliness. Although these findings are not surprising, our attempt to test the social skills deficit hypothesis in a more integrated and theoretical manner represents a contribution to the literature. Many studies have inquired why people feel lonely or how lonely people communicate (e.g. DePaulo et al., 1990; Kraus et al., 1993; Spitzberg and Canary, 1985). Not many studies, however, have tried to incorporate social skills, communication, and loneliness into an overarching theoretical framework.

Constant invention of communication technologies provides us with various new ways of communicating. As the high adoption rate implies, the cell phone is not only a useful tool but also a necessity in people’s social lives (Pew Internet, 2006). Considering cell phone usage in the context of close and personal relationships (Ishii, 2006; Kim et al., 2007), we presumed that individuals’ face-to-face and mobile communications would be alike in that both would be similarly related to psychosocial aspects such as social skills and loneliness. In addition, everyday face-to-face interactions were considered accountable for cell phone use. As expected, both social skills and face-to-face communication are significantly associated with mobile voice communication. Specifically, better social skills were related to more voice calling, even with face-to-face interaction held constant, and more face-to-face interactions were associated with more voice calling, as well. These results generally support our analogy hypothesis between mobile and face-to-face communication, and further indicate that mobile communication, particularly voice calling, can be incorporated in the model of the social skills deficit hypothesis.

Mobile communication and loneliness

Based on the assumptions of the similarity between mobile and face-to-face communication and the social skills deficit hypothesis, we expected that loneliness would be similarly associated with face-to-face and mobile communication. The social skills deficit hypothesis claims that people with poor social skills have difficulties engaging in appropriate and effective communication behavior. This in turn keeps them from developing social relationships, which perpetuates their loneliness (Jones et al., 1982; Segrin, 1998). Therefore,
in our model, poor social skills were related to a lower amount of face-to-face interaction, which was also linked to loneliness. These predictions were confirmed in this study. However, the results did not support our hypothesis on the negative relationship between mobile voice communication and loneliness. The effect of mobile communication on loneliness was the opposite of the effect of face-to-face communication. Specifically, more face-to-face interaction significantly predicted lower levels of loneliness, whereas more mobile voice communication was significantly related to higher levels of loneliness. Supplementary analyses, in which relationships among specific observed variables were examined using regressions, also supported the positive relationship between voice calling and loneliness. Further, the regression analyses detected an interaction effect between the number of friends and voice calling. For those who have more friends, the number of friends was not related to their loneliness, while voice calling frequency was. By contrast, voice calling frequency was not related to loneliness among those who have fewer friends, but the number of friends was. In short, for people who have many friends, more voice calling predicts higher loneliness; for people who have few friends, more friends predict lower loneliness. The positive relationship between voice calling and loneliness still persisted at least for a group of participants (i.e. those who have more friends).

Although these findings are surprising, we can offer possible explanations. As the positive coefficient in our research model indicates, more mobile voice communication may lead to lonely feelings. This seems unlikely, but not impossible, considering that the crux of loneliness is the perceived deficiency in the quantity as well as the quality of one’s social relations (Peplau et al., 1979; Segrin, 1998). Greater amounts of mobile voice communication may not guarantee a better quality of communication; rather, frequent mobile voice communication might cause some distress if it is comprised of meaningless social interaction. This may be why the positive association between cell phone use and loneliness was more pronounced for those who have many friends. People who have many friends and thus spend sufficient time interacting with them in person may not enjoy mobile voice communication as much as they enjoy in-person contact. They may be satisfied with the quality of their relationships, and increased mobile voice communication might somehow interfere with their perceived well-being. In contrast, for those who have fewer friends, it was not the amount of mobile voice calling but the number of friends that was significantly related to loneliness. Perhaps, these people find their social relationships less satisfying than they desire and thus need more in-person contacts to alleviate loneliness rather than a mere increase in mobile voice communication.

Another plausible explanation is that loneliness is the cause of mobile voice communication rather than the outcome of it. We viewed the latter as more plausible, following the reasoning of the social skills deficit hypothesis. However, lonely feelings can motivate people to use cell phones more frequently. That is, people may be inclined to make a call to someone when they feel lonely. This is consistent with Reid and Reid’s (2007) argument and finding that lonelier people used more voice calls. Perhaps patterns of mobile voice communication are more flexible and less bound to individuals’ characteristics than patterns of face-to-face communication. As studies on Internet use and social skills have suggested (e.g. Caplan, 2005), people may feel more confident or comfortable communicating through cell phones instead of in-person contact because mobile voice communication offers characteristics such as the lack of physical contact.
Although this explanation is reasonable, we found a qualification: loneliness was positively related to cell phone use only for those who have many friends. People with many friends used more voice calls when their loneliness increased, but mobile voice communication was not related to loneliness for people with few friends. As previous studies and our results indicate, those who have many friends may have better social skills, and those who have few friends may have poorer social skills. It appears, then, that people with better social skills take advantage of cell phones for their loneliness, while people with poor social skills do not. That is, those who have many friends may be more likely to enjoy mobile voice communication with them when they feel lonely, compared to those who have few friends and are lonely. These results still support the social skills deficit hypothesis in that those with better social skills can cope with loneliness better by utilizing interpersonal resources (see Segrin and Flora, 2000). The face-to-face interaction measured in the present study (i.e. interaction time, the number of people interacted with, the number of friends) may represent a kind of infrastructure of one’s interpersonal communication, which is deeply connected to the person’s characteristics, such as social skills. Perhaps those who have better infrastructure (i.e. better social skills and a larger social network) may also have a better ability to utilize available resources (i.e. cell phones). If this is the case, however, our data did not provide direct evidence on whether they use cell phones in order to decrease loneliness.

Limitations

We acknowledge certain limitations of this study. First, although we adopted a sound theoretical frame, we should be cautious in generalizing our results, particularly about causal relationships. For instance, contrary to the assumptions of the social skill deficit hypothesis and our model, it is plausible that less involvement in face-to-face interaction can interfere with developing social skills (see Spitzberg and Canary, 1985), and that more mobile communication may lead to more face-to-face meetings (see Campbell and Kwak, 2010). More plausibly, the relationships may be reciprocal between social skills and loneliness and between loneliness and communication behavior (see Morahan-Martin and Schumacher, 2003). Additionally, regarding the theory, we did not directly measure social skills. Although there is firm evidence that shyness and social anxiety are closely related to the lack of social skills (e.g. DePaulo et al., 1990; Renshaw and Brown, 1993), we must be cautious when interpret the meaning of being less skillful.

Second, our study mainly focused on the quantity of communication, including both face-to-face and mobile voice communication. Social skills and loneliness may be more relevant to the quality or the perception of communication (see Segrin and Kinney, 1995). In particular, a close examination of the perception of mobile communication, such as motivations, would clarify whether people use cell phones in order to relieve their loneliness. Third, our study did not include text messaging use, which is an increasingly important part of mobile communication. Because text messaging and voice calling are different media (e.g. text-vs. voice-based, asynchronous vs. synchronous), they may have different associations with social skills, face-to-face communication, and loneliness (e.g. see Reid and Reid, 2007). The differences between calling and texting in terms of how they relate to various interpersonal aspects deserve more attention in future...
studies. Finally, the present study may have limited external validity due to the nature of online surveys, which do not provide appropriate sampling frames. For instance, the participants’ median age of 46.1 in the current study is higher than the US population’s median age of 36.4 in 2005 (United States Fact Sheet, 2005). Also, the sample overrepresented female and white participants.

Despite these limitations, this study contributes to the literature on both communication technology and interpersonal communication, attempting to place mobile voice communication within a theoretical framework of interpersonal communication. Our findings indicate that mobile voice communication plays a role similar to, yet distinct from, face-to-face interaction in relation to social skills and loneliness. Although we have not yet provided an answer as to whether cell phone calling is a predictor or an outcome of loneliness, we have provided valuable guidance for future studies on mediated interpersonal communication.

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**References**


**Author biographies**

**Borae Jin** (PhD, University of Texas at Austin) is a researcher in the Communication Research Institute at Yonsei University, South Korea. She is interested in communication technology and interpersonal relationships.

**Namkee Park** (PhD, University of Southern California) is an assistant professor in the School of Communication at Yonsei University, South Korea. His research interests include communication technologies and computer-mediated communication (CMC).