COMMUNICATION

Journal of Computer-Mediated Communication

Frequent Interaction and Fast Feedback Predict Perceived Social Support: Using Crawled and Self-Reported Data of Facebook Users

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The present study examines if Facebooking can contribute to psychological well-being and if so, which aspects of Facebook use could play a significant role. Matching crawled data with self-reported data from mobile Facebook users, we found that more social interactions with Facebook friends and faster friends' reactions to a user's post contributed toFacebook user's perceived social support and ultimately alleviated loneliness. We also found that the association between frequency as well as speed of Facebook social interactions and psychological well-being were more significant among those who were sensitive to other's behaviors and feelings than those who were not. The theoretical and practical implications of the findings, particularly regarding mobile communication context, are also discussed.

Keywords: Facebook, Perceived social support, Loneliness, Crawling, Always on and connected mode, Mobile devices.

doi:10.1111/jcc4.12160

Facebooking has become a part of daily routine for many. Using this interactive venue, people share what they do and how they feel with their Facebook *friends*. Adding new friends, pushing the *Like* button on a friend's photo, and sending birthday wishes through Facebook have become established ways of building and maintaining social networks. Forming and maintaining social ties is a fundamental human

Editorial Record: First manuscript received on October 3, 2015. Revisions received on January 17, 2016 and March 24, 2016. Accepted by S. Shyam Sundar on April 5, 2016. Final manuscript received on April 8, 2016. First published online on May 18, 2016.

motivation, and social network services (SNSs), such as Facebook, seem to provide a handy way to satisfy this basic human need. Then, is this social networking related to gratifying social relationships and psychological well-being? We attempted to answer this question by examining how Facebook users actually interact with their Facebook friends. Specifically, we focused on the *number of Facebook interactions* Facebook users has with their friends and the *speed of friends' feedback* to a Facebook user's post. We propose that *more* social interactions and *faster* responses from friends could be key aspects of understanding positive role of Facebook use in psychological well-being. We also investigate whether individual differences in sensitivity to other's behaviors and feelings (i.e., *interpersonal awareness tendency*) play a moderating role in the proposed relationships.

To accomplish the aforementioned goals, we use two sets of data: *crawled* and *self-reported* data. First, we crawled study participants' one-month period of Facebook activities. As an unobtrusive and objective measure, crawled data could provide the reports about the number of Facebook interactions (e.g., number of comments to their posts) and each of their time stamps during the month prior to the study. Second, we conducted an online survey to measure participants' perceived social support and loneliness. Matching the two data sets allowed us to examine the relationship between Facebook use and psychological well-being.

Social Network, Perceived Social Support, and Loneliness

Human beings do not fare well in social solitariness. People naturally want to be accepted, reassured, and supported by others. "Perceived deficiencies in social relationships" put people in "a state of emotional distress" called loneliness (Chen &Feeley, 2014, p. 142). When people feel lonely, this painful perception of social isolation could deteriorate their physical and psychological health (Jaremka et al., 2013). Social support defined as a social network's provision of various forms of tangible and intangible assistance (Cohen & Hoberman, 1983; Thoits, 2011) is known to be vital in alleviating loneliness. According to prior research, the perception of the availability of social support (i.e., perceived social support) is as important, if not more important, than the actual support received (e.g., Norris & Kaniasty, 1996). Social support is often categorized into a few major groups based on the types of resources people (perceive to) obtain. Uchinio (2004), for instance, suggested four categories of social support: tangible, informational, emotional and belonging support. Tangible (or instrumental) support is understood as the provision of material help such as financial assistance. Informational support refers to provision of relevant information intended to help a person cope with problems or difficulties (e.g., advice or guidance) and depending on research, the term of confidant support is also used (e.g., Broadhead, Gehlbach, Gruy, & Kaplan, 1988). Emotional support refers to the expression of caring, reassurance, and empathy. Belonging support is defined as provision of sense of social belonging by sharing social activities (Cohen & Willis, 1985).

Earlier research on social support focused on the structural features of the social network, such as size (Tolsdorf, 1976; Van Tilburg, 1998), under the assumption that the more people or groups in one's social network, the more social support is potentially available from these people or groups. Later studies, particularly in communication, emphasized social interactions with members of the social network and argued that individuals could have different perceptions about social support depending on the quality as well as quantity of interaction with members of the social network (Kiecolt-Glaser & Newton, 2001). For example, Gottlieb (2000) defined social support as the "process of interaction in relationships which improves coping, esteem, belonging, and competence through actual or perceived exchanges of physical or psychological resources" (p. 28), underscoring that social support is produced through interactive and communicative processes.

Applying to Facebook Context: Facebook Use and Psychological Well-being

As the term *social networking* service suggests, SNSs like Facebook are for building and staying in touch with social ties. People employ various communication strategies to initiate new relationships via Facebook, maintain close offline networks, and seek social information about those who have some offline relationships (Ellison, Steinfield, & Lampe, 2007). Then, could the Facebook social network generate perceived social support and reduce the loneliness of users? There have been ongoing scholarly debates about this question. Some have found benefits of Facebook use, such as increased life satisfaction and reduced loneliness (e.g., Deters & Mehl, 2013; Valenzuela, Park, & Kee, 2009). For example, Baker and Oswald (2010) reported that Facebook use is positively associated with perceived social support, particularly for individuals with weak social skills. In contrast, others argue that spending a great deal of time on Facebook reduce self-esteem (Kalpidou, Costin& Morris, 2011), increase depression (Wright et al., 2013), and dissatisfy deep relatedness need (e.g., Baker & Oswald, 2010). Likewise, Ryan and Xenos (2011) found that frequent use of Facebook is associated with social loneliness positively, although Facebook users felt less social loneliness compared to nonusers. Regarding the relationship between the size of one's Facebook social network and his/her psychological well-being has been generally positive (e.g., Ellison, Vitak, Gray & Lampe, 2014) but is not entirely settled.

These contradicting results may, at least in part, be due to the rather underexplicated concept of SNS use (Burke, Marlow & Lento, 2010). SNS use is usually measured based on self-reports of frequency, duration of use, and/or the number of Facebook friends. These measures, however, do not distinguish the various activities and interactive aspects of SNS use not allowing us to probe whether people spend most of their time on Facebook actively interacting with friends or lurking other's profiles.

Recognizing the lacuna, recent research has employed nuanced approaches to examine various types and features of Facebook use and its differential impacts. Much of the recent research claims that the impacts of Facebook vary depending on how people use Facebook and empirical evidence is starting to show that active Facebook use could galvanize psychological well-being while passive Facebook use could harm it (e.g., Brandtzæg, 2012; Burke et al., 2010; Burke, Kraut, & Marlow, 2011; Kross et al., 2013). For example, Ryan and Xenos (2011) found that Facebook user's preference for active social contribution (e.g., status, wall, comments, like, photo) was negatively associated with loneliness while passive engagement (e.g., groups, games) showed the opposite. Likewise, Burke et al. (2010) reported that active Facebook use (e.g., writing messages and updating status) mitigated loneliness, whereas passive use (e.g., reading a friend's wall and viewing photos) intensified it. In addition to these survey studies, Deters and Mehl (2013) designed an experiment and found that frequent status updates reduced loneliness because participants felt more connected with their friends. These findings all accentuate that *active* Facebook use is crucial to obtain the social-relational benefits of Facebook.

Aside from the various features of Facebook discussed above, another aspect to consider is Facebook friends' feedback or response. The importance of feedback in building intimacy and enhancing relationships has been well documented in the self-disclosure literature (e.g., Berg, 1987). Both self-disclosure and their partner's response toward self-disclosure affect intimacy and social-relational benefits in interactions. Relatedly, literature on ostracism emphasizes the importance of feedback by others, showing that being ignored can threaten one's belonging and related needs and result in psychological ill-being (Williams, 2009). In the context of Facebook, users'*sharings* of personal information and feelings with friends are active gestures to let themselves be known to others and be answered. Facebook users also engage in various forms of relationship maintenance behaviors such as commenting on friends' posts and pushing like buttons, which signals their attention and care to their Facebook friends. At the same time, users also expect reciprocal attention and care (Ellison et al., 2014). Several studies showed that active information sharing with others and others' feedback to users' active gestures in Facebook mattered (e.g.,

Burke et al. 2011; Tobin et al., 2014), underscoring the "interactive" aspect of Facebook use for positive consequences. For example, Tobin, Vanman, Verreynne, and Saeri (2014) reported that a lack of information sharing with Facebook friends as well as *no feedback on status update* could hurt perceived levels of belonging, self-esteem, control, and meaningful existence. Similarly, Burke et al. (2011) also found the importance of quality interactions between users and their friends on Facebook for producing positive social-relational outcomes. Specifically, first, the authors categorized a user's Facebook activities into three groups using log data: directed communication with individual friends (e.g., writing posts on a friend's wall and synchronous chatting), passive consumption of social news (e.g., reading other's updates), and broadcasting (e.g., writing general wall posts). Subsequently, the authors matched the log data with the survey data and found that only direct communication, particularly *receiving messages from friends*, was positively associated with increased social capital (see also Brandtzæg, 2012). Based on the discussion above, we propose that attention should be paid not only to the size of a Facebook social network (i.e., the number of Facebook friends) but also the nature of the interactions (i.e., frequency of interactions and speed of feedback) to comprehend the nature of relationship between Facebook use and perceived social support.

H1: The number of Facebook friends will be positively associated with a Facebook user's perceived social support from their Facebook friends.

H2: The number of interactions (e.g., comments and like buttons) posted to a Facebook page will be positively associated with perceived social support from Facebook friends.

Roles of Immediate Feedback in Understanding Psychological Well-being

The development of various forms of communication technologies has changed how people interact with others. People now "tether" themselves to others by always being on and available through various communication technologies (Turkle, 2006) and tend to take "connected presence" for granted (Licoppe, 2004; Ling, 2012). This on-going connectedness could influence the speed and the number of interactions people have and expect from others (Atchley& Warden, 2012; Igarashi, Motoyoshi, Takai, & Yoshida, 2008; Ling, 2012; Walsh, White, Cox, & Young, 2011).

In daily life, people invest their time on maintaining their relationships. Facebook is a good platform for relationship maintenance because people can quickly interact with multiple others at little cost (Tong & Walther, 2011). The availability of this handy social interaction platform (especially via mobile devices) could accentuate the speedy social interaction. In the context of e-mail exchange, Kalman and Rafeli (2011) found that delayed responses led to negative relational evaluations emphasizing the importance of chronemic cues in mediated social interactions. Atchley and Wadren (2012) also found that people heavily value "immediacy" when they receive text messages, which explains why people rush to check and respond to text messages and even compromise their safety (e.g., while driving).

Then, do people also expect others to respond fast? At least to our knowledge, there is no empirical study to directly answer this question. Ling (2012) argued that "as technologies and systems that aid in the development and maintenance of social interactions" (i.e., social mediation technologies in his term) develop, social practices people carry out are transformed. He also pointed out that social mediation technologies introduced the expectation that others are continually available. Relatedly, Campbell and Russo (2003) noted that members of a personal communication network (PCN) share similar norms and expectations about mobile phone use. This means that if an individual tries to live up to connected presence and fast feedback, their PCN is likely composed of similar individuals who function in an always-connected mode. This expectation of always connected mode could heighten the importance

of response immediacy in social interactions with members of their social network. In addition, technological assistance, such as pushing notifications of Facebook updates, could accelerate the value of response immediacy. Whenever friends update their profile and post a new picture, for instance, mobile devices let people know they have received a new message along with embedded pressure to respond. No study has examined how the response speed that a user's receive from Facebook friends can influence the level of gratifications users feel regarding interactions they make. This discussion may predict that the intensified always-on and connected mode would not only influence how people act but also how people expect others to act. Thus, violating the expected fast response to a user's own Facebook post could potentially harm their feelings of being cared for and supported by Facebook friends. Taken together, people are familiar with seamless communication characterized by frequent interactions with and fast reactions from their social network, which would increase perceived social support from Facebook friends. Perceived social support has been known as a key element that contributes maintaining psychological well-being (Kafetsios & Sideridis, 2006). Specifically, low level of perceived social support may make individuals feel excluded from social relationships with others. When people reach a positive appraisal of their relational resources (i.e., high level of perceived social support), they are unlikely to feel deficiencies in their social relationship (e.g, Kim, 1999). Based on the aforementioned discussion, the following two hypotheses were formulated:

H3: The average time taken to receive comments on a Facebook posting will be negatively associated with perceived social support from Facebook friends.

H4: There will be a negative association between perceived social support from Facebook friends and loneliness.

Moderating Role of Interpersonal Awareness

The need to belong and be accepted by others is one of the most fundamental human motivations (Baumeister & Leary, 1995). People interact with others to satisfy this relatedness need and how they interact with others is at least in part influenced by their personality traits, which could be applicable to the Facebook context. For instance, shy and socially anxious people spend more time on Facebook than others and explained that such people prefer online venues to satisfy their relatedness need for face-to-face interactions (Orr et al., 2009). Ryan and Xenos (2011) also reported that personality traits, such as shyness, influence how people use Facebook. They showed that shy people are likely to engage in passive Facebook use (e.g., reading a friend's wall or news on Facebook) instead of active use (e.g., updating status and commenting). Despite these findings, the roles of individual personality in Facebook use and its impact are still an underdeveloped research area.

Among various personality traits, interpersonal sensitivity, particularly the *interpersonal awareness* dimension, is a main concern of the present study. Interpersonal sensitivity as a personality trait refers to "the extent to which an individual is vigilant to the behaviors and feelings of others" (Wilhelm, Boyce, & Brownhill, 2004, p. 34). High level of interpersonal sensitivity reflects "ongoing concerns about a negative social evaluation" (Marvin & Miller, 2013, p. 2). One negative consequence of being excessively aware and sensitive to other's behaviors and feelings are likely to be trapped by depression and anxiety disorders (Wilhelm et al., 2004). Although people need to be attentive to others to interact with them, overattending to social cues (e.g., high social monitoring) could be a sign of unskilled interaction, resulting in social loneliness (Gardner, Pickett, Jefferies & Knowles, 2005). Interpersonal awareness is particularly important to understand the impacts of Facebook use on perceived social support and loneliness given that users' relationships and interactions (e.g., number of friends, number of like buttons,

and comments received) are all documented and visible on Facebook. In addition, Facebook users are aware of the visibility of Facebook activities. As Boyd and Ellison (2007) described, "what makes SNSs unique" is making social networks "visible" (p. 211), and Facebook offers a unique social stage with an "auditorium-size group of friends" (Greenwood, 2013, p. 224). User's interactions with Facebook friends are archived and shared with other Facebook friends (except for direct messages), which could intensify the importance of the frequency and immediacy of ostensible interactions, particularly for those who are sensitive to other's feelings and behaviors. Interpersonal awareness is an "other-dependent" personality trait. Strong interpersonal awareness could hurt Facebook users' confidence and independence in social interactions and make them more vulnerable to the impact of Facebook social interactions. Facebook users with a strong interpersonal awareness tendency tend to be vigilant to friend's feedback (e.g., number of comments and likes) on their posts and ultimately could hurt their psychological well-being. Against this backdrop, we expected that hypothesized relationships introduced above (from H1 to H4) could be qualified by how sensitive individuals feel about others' feelings and behaviors. Thus, the following hypothesis was drawn.

H5: The hypothesized associations in H1, H2, H3 and H4 will be stronger for those who have high level of interpersonal awareness than for those who have low level of interpersonal awareness.

Method

Data Collection Procedure and Sample

This study is based on the analyses of two sets of data: crawled data and self-reported online survey data. Participants were Facebook users who were recruited from three different South Korean universities. Students who decided to participate in the study were asked to log into their Facebook page using their ID and password *only if* they allowed researchers to crawl their Facebook activities over the past month at the time of data collection. After participants logged in, software developed by a technician for this study started crawling the relevant information from each participant's Facebook account. In the meantime, participants were redirected to an online survey questionnaire. The crawling procedure was completed before the participants submitted the self-reported online survey. After completing data collection, five participants were randomly selected and each received an electronic device as compensation. Among 292 respondents who completed the survey, we excluded 7 participants who never use mobile devices for Facebooking. These were subjected to further analyses, making the final sample size 285. Among them, 61.4% were male, and the age of participants ranged from 18 to 29 years old ($M = 21.81$, $SD = 2.19$). The average score of total months of Facebook membership since the participants had created Facebook account was 25.20 ($SD = 11.34$).

Crawled Data

Number of Facebook friends

The number of Facebook friends was obtained by crawling, which ranged from 6 to 1,480. The average number of Facebook friends of the sample was 303.08 ($SD = 163.98$).

Number of interactions with Facebook postings

The number of interactions with Facebook postings was comprised of four components: the total number of comments on a user's posting (e.g., status update, posting a link or a picture, or sharing a news story) on the user's wall; the total number of comments on the user's postings on friends' walls; the total number

of like buttons for postings uploaded to the user's wall; and the total number of like buttons for the user's postings on friends' walls. Of note, the number of interactions to Facebook posting included a Facebook user's own comment to a posting or a reaction to a comment given by a Facebook friend. An index of the number of interactions to Facebook postings was created by summing all four components listed above ($M = 174.28$, $SD = 238.79$).

Average time taken to receive comments

We calculated the average mean scores of time that it took for a user to receive comments to the user's postings using crawled data (both on one's own wall and on friends' walls). Facebook provides a time stamp for each posting and each comment given to the posting. Crawling allowed us to collect the time stamp information for the postings and comments to the postings, and to calculate the time taken to receive a comment to each posting. Subsequently, average times taken to receive comments measured per each post were averaged to create a composite measure of average comment time to Facebook postings ($M = 6975.90$ sec, $Me = 2464.92$ sec, $SD = 28187.72$). About half of the participants received feedback from their Facebook friends within less than 40 minutes. Additionally, the crawled data indicated that 15.8% of the respondents received their *first comment* less than one minute, 43.6% within 10 min, and 70.5% within 30 min after their posting.

Measures Based on the Self-Reported Data

Perceived social support from Facebook friends

We developed a scale of perceived social support from Facebook friends by adapting a few existing scales including the Duke-UNC Functional Social Support Scale (Broadhead et al., 1988) and the Interpersonal Support Evaluation List (Cohen, Mermelstein, Kamarck & Hoberman, 1985). In the present study, we focused on belonging, emotional, and confidant support related items excluding tangible support. We also slightly modified items to fit the study context (i.e., Facebook and Korean context). The scale consists of 18 items measured on a 5-point scale ranging from 1 (*much less than I would like*) to 5 (*as much as I would like*). An exploratory factor analysis (EFA) with principal component extraction and direct oblimin rotation was conducted. After eliminating items with factor loadings less than 0.7 and with cross loadings that were within 0.2, 11 items were retained and they formed two dimensions. Seven items tapping perceived emotional and belonging support loaded on the *emotional/belonging support* factor ($M = 3.70$, $SD = .91$, $\alpha = .93$), which accounted for 61.17% of the variance. Four items loaded on the *confidant support* factor ($M = 2.85$, $SD = 1.07$, $\alpha = .87$), which accounted for 7.60% of the variance. A few example statements of emotional/belonging support include: Among my Facebook friends, I have someone who "cares what happens to me," and "remembers my birthday and celebrates it." A few examples of confidant support include: I have someone "whom I trust about my personal and family problems" and "who provides advice regarding family crisis." Subsequently, a confirmatory factor analysis (CFA) indicated that the two-factor model had an acceptable fit ($\chi^2 = 126.56$, $df = 42$, $p < .001$, CFI = .96, NFI = .95, RMSEA = .08) and had a better fit than the single-factor model ($\chi^2 = 343.78$, $df = 43$, $p < .001$, CFI = .87, NFI = .85, RMSEA = .16). A chi-square difference test also preferred the two-factor model to single-factor model ($\Delta\chi^2 = 217.22$, $\Delta df = 1$, $p < .001$).

Loneliness

Loneliness was measured using Russell (1996)'s the Revised UCLA Loneliness Scale. Participants answered how often they experienced loneliness on a 5-point scale (1 = *never*; 5 = *always*). A total of 17 items out of the original 20 items were used, and a few example statements include: I feel alone; I am

no longer close to anyone; and I feel left out. Responses were averaged to create a composite loneliness score ($M = 2.13$, $SD = .60$, $\alpha = .90$).

Interpersonal awareness

Interpersonal awareness defined as excessive awareness and sensitivity to other's behaviors and feelings (Boyce & Parker, 1989) was measured on a 5-point scale using four items drawn from the original Interpersonal Sensitivity Scale (e.g., I worry about being criticized for things I have said or done; I care about what people feel about me). The responses to these four items were averaged to build a composite measure of interpersonal awareness ($M = 3.68$, $SD = .91$, $\alpha = .67$).

Results

Path analyses were conducted using the maximum likelihood procedure in AMOS 21.0 to examine the hypotheses and to test the overall fit of the theoretical model. The model showed a good fit based on commonly employed criteria (Hu & Bentler, 1999): χ^2 (3) = 2.06, $p = .56$, CFI = 1.00, NFI = 1.00, RMSEA = .00.

Figure 1 presents the path coefficients, which were used for hypothesis testing. H1 predicted a positive association between the number of Facebook friends and perceived social support from Facebook friends. The number of Facebook friends was not associated with perceived social support from Facebook friends ($ß = .07$, $p = .28$). Therefore, H1 was not supported. H2 expected a positive association between the number interactions users have with their Facebook friends and perceived social support from them. Those who had more interactions around their Facebook postings (e.g., likes or comments to their Facebook postings) perceived stronger emotional/belonging social support ($ß = .50$, $p < .001$) and confidant social support ($ß = .33$, $p < .01$) from their Facebook friends than those whose posts did not involve active interactions. Therefore, H2 was supported. H3 predicted a negative association between average time taken to receive comments to a user's Facebook posting and perceived social support from Facebook friends. As expected, the faster Facebook users received feedback to their postings, the more emotional/belonging social support the users perceived from Facebook friends ($ß = -.24$, $p < .05$). However, the impacts of faster feedback from Facebook friends on confidant social support only approached a traditional significance level ($ß = -.21$, $p = .07$). Therefore, H3 was partially supported. Finally, H4 expected a negative association between perceived social support from Facebook friends and loneliness. As expected, two dimensions of perceived social support showed negative associations with loneliness. Both perceived emotional/belonging ($ß = -.33$, $p < .001$)and confidant support ($ß = -.23$, $p < .001$) were negatively and significantly associated with a sense of loneliness. Therefore, H4 was supported.

Last, we expected that the hypothesized relationships would be invariant depending on the user's degree of interpersonal awareness (H5). One way to test for this group variation in a path analysis is to show that the path structure for one group differs from the path structure for another group. The results of this method can be interpreted in a way that is similar to how we understand interaction analyses and effects. To run a multigroup analysis, we created two models: (1) an unconstrained model (default model) and (2) a model with the parameters in two groups constrained. If constraining the parameters results in a significantly worse fit, we can conclude that the regression weights in the model as a whole for the high and low interpersonal awareness groups are different. Following this logic, we split the sample into a high interpersonal awareness group and a low interpersonal awareness group by comparing individual interpersonal awareness index scores to the median ($Me = 3.75$). Then, we compared the default model with the constrained model. The results showed that the difference between the two models approached

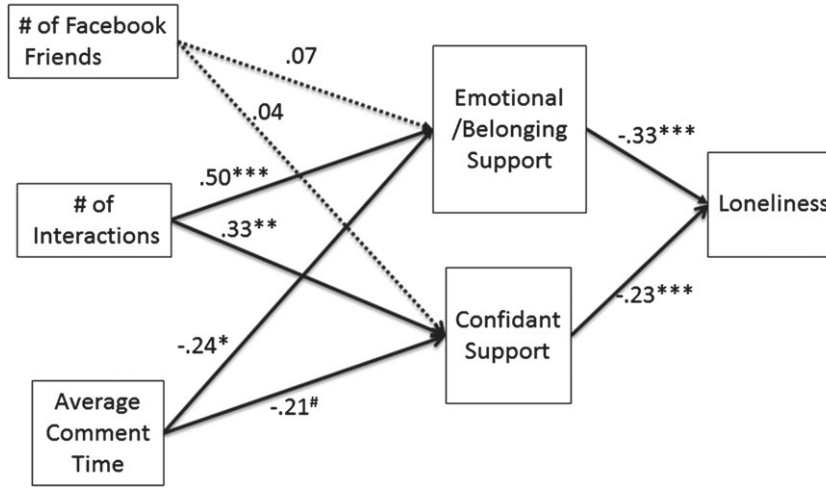

Figure 1 The Hypothesized Model of Facebook Use, Social Support, and Loneliness.
Notes. $^{*}p < .05$, $^{**}p < .01$, $^{***}p < .001$. Dotted arrows denote paths that are not statistically significant. Numbers presented in Figure 1 are standardized path coefficients. Model fit: χ^2 (3) = 2.06, $p = .56$, CFI = 1.00, NFI = 1.00, RMSEA = .00. R^2 for belonging support = .13, R^2 for confidant support = .05, R^2 for loneliness = .26. Covariance between error term of two perceived social support dimensions = .57 (*SE* = .06), $p < .001$. Covariance among three exogenous variables: # of Facebook friends and # of interactions = 177.21 (*SE* = 22.59), $p < .001$; # of Facebook friends and average comment time = 147.38 (*SE* = 22.31), $p < .001$; # of interactions and average comment time = 3.54 (*SE* = .33), $p < .001$; We examined skewness and kurtosis of the univariate distributions of all focal variables used in the model to avoid potential estimation errors from violating the normality assumption (West, Finch & Curran, 1995). It turned out that the skewness and kurtosis values of the two exogenous variables (i.e., the number of interactions and average comment time) were off from the general standards of skewness 3.0 and kurtosis 10.0. After log transformation, the normality of these two variables was within the normal range; thus, the log transformed values were used in subsequent path analyses.

a traditional significance level, $\Delta\chi^2$ (8) = 14.48, $p = .07$. Subsequently, we also tested whether path coefficients in each model were statistically different to each other by using critical ratio for the difference test. As indicated in Figure 2, the path coefficients were different across the two conditions. Three points are worthy of mention. First, the path coefficients between the average time taken to receive comments and each of the two dimensions of perceived social support were significant in the high interpersonal awareness group ($\beta = -.51$, $p < .001$ for emotional/belonging support; $\beta = -.38$, $p < .05$ for confidant support); however feedback speed did not affect emotional/belonging social support ($\beta = -.12$, $p = .44$) or just approached a significance level for confidant support ($\beta = -.27$, $p = .08$) in the low interpersonal awareness group. These results suggest the relative importance of a fast response for those who are sensitive to others' feelings and behaviors. The path coefficients from feedback speed to emotional/belonging support were significantly different between the two groups (critical ratio for difference between parameters = −1.93, $p < .05$). Second, in both groups, the path coefficients from the number of interactions to the each of the two domains of perceived social support were significant. However, the impact of the number of interactions on perceived emotional/belonging social support was more salient in the high interpersonal awareness group ($\beta = .79$, $p < .001$) than in the lowinterpersonal awareness group ($\beta = .33$,

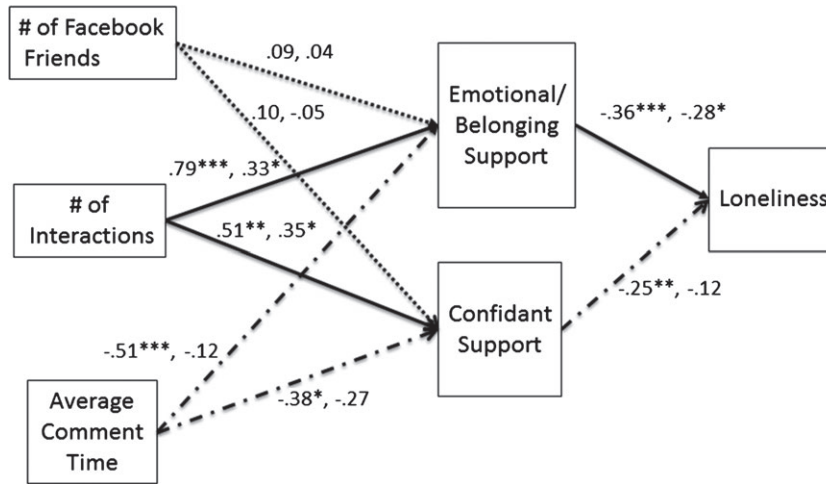

Figure 2 High and Low Interpersonal Awareness Group Comparison.
Notes. $^{*}p < .05$, $^{**}p < .01$, $^{***}p < .001$. Numbers presented in Figure 2 are standardized path coefficients. The first and second numbers in a pair are for the high- and low-interpersonal awareness groups, respectively. Dotted arrows denote paths that are not statistically significant for at least one group.

$p < .05$) suggesting that, regardless of the level of interpersonal awareness, frequent social interactions on Facebook made people feel like being surrounded by supportive friends. However, this positive impact was statistically significantly stronger for the high interpersonal awareness group than for low interpersonal awareness group (critical ratio for difference between parameters = 2.26, $p < .05$). Last, although the path coefficients from emotional/belonging support to loneliness were significant in both groups, the path coefficient from confidant support to loneliness became insignificant for those in the low interpersonal group. Taken together, the positive impacts of Facebook social interactions (in terms of frequency and feedback time) were more salient for those who are sensitive to others than those who are insensitive. At the same time, those in the high interpersonal awareness group seem to benefit from the increased perception of emotional/belonging support from Facebook friends as well as confidant support, which also decreased feelings of social loneliness. However, those in the low interpersonal awareness group did not get much benefit through confidant support in terms of decreasing social loneliness.

Discussion

The pervasive popularity of SNSs, particularly Facebook, has drawn much scholarly attention. We found that the interactive use of Facebook (i.e., number of social interactions and speed of feedback) was positively associated with the perceived availability of social support from Facebook friends, which was, in turn, related to the reduced feeling of loneliness. In a broad sense, these findings are consistent with previous studies showing that the active use of Facebook is essential to facilitate the social-relational benefits of Facebook, whereas the passive use of Facebook could even hurt social well-being (e.g., Burke et al., 2010, 2011). Psychological well-being, especially perceived social support, is deeply related to terms such as exchange process, mutual obligation, and reciprocity (Cobb, 1976). People often perceive high social support when they share day-to-day conversations that may include topics of positive or negative events and even daily routines (Lakey & Orehek, 2011). Individuals are motivated to share life events with close

others and Facebook is a handy platform for sharing. This sharing, we believe, is more than just posting about life events and it also carries signals that invite friends' responses. Even when people engage in relationship maintenance behaviors (e.g., writing comments on friends' posts), these behaviors not only signal their attention to Facebook friends, but also activate expectations of reciprocity (Ellison et al., 2014). The present study examined the overall interactions (i.e., not only sharing, relationship maintenance behaviors but also responses from friends) and found their relationships with perceived social support and loneliness. In addition, one of our novel findings was that the speed of responses from Facebook friends played a significant role in explaining increase of perceived social support. Those who did not receive immediate feedback from a Facebook friend felt a lack of perceived social support from their Facebook friends, which, in turn, made them feel lonely. We speculate that the importance of faster feedback could be, at least in part, attributed to pervasive use of mobile communication technology. Mobile devices enable people to be always on and connected and make people expect others to function in this mode (Ling, 2012). In a sense, fast feedback contributes to facilitating the "connected presence" by making mediated communication virtually seamless (Licoppe, 2004) and could enhance perceived social support. When Facebook friends violate the expectation of an immediate response, however, it could also deteriorate the perceived social support people expect from Facebook friends. The results of the present study could raise an interesting research question regarding how portable social networks might shape a social norm of fast responses when people interact and its potential impacts on psychological well-being.

Social interactions on Facebook are documented and visible. The number of comments and likes are ostensible evidence of social interaction that could be used to evaluate how much social support is available from their Facebook friends. The connection between the faster and more social interactions and perceived social support was stronger for those who were sensitive to others' feelings and behaviors (i.e., high interpersonal awareness). People who were vigilant about others' behaviors and feelings were more likely to be influenced, in a good or bad way, by social interactions on Facebook than those who were not sensitive to others. Considering that interpersonal awareness is an inherently other-dependent personality trait, it is quite natural that those who are highly attentive to others are more influenced by archived and visible social interactions on Facebook than those who are less attentive. Furthermore, the negative connection between perceived social support and loneliness was stronger for those who were sensitive to others' feelings and behaviors than those who were not sensitive. In other words, the perceived availability of support from Facebook friends buffered people from social loneliness in general, yet the size of this buffering effect was stronger for those who were sensitive to others' feelings and behaviors. This finding can be interpreted as suggesting that the perceived deficiency in Facebook support deteriorates psychological well-being more for those who are vigilant to others than those who are not.

Different from our expectation, the size of the social network neither contributed to nor detracted from the amount of perceived social support Facebook users felt. Not all social relationships are constructive and pleasant. Sometimes, social ties could be hurtful by increasing the chances of conflicts, disputes, or tense relationships (Thoit, 2011). The null effects of the size of the social network on perceived social support reported in the current study may suggest that how people interact with their social networks is more important than how big their social network is. In addition, we found that Facebook users felt that they are surrounded by friends who care and hang out with them (i.e., perceived emotional/belonging support), which alleviated their feeling of loneliness. However, Facebook social interactions showed relatively weak impacts in facilitating the perception that Facebook users are surrounded by friends who could provide advices or guidance when they face with various forms of difficulties in life (i.e., perceived confidant social support). Considering the roles of various forms of social support in coping and enhancing psychological well-being, it is important to probe what kinds of psychological benefits Facebook users could expect from their social interactions in future research.

It is important to recognize the limitations of the study that may inform fruitful directions for future research. First, although we examined the interactive features of Facebook use, our attempt was limited to the frequency and immediacy of social interactions that occurred on Facebook. Thus, the specific content and valence of the social interaction were not examined. Of course, the number of like buttons may signify the degree of positive reaction from a Facebook friend, yet examining actual social interaction content could still be important. Furthermore, the specific number of core friends contributing to social interactions should be considered. In other words, some people might maintain very intimate relationships with a few friends, whereas others might interact with a broad range of friends. Identifying which case is the main contributor to healthy social interactions on Facebook could be an interesting aspect to examine in a future study. In addition, it is important to consider offline social networks and their relationships with Facebook social networks to expand our understanding of the impacts of Facebook interaction on psychological well-being. Prior research suggests that people use Facebook to maintain their offline social network (e.g., Boyd & Ellison, 2007) and one of the major communication strategies people frequently apply in Facebook is seeking social information about those with whom they have some offline relationships (Ellison, Steinfield, & Lampe, 2011). Given that Facebook and offline social networks could highly overlap, probing the relationships between these two networks is worth considering in a future study. We utilized crawled and self-reported data. The crawled data provided us the reports about Facebook activities that had happened for one month before the self-reported data was collected. Compared to cross-sectional data solely relying on self-reported data, matching the two data sets also enabled us to examine the impacts of Facebook use on perceived social support with a proper time frame. However, it is important to clarify that the present study does not show the full picture of how social network and psychological well-being are related on the basis of causal relationships. It is not possible to establish causal relationship between perceived social support and loneliness with current data. Moreover, it is not possible to discuss how long the beneficial effects of Facebook interaction could be sustained, which may also influence subsequent Facebook use (i.e., circular relationship). The current data set cannot test the circular relationships among social network use, perceived social support, and loneliness. Furthermore, the data sets we used relied on convenient sampling, which limits the extent to which the findings may be generalized. Specifically, our sample was composed of young college students whose Facebook use pattern, expectation about Facebook friends' interaction, and feedback speed might be different from those of the general population. Therefore, our findings should be interpreted cautiously and should be closely reexamined with representative samples in the future. Relatedly, the study data sets were collected in South Korea whose culture is highly collectivistic. In a collectivistic culture, relationships with others constitute a significant part of self and govern everyday life (Hofstede, Hofstede, & Minkov, 2010). Therefore, it is important to replicate the study in a different cultural context. In addition, considering the importance of gender differences in new technology use and psychological well-being suggested in prior research (e.g., Brandtzæg, 2012), future research should probe whether gender plays an important role in understanding the relationship between Facebook interactions and psychological well-being. Lastly, given the high visibility of Facebook activities, too much information resulting from excessive sociability may create social tension and annoyance rather than support (Brandtzæg, Luders, & Skjetne, 2010). This dark side of frequent Facebook social interaction is also worth studying in future research.

To conclude, we found several interesting results that could shed light on the importance of satisfying and meaningful connections through social interactions on Facebook to promote psychological well-being. Those who are actively interacting with Facebook friends enjoy the beneficial outcomes of Facebook use. In particular, we found that not only the number of social interaction but also the immediacy of friends' feedback matter, which is a unique contribution of our study.

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