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Absence Makes the Communication Grow Fonder: Geographic Separation, Interpersonal Media, and Intimacy in Dating RelationshipsL. Crystal Jiang¹ & Jeffrey T. Hancock²¹ Department of Media and Communication, City University of Hong Kong, Kowloon Tong, Hong Kong² Department of Communication, Cornell University, Ithaca, NY 14853, USA

Many people assume that it is challenging to maintain the intimacy of a long-distance (LD) relationship. However, recent research suggests that LD romantic relationships are of equal or even more trust and satisfaction than their geographically close (GC) counterparts. The present diary study tested an intimacy-enhancing process, in which LD couples (a) engage in more adaptive self-disclosures and (b) form more idealized relationship perceptions than do GC couples in the pursuit of intimacy across various interpersonal media. The results demonstrate the effects of behavioral adaptation and idealization on intimacy, and suggest that the two effects vary depending on the cue multiplicity, synchronicity, and mobility of the communication medium employed. Implications for understanding LD relating and mix-mode relating are discussed.

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Close relationships maintained across geographic distance are fairly common nowadays due to society's increasing mobility and the widespread adoption of communication technologies. Romantic relationships are normally characterized by physical proximity, but even this type of relationship is often carried out in geographic separation due to educational demands, dual-career pursuits, military deployment, emigration, and other such factors (Stafford, 2005). About 3 million Americans live apart from their spouses for reasons other than divorce or discord (Bergen, Kirby, & McBride, 2007). About 25–50% of college students are currently dating a long-distance (hereafter referred to as LD) partner, and up to 75% of them have engaged in a LD relationship at some point in college (Stafford, 2005).

The prevalence of LD relationships, however, is not well reflected in communication or other social science studies (Stafford, 2005). This domain is poorly

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understood, from a practical point of view, partly because of various research challenges such as recruiting a diversified group of participants and collecting dyadic or conversational data over time and at a distance (Sahlstein, 2010). But more importantly, this topic is understudied because the public and even many scholars firmly believe that geographic proximity and frequent face-to-face (FtF) contact are necessary for developing mutual understanding, shared meanings, and emotional attachment in romantic relationships (for a review, see Sahlstein, 2010; Stafford, 2005). LD relationships obviously stand in contrast to these cultural values, and hence are viewed as problematic or atypical relational states (Bergen, 2010; Maguire & Kinney, 2010).

Counter to these intuitions, a limited but growing body of research which has compared LD dating relationships with geographically close (hereafter referred to as GC) ones has consistently found that, on average, the relationship stability, satisfaction, and trust reported by LD couples are equal to or better than those reported by GC couples (for a review, see Stafford, 2010). Importantly, the quality of LD relationships is apparently not driven by the amount of communication involved. Compared to GC couples, LD couples spend less time together FtF and have only an equal amount of mediated communication (Stafford & Merolla, 2007). Distance may shape the communication goals LD couples want to achieve and give rise to corresponding changes in cognition and behavior that tend to stabilize the relationship (Carstensen, Isaacowitz, & Charles, 1999; Stafford, 2010).

This study seeks to replicate and expand previous work on LD relational satisfaction and trust to intimacy, another important dimension of romantic relationships. While intimacy is a complex concept that has been conceptualized in various ways (e.g., an individual disposition, a desired relationship feature, and a positive state of interactions; Laurenceau, Rivera, Schaffer, & Pietromonaco, 2004), this study considers intimacy as a dyadic and interdependent relating process whereby a personal, subjective sense of closeness develops through enduring interactions using a range of interpersonal media over time. Drawing on the framework of the interpersonal process model of intimacy (IPMI; Reis & Shaver, 1988), the study specifically examines if LD couples indeed experience greater intimacy on an interaction-by-interaction basis, and if so, what relational dynamics contribute to such intimacy enhancement.

Intimacy as an interpersonal process

According to the IPMI (Reis & Shaver, 1988), intimacy is derived from transactions of self-disclosure and perceived partner responsiveness. Self-disclosure generally refers to the communication of personal facts, thoughts, and emotions to another. Perceived partner responsiveness is the perception that the relationship partner recognizes, values, and behaviorally supports the core aspects of the self. Intimacy develops when one party (termed the discloser) reveals personally relevant information, thoughts, or feelings to the partner (the disclosive act). It continues when the partner's response addresses the specific content of the disclosure and conveys understanding, validation, and caring for the discloser (the responsive act). For the discloser to

experience intimacy, it is essential that the responsive act be subjectively perceived, that is, the discloser feels understood, validated, and cared for in the interaction (the perceptual act). The process of developing intimacy is the sequential unfolding of sets of these disclosive, responsive, and perceptual acts, and a breakdown in one of the acts decreases the intimacy perception.

The intimacy process is depicted in Figure 1a. The IPMI model posits one behavioral variable (self-disclosure) and three perceptual variables (perceived partner disclosure, perceived partner responsiveness, and intimacy). The central prediction is that perceived partner responsiveness is a determinant of intimacy above and beyond the actual communication involved, and both self-disclosure and perceived partner disclosures contribute to the development of intimacy through the mediation of perceived partner responsiveness. The IPMI model was developed to address general relational processes but has been mostly tested only in copresent relationships (for a review, see Laurenceau et al., 2004). This study seeks to test the boundary conditions of the IPMI by extending it to the context of LD relationships. If the model holds for both types of dating it will be a valid framework for comparing relational dynamics across GC and LD relationships. Hence, we first predict that perceptions of partner responsiveness mediate the effects of self-disclosure and perceived partner disclosures on intimacy in both LD and GC relationships (H_1).

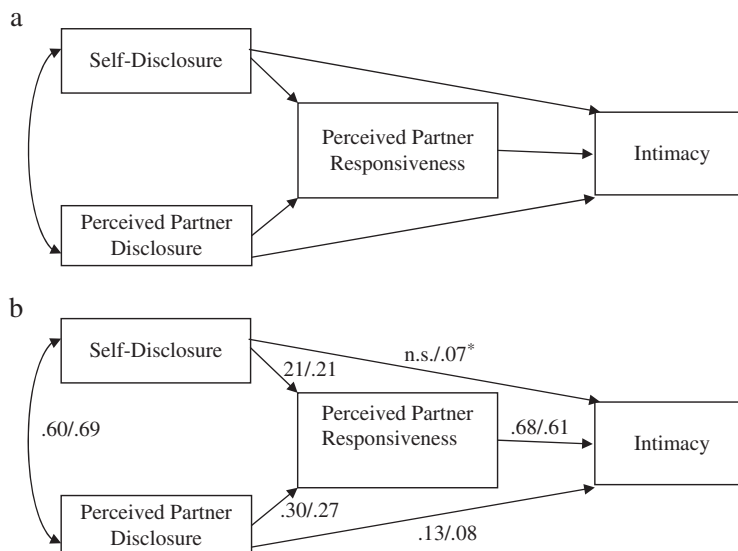


Figure 1 (a) The theoretical model of interpersonal process model of intimacy (IPMI; Reis & Shaver, 1988). (b) The results of model testing. The path coefficients for long-distance (LD) relationships appear first, followed by the coefficients for geographically close (GC) relationships. No significant difference in path coefficients was detected between LD and GC relationships except for the effect of self-disclosure on intimacy (indicated by *).

Intimacy in long-distance dating

Perhaps the most important difference between LD and GC dating is that LD daters are not able to see each other FtF on a daily basis (Stafford & Merolla, 2007) so they face a much more challenging situation than GC daters. Geographic separation leads to restricted communication, reduced interdependence, and heightened uncertainty about the future of the relationship, all of which complicate relationship maintenance (Stafford, 2010).

However, lovers are motivated to change the frustrating situation. As research on interpersonal interdependence points out, interpersonal goals can be achieved by selecting situations or by transforming them (Kelley & Thibaut, 1978). When the choice of situations is constrained by geographic distance (e.g., individuals cannot see their loved ones whenever they want), the need for personal bonding can be accomplished by transforming the situation through engaging in adaptive behaviors and cognitions. The IPMI model similarly implies that the intimacy process is adapted to the relational situation. When the discloser desires a closer relationship, he or she may engage in more frequent self-disclosures and perceive the partner's reciprocal disclosures as an expression of intimacy. For example, Sanderson and Cantor (2001) suggest that, besides spending more time together, there are some other pathways through which the pursuit of intimacy goals may lead to relationship satisfaction, including interacting in goal-relevant situations, strategically managing conflicts, sharing similar intimacy pursuits, and subjectively perceiving the partner as intimacy-oriented.

This study considers LD status as an important situational variable that affects both parties' relational goals, self-disclosure behaviors, and relationship perceptions. Specifically, the study proposes and tests two concurrent intimacy-enhancing mechanisms within the IPMI framework: (a) *behavioral adaptation*, in which LD daters strategically adapt their self-disclosure behaviors and (b) *idealization*, in which LD daters form intensified relational perceptions. These two effects are expected to enhance intimacy via the effects of self-disclosure and perceived partner responsiveness specified in the IPMI model.

First, behavioral adaptation is expected to lead LD partners to disclose more to their partners than GC couples. Previous studies have provided some initial evidence for adaptive communication that aims to enhance intimacy, such as saying sweet words in texting (Carstensen et al., 1999). A recent survey indeed shows that communication in LD dating is more intimate, more positive, and less contentious than in GC dating (Stafford, 2010). LD couples report more intimate talk and activities, more avoidance of conflict and taboo topics, and less discussion of important premarital decisions. The relationship maintenance literature also offers indirect evidence for such behavioral adaptation. One study (Johnson, Haigh, Becker, Craig, & Wigley, 2008), for example, suggests that openness and positivity, two strategies that potentially involve self-disclosing behaviors, are the most frequently observed maintenance strategies in e-mails between LD romantic partners, and that they significantly contribute to relationship stability and satisfaction. Thus, the study

predicts a behavioral adaptation effect within the IPMI model that LD partners will engage in more self-disclosure than GC partners (H_2).

Second, in addition to these behavioral adaptations, LD daters are likely to enhance intimacy through the perceptual mechanism of idealization. Idealization is the tendency to perceive a partner or relationship in unrealistically positive terms, including developing more positive assessment of the partner's personality relative to the average partner, recalling fewer disagreements with the partner than actual occurrences, and having optimistic perceptions about the relationship's future and the control over relational uncertainty (Murray, Holmes, & Griffin, 1996). Idealization is likely magnified in LD dating because it may help reduce the heightened uncertainty arising from the situation.

The behavioral adaptation described above provides a behavioral basis for idealization (Stafford & Merolla, 2007). Idealization, however, must involve a change in perceptions that is above and beyond any effects attributable to behavioral changes in a partner's self-disclosure. That is, changes in relational perceptions involve two components, one based on actual changes in the behaviors perceived, referred to as behavioral carryover effects, and an additional component based on perceptual biases, such as idealization. For example, if partner A typically produces a given number of disclosures during FtF conversations with partner B, but twice the disclosures during text-messaging conversations, this would represent a behavioral adaptation by A. If B then perceives their partner as, say, twice as disclosive in text messages, then this would represent a behavioral carryover effect from A's change in disclosure. Identifying idealization requires controlling for this carryover effect. That is, idealization represents an additional and independent effect from the behavioral adaptation.

We predict that, after controlling for carryover effects, LD partners will idealize relational perceptions relative to GC partners, including (a) perceive more disclosure by their partners, (b) perceive more partner responsiveness, and (c) perceive more intimacy, as specified by the IPMI model (H_3).

Interpersonal media and intimacy

Intimacy dynamics may operate differently across interpersonal media. Dainton and Aylor (2002), for example, have shown that LD couples use different maintenance strategies in different interpersonal media. Openness and assurance are emphasized on the telephone, while positivity, social networking, and shared tasks get more emphasis in text-based communications. It is unclear, however, why media matter in LD relationships and how they interact with the geographic separation to produce changes in relational perceptions and behaviors. Previous studies of LD relationships have been limited to one or a couple of media (Parks, 2009), and they have not systematically compared the relational processes emphasized in different media. The present study was designed to remedy this by examining how the intimacy enhancement discussed above operates in FtF, phone call, video, instant messaging (IM), texting, and e-mail.

As described above, when alternatives are limited, communicators are likely to adapt to the constrained situation in pursuit of the desired communication effect, such as enhancing intimacy (Kelley & Thibaut, 1978). Various interpersonal media, however, constrain communication in different ways (Clark & Brennan, 1991). For instance, interpersonal media may affect how many cues are available, whether the communicators can interact in real time, or whether they are accessible while moving through different locations. This study investigated intimacy enhancement in LD relationships in connection to three attributes that have emerged as important for many interpersonal dynamics: cue multiplicity (Daft & Lengel, 1986), synchronicity (Walther, 2007), and more recently, the mobility of the communication medium (Dimmick, Feaster, & Hoplamazian, 2011).

Cue multiplicity refers to the extent to which a medium can convey multiple cues relevant to the interaction such as verbal expressions, voice inflection, facial expression, and body gestures (Daft & Lengel, 1986; Dennis, Fuller, & Valacich, 2008). FtF communication offers the highest cue multiplicity because it affords the exchange of verbal, audio, and visual cues simultaneously. Video chats, phone calls, and text-based media (IM, texting, and e-mail) offer decreasing multiplicity.

Synchronicity is the degree to which messages are exchanged instantaneously in real time (Dennis et al., 2008). Synchronous media such as FtF, phone calls (except voice mail), and video chat normally involve conversation partners communicating at the same time. IM, while it often affords simultaneous chatting when two partners are online at the same time, tolerates some delay in responses (e.g., the busy or away status indicates unavailability) and hence is categorized as semisynchronous. Text messaging and e-mail are normally considered as asynchronous media given their much longer response latencies.

Mobility (or portability) is the third dimension considered in the study. It relates to a medium's utility during physical travel (Dimmick et al., 2011). The mobile phone (speaking or texting) provides the highest mobility. Video chat, IM, and e-mail, together termed computer-mediated communication (CMC) media, provide some mobility to users carrying a laptop or using different computers in different locations. FtF is the least mobile medium because it requires the physical presence of both partners.

People typically have strong preferences for cue multiplicity, high synchronicity, and less mobility for interpersonally complex interactions. For example, media richness theory (Daft & Lengel, 1986) considers FtF as the most appropriate for dyadic and equivocal interpersonal exchanges. Cappella's (1991) work on the biological origins of communication indicates that a delay of more than 2 or 3 seconds in FtF responses is likely to create negative affect and relational dissatisfaction and consume more cognitive effort. Although mobile devices offer more convenient access, they are constrained by their interstitial nature, in which calls and text messages frequently take place during the time between other activities, such as shopping or waiting in line (Dimmick et al., 2011).

The two intimacy-enhancing effects in LD dating described above, behavioral adaptation and idealization, should increase with medium constraints. When individuals communicate using a medium that involves reduced cues, reduced synchronicity, or increased mobility, they should increase behavioral adaptation by self-disclosing more frequently. Empirically, studies have shown that relative to FtF, text-based interaction has more frequent (Joinson, 2001; Tidwell & Walther, 2002) and more intimate self-disclosure (McKenna & Bargh, 1998). Asynchronous text-based communication involves substantial strategic disclosure of personal information (Gibbs, Ellison, & Heino, 2006), while mobile communication reveals frequent but nuanced disclosures of daily routines and affection (Ling & Yttri, 2002; Thurlow, 2003). Hence, we predict that adaptation through self-disclosure will increase as (a) cue multiplicity decreases, (b) synchronicity decreases, or (c) mobility increases (H₄).

Idealization should also increase when communicating with reduced cues, reduced synchronicity, or increased mobility. The rationale is twofold: first, the constraints of limited cues, synchronicity, and communication time should lead to more behavioral adaptation (Kelley & Thibaut, 1978), which serves as a behavioral basis for idealization; and second, because all these constraints reduce information exchange there should be more room for idealizations about the partner or the relationship (Walther, 1996). CMC research (e.g., Hancock & Dunham, 2001) has established an intensification effect in which individuals who communicate in text-based, asynchronous CMC environments overrely on limited cues and develop more biased impressions of one another than those who communicate FtF (for a review, see Jiang, Bazarova, & Hancock, 2011). While intensification of interpersonal dynamics can be either positive or negative (Walther, 1996), intensification is likely to be positively biased for those in a romantic relationship. The same effect may apply to mobile interactions because a brief but very romantic message (e.g., “just thinking of you”) may be saved as a symbol of connectedness and love, and revisiting such a message is a form of reminiscent thinking, which is believed to create idealized representations of partners (Stafford & Merolla, 2007). Thus, we hypothesize that the idealization effects on partner disclosure, partner responsiveness, and intimacy increase as (a) cue multiplicity decreases, (b) synchronicity decreases, or (c) mobility increases (H₅).

Methods

These hypotheses were tested by means of a diary study wherein dating couples independently completed online surveys over a 1-week period. Compared to experiments or cross-sectional surveys, the diary method provides more detailed and accurate self-reports in a natural context (Bolger, Davis, & Rafaeli, 2003) and thus promises to better capture the dynamic nature of intimacy processes.

Participants

Sixty-seven heterosexual dating couples ($N = 126$) were recruited from several communication and psychology classes at a large university in the northeastern United States to participate for course credit, a \$20 Amazon gift certificate, and a chance to win a raffle. The participants self-defined their LD status by answering the forced-choice question “We are unable to see each other, face to face, on a frequent basis due to geographical separation” (Dellmann-Jenkins, Bernard-Paolucci, & Rushing, 1994, p. 214). This self-defining criterion has been found more valid for measuring of LD status than fixed standards of contact frequency or miles apart (Pistole & Roberts, 2011). Four couples (1 LD couple and 3 GC couples) dropped out during the study period, resulting a sample of 63 couples (30 LD couples and 33 GC couples). The average age of the sample was 20.97 years ($SD = 2.55$), ranging from 18 to 34 years. The majority of the sample (73%) was college students. The participants were 54% Caucasian, 30.2% Asian, 7.8% African-American, 2.4% Hispanic, 1.6% Native American or Pacific Islander, and 4% other. The average length of their relationships was 22.71 months ($SD = 20.43$), ranging from 1 to 125 months. About half (51.6%) of the participants were smartphone users. Almost half (49.2%) of the participants considered their relationship stage as committed (intense feelings of love and serious plans for the future), 31.7% described it as serious (feelings of trust, attraction, love, and interdependence), 15.1% as somewhat serious (increased interaction, affection, dependence on each other), and 4% as casual (sharing superficial information, uncertain about the future of the relationship).

The LD couples on average had been geographically separated for 17.03 months ($SD = 11.22$; range = 1–40 months) and most of them were separated for school reasons (96.7%). The LD couples lived apart from each other at distances ranging from 37 to 3,981 mi ($M = 539.17$, $Mdn = 170$, $SD = 930.87$). Importantly, 7% of them could see each other FtF at least once a week, 30% two to three times a month, 30% once a month, 33% less than once a month.

Procedure

Each couple signed up for the study by providing both partners' e-mail addresses and mobile phone numbers and indicating whether it was a LD relationship. They then completed a one-time questionnaire that measured relationship characteristics and demographics (e.g., age, gender, education, ethnicity, get-up time, and bedtime). Each participant also followed a tutorial that explained how he or she should track the interactions in each medium (FtF, phone chat, video chat, texting, IM, e-mail, and social network communication). The tutorial specified that each encounter of any length in which the dating partners attended to one another, conversed, and adjusted their behavior in response to one another should be considered an interaction (Duck, Rutt, Hoy, & Strejc, 1991). Specific examples were provided defining an interaction in each medium.

To ensure the participants fully understood the tutorial, a follow-up session (by phone or through a web-based survey) was conducted to ask the participants'

judgments about nine interaction scenarios and to probe for any questions they might have. The scenarios presented on the phone and web-based surveys were identical; the only difference was on the phone they were read aloud by a research assistant but in the web-based survey they were presented in text.

Each of the seven mornings each participant received a diary survey by e-mail which asked them to report all their interactions with their partner during the coming day. Because it was crucial to retain participants and increase response accuracy, each participant received three text messages (at 12 p.m., 6 p.m., and 30 minutes before their reported bedtime) reminding them to report their interactions during the morning, the afternoon, and the evening.

Diary measures

For each interaction, the participant reported in an HTML web form the medium employed and the interaction's length, the level of self-/perceived partner disclosure, perceived partner responsiveness, and intimacy. Unless noted otherwise, all the items were measured on a 7-point scale.

Interpersonal media

The participant was asked to identify the medium by choosing one of the following: FtF, phone call, video chat, texting, IM, and e-mail. Facebook messages were categorized as e-mail due to their asynchronous and text-based nature.

Interaction length

The participant reported how long the interaction lasted by rating the length: for FtF, phone call, and video chat interactions the scale ran from 1 = less than 15 minutes to 7 = more than 1.5 hours; for texting, IM, and e-mail interactions it ran from 1 = less than 5 messages to 7 = more than 30 messages.

Self-disclosure

Two items from a previous disclosure diary study which tested the IPMI model (Laurenceau, Barrett, & Rovine, 2005) were used to assess self-disclosure: "I shared personal experience and thoughts during this interaction," and "I told my partner about my personal feelings or emotions" (Pearson's $r = .74$).

Perceived partner disclosure

Two parallel items were used to assess perceived partner disclosure: "My partner shared experience and thoughts during this interaction," and "My partner told me about his/her personal feelings or emotions" (Pearson's $r = .73$).

Perceived partner responsiveness

Three items developed by Laurenceau et al. (2005) were used to assess perceived partner responsiveness: "My partner understood what I said," "My partner gave positive comments toward what I said," and "My partner expressed caring for me during the interaction" (Cronbach's $\alpha = .82$).

Intimacy

The participants indicated how intimate they felt with their partner as a result of each interaction by rating “I feel close to my partner following this interaction.” The word “close” rather than “intimate” was used to capture the degree of psychological closeness rather than physical or sexual, proximity. Such single-item measures are normally not desirable in instruments, but it has been argued that single-item measures of intuitive concepts such as intimacy can be valid and justifiable, particularly in diary studies (Laurenceau et al., 2005).

Relationship characteristics measures

Relationship uncertainty

Twelve items from Knobloch and Solomon’s (1999) relational uncertainty scale (RUS) were adopted to quantify this. The items asked how certain the participant felt about mutual understanding, relationship definition, relationship norms, and future plans (Cronbach’s $\alpha = .92$). All the items were reverse coded to create an RUS with higher scores reflecting greater relational uncertainty.

Relationship satisfaction

Relationship satisfaction was measured with a seven-item relationship assessment scale (RAS; Hendrick, 1988). Sample questions included “how well does your partner meet your needs?” and “how satisfied are you with your relationship?” (Cronbach’s $\alpha = .85$).

Relationship commitment

Relationship commitment was measured by a seven-item commitment scale (Rusbult, Martz, & Agnew, 1998). Sample items included “I want our relationship to last for a long time,” and “I am committed to maintaining my relationship with my partner” (Cronbach’s $\alpha = .89$).

Data analysis strategy

The six interpersonal media were categorized in terms of their cue multiplicity, synchronicity, and mobility. Visual-and-audio accessible media (FtF and video chat) have the highest cue multiplicity, followed by audio-only (phone calls), and text-based communication (texting, IM, and e-mail). FtF, phone calls, and video chat were grouped as synchronous media, IM was considered semisynchronous, and texting and e-mail were asynchronous. For mobility, phone calls and texting were considered as high-mobility media; video chat, IM, and e-mail as moderate mobility media; and FtF was considered to have low mobility.

The data were organized in a hierarchical structure, with different numbers of interactions nested within each day, 7 days nested for each participant and two participants nested within each couple. As a result, all the observations in this multilevel data set had some nonzero covariance because they came from the same person’s self-report, and they were of course correlated with the partners’ reports on

the same interactions. Linear mixed modeling (LMM; Hayes, 2006), which expands the general linear model (GLM) to correlated, unbalanced data, was used to handle the interdependence among multilevel observations, with three random effects (couple, couple \times gender, and couple \times gender \times day) estimated in the modeling.

The primary analytical focus was to test the effects of LD status on behavioral adaptation and idealization across media. Following the approach of testing interpersonal adaptation and exploitation of media (Walther, 2010), we considered GC dating as the unconstrained control group, and used the differences in rates of self-disclosure between the LD and GC groups to reflect the effects of behavioral adaptation in self-disclosure. Idealization was similarly measured by an effect of LD status on relationship perceptions, but it is worth noting that this effect also controlled for behavioral carryover effects specified by the IPMI model, including the effects of self-disclosure and the partner's self-reported disclosure. Specifically, the idealization effect on perceived partner disclosure was controlled for the partner's self-report of disclosure; the idealization effect on perceived partner responsiveness was controlled for self-disclosure and perceived partner disclosure; the idealization effect on intimacy was controlled for self-disclosure, perceived partner disclosure, and perceived partner responsiveness.

Results

The participants submitted 876 diaries (six missing cases) reporting a total of 3,024 interactions, including 1,038 FtF interactions, 557 phone calls, 101 video chats, 1,090 texting interactions, 202 IM interactions, and 36 e-mail interactions. They reported an average of 3.45 interactions per day ($SD = 2.15$, range = 1–14) and typically used more than one medium. Table 1 describes the descriptive data across LD and GC groups.

As might be expected, there were several significant differences in communication patterns between LD and GC couples. On average, LD participants reported significantly fewer interactions per day than GC participants ($t = 3.45$, $p < .001$), but they reported using more mediated channels, and had more phone calls, video chats, texting interactions, and IM interactions than GC participants (in all cases, $t > 3.01$, $p < .01$). The number of e-mail interactions did not differ significantly between the two groups, $t(864) = 1.36$, $p = .18$, but both groups reported little communication via e-mail. They had lengthier FtF encounters, phone calls, video chats, and texting interactions than their GC counterparts (in all cases, Mann–Whitney's $z > 2.34$, $p < .05$); but the lengths of IMs and e-mails did not differ significantly between the two groups (in both cases, $z < 0.92$, $p > .90$). To control for the above differences, the z -scores of these interaction variables were used as covariates in the subsequent analyses. The use of smartphone did not affect any of the IPMI or interaction variables, hence was dropped from the analysis.

Any pre-existing differences in relationship characteristics that might affect the intimacy process were also analyzed. LD couples, compared with GC couples, had

Table 1 Means and standard deviations of interaction and relationship variables

| Number of interactions | LD | | GC | |
|-----------------------------------|----------|------|--------|------|
| | Mean | SE | Mean | SE |
| Total | 3.19*** | 0.09 | 3.69 | 0.11 |
| FtF | .20*** | 0.03 | 2.08 | 0.08 |
| Phone | 1.01*** | 0.06 | 0.29 | 0.03 |
| Video | .23*** | 0.03 | 0.01 | 0.00 |
| Texting | 1.39** | 0.06 | 1.12 | 0.07 |
| IM | .33*** | 0.03 | 0.14 | 0.02 |
| E-mail | .03 | 0.01 | 0.05 | 0.01 |
| Number of media used | Mean | SE | Mean | SE |
| Total (including FtF) | 1.87 | 0.04 | 1.88 | 0.03 |
| Mediated media (excluding FtF) | 1.83* | 0.04 | 1.58 | 0.05 |
| Interaction Length | Median | IQR | Median | IQR |
| FtF | 7.00*** | 5 | 5.00 | 5 |
| Phone | 2.00* | 1 | 1.00 | 0 |
| Video | 4.00** | 3 | 2.00 | 0 |
| Texting | 2.00* | 3 | 2.00 | 2 |
| IM | 5.00 | 4 | 5.00 | 3 |
| E-mail | 1.00 | 0 | 1.00 | 0 |
| Relationship characteristics | Mean | SE | Mean | SE |
| Relationship lengths (months) | 29.86*** | 2.87 | 17.11 | 2.11 |
| Relationship commitment | 6.26* | 0.13 | 5.78 | 0.14 |
| Relationship satisfaction | 6.09 | 0.13 | 5.95 | 0.09 |
| Relational uncertainty | 2.81 | 0.12 | 3.06 | 0.11 |

Note: For FtF, phone calls, and video calls, 1 = less than 15 minutes, 7 = more than 1.5 hours; for texting, IM, and e-mail interactions, 1 = less than 5 messages and 7 = more than 30 messages.

FtF = face-to-face; IM = instant messaging; LD = long-distance; GC = geographically close; IQR = interquartile range.

Asterisks indicate significant mean/media differences within each row (* $p < .05$; ** $p < .01$; *** $p < .001$).

on average been in their relationships longer, $t(124) = 3.88, p < .001$; and reported higher relationship commitment, $t(124) = 2.53, p < .05$. The two groups did not differ significantly in reported relationship satisfaction or relational uncertainty (in both cases, $t < 1.64, p > .11$). These relationship characteristics were also included as covariates in the subsequent analyses.

Interpersonal process model of intimacy

We begin the primary analysis by investigating whether the IPMI model can account for the intimacy effects in both relationship types (H_1). Figure 1b presents the results of testing the IPMI model on both LD and GC samples, with all the path coefficients (β) reported in standardized units. The mediational relation of self-disclosure \rightarrow perceived partner responsiveness \rightarrow intimacy was significant in both groups (in both cases, Sobel's $z > 5.85, p < .001$), and the other mediational relationship (perceived partner disclosure \rightarrow perceived partner responsiveness \rightarrow intimacy) also achieved significance in both groups (in both cases, Sobel's $z > 7.37, p < .001$). These data reveal that in both groups self-disclosure and perceived partner disclosures affected intimacy through the mediation of perceived partner responsiveness, suggesting that the IPMI held for both the LD and GC intimacy processes.

An additional moderated mediation analysis (Muller, Judd, & Yzerbyt, 2005) indicated that the mediational relation of self-disclosure \rightarrow perceived partner responsiveness \rightarrow intimacy was stronger for LD than that for GC participants. Perceived partner responsiveness fully mediated the effect of self-disclosure on intimacy in the LD group, while the same mediation in the GC group was only partial, which suggests that perceived partner responsiveness played a more important role in LD dating than in GC dating. Nonetheless, the IPMI model provided a good fit for explaining the relational dynamics and intimacy ratings in both GD and LD groups. The IPMI components (self-disclosure, perceived partner disclosure, and perceived partner responsiveness) accounted for 45.2 and 48.7% of the total variance in intimacy on the interaction level, respectively for GC and LD groups.¹

Intimacy enhancement in long-distance relationships

The second set of hypotheses (H_2 and H_3) predicted that intimacy enhancement would be driven by behavioral adaptation in self-disclosure and idealization in relationship perceptions. To test these predictions, four LMM analyses were performed on the four variables of the IPMI model: self-disclosure, perceived partner disclosure, perceived partner responsiveness, and intimacy, controlling for relevant covariates and any carryover effects suggested by the IPMI.

First, as expected, LD participants experienced greater intimacy ($M = 6.08, SE = 0.09$) than GC ones ($M = 5.80, SE = 0.09$) on an interaction-by-interaction basis, $\beta = 0.27, SE = .13, t(58.96) = 2.14, p < .05$, and this effect was independent of any pre-existing relationship characteristics. The next question was whether this difference could be explained by the proposed intimacy-enhancing mechanisms. Consistent with the proposed behavioral adaptation mechanism in H_2 , the effect

of LD status on self-disclosure was significant, $\beta = 0.36$, $SE = 0.13$, $t(59.54) = 2.68$, $p < .01$. LD participants ($M = 5.95$, $SE = 0.09$) engaged in more self-disclosures than GC participants ($M = 5.59$, $SE = 0.09$).

LD participants also perceived their partners to be more disclosing ($M = 5.86$, $SE = 0.07$) than GC participants ($M = 5.63$, $SE = 0.06$), $\beta = 0.22$, $SE = 0.10$, $t(119.27) = 2.31$, $p < .05$. Consistent with the proposed idealization mechanism in H₃, this effect was independent of the partners' self-reported self-disclosure, indicating that LD participants idealized their partners as more disclosing than they actually were. Notably, partner's self-reported self-disclosure also positively predicted perceived partner disclosure, $\beta = 0.24$, $SE = 0.02$, $t(1393.75) = 9.96$, $p < .001$, indicating that perceptions of partner disclosure were based to some degree on actual behavior. For the idealization of partner responsiveness, LD participants perceived their partners to be more responsive ($M = 6.16$, $SE = 0.07$) than GC participants ($M = 5.95$, $SE = 0.07$), $\beta = 0.23$, $SE = 0.10$, $t(55.54) = 2.26$, $p < .05$, but this effect disappeared after controlling for self-/partner disclosures, $t(241.39) = 1.40$, $p = .16$. This suggested that the effect of LD status on perceived partner responsiveness was driven by the effects of LD status on self-/partner disclosures. No additional idealization of perceived partner responsiveness occurred.

The test on the idealization of intimacy yielded similar results: LD participants experienced greater intimacy than GC participants as tested above, but the effect disappeared when self-disclosure, perceived partner disclosures, and perceived partner responsiveness were controlled for, $\beta = 0.04$, $SE = 0.06$, $t(61.22) = 0.61$, $p = .54$. We can therefore conclude that the greater intimacy for LD participants was driven by (a) their adaptive increase in self-disclosure behavior and (b) idealized perceptions of their partners' disclosures.

Media effects in intimacy enhancement

Two sets of interaction effects between LD status and media attributes were expected, in which behavioral adaptation and idealization should depend on the cue multiplicity, synchronicity, and mobility of the medium of communication. Figure 2 illustrates how both adaptation and idealization varied along three media attributes with Cohen's d calculated to reflect the standardized mean differences between LD and GC.

As H₄ predicted, the interaction effects of LD status and media attributes were significantly related to self-disclosure (in all cases, $F > 5.90$, $p < .01$), suggesting that self-disclosure was differentially adapted to media (see Figure 2). For cue multiplicity, the strength of adaptation (reflected as the mean differences in self-disclosure between the LD and GC groups) was greatest in text-based media (Cohen's $d = 1.09$), followed by the audio-only media (Cohen's $d = 0.87$), and the visual-and-audio accessible media (Cohen's $d = 0.43$). With fewer cues available there was greater behavioral adaptation (i.e., increased difference between LD and GC in self-disclosure). For synchronicity, adaptation in self-disclosure was significant only in asynchronous

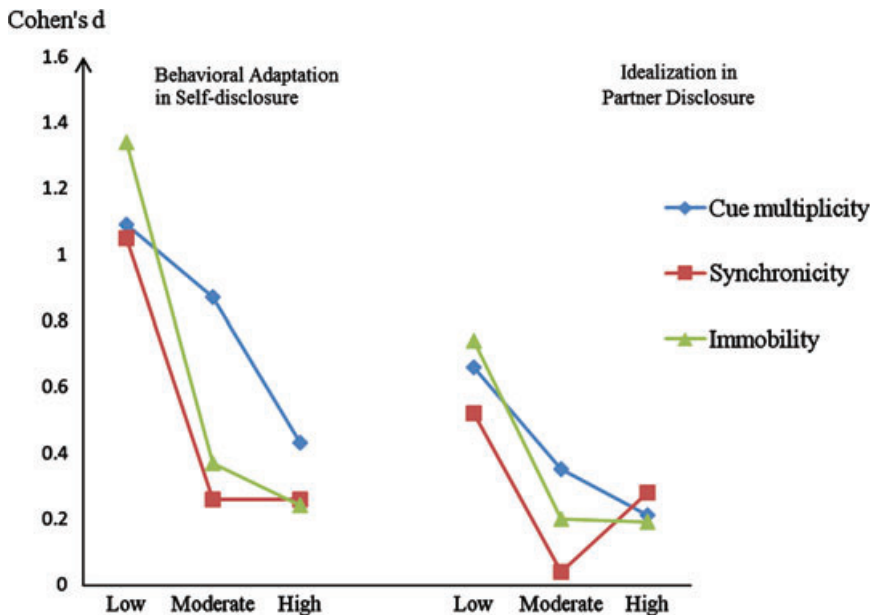


Figure 2 Behavioral adaptation and idealization a function of three media attributes. (1) The Cohen's d reflect the standardized mean differences between long-distance (LD) and geographically close (GC) groups. (2) Visual-and-audio accessible media [face-to-face (FtF) and video chat] have the highest cue multiplicity, followed by audio-only (phone calls) with moderate cue multiplicity, and text-based media (texting, instant messaging [IM], and e-mail) with the lowest cue multiplicity. (3) Synchronous media have the highest synchronicity, including FtF, phone, and video chat; semi-synchronous media include IM; asynchronous media include e-mail and texting. (4) Phone-based media (texting and phone calls) have the highest mobility, followed by computer-based media (IM, e-mail, and video chat) with moderate mobility, and FtF with the lowest mobility.

media, Cohen's $d = 1.05$, $F(1, 80.09) = 21.97$, $p < .001$; no significant adaptation was found in semi-synchronous or synchronous media (in both cases, $F < 2.88$, $p > .10$). Finally for mobility, adaptation in self-disclosure was significant only in high and moderate mobility media: for high-mobility media, Cohen's $d = 1.34$, $F(1, 71.93) = 32.13$, $p < .001$; for moderate-mobility media, Cohen's $d = 0.37$, $F(1, 219) = 7.42$, $p < .01$; no significant adaptation was found for low-mobility media, $F(1, 216) = 3.15$, $p = .08$.

In sum, cue multiplicity, synchronicity, and mobility moderated the effects of behavioral adaptation, with media that involve reduced cues, reduced synchronicity, or increased mobility producing relatively larger differences between LD and GC in self-disclosures.

Next, consider the media effect on idealization. Because significant idealization was found only for partner disclosure, the testing of H_5 was limited to demonstrating whether the idealization of partner disclosure varied with the three media attributes.

The predicted interactions of LD status with the media attributes were confirmed only for synchronicity, $F(2, 1395.17) = 3.28, p < .05$. LD couples formed more idealized perceptions about partner disclosure when communicating with asynchronous media, Cohen's $d = 0.52, F(1, 214.23) = 14.55, p < .001$; but the idealization of partner disclosure in semi-synchronous and synchronous interactions was not significant, both Cohen's $d < 0.28$, both $F > 3.86$, and $p > 0.07$. Cue multiplicity and mobility did not achieve significant interactions with LD status on perceived partner disclosure (in both cases, $F < 0.98, p > .38$); however, the patterns of Cohen's d roughly aligned with the prediction of text-based and high-mobility media producing relatively large idealization (see Figure 2).

In sum, media attributes did not play a strong role in idealization differences across the two relationship types. The study provided some evidence that media that involve reduced cues, reduced synchronicity, or increased mobility produced relatively larger idealization on perceived partner disclosures.

Discussion

The purpose of this study was to examine how LD status and communication media affect the intimacy process on an interaction-by-interaction basis. Although LD relationships are now maintained with a mix of interpersonal media, there has been little published research on LD intimacy and mixed-mode communication.

The results of this study offer three main theoretical contributions to understanding LD relational processes and mixed-mode communication. First, this study provides the first empirical support for the central tenets of the IPMI model in the LD context, and the results also suggest that LD status magnifies the mediating effects of perceived partner responsiveness.

Second, these data replicate and extend previous cross-sectional research on LD relational stability, satisfaction, and trust by demonstrating that LD couples generally experience greater intimacy than GC couples when examined on an interaction-by-interaction basis. This diary approach revealed that this intimacy effect can be explained by an intimacy-enhancing process in which LD daters increase self-disclosures and idealize their partner's disclosures, leading ultimately to more intimacy.

Third, the study also explored the role of interpersonal media in ongoing relationships that take place in GC and distant contexts. The results suggest that the medium can affect the strength of behavioral adaptations and, to a lesser extent, idealization, in LD interactions. While these findings are consistent with the media effects predicted by traditional CMC theories, they also suggest some new directions for future research. The following sections consider each of these contributions in turn.

Extending the IPMI to long-distance dating

The results indicate that the IPMI framework, although mostly used to explain and predict intimacy in co-present relationships, can sufficiently capture the intimacy

dynamics in distanced relationships as well. The self-disclosure → perceived partner responsiveness → intimacy process was found to be stronger for LD than for GC couples, suggesting that relative to GC daters, the intimacy LD daters experience is more dependent on the perceptions of being understood, validated, and cared for by their partners.

The more important role of perceived partner responsiveness in LD relationships aligns with previous research on the rewards and incentives associated with maintaining LD relationships (Johnson, Haigh, Craig, & Becker, 2009). People receive different benefits from LD and GC relationships, which provides reasons for maintaining both of them. LD friends focus more on mutual understanding and trust while GC friends value practical help and consider “being there when needed” an important feature of close friendship (Fehr, 2004).

Intimacy in long-distance dating

Previous studies have consistently documented that LD dating relationships can equal or even exceed the relationship satisfaction and trust that occur in GC dating relationships, but there has been limited research explaining how such positive results are created through day-to-day communication. By obtaining repeated self-reports from both LD and GC couples over a week, the study offers novel evidence about the intimacy enhancement effect. It bears noting that this effect was independent of any pre-existing relationship characteristics such as relationship length, relationship satisfaction, or relationship commitment. Hence, the possibility that pre-existing conditions drive the relational positivity can be ruled out.

More importantly, by drawing on the IPMI framework, this study introduces a process-based framework with explanatory power for understanding and predicting how intimacy is enhanced in LD dating. While previous research treats relational idealization as a state of LD relationships associated with infrequent FtF communication (Stafford & Merolla, 2007), this study revealed a dynamic process that produces idealization. Specially, LD partners strategically oriented their restricted communication to be more disclosive, and the proportional increase of positive interactions further led to more idealized perceptions of partner disclosures. The findings thus lend new support to the behavioral idealization mechanism, which argues that idealization is driven by over-interpretation of the selective self-presentation in restricted communication (Stafford & Merolla, 2007).

The results also indicated that idealization was not a uniform effect across all three relational perceptions. Instead, LD participants idealized only their partners' disclosure behaviors, but this idealization subsequently affected other relationship perceptions, such as perceived partner responsiveness and intimacy. These data suggests it is over-simplistic to assume idealization operates in the same manner for all relational perceptions. Clearly, more research is required to understand how LD partners cognitively recognize and restore positive interactions in the face of intensification biases.

The diary method that accompanies the use of the IPMI also provided insight into the operation of these mechanisms at the level of individual social interactions, allowing for the discovery that in addition to disclosing more, LD couples also adapted their use of mediated communication. While LD couples indeed have fewer interactions overall than GC couples, LD couples relied more on mediated interactions (except for e-mail) and lengthier calls, video chats, and texting, suggesting another behavioral adaptation effect where restraints on the frequency of communication are made up for by more frequent and longer mediated interactions.

The role of interpersonal media in intimacy enhancement

The current investigation extends prior CMC theorizing of adaptation and idealization to the mixed-mode setting. The results provide strong evidence that behavioral adaptation in self-disclosures increases as the communication medium became more text-based, asynchronous, and mobile. The medium affects the strength of idealization to a lesser extent, with text-based, asynchronous, and mobile interactions consistently producing relatively large idealizations on perceived partner disclosure. These findings align with previous findings that when interactions move from FtF to a text-based, asynchronous environment the need for interpersonal exchange activates adaptive communication behavior such as selective self-presentation and uncertainty-reducing strategies (Tidwell & Walther, 2002; Walther, 1996). The text-based, asynchronous environment also leads to intensified, usually idealized interpersonal perceptions such as over-attributions (Walther, 1996).

The present research suggests that such adaptation and idealization effects may extend to other constrained media situations, for example, situations in which individuals have very limited time to communicate between scheduled activities. Mobility supports interstitial interactions, for instance texting or calling while using public transportation or waiting in line at the supermarket. As shown in this study, increased mobility produced larger differences in self-disclosures between LD and GC couples, further leading to more intimacy in LD dating. This observation highlights that interpersonal media must be conceptualized in ways beyond their technical properties to understand how media support relationships and their intimacy. Mobility is able to capture some gratification concerns that arise from a mixture of time, space, and social constraints (Dimmick et al., 2011). For instance, it enables exploiting gaps in daily routines for which other media are unavailable or inappropriate.

Limitations

These findings are encouraging, but several limitations of the study need to be acknowledged. First, the study protocol disallows making any assertions about causal relationships among intimacy components over time. The IPMI model should theoretically be self-perpetuating with repeated interactions over time, but a week's study period may not have been sufficient to demonstrate this. Another methodological issue is that participation likely led the respondents to become more

self-aware of their communication behavior, so their self-reports may not reflect their normal interactions. Last but not least, the sample of tech-savvy college students may limit the generalizability of the conclusions. LD couples vary drastically in terms of relationship stage, reasons for separation, miles apart, and communication patterns (Merolla, 2010), hence caution is needed when generalizing the results to other LD couples. For example, marriage may have less fluctuation in the intimacy dynamics compared to dating relationships. Military couples separated by deployment may have much less communication opportunities, and social networks may play a more important role in the maintenance process. Future research must address the issue and examine how the intimacy process may operate differently across a wider range of LD relationships.

Conclusions

These results contribute to our understanding of how close relationships are maintained at a distance using a variety of interpersonal media in a few important ways. They provide a more dynamic analysis of daily romantic interactions than has been available previously, and they also offer an extension to the IPMI model to the context of LD romantic relationships. The study has revealed the process by which intimacy is enhanced in LD romances and explained how concurrent cognitive and communication processes operate differently in different media. This type of descriptive work helps map out the nuances of mixed-mode, everyday communication at a time when more of our relationships are at a distance and are maintained using various interpersonal media.

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Note

- 1 The variance explained by the IPMI components was calculated by comparing the residual variance (σ^2) of LMM models with/without the IPMI predictors (Hayes, 2006). One minus the ratio of the two variance estimates stands for the variance attributable to the addition of the IPMI predictors.

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