Interpersonal Media and Face-to-Face Communication: Relationship with Life Satisfaction and Loneliness

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Abstract
Framed by need to belong theory, this study considers the role of communication modality, geographic proximity, and the number of close relationship partners to predict life satisfaction and loneliness. A quota sample of American adults (N=1,869) completed four name generation tasks to identify up to 16 alters, resulting in four alters per participant (n=7,471). Participants reported the frequency with which they communicated with each alter in the past year in person and through eight interpersonal media. Results suggest that number of relationship partners and frequency of face-to-face interaction were robust predictors of life satisfaction and loneliness. Those living alone faced significant threats to well-being. Video chat and voice call frequency were also associated with greater life satisfaction. Mediation analyses showed voice call frequency was indirectly associated with less loneliness through greater relationship maintenance satisfaction, while lean media was indirectly associated with greater loneliness through relationship maintenance frustration.

Keywords interpersonal media · life satisfaction · loneliness · need to belong

1 Introduction
Several theoretical frameworks reinforce the importance of social relationships in promoting human flourishing (e.g., Baumeister & Leary 1995; Deci & Ryan, 2000). Across 123 countries, once people’s basic needs are met (i.e., shelter, food, security), the degree to which their social needs are met is the best predictor of life satisfaction (Tay & Diener, 2011). This begs the question; how do people get their social needs met? The need to belong theory (Baumeister & Leary, 1995) proposes that people need relationship partners and opportuni-
ties to socialize with them. Many studies demonstrate that having close relationships and socializing with close friends and family are positively associated with life satisfaction (van der Horst & Coffe, 2012) and lower loneliness (Burholt et al., 2020; Hall & Merolla, 2020). Past research has focused primarily on the association between face-to-face (FtF) interactions and well-being. Throughout the world, mobile and social media have transformed the number of channels through which people can communicate. To better reflect the modern media landscape, research should explore which types of interpersonal media (e.g., voice calls, text messaging) can meet individuals’ social needs and improve well-being (Hall & Merolla, 2020; Liu et al., 2019).

Drawing from need to belong theory, the present investigation will address the degree to which life satisfaction and loneliness are associated with the number of close relationship partners and the frequency of interacting with them. Additionally, it will examine the relative value of geographically close (i.e., in-home) and geographically distant partners in relation to the benefits of interpersonal media use. This research will examine the degree to which interpersonal media are associated with relationship maintenance, reflecting the multi-modal nature of modern relationships (i.e., people use several modalities to communicate with close partners) Hall, J. A. (2020). The present manuscript will argue that the degree to which media are satisfactory and not impediments for maintaining relationship helps to account for their negative association with loneliness. Thus, the overarching research questions of this manuscript are, to what degree do the modality of communication (i.e., FtF vs. online), the geographic proximity, and the number of close relationship partners predict life satisfaction and loneliness?

2 Need to Belong

Need to belong theory posits that humans have a fundamental need to connect (Baumeister & Leary, 1995). Self-determination theory also sees the relatedness need as a central psychological component of well-being (Deci & Ryan, 2000). In both perspectives, satisfying the need to relate to others is fundamental to human thriving. The importance of belonging is also evidenced in the context of lack of belonging, which is associated with adverse outcomes: emotional distress, weakened immune system, depression, and compromised mental well-being (Baumeister & Leary, 1995; Hall & Merolla, 2020; Holt-Lundstad, 2021; Teo et al., 2015). According to theory, a lack of belonging is a form of deprivation caused by the absence of either relationships or sufficient opportunities to socially interact. Therefore, it follows that both the frequency of interaction and the number of relationship partners should be independently associated with well-being (Lucas & Dyrenforth, 2006). Each is a component of satisfying an essential human need; when either is absent, people cannot fully thrive (Hall & Merolla, 2020).

3 Interpersonal Media and Access to Relational Partners

Although no single theoretical perspective explains how interpersonal media use and FtF communication function in tandem, the social ecology perspective suggests the effects of mediated communication must be considered in conjunction with the presence of and access...
to relational partners Hall J. A. (2020). Although new technology research often focuses on one medium at a time (e.g., text messaging, video chat), most relationships, especially close relationships, are multi-modal (i.e., people use several media to communicate in their relationships) (Tillema et al., 2010; van den Burg et al., 2012). Hall J. A. (2020) summarizes these perspectives in three components: (1) Individuals have an innate need to belong that can be satisfied through social interaction, including mediated communication; (2) The presence of and access to relational partners both play a role in explaining interpersonal media use; (3) FtF communication and interpersonal media vary in their ability to satisfy belongingness needs. Therefore, the frequency of interpersonal media and access to relationship partners – both components of the need to belong – must be understood together.

Although research suggests that interpersonal media vary in their association with global well-being (Burholt et al., 2020; Liu et al., 2019; Teo et al., 2015), there have been consistent empirical findings that FtF interaction frequency explains more variance in global well-being than the frequency of mediated communication. Compared to contact by phone calls or email, FtF contact is more strongly associated with subjective well-being (van der Horst & Coffe, 2012) and lower depression (Teo et al., 2015). In a representative sample of Americans, the amount of FtF time with friends and family both predicted higher life satisfaction and lower loneliness, but the amount of contact via email and other internet-based modalities showed no such relationships (Stepanikova et al., 2010). Similar results were found in a representative sample of Canadians, where the number of offline friends had a positive association with life satisfaction and happiness, but the number of online friends did not (Helliwell & Huang, 2013). Most studies do not consider geographic access to relationship partners when testing these associations.

Consistent with need to belong theory and the social ecology perspective, mediated communication can be considered as compensating for what people lack in their local environment. Once people no longer share FtF routines, such as when a young adult moves out of their family home, families must compensate for the lack of access by using interpersonal media Hall J. A. and Woszidlo, A. (2021). The geographic proximity of close relatives facilitates more frequent FtF contact, which promotes more social integration (Burholt et al., 2020). The lack of relational partners at home appears to increase both FtF and mediated communication outside of the home (Sarkisian & Gerstel, 2016) and is associated with having a larger social network (Helliwell & Huang, 2013). Indeed, having a partner in the home is associated with decreased communication with others outside of the home (van den Berg et al., 2012). The social ecology perspective Hall, J. A. (2020) would suggest that FtF relationships outside of the house are more important for single, widowed, or divorced individuals’ well-being (Helliwell & Huang, 2013). These studies suggest that the presence or absence of relational partners – both geographically and in a structural sense (e.g., having friends) – play a role in whether people get their social needs met and when and why they use interpersonal media.

Burholt et al., (2020) is one of few studies that considers access to close partners in conjunction with FtF contact and mediated communication. For older adults, voice calls and texting/email compensate for the lack of FtF communication with friends and family outside the house. Specifically, the loss of FtF contact was less deleterious for older adults who frequently used interpersonal media to keep in touch (Burholt et al., 2020).

For people who live together, however, interpersonal media are complementary rather than compensatory. A well-established pattern of interpersonal media use is that closer rela-
tionship partners communicate through multiple modalities Hall, J. A. (2020). Research on family communication suggests that mediated communication is only a small part of the whole of communication Hall, J. A. and Woszidlo, A. (2021). For example, the Pew Research Center (Lenhart & Duggan, 2014) reported that 72% of married couples reported that the internet had “no real impact at all” on their relationships. Thus, when the frequency of interpersonal media use is measured in isolation, without accounting for FtF access, it is likely misattributing the benefit of mediated contact because FtF and interpersonal media communication frequency strongly covary Hall, J. A. (2020). This suggests two hypotheses:

**H1:** The association between mediated interaction frequency and well-being (i.e., life satisfaction, loneliness) should be weaker after FtF frequency is taken into account.

**H2:** Mediated and FtF communication frequency with friends and family should have a stronger association with well-being (i.e., life satisfaction, loneliness) for individuals who live alone than for people who live with others.

### 4 Interpersonal Media and Well-Being

A recent meta-analysis (Liu et al., 2019) shows that interpersonal media vary in their association with global well-being. The frequency of voice calls shows a weak but positive association with well-being ($k=9, r=.10$). This association is similar in size to associations between well-being and FtF contact frequency found in the General Social Survey (Lucas & Dyrenforth, 2006). However, Liu et al., (2019) caveat their meta-analytic findings, pointing out that effect sizes may be conflating partner choice with modality. People tend to use specific media (e.g., voice calls) with closer relationship partners and other media (e.g., online games) with more distant relationship partners (Liu & Yang, 2016). Thus, correlational studies often conflate media usage with relationship partner closeness by measuring media use without accounting for partner closeness. Therefore, while online gaming, email, social media engagement, and online groups have demonstrated null or trending-negative associations with well-being (Liu et al., 2019), this may be because of more frequent contact with less emotionally close others, compared to closer others, is of lesser value to well-being. Few studies e.g., Hall, J. A. (2020) have focused on media use controlling for relational partner closeness, and none have concurrently accounted for geographic access to the partner.

By not accounting for FtF access to relational partners, past research has not considered the full range of factors impacting media’s effect on well-being. Arampatzi et al. (2018) suggest that social networksites (SNS) do very little for happiness compared to “real-life” social interactions but did not account for how participants may have been using these SNSs or with whom. The connection between mediated communication and well-being could be more clearly established if individual and relational characteristics were accounted for. Although media can promote well-being in a relational context, it depends on how they are used Hall, J. A. (2020).

Relational maintenance scholarship has addressed how and why people use media with different relationship partners, often concluding that it offers a sense of connection to close others when FtF access is limited (Ruppel et al., 2018; Sharabi et al., 2019). Holtzman et al. (2021) found that texting can offer unique benefits for long-distance romantic relationships...
that are not apparent in geographically close romantic relationships. Mediated communication fulfills a crucial maintenance function for close partners when physically separated. People who greatly increased mediated communication in the beginning of the pandemic reported significantly more closeness to friends and family compared to those who did not (Lee et al., 2022). Therefore, we propose the final hypothesis:

\[ H3: \text{The relationship between mediated communication and loneliness will be mediated by the degree to which individuals feel satisfied or frustrated with relational maintenance.} \]

5 The Year Following the Outbreak of COVID-19

The data for this study were collected in early May of 2021, and participants reported on the frequency of contact in the past year. In this timeframe, the COVID-19 pandemic had dramatically influenced most people’s social lives for 14 months. In response to the anxiety of the pandemic, many people felt lonelier and wished for more social contact when they were alone (Merolla et al., 2021). Consequently, people increasingly turned to interpersonal media to keep in touch with friends and family. In April of 2020, 87% of U.S. adults reported that internet communications were necessary, with 53% reporting that such forms of communication were essential Auxier, B. (2020). In the first few months of the pandemic, basic mobile functionality, voice calls and texting, were the most used and most important forms of communication for keeping in touch with friends and family outside of the house (Hall et al., 2021; Lee et al., 2022). Nonetheless, there is mixed research regarding the extent to which these modalities promote connection and satisfy the need to belong.

The value of interpersonal media in promoting well-being depends on two intertwined concepts: geographic access to important others and the frequency of FtF interaction. People’s social lives varied considerably during the pandemic. For those sheltering in place with close family or romantic partners, more frequent FtF contact with loved ones may have served as a protective buffer (Hall et al., 2021; Merolla et al., 2021). For others, such as single adults living alone, the lost FtF connection may have been irreplicable. In March 2020, most Americans (64%) believed that the internet and phone calls would not be adequate substitutes for in-person interactions Auxier, B. (2020). Lack of social interaction opportunities and few relational partners could create belonging need deprivation (Baumeister & Leary, 1995) and, thus, less well-being.

During the shelter-in-place period, mediated communication, particularly voice calls and email, may have compensated for some lost opportunities for FtF interaction (Hall et al., 2021; Lee et al., 2022). Nonetheless, FtF communication was more strongly associated with lower loneliness and social need satisfaction than interpersonal media communication (Hall et al., 2021). As the pandemic carried on from May 2020 to May 2021, people returned to their social lives to varying degrees. Research on individuals’ social experiences in the wake of the pandemic is needed to understand how this period affected individuals’ social habits and well-being. The present investigation focuses on the year following those early months of relational and personal disruption to understand what patterns of communication, both
FtF and mediated, with Americans’ closest relational partners are associated with participants’ loneliness and life satisfaction. Thus, we offer this final research question:

*RQ1: Accounting for the frequency of FtF communication, will there be differences among eight forms of interpersonal media in terms of their association with life satisfaction and loneliness?*

### 6 Method

#### 6.1 Procedures

From April 21 to May 3 of 2021, a representative panel of American adults was surveyed (*N*=2,008) by the Siena College Research Institute through Lucid. This company maintains a quota sample of American adults that proportionally reflects the country’s population based on age, sex, political affiliation, region of the country, and race and ethnicity. All measures were completed via an online survey, and Lucid compensated participants in a manner consistent with the terms of their agreement. The IRB of the authors’ university approved these procedures.

The survey started with four name generation tasks to identify participants’ personal network. This method required participants to fill in the first name or initials of their discussion partners, core network, interaction partners, and sources of instrumental aid (see below). Participants’ responses were screened for suspicious responses and bot detection. Participants were deleted listwise if all the names they generated met any of the following conditions: listing numbers instead of names, famous people’s names or homophones of them (e.g., Jo Byden), repeated words instead of names (e.g., like, like, like; yes, yes, yes), and repeated sequences instead of names (e.g., mr, mrs, ms; good, better, best; x, y, z). Participants were flagged but not deleted if it was unclear if they met the above criteria. This flagging was used in conjunction with other criteria to further check data quality.

Participants began each name generation task by answering a yes/no question about having four types of relational partners (see below). If they indicated “yes” but then left the open-ended boxes blank or wrote “no,” “N/A,” or “none” and provided no other information about this person, their “yes” response was reverted to a “no.” However, such participants were flagged if they responded to two or more (out of four) name generation tasks in this inconsistent fashion. Finally, participants were flagged if they completed the survey in three standard deviations below the mean completion time or if they responded with the same, non-midpoint response to two items that were positively and negatively worded from the same scale. Participants with two or more flagged responses were deleted listwise (*n*=139).

#### 6.2 Participants

Among the final sample (*N*=1,869), 46.2% identified as female, 53.1% as male, and 0.6% identified as transgender male or female, non-binary, or by filling in an “other” fill-in-the-blank box. The mean age of participants was 47.5 years old (*SD*=17.58, range=18–93, *mdn*=47). Participants identified as many race and ethnicity categories as they wanted:
74.8% identified as White, 11.0% as Black/African-American, 7.1% as Latino/a/x/Hispanic (of any race), 6.6% as Asian-American, 1.9% as Native-American, 0.2% as Pacific Islander, 0.2% as Mixed Race, and 0.7% identified as an “other” race or ethnicity. Six percent of participants did not choose a race or ethnicity. Participants indicated their completed years of education income on a 7-pt ordinal scale from 1 = did not complete high school to 7 = completed advanced degree. The modal level of education was high school graduate (34.9%), the median was having completed “some college” (13.4%). Additionally, 10.2% were currently seeking an associates or bachelor’s degree. Participants indicated their household income on a 12-pt ordinal scale that increased in increments of $10K up to $100K, with the final two categories representing a larger range: $100-150K and more than 150K. Income was bimodally distributed: $20,000–29,999 (12.3%) and $100,000-$149,999 (14.4%) with a median of $50,000-$59,999. Participants were primarily married or engaged (47.4%) or single (28.4%), with fewer in a committed dating relationship, but not engaged or married (7.7%). Others indicated they were divorced (9.7%), widowed (5.2%), or separated (1.1%). Most participants (61.4%) had no children under 18 at home. 25% of participants lived alone. Most participants were currently employed (54.4%), of which 77% were employed full time. Of those who were not currently employed, 51.1% were retired, 25.7% were unemployed, 7.2% were full-time caregivers, 6.8% were full-time students, 6.1% were on disability, and 3.2% listed an “other” situation. See supplemental materials for participant characteristics.

6.3 Measures

After consenting to participate and completing demographic measures, participants were asked to complete four name generation tasks. (i) Participants were asked to generate the first name or initials of up to five members of their discussion network using the following prompt: “From time to time, most people discuss important matters with other people. Looking back over the last year, do you have at least one person with whom you discussed matters that are important to you?” (Marsden, 1987, p. 123). Then, (ii) participants were asked to generate the first name or initials of up to five members of their core network using the following prompt: “Now let’s think about people you know in another way. Looking back over the last year, did you have at least one person who was especially significant in your life that you haven’t mentioned?” (Hampton et al., 2011, p. 140). Then, (iii) participants were asked to generate the first name or initials of up to three members of their interaction network using the following prompt: “Are there people you have regular and meaningful interactions with that you haven’t mentioned?” This prompt was developed for the present investigation to capture ties that are frequent communication partners, but not necessarily significant or those with whom they discuss important matters. Finally, (iv) participants were asked to generate the first name or initials of up to three members of their help network using the following prompt: “If you need help (e.g., figuring out a problem, to complete an odd job at home, or to lend a hand), do you have at least one person who can you ask that you haven’t mentioned?” This final question was modified from the name generator task used by Mollenhorst et al., (2014).

These four name generators were developed to achieve specific goals. This study intended to identify members of individuals’ personal network of intimates, which theoretically includes 12–15 members Hall, J. A. (2020). Thus, 16 possible names could be
generated. Using at least two name-generation tasks increases the likelihood of identifying ties that may not be otherwise reported (Bell et al., 2007; Merluzzi & Burt, 2013). Asking participants to think about specific behaviors shared with others (e.g., help network) aids in recall (Bell et al., 2007; Mollenhorst et al., 2014). The goal of the present study was to develop a network of close relationship partners, not just a discussion or help network, thus core network generators are useful (Hampton et al., 2011; Marin, 2004; Merluzzi & Burt, 2013). Repeatedly reminding participants to only write names they have not already listed reduces participant burden.

For each person listed, from this point forward identified as an alter, participants then reported the approximate age, sex, geographic distance, and relationship with the participant from a list of options: romantic partner, spouse, father/step-father, mother/step-mother, child/step-child, sibling (e.g., brother or sister), grandparent, best friend, friend, neighbor, workmate, other family tie (e.g., cousin, uncle, aunt), other. In total, participants had an average of 4.00 members in their network (range 0–16, $SD=3.17$, $mdn=3$, $mode=3$). One hundred and eleven respondents (5.9%) listed no one.

For each alter, participants were then asked to identify the frequency of communication with eight interpersonal media (i.e., voice call, video chat, email, texting or DM, person-to-person media sharing, social media engagement, online groups, online gaming) and frequency of FtF communication. This list was developed in consultation with past typologies of distinct communication modalities to be mutually exclusive and exhaustive Hall, J. A. (2020; Tillema et al., 2010; van den Berg et al., 2012). For each alter and each modality, participants responded using the following ordinal scale: 9=several times a day, 8=daily, 7=few times a week, 6=weekly, 5=every other week, 4=once a month, 3=a few times a year, 2=once in the last year, 1=never. Mean frequencies were calculated by summing modality frequency across all alters, then dividing by total number of alters.

Loneliness was measured using three items identified by Hughes et al., (2004) on a three-point scale (1=Hardly ever, 2=some of the time, 3=often). The scale was reliable ($\alpha=0.84$), and the three items were combined into a mean score.

Life satisfaction was measured using the five-item scale from by Diener et al., (1985) on a seven-point Likert type scale. The scale was reliable ($\alpha=0.92$), and the five items were combined into a mean score.

Relational maintenance was measured using two items. Satisfaction was measured using one item: “In the past year, I am satisfied by how well I have maintained my close relationships.” Frustration was measured using one item: “In the past year, maintaining my close relationships has been difficult and frustrating for me.” Both items were evaluated on a seven-point Likert type scale.

7 Results

Eight OLS regressions using block entry were conducted (see Table 1). Block 1 reports the associations with control variables, and suggests that participant age, income, and education are significantly associated with loneliness and life satisfaction. To construct a dummy code for race/ethnicity, participants who only indicated one race category were coded with that race, and those who indicated multiple races were recoded as multiple races. Ethnicity (Hispanic/Latino/a/x) was treated as a separate category for analyses. Loneliness was
negatively and life satisfaction was positively associated with the number of alters (Block 2). To test H1, Block 3 of Table 1 shows the results of stepwise regression for the eight forms of mediated contact. The number of voice calls was a negative predictor of loneliness, while more frequent text/DM was associated with greater loneliness ($\Delta R^2 = 0.003$). As predicted by H1, once the frequency of FtF communication was considered (Block 4), the association between voice calls and loneliness was no longer significant. The stepwise regression showed that voice calls and video chat frequency were positively associated and text/DM frequency was negatively associated with life satisfaction ($\Delta R^2 = 0.063$). In Block 4, multiple regression was used to account for the frequency of FtF communication with the interpersonal media. The frequency of FtF communication was a predictor of both life satisfaction ($\Delta R^2 = 0.009$) and loneliness ($\Delta R^2 = 0.017$), accounting for both frequency of mediated communication and total number of alters (Block 4). Supporting H1, once FtF was taken into the association between voice calls and life satisfaction was no longer significant. Finally, after mediated and FtF contact frequency were included, the number of alters was still associated with life satisfaction but not loneliness.

To further test H1 and provide evidence to answer RQ1, the bivariate associations without accounting for FtF communication frequency and the partial correlations once accounting for FtF communication frequency are reported on Table 2. Nearly all the eight forms of mediated contact were positively associated with life satisfaction and negatively associated with loneliness, even after accounting for FtF contact. These results contrast those presented in Table 1 Block 4, which suggest that after accounting for all forms of communication at once, only a few remained significant predictors. The results showed evidence in opposition to what was predicted in H1. Although the associations between life satisfaction and mediated communication declined consistently after taking FtF frequency into account (as predicted in H1), the associations between loneliness and mediated communication frequency were stronger after taking FtF contact into account.

Table 3 reports eight OLS regressions to test H2, focusing on alters who lived outside of the house. Results demonstrate that living alone was a consistent predictor of loneliness and life satisfaction, confirming the importance of in-home access to at least one person (Block 1). The results of Block 2 suggest that having more close relationships was associated with lower loneliness ($\Delta R^2 = 0.002$) and increased life satisfaction ($\Delta R^2 = 0.007$) beyond the variance accounted for by having at least one other person in their home. The results reported in Block 3 suggest that more voice calls and video chats with close others outside of the home were both positively associated with life satisfaction, but text/DM was negatively associated with life satisfaction ($\Delta R^2 = 0.063$). These associations were still present for life satisfaction after accounting for FtF contact with friends and family outside of the home (Block 4). However, the results reported in Block 4 regarding loneliness demonstrate evidence contrary to H2. Once accounting for FtF contact, which was negatively associated with loneliness, voice call and text/DM contact with those outside of the home were positively associated with loneliness.

The results reported on Table 3 explored the associations between interpersonal media frequency and outcomes, controlling for living alone and outside of the home FtF contact. H2 suggested a moderated relationship, wherein the communication frequency would be more strongly related to well-being (i.e., life satisfaction, loneliness) for individuals who live alone than for people who live with others. Drawing from the results reported on Table 3, moderation analyses were conducted to compare the associations between video...
| Block        | Loneliness | Life Sat. | Loneliness | Life Sat. | Loneliness | Life Sat. | Loneliness | Life Sat. |
|--------------|------------|-----------|------------|-----------|------------|-----------|------------|-----------|
| Male         | \(-.06 (.03)\) | \(.07 (.02)\) | \(-.06 (.03)\) | \(.08 (.07)\) | \(-.06 (.03)\) | \(.02 (.07)\) | \(-.06 (.03)\) | \(.00 (.07)\) |
| Trans/Non-binary | \(.09 (.21)\) | \(-.41 (.45)\) | \(.09 (.21)\) | \(-.41 (.45)\) | \(.05 (.21)\) | \(-.40 (.44)\) | \(.08 (.21)\) | \(-.44 (.44)\) |
| Age          | \(-.008 (.001)\)** | \(.005 (.002)*\) | \(-.007 (.001)\)** | \(.006 (.002)*\) | \(-.006 (.001)\)** | \(.012 (.002)** | \(-.006 (.001)\)** | \(.013 (.002)** |
| Black/African-American | \(-.03 (.05)\) | \(.05 (.12)\) | \(-.03 (.05)\) | \(.04 (.11)\) | \(-.03 (.05)\) | \(-.02 (.11)\) | \(-.06 (.05)\) | \(.02 (.11)\) |
| Asian-American | \(-.11 (.06)\) | \(-.01 (.14)\) | \(-.11 (.06)\) | \(-.01 (.14)\) | \(-.11 (.06)\) | \(-.14 (.14)\) | \(-.12 (.06)\) | \(-.11 (.14)\) |
| Native American | \(-.14 (.15)\) | \(-.13 (.33)\) | \(-.14 (.15)\) | \(-.15 (.33)\) | \(-.14 (.15)\) | \(-.16 (.32)\) | \(-.15 (.15)\) | \(-.15 (.32)\) |
| Pacific Islander | \(.32 (.38)\) | \(-.98 (.82)\) | \(.34 (.38)\) | \(-.88 (.82)\) | \(.37 (.37)\) | \(-1.15 (.79)\) | \(.38 (.37)\) | \(-1.19 (.79)\) |
| Multiple Race | \(.04 (.10)\) | \(-.41 (.22)\) | \(.04 (.10)\) | \(-.40 (.22)\) | \(.04 (.10)\) | \(-.33 (.21)\) | \(.02 (.10)\) | \(-.29 (.21)\) |
| No race identified | \(.06 (.13)\) | \(-.25 (.29)\) | \(.06 (.13)\) | \(-.23 (.29)\) | \(.06 (.13)\) | \(-.15 (.28)\) | \(.02 (.13)\) | \(-.07 (.28)\) |
| Latino/a/x/Hispanic | \(-.11 (.12)\) | \(.14 (.27)\) | \(-.12 (.12)\) | \(.10 (.27)\) | \(-.12 (.12)\) | \(.02 (.26)\) | \(-.09 (.12)\) | \(-.05 (.26)\) |
| Education     | \(.02 (.01)*\) | \(.05 (.02)*\) | \(.02 (.01)\) | \(.05 (.02)*\) | \(.02 (.01)\) | \(.04 (.02)\) | \(.02 (.01)\) | \(.04 (.02)\) |
| Income        | \(-.02 (.01)*\) | \(.13 (.01)**\) | \(-.02 (.01)*\) | \(.13 (.01)**\) | \(-.02 (.01)*\) | \(.11 (.01)**\) | \(-.01 (.01)*\) | \(.11 (.01)**\) |
| Employed=1    | \(-.01 (.04)\) | \(-.02 (.08)\) | \(-.02 (.04)\) | \(-.04 (.08)\) | \(-.02 (.04)\) | \(-.13 (.08)\) | \(-.01 (.04)\) | \(-.13 (.08)\) |
| Number of Alters | \(-.012 (.005)*\) | \(.04 (.01)**\) | \(.01 (.01)\) | \(.03 (.01)*\) | \(.01 (.01)\) | \(.03 (.01)*\) | \(.01 (.01)\) | \(.03 (.01)*\) |
| Mean Voice Calls | \(-.01 (.00)*\) | \(.07 (.02)**\) | \(-.01 (.01)\) | \(.07 (.02)**\) | \(-.01 (.01)\) | \(.03 (.02)\) | \(.02 (.00)*\) | \(-.07 (.02)*\) |
| Mean Texting  | \(.02 (.00)*\) | \(-.05 (.02)**\) | \(.02 (.00)*\) | \(-.05 (.02)**\) | \(.02 (.00)*\) | \(-.07 (.02)*\) | \(.02 (.00)*\) | \(-.07 (.02)*\) |
### Table 1 (continued)

|                      | Block One | Block Two | Block Three | Block Four |
|----------------------|-----------|-----------|-------------|------------|
| Mean Video Chat      | .15 (.02)** | .14 (.02)** |
| Mean Face-to-Face    | −.05 (.01)** | .08 (.02)** |
| R-squared            | .045 | .135 | .048 | .142 | .051 | .205 | .068 | .214 |

Notes: * p<.01, ** p<.001, Reference group White, Non-Latinx, Female; Block 3 used step-wise regression and only reports the media with significant associations.
J. A. Hall et al. chat, texting/DM, voice calls, and FtF communication and the two outcomes by living alone using the PROCESS macro for SPSS. To avoid inflating Type 1 error, two models (i.e., life satisfaction, loneliness) were estimated using additive moderation (i.e., FtF, voice, video, text simultaneously). There was no evidence of a moderated effect: the associations between outcomes and three interpersonal media and FtF frequency were similar for both those who lived alone and those who did not.

Three separate parallel mediation models were run to test H3 using the PROCESS macro (see Table 4). Controlling for FtF communication frequency, age, and income, three models tested the relationship between media use (i.e., voice calls, texting, lean media) and loneliness mediated by maintenance satisfaction and maintenance frustration. Each model explained a significant portion of the variance in loneliness (voice calls: $R^2 = 0.027, p < .001$; texting: $R^2 = 0.027, p < .001$; lean media: $R^2 = 0.027, p < .001$). Controlling for maintenance frustration, maintenance satisfaction significantly mediated the effect of voice calls on loneliness ($b = -0.010$). Controlling for maintenance satisfaction, maintenance frustration also significantly mediated the effect of voice calls on loneliness ($b = 0.012$). The total indirect effect of voice call use on loneliness through maintenance satisfaction and frustration together was not significant ($b = 0.003$) because the positive and negative effects cancelled one another out.

For texting, controlling for maintenance frustration, maintenance satisfaction did not significantly mediate the effect of texting on loneliness ($b = -0.001$). Controlling for maintenance satisfaction, maintenance frustration significantly mediated the effect of texting on loneliness ($b = 0.006$). The total indirect effect of texting on loneliness carried through maintenance satisfaction and frustration together was not significant ($b = 0.005$).

Finally, maintenance satisfaction significantly mediated the effect of lean media (e.g., SNSs, group messaging, online gaming) on loneliness ($b = -0.012$), controlling for maintenance frustration. Controlling for maintenance satisfaction, maintenance frustration significantly mediated the effect of lean media use on loneliness ($b = 0.023$). These media showed the largest estimated coefficient with maintenance frustration. The cumulative indirect effect of lean media on loneliness through maintenance satisfaction and frustration together

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Table 2 The bivariate associations between eight modalities of communication and life satisfaction and loneliness, and after controlling for FtF frequency ($N$=1851)

|                      | Loneliness | Life Satisfaction |
|----------------------|------------|-------------------|
|                      | $M$  | $SD$  | Bivariate | Partial | Bivariate | Partial |
| Voice Calls          | 5.69 | 2.36  | .00       | .07     | .22*      | .12*     |
| Video Chat           | 3.24 | 2.70  | .09*      | .14*    | .25*      | .19*     |
| Text/DM              | 5.30 | 2.68  | .07       | .13*    | .12*      | .01      |
| Email                | 3.28 | 2.50  | .00       | .04     | .26*      | .20*     |
| Person-to-Person     | 2.96 | 2.78  | .12*      | .17*    | .18*      | .11*     |
| Social Media         | 3.95 | 2.79  | .09*      | .15*    | .17*      | .09*     |
| Online groups        | 2.60 | 2.55  | .10*      | .15*    | .23*      | .16*     |
| Online games         | 2.22 | 2.36  | .10*      | .14*    | .22*      | .15*     |
| Face-to-face         | 5.46 | 2.40  | -.10*     | .22*    |           |          |
| Life satisfaction    | 6.66 | 1.52  | -.37*     | 1.78    | .66       |          |

*Notes: * $p<.001$; Frequency reported on a 9-pt ordinal scale, life satisfaction on a 7-pt scale, and loneliness on a 3-pt scale
Table 3  Regression results for number of alters, frequency of mediated and FtF contact and loneliness and well-being for participants with one alter not living in home ($N=1757$)

|                          | Block One | Block Two | Block Three | Block Four |
|--------------------------|----------|----------|-------------|------------|
|                          | Loneliness | Life Sat. | Loneliness | Life Sat. |
| Male                     | -0.06 (.03) | 0.09 (.07) | -0.06 (.03) | 0.04 (.07) |
| Trans/Non-binary         | -0.11 (.22) | -0.58 (.47) | 0.10 (.07) | -0.06 (.03) |
| Age                      | -0.009 (.00')** | -0.008 (.001)** | 0.007 (.002)** | -0.008 (.001)** |
| Black/African-American   | -0.12 (.07) | 0.01 (.12) | -0.02 (.07) | -0.08 (.12) |
| Native American          | -0.17 (.16) | -0.10 (.34) | -0.13 (.35) | -0.20 (.16) |
| Pacific Islander         | 0.31 (.37) | -1.04 (.81) | -0.96 (.81) | -0.98 (.80) |
| Multiple Race            | 0.07 (.10) | -0.40 (.23) | -0.39 (.27) | -0.34 (.22) |
| No race identified       | 0.05 (.14) | -0.06 (.02) | -0.06 (.29) | -0.08 (.28) |
| Latino/a/x/Hispanic      | -0.12 (.13) | 0.02 (.27) | -0.13 (.13) | -0.13 (.13) |
| Education                | 0.02 (.01) | 0.02 (.01) | 0.02 (.01) | 0.02 (.01) |
| Income                   | -0.01 (.04) | 0.11 (.08) | -0.01 (.01) | 0.01 (.01) |
| Employed=1               | -0.05 (.04) | -0.03 (.08) | -0.03 (.08) | -0.07 (.08) |
| Live Alone=1             | 0.16 (.04)** | -0.33 (.08)** | -0.55 (.04)** | -0.36 (.08)** |
| Number of Alters         | -0.01 (.00)* | -0.01 (.01) | -0.01 (.01) | -0.01 (.01) |
| Outside Home             | .003 (.002) | .006 (.002)* | .003 (.002) | .03 (.004)** |
| Total Voice Calls        | .003 (.002) | .02 (.004)** | .004 (.002)* | .02 (.004)** |
| Outside Home             | .003 (.002) | .03 (.004)** | .003 (.002) | .14 (.02)** |
| Total Texting            | .003 (.002) | .02 (.004)** | .004 (.002)* | .02 (.004)** |
| Outside Home             | .003 (.002) | .03 (.004)** | .003 (.002) | .14 (.02)** |

**Notes:** *p < 0.05, **p < 0.01
Table 4  Model coefficients for interpersonal media use on loneliness through relational maintenance frustration and satisfaction for all alters (N=1855)

| Antecedent | Maintenance Frustration | Maintenance Satisfaction | Loneliness |
|------------|-------------------------|--------------------------|------------|
|            | Coeff.  | SE     | Coeff.  | SE     | Coeff.  | SE     |
| Voice Calls| 0.117***| 0.023  | 0.076***| 0.019  | 0.019**| 0.007  |
| Maintenance frustration | 0.106***| 0.007  |
| Maintenance satisfaction | −0.128***| 0.008  |
| FtF Access | −0.079***| 0.023  | 0.088***| 0.019  | −0.025***| 0.007  |
| Age        | −0.021***| 0.002  | 0.015***| 0.002  | −0.003***| 0.001  |
| Income     | 0.044***| 0.012  | 0.068***| 0.010  | −0.002  | 0.004  |
| Constant   | 4.525***| 0.190  | 2.936***| 0.157  | 2.187***| 0.071  |
| R² = 0.06***  | R² = 0.10***  | R² = 0.27***  |
| F(4, 1850) = 28.34 | F(4, 1850) = 49.70 | F(4, 1850) = 113.64 |
| Texting    | 0.060** | 0.021  | 0.008   | 0.017  | 0.020** | 0.006  |
| Maintenance frustration | 0.107***| 0.007  |
| Maintenance satisfaction | −0.126***| 0.008  |
| FtF Access | −0.045*  | 0.022  | 0.126***| 0.018  | −0.024***| 0.007  |
| Age        | −0.020***| 0.003  | 0.015***| 0.002  | −0.003***| 0.001  |
| Income     | 0.042**  | 0.013  | 0.070***| 0.010  | −0.004  | 0.004  |
| Constant   | 4.603***| 0.198  | 3.108***| 0.164  | 2.15*** | 0.074  |
| R² = 0.05***  | R² = 0.09***  | R² = 0.27***  |
| F(4, 1850) = 23.75 | F(4, 1850) = 45.39 | F(4, 1850) = 114.14 |
| Lean Media | 0.222***| 0.024  | 0.086***| 0.020  | 0.028** | 0.008  |
| Maintenance frustration | 0.102***| 0.007  |
| Maintenance satisfaction | −0.130***| 0.009  |
| FtF Access | −0.090***| 0.020  | 0.099***| 0.020  | −0.023***| 0.006  |
| Age        | −0.010***| 0.003  | 0.019***| 0.002  | −0.002*  | 0.001  |
| Income     | 0.024   | 0.012  | 0.061***| 0.010  | −0.005  | 0.004  |
| Constant   | 4.19*** | 0.190  | 2.88*** | 0.160  | 2.18*** | 0.071  |
| R² = 0.09***  | R² = 0.10***  | R² = 0.27***  |
| F(4, 1850) = 43.82 | F(4, 1850) = 50.60 | F(4, 1850) = 115.02 |

Note: *p < .05, **p < .01, ***p < .001; Lean media combined multiple interpersonal media (i.e., online gaming, SNSs, group messaging)
was positive and significant \( (b=0.011) \), suggesting that lean media frequency contributes to loneliness. These results provide support for H3. The indirect effects of interpersonal media use on loneliness were mediated by both maintenance frustration and maintenance satisfaction. As H3 predicted, the indirect effects carried through maintenance satisfaction was negatively associated with loneliness, except texting. In contrast, indirect effects carried through maintenance frustration were positively associated with loneliness in all three parallel mediation analyses.

### 8 Discussion

Consistent with need to belong theory, the present study found the number of close friends and family and the frequency of contact with them were consistent predictors of both life satisfaction and loneliness. These results suggest that the frequency of contact may be more critical for alleviating loneliness than the number of friends and family. By contrast, life satisfaction was positively associated with both having more friends and family and frequent FtF communication with them. The analyses regarding geographic access to a partner reinforced these main effects. No matter the frequency of FtF or interpersonal media, living alone positively predicted loneliness and negatively predicted life satisfaction. For those who had at least one close friend or family who lived outside of the home, an increasing number of close friends and family was associated with increased life satisfaction and decreased loneliness. Moderation analyses revealed that more communication with friends and family outside of the home is equally valuable whether individuals live alone or not. Overall, results offer support for the predictions derived from need to belong theory: both having close contacts and routine access to them, particularly in one’s home, are important predictors of global well-being.

The benefits of communication through interpersonal media were more nuanced. Most pertinent to the present investigation, and in response to past calls for research considering several media simultaneously e.g., Hall, J. A. (2020; Liu et al., 2019), the present investigation suggests that voice calls are most substitutable for lost FtF contact. The present study focused only on close relational partners and confirmed that voice calls were the most common modality among them (Liu & Yang, 2016). In the present study, once the frequency of FtF communication was accounted for, voice calls were no longer a significant predictor of loneliness or life satisfaction. This finding suggests that, accounting for partner closeness, voice calls are most similar to FtF communication for in-the-moment affective well-being, connection, and lower loneliness. This is consistent with research conducted in early weeks of the COVID-19 pandemic (Hall et al., 2021; Lee et al., 2022) that found voice calls were both an important and a frequent substitute for lost FtF contact.

The stepwise regressions conducted with the other interpersonal media accounted for the multi-modal nature of close relationships. Considering all participants and their alters, video chat frequency was positively associated and text/DM frequency was negatively associated with life satisfaction. These results were also confirmed in analyses focusing on the frequency of communication with close friends and family outside of the home. Again, video chat frequency was positively and text/DM frequency was negatively associated with life satisfaction. Burholt et al.’s (2020) study of older adults found no significant associations among video chat and texting/email and social integration. Because the present investiga-
tion focused on the 16 most important relationships, however, it differs from cumulative approaches to measuring frequency of contact with broad social networks. Accounting for geographic access and frequency of FtF communication, the present study suggests that video chat frequency among close friends and family is positively associated with life satisfaction.

9 Loneliness and Interpersonal Media Use

The current findings demonstrate that the relationship between interpersonal media use and loneliness may be mediated by the extent to which media use satisfies or frustrates relational maintenance efforts. A similar pattern emerged for all media types, accounting for participants’ FtF frequency, age, and income. The parallel mediation analyses indicated that in addition its direct association with loneliness, interpersonal media may be associated with loneliness through relationship maintenance frustration and satisfaction. More frequent interpersonal media use of all types (i.e., voice calls, texting/DM, lean media) was associated with greater frustration maintaining relationships, showing a significant indirect effect with loneliness. Lean media (i.e., SNSs, online communities, gaming) were strongly associated with maintenance frustration. Compared to FtF contact, interpersonal media require more planning, intentionality, and coordination Hall, J. A. (2020), which may contribute to maintenance frustration.

The results of the parallel mediation analyses suggest that relationship maintenance frustration and maintenance satisfaction were positively associated with increased interpersonal media use. Specifically, voice calls and lean media were associated with lower loneliness, indirectly through maintenance satisfaction. As past approaches have emphasized, media effects are ironic (e.g., good and bad, not good or bad) (Hall & Baym, 2012). More frequent media use both frustrated and assisted in relationship maintenance, which, in turn, both helping and hindering feelings of connection.

Furthermore, it was presumed that the strength of association between media use and well-being would decline once accounting for FtF communication frequency. This appeared to be true for life satisfaction, but not loneliness. Instead, the associations between loneliness and mediated communication frequency increased in strength after taking FtF contact into account. Consider the results focused on communication outside of the home; once the amount of FtF contact was accounted for, both voice calls and text/DM contact with those outside of the home were positively associated with loneliness. Given the seemingly contradicting evidence for life satisfaction, particularly regarding voice calls, these results are somewhat surprising.

One interpretation is relationships are both a source of life satisfaction and a means of coping with loneliness. Consistent with need to belong theory (Baumeister & Leary, 1995), the very purpose of social contact is to alleviate feelings of disconnection. Hall and Merolla’s (2020) exploration of thriving and patterns of social interaction notes that turning to interpersonal media in response to feelings of disconnect is common. Theoretically, mediated communication should increase in times of greater loneliness, which could boost life satisfaction. To further develop need to belong theory in relation to interpersonal media use, future research should focus on both the positive elements of connection (e.g., life satisfaction, belongingness) and the negative experiences of disconnection (e.g., loneliness, anxi-
The parallel mediation analyses shed light on the association between texting and loneliness found in the regression analyses. Texting showed a significant mediated effect through maintenance frustration but not through maintenance satisfaction. This could mean that although keeping in touch through texting is frustrating—similar to other media—texting does not achieve its goals of maintaining relationships. This distinction shows that the same modality might be used to maintain connection and yet be insufficient in doing so. By comparison, voice calls showed consistent and positive associations with lower loneliness, higher life satisfaction, and more relationship maintenance satisfaction. Further documenting whether these dual processes—frustration and satisfaction—are medium specific could explain previous conflicting findings regarding texting’s effects on well-being (e.g., Burholt et al., 2020).

One final interpretation of the increasingly negative associations between interpersonal media and loneliness once FtF frequency is taken into account focuses on the experience of longing for what was lost due to the pandemic. Sometimes contact with long-distance friends and romantic partners can remind individuals of the longing and missed company that comes with distance (Merolla et al., 2021). Early in the pandemic, those who heavily curtailed their FtF communication while increasing the mediated communication were more likely to experience both more loneliness and increased emotional closeness to their friends and family (Lee et al., 2022). Unfortunately, trying to reach out to loved ones during the pandemic can miss the mark: not all media can equally meet people’s social needs (Hall et al., 2021). The present study suggests that perhaps only voice calls are suitable for the task.

10 Limitations

The most important limitation of the present investigation is although participants reported their experiences in the year following the emergence of the pandemic, it is unknown whether any of the results presented here would have been present before the pandemic or whether the pandemic changed the associations between variables. It is important not to interpret these results as being caused by or unique to the year following the pandemic.

The present investigation is cross-sectional and cannot show causal relationships or predict change over time. A longitudinal approach could demonstrate how well-being is impacted by new patterns of sociality and preferences for media. Did people benefit from planned phone calls, Zoom calls, or socially distanced meetups with friends or family? What types of mediated communication routines helped individuals ease anxiety and loneliness?

Additionally, our measure on distance was focused on geography (i.e., how far away did this person live). This does not account for the psychological distance a person feels, nor the degree to which they perceive geographic distance to be a barrier to communication. Future research could attend to other perceptions of distance beyond geography.

Finally, one expected moderation—between living alone and frequency of interactions with those outside the house—showed no support. This suggests that the benefits of having contact with people outside the house is equivalent for those who live alone and those who do not.
This investigation provided noteworthy contributions to the literature on well-being in relation to interpersonal media use. Compared to past studies, the present investigation used a more robust design to measure the number of close partners and frequency of communication in multi-modal relationships. Additionally, this research used data from a quota sample, thus yielding more generalizable results than convenience samples of college students. This project offered a nuanced perspective of how individuals use communication modalities with different relationship partners, revealing that voice calls and FtF communication may be the most suitable forms of contact for both promoting life satisfaction and mitigating loneliness. It appears DM/texting is not up to the task, as it is associated with more frustration and loneliness and not maintenance and life satisfaction. In addition, video chat appeared to be associated with greater life satisfaction, while lean media was associated with loneliness via a strong association with relationship maintenance frustration. Taken together, these results suggest that research on well-being and mediated communication should continue to address the complexities of these relationships in the context of individuals’ relationships and FtF access to important others.

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