Article

new media & society
2022, Vol. 24(9) 2046–2067

DOI: 10.1177/1461444820985442
journals.sagepub.com/home/nms


Staying connected while physically apart: Digital communication when face-to-face interactions are limited

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Abstract

Theoretical and empirical work on digital media use and social connectedness has often considered face-to-face communication to be an available option. But how do various digital media uses relate to social connectedness when face-to-face communication is not, or much less, possible? Drawing on survey data from 2925 US adults during the early months of the COVID-19 pandemic, we find that different digital communication methods display different relationships with social connectedness under stay-at-home circumstances with limited in-person interactions outside the home. Overall, digital communication relates to lower social connectedness. In line with notions from social presence theory, especially digital media lower in social presence (e.g. email, social media, and online games, and to some extent text messaging) relate negatively to social connectedness, while this is not the case for higher social presence media (e.g. voice and video calls). Our study has implications for theorizing about digital media use and social connectedness in times when face-to-face communication is less available.

Keywords

COVID-19, digital communication, quarantine, social connectedness, social presence theory

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During the COVID-19 pandemic, governments and public health institutions worldwide set physical-distancing and stay-at-home guidelines to prevent the spread of the novel coronavirus with potentially severe health consequences (World Health Organization, 2020). Places where individuals typically gather such as schools, shops, businesses, and public spaces were often closed to minimize the public health threat. The extraordinary stay-at-home circumstances made for fewer opportunities to meet in person, and so the ways many people connect socially were no longer available. In the United States, stay-at-home orders were issued at the state level beginning in mid-March of 2020 (Mervosh et al., 2020), with cell phone data showing substantial increases in physical distancing among Americans during the first months of the pandemic (Brzezinski et al., 2020). Using the COVID-19 pandemic in the United States as a case study, we explore how people's digital communication uses relate to their sense of social connectedness in a time when face-to-face interactions are strongly restricted.

Meaningful social interactions and relationships are at the core of human wellbeing (Baumeister and Leary, 1995; Kawachi and Berkman, 2001). Already in the first weeks of the pandemic, industry reports showed that people increasingly turned to social media and messaging apps, especially video conferencing tools, for interaction (Kemp, 2020; Koeze and Popper, 2020). Digital communication (e.g. social media, messaging, video and voice call apps, online games) can create a sense of togetherness, help maintain relationships, and thus, cultivate social connectedness (e.g. Ellison et al., 2014; Grieve et al., 2013; Pettegrew and Day, 2015; Ryan et al., 2017; Tseng et al., 2015; Wei and Lo, 2006). However, prior studies investigating these relationships took place under circumstances where digital means naturally intertwined with face-to-face communication. With COVID-19 circumstances, a question that arises is to what extent digital media play a role in facilitating social connectedness when opportunities for face-to-face interactions are curtailed.

We draw on survey data from 2925 US adults that we collected between 4 April and 9 May, 2020, during which physical distancing and lockdown measures were ongoing in most parts of the United States due to COVID-19 (Mervosh et al., 2020). The COVID-19 pandemic provides a unique opportunity to address these questions whose relevance may apply to other contexts (e.g. natural disasters, epidemics, political upheavals) where substantial numbers of people have to rely heavily on digital communication tools. While our study is specific to the US context, the findings can inform scholarly understanding of the relationships between digital communication and social connectedness in times of reduced face-to-face contact more broadly, as well as guide future theorizing and empirical research in this domain.

Theorizing digital communication and social connectedness

Today, people can draw on a variety of information and communication technologies to maintain social contact across distances when opportunities for in-person interactions are not possible. Studies examining the digital communication practices of geographically dispersed families (e.g. migrant families, people in long-distance relationships) have suggested that voice, but especially video calls, create a sense of co-presence where people

feel togetherness even when living apart (Baldassar, 2016; Nedelcu and Wyss, 2016; Neustaedter and Greenberg, 2012). Previous work on family communication has shown that video calls can mimic the idea of offline social gatherings, as video calls make it easier for multiple family members on both sides of the call to take part (Ames et al., 2010). Text messaging, however, may not facilitate the sense of being together that voice and video chat do, but it can deliver social support in the form of "being there" for someone (Baldassar, 2016). Other work on "hidden youth," that is, young people who have shut themselves in their bedroom or homes for a long time, has shown that digital technology and, in particular, online gaming communities are of vital importance for their sociality (Wong, 2020). Thus, in situations where in-person interaction is not possible or desired, digital methods are a vital means of communication on their own (Baym, 2015).

The observation that assorted digital media can differentially influence social connectedness processes corroborates notions from social presence theory (SPT; Short et al., 1976). SPT suggests that digital media vary in their ability to transmit social cues and thereby facilitate social presence through computer-mediated interpersonal communication (for a systematic review see Oh et al., 2018). Media that are high in social presence (e.g. synchronous and with more communicative cues) such as video and phone calls are likely better at facilitating social connectedness because they are closer to face-to-face communication compared to media that are lower in social presence (e.g. asynchronous and with fewer communicative cues) such as text messaging and email. As such, SPT can help us understand why some digital communication methods are more likely to facilitate social connectedness than others.

Empirical work has supported the theory-based notion that different digital communication methods associate in varied ways with social connectedness processes. Previous research has ranked voice and video calls higher in social presence than text and email communication (Rice, 1993), and video calls have been considered more capable of creating co-presence than voice calls (Sallnäs, 2005). The ability of voice and video modality to elicit social presence through synchronous verbal and non-verbal cues over and above text-based digital communication is evident (Oh et al., 2018). However, text messaging conversations with high synchronicity and visual cues (e.g. emoticons) can also elicit social presence, more so than asynchronous text-based conversations without visual cues (Hsieh and Tseng, 2017; Park and Sundar, 2015). Indeed, critics of approaches like SPT argue that even in digital communication, where traditional social cues are limited (e.g. messaging apps), high social presence can be achieved through the creative use of communication means (e.g. emoticons; Baym, 2015). Therefore, investigating whether SPT holds in the instance of limited face-to-face contact is warranted.

When it comes to social media and online games, traditional classifications of which channels are considered high or low in social presence have become blurred. Social media platforms may share features of voice and video modality through visual content sharing, direct messaging, voice and video chat, and video live streams, and thus, may be just as suitable in creating social presence and connectedness. A study comparing various communication channels showed that in-person interactions were rated highest in social presence, followed by video and phone calls, then Snapchat and instant messaging in the middle range, and text messaging, Facebook, and email in the lower range (Fox and McEwan, 2017). Indeed, visual social media such as Snapchat generated a higher sense of

social presence than platforms like Facebook. A meta-analytical review comparing text messaging, instant messaging, phone calls, online games, and social network sites (SNSs) also found that these associate differently with social wellbeing (i.e. loneliness; Liu et al., 2019). Specifically, higher frequency of SNS use positively related to wellbeing when used for social interaction, but not when used for consumption of content, a non-communicative function. While the frequency of digital communication through phone calls and text messaging positively associated with wellbeing, online game playing (which can, but does not have to be a social activity) negatively associated with wellbeing (Liu et al., 2019). That being said, online games with multiple players may involve synchronous voice and video chat, and previous research suggests online gaming can facilitate social presence (De Kort et al., 2007). Thus, depending on the features of various digital communication methods, and whether and how people use and experience these specific features, perceptions of social presence and connectedness may differ.

Overall, the literature suggests that different types of digital communication can facilitate social connectedness in various ways. However, studies on digital communication and social connectedness have typically been conducted under circumstances when face-to-face communication in general is not limited, as is the case during the COVID-19 pandemic. Under usual circumstances, people use digital methods intertwined with face-to-face communication, but rarely as a complete replacement of in-person interactions (Baym et al., 2004; Gonzales, 2014). Compared to digital communication like text messages, email, and SNSs, people perceive face-to-face interactions as more meaningful, of higher quality (Baym et al., 2004; Gonzales, 2014), and more useful in building social connections and emotional closeness (Schiffrin et al., 2010). It is worth noting that in some cases digital communication may in fact be equivalent to or even preferred over face-to-face interactions (Baym, 2015; Joinson, 2004). Still, overall, the importance of face-to-face communication for social connection raises the question: what role do digital media play in maintaining social connectedness under circumstances where in-person interactions are less available? Moreover, do earlier findings about the relationships between digital communication and social connectedness extend to situations where face-to-face communication is limited?

The case of COVID-19

The COVID-19 pandemic presents a real-world scenario to explore the question of how digital communication relates to social connectedness when face-to-face interactions are limited. Existing research on the role of digital communication within relationships maintained at a physical distance focuses on particular situations and demographics, such as geographically dispersed families (Baldassar, 2016; Nedelcu and Wyss, 2016; Neustaedter and Greenberg, 2012) and hidden youth who turn to online video games while confining at home (Wong, 2020). The question remains if the dynamics of digital communication observed in these scenarios hold when considered across a broad swath of the population. The pandemic offers a case of imposed physical distancing affecting a broad range of situations and demographics, improving our ability to examine the role of digital communication for social connectedness during periods of limited face-to-face interactions.

A review examining the psychological effects of quarantine measures such as sheltering in place suggests that being prohibited from one's usual daily activities and interactions can result in frustration, boredom, and feelings of social isolation (Brooks et al., 2020). Digital media can alleviate the negative effects of quarantining on social connectedness, as they offer people the ability to connect with their loved ones without meeting in person (Brooks et al., 2020). This is noteworthy given that a study of 1692 Korean participants who self-isolated for 2 weeks during the Middle East respiratory syndrome (MERS) outbreak in 2015 showed that not connecting with loved ones through digital media (telephone, text, and email) could lead to increased long-term psychological distress (Jeong et al., 2016).

During the COVID-19 pandemic, many people turned to talking to friends and family as a way to support their own mental health (GlobalWebIndex, 2020: 11). In a study among college students, participants reported enjoying pleasant social interactions through digital communication, even though the total number of interactions—including those face-to-face—were lower than before the pandemic (Elmer et al., 2020). An industry report suggests that engaging in digital communication may strengthen social connectedness for some, while others may feel more anxious and lonely afterwards (The Harris Poll, 2020a: 8). Thus, digital media may be able to mitigate some of the negative effects of quarantining on social connectedness, but this may not apply equally to everyone. Moreover, whether digital communication relates to feelings of social connectedness might further depend on the specific methods used.

Research questions

This article examines whether the use of digital communication contributes to people's perceived social connectedness during a time with fewer opportunities for face-to-face communication. Using the COVID-19 pandemic as a case study, we address the following research questions:

RQ1. How does frequency of use of different digital communication methods during the COVID-19 pandemic relate to perceived social connectedness?

RQ2. How do people's changes (i.e. increases and decreases) in different digital communication methods during the COVID-19 pandemic relate to perceived social connectedness?

Methods

We surveyed 2925 US adults during the early months of the Coronavirus pandemic in 2020. We administered the first survey between 4 and 8 April ($N = 1374$), and the second survey with different respondents between 4 and 9 May ($N = 1551$). We contracted with the online research company Cint to distribute our questionnaire using the Qualtrics platform. Cint relies on a double opt-in national panel of Internet users and respondents receive a modest financial compensation for their participation. We used quotas for age, gender, education level, and region to achieve a diverse sample resembling US Census

figures. All 50 US states plus Washington, DC, are represented in the sample. The study met the ethical regulations of our university; we reflect on ethical considerations when collecting data during a global pandemic in Hargittai et al (2020).

Independent variables

Sociodemographics. We measured age by asking for respondents' birth year and subtracting that from 2020. Gender options were male, female, and other, which we recoded into a female category (1 vs 0 for others). To measure race and ethnicity, following US Census conventions, we first asked whether the respondent was of Hispanic or Latino descent, after which we asked about race through the following categories: White, Black or African American, Asian, American Indian or Alaska Native, Native Hawaiian or Pacific Islander, and/or other. We created dummy variables from these. Respondents reported their highest level of school completed out of six options, which we recoded into the following: completed high school or less, attended some college, completed college or more. Household income was measured through 13 categories ranging from less than US$10,000 to US$200,000 or more, which we recoded into midpoint values. We also asked if people lived in a big city, the suburbs or outskirts of a big city, a town or a small city, or a rural area, and created three dummy variables representing rural, suburban, and urban residence.

In-person experiences. To measure people's living situation, we asked whether people lived with other adults, and if they lived with children under the age of 18. From this, we created two dummy variables: one reflecting whether people lived alone (meaning without other adults or children) and another reflecting the presence of children in the household. We included the latter variable because reports have shown that people with children in the household may be more likely to take up certain types of digital communication during the pandemic (The Harris Poll, 2020b).

While most US states were still under stay-at-home orders at the time of our study (Mervosh et al., 2020), some people may have chosen to leave home and engage in social and other public activities. To control for face-to-face interactions with people outside the household, we measured if people had gone out for non-essential social activities since the start of the Coronavirus pandemic, including meeting with friends, attending religious services, going to the movies, theater or a concert, going to a bar or cafe, and going out for beauty and care services. We dichotomized this into one variable indicating if someone had gone out for any of these social outings.

Digital experiences. To measure frequency of Internet use, in the first survey, we asked how often respondents used the Internet on weekdays and on weekends, either on a computer, tablet, or phone. We used a slightly different question in the second survey, where we separately asked how often respondents used the Internet at home through computer, tablet, and phone. Answer options for both questions included almost constantly, several times a day, about once a day, several times a week, and less often. We recoded the answers into one variable reflecting frequent Internet use as those who use the Internet several times a day or almost constantly on either weekdays or weekends, regardless of device versus those

who used it less often. For digital skills, we are inspired by an established and validated index to measure people's know-how of social media (Hargittai and Hsieh, 2012) as such skills are relevant when examining the role of digital media for social connection. We asked respondents to report their understanding of six social media-related terms on a 1–5 point scale ranging from no understanding to full understanding (i.e., "privacy settings," "meme," "tagging," "followers," "viral," "hashtag"). We took the average of the items as the social media skills score (Cronbach's $\alpha = .93$).

Digital communication. We first measured the frequency of digital communication for six methods, and then the respondent's perception of how this had changed during the pandemic. We asked about people's use of the following six digital communication methods: voice calls, video calls, text messages (through any messaging app), email, social media, and online games. First, we asked, "Since the Coronavirus pandemic, how often have you used the following methods to communicate with friends and family who do not live in your household?" We included four answer options, which we recoded into a continuous variable using midpoint daily values on a weekly scale: daily/almost daily (6.5), few times a week (3), less than weekly (0.5), and never (0). Next, we asked, "Compared to before the Coronavirus pandemic, has your communication with friends and family who do not live in your household increased, decreased or remained the same for these methods?" Answer options were more, about the same, or less. We recoded these into binary variables reflecting an increase for "more" as compared to "same" or "less" responses; and a decrease for "less" compared to "same" or "more" responses, for each method. We asked respondents to exclude work-related communication in considering their answer.

Dependent variable

Social connectedness. We measured social connectedness with a shortened six-item version of the oft-used scale by Lee and Robbins (1995) asking about people's feelings applied to experiences to "the past two weeks." Respondents rated their agreement with each item on a 6-point scale ranging from 1 "Strongly disagree" to 6 "Strongly agree." Example items include "I felt disconnected from the world around me" and "I felt so distant from people." We recoded the data so that a higher score indicates a higher sense of social connectedness, and we averaged the items into one social connectedness score (Cronbach's $\alpha = .91$).

Sample characteristics

Table 1 displays the sample characteristics. The mean age of respondents is 46 (range: 18–91), and over half of the sample is female (55%) with one participant selecting the "other" gender option. About half of respondents (49%) have no more than a high school degree, 19% some college, and 32% hold a college degree or more. Less than half of the sample lives in an urban area (45%), with over one-third (38%) living in suburban areas, the rest in rural areas (18%). About one-fifth (22%) lives alone and a little less than one-third (32%) lives with one or more children below age 18. During the COVID-19 lockdown, 23% of the sample reported having gone out for non-essential activities. Most

Table 1. Sample characteristics.

	%	Mean	*SD*	*N*
Age	–	46.43	16.51	2919
Female	54.7	–	–	2924
Education	–	–	–	2925
High school or less	49.1	–	–	–
Some college	18.8	–	–	–
Bachelor's degree or more	32.1	–	–	–
Race and ethnicity	–	–	–	–
White	67.2	–	–	2917
African American	11.7	–	–	2917
Hispanic	14.1	–	–	2923
Asian	5.0	–	–	2917
Native American	1.8	–	–	2917
Household income	–	$59,462	$51,486	2020
Metropolitan status	–	–	–	2924
Rural	17.4	–	–	–
Suburban	37.6	–	–	–
Urban	44.9	–	–	–
In-person experiences				
Living alone	21.5	–	–	2925
Child(ren) in household	32.3	–	–	2925
Went out for any social activity	23.4	–	–	2925
Internet experiences				
Frequent Internet use	92.6	–	–	2923
Social media skills (range 1–5)	–	3.73	1.18	2923
Digital communication frequency				
Voice calls	–	3.16	2.47	2922
Video calls	–	1.90	2.32	2924
Text messages	–	4.34	2.47	2922
Email	–	2.78	2.64	2924
Social media	–	3.55	2.76	2923
Online games	–	2.02	2.63	2922
Social connectedness (range 1–6)	–	3.96	1.28	2925

Digital communication is recoded to midpoints reflecting frequency in days per week.

participants used the Internet at home at least several times per day (93%). Their average social media skills were 3.73 ($SD = 1.18$; scale 1–5).

Analytical strategy

We first describe how many respondents increased or decreased their digital communication during the COVID-19 pandemic. To answer our first research question, we present bivariate statistics to examine how frequency of digital communication relates to social

connectedness, as well as how those who have increased and have decreased digital communication differ in their sense of social connectedness.

To test whether the bivariate relationships between digital communication and social connectedness hold when controlling for sociodemographics, in-person experiences, and digital experiences, we estimate separate linear regression models for each digital communication method (Models 1–6: voice calls, video calls, text messages, email, social media, and online games, respectively) with social connectedness as the dependent variable. Although there was only 1 month in between our two data collection efforts, given the rapidly changing environment in spring 2020, we control for the time of data collection in the models (variable "time point"). In the regression analyses, we use the log transformation of income. We first included race and ethnicity in the analyses, but given that there were no differences in the results, we opted for reporting the models without these variables due to space constraints. We also ran three regression models with the frequency of, increases in, and decreases in all six digital communication methods as predictors, but due to overlap in variance of these methods, we opted for not reporting these models. Importantly, the results from these models were comparable and would not have substantially changed our results and conclusions. In the final analyses, assumptions of linearity, normality, homoscedasticity, independent errors, and multicollinearity were met.

Results

Changes in digital communication during COVID-19

Figure 1 displays the changes in digital communication during COVID-19. Overall, we observe an increase in digital communication. In total, 41% of the sample reported using text messaging more often compared to before the pandemic, followed by an increase in voice calls (35%), social media (33%), video calls (30%), email (22%), and online games (21%). Considering all modes together, 64% had increased any digital method, and 45% had only increased digital communication without decreasing any method. There were also people who reduced digital communication. While a small number (6%) used text messaging less often, somewhat more people reduced their communication over voice calls (9%), social media (10%), email (11%), video calls (14%), and online games (19%). Considering all modes together, 30% had decreased any method, and 11% had only decreased digital communication without increasing any method.

The relation between digital communication and social connectedness

Our first research question asks how people's frequency of using digital communication during the COVID-19 pandemic affected their perceived social connectedness. Correlations show that higher frequency of digital communication is related to lower social connectedness overall (Table 2) with the exception of voice calls. When controlling for sociodemographics, in-person experiences, and digital experiences (Table 3), we find that more frequent use of email ($\beta = -.05$), social media ($\beta = -.04$), and online games ($\beta = -.06$) relates to a lower sense of social connectedness. These relationships are not significant for voice calls, video calls, and text messaging.

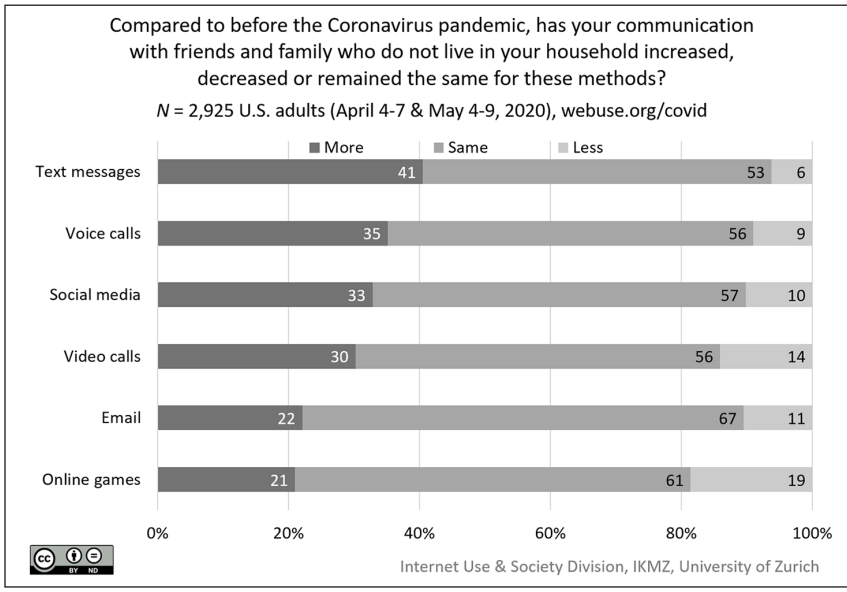

Figure 1. Changes in digital communication during COVID-19.

Table 2. Correlations: digital communication frequency and social connectedness.

		1	2	3	4	5	6	7
1	Social connectedness	–	–	–	–	–	–	–
2	Voice calls	−.02	–	–	–	–	–	–
3	Video calls	−.11***	.47***	–	–	–	–	–
4	Text messages	−.05*	.37***	.35***	–	–	–	–
5	Email	−.06**	.26***	.30***	.29***	–	–	–
6	Social media	−.10***	.24***	.37***	.39***	.35***	–	–
7	Online games	−.12***	.27***	.36***	.25***	.32***	.37***	–

*$p < .05$; **$p < .01$; ***$p < .001$.

Our second research question asks whether changes in digital communication relate to people's sense of social connectedness. Here, we specifically focus on whether people increased or decreased certain methods since the start of the COVID-19 pandemic. Overall, bivariate statistics reveal that people who had increased their communication through digital methods felt less socially connected than those who had not (Table 4). There was no difference in social connectedness between those who had decreased each method of communication and those who had not, except for email. Specifically, people who had decreased email communication felt less socially connected than people who had not. When controlling for sociodemographics, in-person experiences, and digital experiences, we find that increases in text messaging ($\beta = -.06$), email ($\beta = -.09$), social

Table 3. OLS regressions: digital communication frequency and social connectedness.

	Model 1 (*N* = 2908)			Model 2 (*N* = 2906)			Model 2 (*N* = 2908)			Model 4 (*N* = 2908)			Model 5 (*N* = 2907)			Model 6 (*N* = 2906)		
	β	*b*	*SE*	β	*b*	*SE*	β	*b*	*SE*	β	*b*	*SE*	β	*b*	*SE*	β	*b*	*SE*
Time point	.04*	0.11	0.05	.04*	0.11	0.05	.04*	0.11	0.05	.04*	0.11	0.05	.04*	0.11	0.05	.04*	0.10	0.05
Age	.19***	0.01	0.00	.18***	0.01	0.00	.19***	0.01	0.00	.19***	0.02	0.00	.02***	0.01	0.00	.18***	0.01	0.00
Female	−.04*	−0.09	0.05	−.04	−0.09	0.05	−.04	−0.09	0.05	−.04*	−0.10	0.05	−.03	−0.08	0.05	−.04*	−0.11	0.05
Education																		
Some college	.00	−0.01	0.06	.00	−0.01	0.06	.00	−0.01	0.06	.00	−0.01	0.06	.00	−0.01	0.06	.00	−0.01	0.06
Bachelor's degree or more	−.08***	−0.23	0.06	−.08***	−0.22	0.06	−.08***	−0.23	0.06	−.08***	−0.22	0.06	−.08***	−0.23	0.06	−.09***	−0.24	0.06
Household income	.07***	0.10	0.03	.07***	0.10	0.03	.07***	0.10	0.03	.08***	0.10	0.03	.07***	0.10	0.03	.07***	0.10	0.03
Metropolitan status																		
Rural	−.01	−0.03	0.06	−.01	−0.03	0.06	−.01	−0.03	0.06	−.01	−0.03	0.06	−.01	−0.04	0.06	−.01	−0.04	0.06
Suburban	−.02	−0.06	0.06	−.02	−0.04	0.06	−.02	−0.05	0.06	−.02	−0.05	0.06	−.02	−0.05	0.06	−.01	−0.04	0.06
In-person experiences																		
Living alone	.01	0.04	0.07	.01	0.03	0.07	.01	0.03	0.07	.01	0.03	0.07	.01	0.03	0.07	.01	0.03	0.07
Child(ren) in household	.00	0.00	0.05	.00	0.00	0.05	.01	0.00	0.05	.00	0.00	0.05	.01	0.00	0.05	.00	0.00	0.05
Gone out for any social activity	−.07***	−0.23	0.06	−.07***	−0.22	0.06	−.07***	−0.22	0.06	−.07***	−0.21	0.06	−.07***	−0.21	0.06	−.07***	−0.20	0.06
Internet experiences and skills																		
Frequent Internet use	−.02	−0.09	0.09	−.02	−0.08	0.09	−.02	−0.09	0.09	−.01	−0.07	0.09	−.01	−0.07	0.09	−.01	−0.07	0.09
Social media skills	.02	0.02	0.02	.03	0.03	0.02	.02	0.03	0.02	.02	0.03	0.02	.03	0.04	0.02	.03	0.03	0.02
Digital communication frequency																		
Voice calls	.01	0.00	0.01	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Video calls	–	–	–	−.03	−0.02	0.01	–	–	–	–	–	–	–	–	–	–	–	–
Text messages	–	–	–	–	–	–	−.03	0.00	0.01	–	–	–	–	–	–	–	–	–
Email	–	–	–	–	–	–	–	–	–	−.05*	−0.02	0.01	–	–	–	–	–	–
Social media	–	–	–	–	–	–	–	–	–	–	–	–	−.04*	−0.02	0.01	–	–	–
Online games	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	−.06***	−0.03	0.01
Adjusted R^2	.05***			.05***			.05***			.06***			.05***			.06***		

The reference category for education level is "High school or less," and for metropolitan status "Urban." β: standardized coefficient; *b*: unstandardized coefficient.
*$p < .05$; **$p < .01$; ***$p < .001$.

Table 4. Bivariate tests: social connectedness by changes in digital communication.

	Increased digital communication			Decreased digital communication		
	Yes	No		Yes	No	
	M (*SD*)	*M* (*SD*)	*t*-test	*M* (*SD*)	*M* (*SD*)	*t*-test
Voice calls	3.88 (1.28)	4.00 (1.26)	2.46*	3.76 (1.26)	3.98 (1.29)	2.67**
Video calls	3.85 (1.29)	4.00 (1.28)	3.01**	3.95 (1.27)	3.96 (1.29)	0.14
Text messages	3.84 (1.28)	4.04 (1.28)	4.24***	3.72 (1.34)	3.97 (1.28)	2.42*
Email	3.70 (1.33)	4.03 (1.26)	5.62***	3.85 (1.27)	3.97 (1.28)	1.61
Social media	3.78 (1.32)	4.04 (1.25)	5.21***	4.00 (1.29)	3.95 (1.28)	−0.65
Online games	3.67 (1.32)	4.03 (1.26)	6.08***	4.02 (1.26)	3.94 (1.29)	−1.26

Higher scores reflect higher perceptions of social connectedness.
*$p < .05$; **$p < .01$; ***$p < .001$.

media (β = −.06), and online games (β = −.07) relate to lower perceptions of social connectedness, with no such relationships found for voice calls and video calls (Table 5). With respect to decreases in digital communication (Table 6), the analyses suggest that decreases in voice calls associate with lower levels of social connectedness (β = −.05), as do decreases in text messaging (β = −.05).

Across all regression models (Tables 3, 5, and 6), various sociodemographics, as well as in-person experiences during a time of physical distancing reveal themselves to be important for people's sense of social connectedness as well. Age and household income positively associate with social connectedness, but higher-educated people felt less socially connected overall. With respect to in-person experiences, we find that those who had gone out for non-essential activities felt less socially connected compared to those who had not.

Discussion

Drawing on a national sample of 2925 US adults, this study examines people's use of digital communication as well as how changes in their digital media uses relate to their sense of social connectedness during the early months of the COVID-19 pandemic, an unprecedented time of sheltering-in-place with limited opportunities for face-to-face interaction. Our study confirms notions from social presence theory (SPT; Short et al., 1976) and previous empirical work (e.g. Fox and McEwan, 2017; Rice, 1993; Sallnäs, 2005), and suggests that higher social presence media may be more important in building social connectedness from digital communication compared to lower social presence media.

In line with SPT, we found negative relationships between perceived social connectedness and the frequency of digital communication over email, social media, and games—which may be considered lower social presence media, and no such relationship for medium to higher social presence media such as text messaging, voice calls, and video calls. When considering changes in digital communication during the pandemic, similar patterns emerged when we looked at those who had increased their digital

Table 5. OLS regressions: increased digital communication and social connectedness.

	Model 1 (*N* = 2907)			Model 2 (*N* = 2907)			Model 2 (*N* = 2908)			Model 4 (*N* = 2907)			Model 5 (*N* = 2907)			Model 6 (*N* = 2905)		
	β	*b*	*SE*	β	*b*	*SE*	β	*b*	*SE*	β	*b*	*SE*	β	*b*	*SE*	β	*b*	*SE*
Time point	.04*	0.11	0.05	.04*	0.11	0.05	.04*	0.10	0.05	.04*	0.10	0.05	.04*	0.10	0.05	.04*	0.11	0.05
Age	.19***	0.02	0.00	.19***	0.01	0.00	.19***	0.01	0.00	.19***	0.01	0.00	.19***	0.01	0.00	.18***	0.01	0.00
Female	−.04	−0.09	0.05	−.03	−0.09	0.05	−.03	−0.09	0.05	−.04*	−0.10	0.05	−.04*	−0.09	0.05	−.04*	−0.11	0.05
Education																		
Some college	.00	0.00	0.06	.00	0.00	0.06	.00	0.00	0.06	.00	−0.01	0.06	.00	0.00	0.06	.00	−0.01	0.06
Bachelor's degree or more	−.08***	−0.21	0.06	−.08***	−0.22	0.06	−.08***	−0.23	0.06	−.08***	−0.21	0.06	−.08***	−0.23	0.06	−.08***	−0.23	0.06
Household income	.08***	0.10	0.03	.07***	0.10	0.03	.08***	0.10	0.03	.08***	0.10	0.03	.07***	0.10	0.03	.08***	0.10	0.03
Metropolitan status																		
Rural	−.01	−0.03	0.06	−.01	−0.03	0.06	−.01	−0.03	0.06	−.01	−0.03	0.06	−.01	−0.04	0.06	−.01	−0.03	0.06
Suburban	−.02	−0.05	0.06	−.02	−0.05	0.06	−.02	−0.05	0.06	−.02	−0.04	0.06	−.02	−0.04	0.06	−.01	−0.04	0.06
In-person experiences																		
Living alone	.01	0.03	0.07	.01	0.03	0.07	.01	0.03	0.07	.01	0.02	0.07	.01	0.03	0.07	.01	0.03	0.07
Child(ren) in household	.00	0.00	0.05	−.01	0.00	0.05	.00	0.00	0.05	.00	0.00	0.05	.00	0.00	0.05	.00	0.00	0.05
Gone out for any social activity	−.07***	−0.22	0.06	−.07***	−0.23	0.06	−.08***	−0.23	0.06	−.07***	−0.21	0.06	−.07***	−0.22	0.06	−.07***	−0.21	0.06
Internet experiences and skills																		
Frequent Internet use	−.02	−0.08	0.09	−.02	−0.08	0.09	−.01	−0.07	0.09	−.01	−0.07	0.09	−.02	−0.07	0.09	−.02	−0.07	0.09
Social media skills	.03	0.03	0.02	.03	0.03	0.02	.03	0.03	0.02	.02	0.03	0.02	.03	0.03	0.02	.03	0.03	0.02
Increased digital communication																		
Voice calls	−.04	−0.10	0.05	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Video calls	–	–	–	−.02	−0.06	0.05	–	–	–	–	–	–	–	–	–	–	–	–
Text messages	–	–	–	–	–	–	−.06***	−0.16	0.05	–	–	–	–	–	–	–	–	–
Email	–	–	–	–	–	–	–	–	–	−.09***	−0.29	0.06	–	–	–	–	–	–
Social media	–	–	–	–	–	–	–	–	–	–	–	–	−.06**	−0.15	0.05	–	–	–
Online games	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	−.07***	−0.21	0.06
Adjusted R^2	.05***			.05***			.06***			.06***			.06***			.06***		

The reference category for education level is "High school or less," and for metropolitan status "Urban." β: standardized coefficient; *b*: unstandardized coefficient.
*$p < .05$; **$p < .01$; ***$p < .001$.

Table 6. OLS regressions: decreased digital communication and social connectedness.

	Model 1 (*N* = 2907)			Model 2 (*N* = 2907)			Model 2 (*N* = 2908)			Model 4 (*N* = 2907)			Model 5 (*N* = 2907)			Model 6 (*N* = 2905)		
	β	*b*	*SE*	β	*b*	*SE*	β	*b*	*SE*	β	*b*	*SE*	β	*b*	*SE*	β	*b*	*SE*
Time point	.04*	0.11	0.05	.04*	0.11	0.05	.05*	0.12	0.05	.04*	0.11	0.05	.04*	0.11	0.05	.04*	0.11	0.05
Age	.19***	0.01	0.00	.19***	0.02	0.00	.19***	0.01	0.00	.19***	0.01	0.00	.19***	0.01	0.00	.19***	0.02	0.00
Female	−.04*	−0.09	0.05	−.04*	−0.09	0.05	−.04*	−0.10	0.05	−.04*	−0.09	0.05	−.04*	−0.10	0.05	−.04*	−0.10	0.05
Education																		
Some college	.00	−0.01	0.06	.00	−0.01	0.06	.00	−0.01	0.06	.00	−0.01	0.06	.00	−0.01	0.06	.00	−0.01	0.06
Bachelor's degree or more	−.09***	−0.24	0.06	−.09***	−0.24	0.06	−.09***	−0.24	0.06	−.09***	−0.24	0.06	−.08***	−0.23	0.06	−.09***	−0.23	0.06
Household income	.07**	0.09	0.03	.07***	0.09	0.03	.07***	0.09	0.03	.07***	0.10	0.03	.07***	0.10	0.03	.07***	0.10	0.03
Metropolitan status																		
Rural	−.01	−0.03	0.06	−.01	−0.03	0.06	−.01	−0.02	0.06	−.01	−0.03	0.06	−.01	−0.03	0.06	−.01	−0.02	0.06
Suburban	−.02	−0.05	0.06	−.02	−0.05	0.06	−.02	−0.06	0.06	−.02	−0.05	0.06	−.02	−0.05	0.06	−.02	−0.05	0.06
In-person experiences																		
Living alone	.01	0.03	0.07	.01	0.04	0.07	.01	0.04	0.07	.01	0.04	0.07	.01	0.04	0.07	.01	0.04	0.07
Child(ren) in household	.00	0.00	0.05	.00	0.00	0.05	.00	0.00	0.05	.00	0.00	0.05	.00	0.00	0.05	.00	0.00	0.05
Gone out for any social activity	−.08***	−0.23	0.06	−.07***	−0.23	0.06	−.07***	−0.23	0.06	−.08***	−0.23	0.06	−.08***	−0.23	0.06	−.08***	−0.23	0.06
Internet experiences and skills																		
Frequent Internet use	−.02	−0.09	0.09	−.02	−0.09	0.09	−.02	−0.10	0.09	−.02	−0.09	0.09	−.02	−0.09	0.09	−.02	−0.09	0.09
Social media skills	.02	0.02	0.02	.02	0.02	0.02	.02	0.02	0.02	.02	0.02	0.02	.02	0.02	0.02	.02	0.02	0.02
Decreased digital communication																		
Voice calls	−.05*	−0.20	0.08	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Video calls	–	–	–	−.03	−0.11	0.07	–	–	–	–	–	–	–	–	–	–	–	–
Text messages	–	–	–	–	–	–	−.05**	−0.28	0.10	–	–	–	–	–	–	–	–	–
Email	–	–	–	–	–	–	–	–	–	−.02	−0.10	0.08	–	–	–	–	–	–
Social media	–	–	–	–	–	–	–	–	–	–	–	–	−.01	−0.03	0.08	–	–	–
Online games	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	−.01	−0.03	0.06
Adjusted R^2	.05***			.05***			.06***			.06***			.06***			.06***		

The reference category for education level is "High school or less," and for metropolitan status "Urban." β: standardized coefficient; *b*: unstandardized coefficient.
*$p < .05$; **$p < .01$; ***$p < .001$.

communication: those who increased their use of text messaging, email, social media, and online games experienced lower social connectedness, while not for voice calls and video calls. Moreover, those who had decreased voice calls and text messaging experienced lower social connectedness.

Although our findings support SPT generally, there are a number of potential nuances that require interpretation and suggest room for future research. The trend that higher frequency of use of text messaging is not associated with lower social connectedness, while the use of email, social media and online games is, could point to the importance of type of social ties communicated with. Text messaging typically involves close ties, while email, social media, and online games often also involve people outside one's tight social circle (Liu and Yang, 2016; Yang et al., 2013). Indeed, while text messaging is text-based, often asynchronous, and thus generally perceived as low to moderate in social presence (Fox and McEwan, 2017), it is often used for connecting with the same closer ties with which one communicates face-to-face or over mobile voice calls (Kim et al., 2007). Altogether, this suggests that different media play different roles in cultivating social connectedness in times when face-to-face communication is significantly reduced, and that higher and lower levels of social presence associated with different media (Fox and McEwan, 2017; Oh et al., 2018) can help understand these roles.

When it comes to changes in digital communication during the pandemic, interestingly, people who had increased and people who had decreased their use of text messaging during the pandemic both experienced lower levels of social connectedness (although the frequency of text messaging was not related to social connectedness). While these findings might seem contradictory at first, they suggest the importance of individual variation in people's digital communication behaviors and sense of social connectedness. Varying uses of text messaging (i.e. synchronous vs asynchronous; with vs without visual cues such as emoticons, animated images, and stickers) may foster different levels of social presence (Hsieh and Tseng, 2017; Park and Sundar, 2015) as well as the degree of social connectedness that one obtains from such communication. The contradicting findings for changes in text messaging can also be explained by theoretical notions from the Differential Susceptibility to Media Effects Model (Valkenburg and Peter, 2013), which posits that depending on individual characteristics and situational contexts, people may react differently to digital media use. As such, individuals may vary in if, how, and when they benefit from various digital communication methods for social connection during the pandemic, and besides longitudinal work, future research could explore such contextual variations further in-depth as well.

We find that an increase in email communication is related to lower social connectedness. Email is often used for professional communication (Kim et al., 2007), and while our survey item asked participants to exclude work-related communication, it is possible that changes in such communication still played a role given the blurring boundaries of work and home life for many during COVID-19. During the pandemic, increased use of email may have reflected that people missed out on in-person communication at the workplace, such as spontaneous socializing and communication with colleagues, leading to lower social connectedness overall. Further research might explore the ways one uses email during stay-at-home measures, as well as the types of social connections such communication supports.

In line with earlier studies (Liu et al., 2019), we find that the frequency of online gaming as a means of communication negatively correlated with social connections. At odds with how previous studies have explained this correlation, during the pandemic, one potential interpretation is that people felt disconnected and turned to online games to spend time with close ones. This interpretation becomes more likely when considering that, during quarantine measures, social video games and online board games that can be played virtually with friends and family became popular (Wamsley, 2020). As such, the type of online gaming captured in our study might have been different from online gaming typically investigated in previous scholarship. Alternatively, it may be that people turned to online games as an escape or distraction (Kardefelt-Winther, 2014; Liu et al., 2019), not necessarily involving friends and family, with the result of this activity replacing time spent with close ties, leading to lower social connectedness overall. While we specifically asked about communication with friends and family outside the household, we did not distinguish between the type of online game, or with whom people played. Different online gaming experiences have shown to relate differently to social wellbeing (Johnson et al., 2013; Kaufman et al., 2019), thus this could be a fruitful avenue for future research.

Overall, the nature of the relationships between different digital communication methods and social connectedness will require further research to explore. Notably, in our study, we did not distinguish between the specific features of various digital communication channels (e.g. video sharing on social media, voice, and video chat in online gaming). Distinguishing between such uses in future work can provide a more nuanced understanding of how different channels can build social connectedness in today's rich digital media environment. Moreover, as Fox and McEwan (2017) note, different types of social media (e.g. Facebook vs Snapchat) generate varying perceptions of social presence, and thus lumping all social media in one category undermines our understanding of the specific elements of digital media that facilitate social presence and connectedness. In our study, distinguishing between social media platforms and uses could have shown different relationships to social connectedness. Furthermore, given the limitation of our study in not including measures of social presence, future work can extend SPT by including measures of social presence rather than relying on existing categorizations to examine the social processes facilitated by modern technology.

In situations where in-person social interactions are largely unavailable, researchers should ask to what extent digital communication can replace the unique social benefits of face-to-face communication (e.g. physical presence and touch, non-verbal communication). This question also shifts a key aspect of the perennial debate over "displacement" and "stimulation" in previous research on digital media use and wellbeing (Kraut et al., 1998; Liu et al., 2019; Valkenburg and Peter, 2007). This debate has typically assumed face-to-face communication as an option, such that digital media use takes away or "displaces" time (typically thought of as offline time) spent with close ties, or that digital media use for communication increases or "stimulates" overall interactions (including face-to-face interactions) with close ties. During stay-at-home orders, rather, the question is how people turn to digital communication when face-to-face communication is simply not available. This requires different theoretical perspectives on the relationship between digital media use and social connectedness.

Our results show that the frequency of, as well as increases and decreases in, different digital communication methods during the pandemic have different relationships to social connectedness. While it is plausible that people turned to digital communication to make up for feelings of reduced connectedness, it is also possible that some might have felt more socially isolated after such digital interactions (The Harris Poll, 2020a: 8) as relying on digital communication more than usual can lead to realizations of what people are missing from in-person interactions (e.g. physical closeness, body language). Given the cross-sectional nature of our data, we cannot draw conclusions about the causal direction. We encourage future research to explore longitudinal effects of digital media use on social connectedness in contexts where face-to-face interactions may be limited.

In this study, we did not include a measure of face-to-face communication, as under the physical distancing and stay-at-home guidelines during the pandemic this had likely decreased for most people. We did include measures of living situation as well as going out for non-essential social activities, and although we did not measure how frequently people engaged in such activities, our measure likely accounts for part of the face-to-face interactions that occurred on a daily basis. Future work could include measures of face-to-face communication to control for the effect of these interactions on people's sense of social connectedness, as well as exploring what aspects of face-to-face communication people miss in times of physical distancing, and how these losses can be made up using digital communication methods. In addition, work has shown that mobile phone use data can offer unobtrusive measures of people's movement and adherence to physical distancing and stay-at-home guidelines so coupling such data with other measures could be a fruitful future avenue as well (Brzezinski et al., 2020; Gao et al., 2020).

When in-person interactions are minimized and digital media behaviors of people change such as during the COVID-19 pandemic, different digital communication methods take on different roles in keeping people socially connected. Social connectedness can be an important indicator of wellbeing outcomes in times of COVID-19, such as loneliness, depression, and resilience (Capanna et al., 2013; Satici et al., 2016; Williams and Galliher, 2006). In the future, other incidents might occur where people will have to rely heavily on digital communication tools (e.g. natural disasters, epidemics, political upheavals) raising the question of whether similar patterns in digital communication and social connectedness generalize to such scenarios. Moreover, in most parts of the world, including the United States, people were encouraged to stay at home as much as possible, but not prohibited from leaving home. In other heavily affected areas (e.g. Italy, Spain, China) governments had called for complete lockdowns only allowing people to go out under strict conditions. Industry reports indicate that digital communication patterns in countries under stricter lockdown are different in that the uptake of video chat is higher (Kemp, 2020). In such areas, people may be more dependent on digital media to remain socially connected than in areas where lockdown measures are less strict, and so the relationships between digital media use and social connectedness could differ from what we have observed in this study. Future research on people's digital communication behaviors and social connectedness could include cross-national comparisons to address these questions.

Conclusion

Drawing on a sample of US adults, we find that the relationship between digital communication methods and social connectedness during a time of limited face-to-face interaction outside the home varies by mode of communication. Our study shows that social presence theory can help explain the relationship between changes in people's digital communication and levels of social connectedness. Engaging in digital media that offer lower social presence (e.g. email, social media, and online games) relates negatively to a sense of social connectedness, while the same finding does not hold for digital communication methods with higher social presence (e.g. voice and video calls). Moreover, decreases in higher social presence media (i.e. voice calls) relate to lower perceived social connectedness. Whether these relationships are long-lasting remains to be seen, yet they have ramifications for how we understand social connectedness during a time when society is highly reliant on digital communication. The nuance reported here offers insights into the kinds of communication methods that may be more important to maintain and support in times of crises.

Acknowledgements

The authors appreciate helpful input from Gökçe Karaoglu and Elissa Redmiles.

Funding

The authors are grateful to the University of Zurich and Microsoft Research for supporting the data collection.

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References

Ames MG, Go J, Kaye J, et al. (2010) Making love in the network closet: the benefits and work of family videochat. In: *Proceedings of the 2010 ACM conference on computer supported cooperative work*, Savannah, GA, 6–10 February, pp. 145–154. New York: ACM.

Baldassar L (2016) De-demonizing distance in mobile family lives: co-presence, care circulation and polymedia as vibrant matter. *Global Networks* 16(2): 145–163.

Baumeister RF and Leary MR (1995) The need to belong: desire for interpersonal attachments as a fundamental human motivation. *Psychological Bulletin* 117(3): 497–529.

Baym N (2015) *Personal Connections in the Digital Age*. Malden, MA: Polity Press.

Baym N, Zhang YB and Lin M (2004) Social interactions across media: interpersonal communication on the internet, telephone and face-to-face. *New Media & Society* 6(3): 299–318.

Brooks SK, Webster RK, Smith LE, et al. (2020) The psychological impact of quarantine and how to reduce it: rapid review of the evidence. *The Lancet* 395(10227): 912–920.

Brzezinski A, Deiana G, Kecht V, et al. (2020) The Covid-19 pandemic: government vs. community action across the United States. *Covid Economics: Vetted and Real-Time Papers* 7: 115–156.

Capanna C, Stratta P, Collazzoni A, et al. (2013) Social connectedness as resource of resilience: Italian validation of the social connectedness scale-revised. *Journal of Psychopathology* 19: 320–326.

De Kort YA, IJsselsteijn WA and Poels K (2007) Digital games as social presence technology: development of the Social Presence in Gaming Questionnaire (SPGQ). In: *Proceedings of the 10th annual international workshop on presence* (ed Moreno L), Barcelona, Spain, 25–27 October, pp. 1–9. Barcelona: Starlab.

Ellison NB, Vitak J, Gray R, et al. (2014) Cultivating social resources on social network sites: Facebook relationship maintenance behaviors and their role in social capital processes. *Journal of Computer-Mediated Communication* 19(4): 855–870.

Elmer T, Mepham K and Stadtfeld C (2020) Students under lockdown: comparisons of students' social networks and mental health before and during the COVID-19 crisis in Switzerland. *PLoS One* 15(7): e0236337.

Fox J and McEwan B (2017) Distinguishing technologies for social interaction: the perceived social affordances of communication channels scale. *Communication Monographs* 84(3): 298–318.

Gao S, Rao J, Kang Y, et al. (2020) Association of mobile phone location data indications of travel and stay-at-home mandates with covid-19 infection rates in the US. *JAMA Network Open* 3(9): e2020485–e2020485.

GlobalWebIndex (2020) *GWI Coronavirus Research Series 8: Health*. Available at: https://www.globalwebindex.com/hubfs/1.%20Coronavirus%20Research%20PDFs/GWI%20coronavirus%20findings%20April%202020%20-%20Health%20(Release%208).pdf

Gonzales AL (2014) Text-based communication influences self-esteem more than face-to-face or cellphone communication. *Computers in Human Behavior* 39: 197–203.

Grieve R, Indian M, Witteveen K, et al. (2013) Face-to-face or Facebook: can social connectedness be derived online? *Computers in Human Behavior* 29(3): 604–609.

Hargittai E and Hsieh YP (2012) Succinct measures of web-use skills. *Social Science Computer Review* 39(1): 95–107.

Hargittai E, Nguyen MH, Fuchs J, et al. (2020) From Zero to a National Data Set in 2 Weeks: Reflections on a COVID-19 Collaborative Survey Project. *Social Media + Society* 6(3). DOI: 10.1177/2056305120948196.

Hsieh SH and Tseng TH (2017) Playfulness in mobile instant messaging: examining the influence of emoticons and text messaging on social interaction. *Computers in Human Behavior* 69: 405–414.

Jeong H, Yim HW, Song Y-J, et al. (2016) Mental health status of people isolated due to Middle East Respiratory Syndrome. *Epidemiology and Health* 38: e2016048.

Johnson D, Jones C, Scholes L, et al. (2013) *Videogames and Wellbeing: A Comprehensive Review*. Young and Well Cooperative Research Centre. Available at: https://eprints.qut.edu.au/105915/1/2013%2BCRC%2BReport%2BVideogames_and_Wellbeing.pdf

Joinson AN (2004) Self-esteem, interpersonal risk, and preference for e-mail to face-to-face communication. *Cyberpsychology & Behavior* 7(4): 472–478.

Kardefelt-Winther D (2014) The moderating role of psychosocial well-being on the relationship between escapism and excessive online gaming. *Computers in Human Behavior* 38: 68–74.

Kaufman DR, Ma H, Sauvé L, et al. (2019) Benefits of digital gameplay for older adults: does game type make a difference? *International Journal of Aging Research* 2(4): 4.

Kawachi I and Berkman LF (2001) Social ties and mental health. *Journal of Urban Health* 78(3): 458–467.

Kemp S (2020) Report: most important data on digital audiences during coronavirus. *Growth Quarters|The Next Web*. Available at: https://thenextweb.com/growth-quarters/2020/04/24/report-most-important-data-on-digital-audiences-during-coronavirus/

Kim H, Kim GJ, Park HW, et al. (2007) Configurations of relationships in different media: FtF, email, instant messenger, mobile phone, and SMS. *Journal of Computer-Mediated Communication* 12(4): 1183–1207.

Koeze E and Popper N (2020) The virus changed the way we internet. *The New York Times*. Available at: https://www.nytimes.com/interactive/2020/04/07/technology/coronavirus-internet-use.html

Kraut R, Lundmark V, Patterson M, et al. (1998) Internet paradox: a social technology that reduces social involvement and psychological well-being? *American Psychologist* 53(9): 1017–1031.

Lee RM and Robbins SB (1995) Measuring belongingness: the social connectedness and the social assurance scales. *Journal of Counseling Psychology* 42(2): 232.

Liu D, Baumeister RF, Yang C, et al. (2019) Digital communication media use and psychological well-being: a meta-analysis. *Journal of Computer-Mediated Communication* 24(5): 259–273.

Liu D and Yang C (2016) Media niche of electronic communication channels in friendship: a meta-analysis. *Journal of Computer-mediated Communication* 21(6): 451–466.

Mervosh S, Lee JC, Gamio L, et al. (2020). See how all 50 states are reopening. *The New York Times*. Available at: https://www.nytimes.com/interactive/2020/us/states-reopen-map-coronavirus.html

Nedelcu M and Wyss M (2016) "Doing family" through ICT-mediated ordinary co-presence: transnational communication practices of Romanian migrants in Switzerland. *Global Networks* 16(2): 202–218.

Neustaedter C and Greenberg S (2012) Intimacy in long-distance relationships over video chat. In: *Proceedings of the SIGCHI conference on human factors in computing systems*, pp. 753–762. Available at: http://grouplab.cpsc.ucalgary.ca/grouplab/uploads/Publications/Publications/2011-IntimateMediaSpaces.Report2011-1014-26.pdf

Oh CS, Bailenson JN and Welch GF (2018) A systematic review of social presence: definition, antecedents, and implications. *Frontiers in Robotics and AI*. Epub ahead of print 15 October. DOI: 10.3389/frobt.2018.00114.

Park EK and Sundar SS (2015) Can synchronicity and visual modality enhance social presence in mobile messaging? *Computers in Human Behavior* 45: 121–128.

Pettegrew LS and Day C (2015) Smart phones and mediated relationships: the changing face of relational communication. *Review of Communication* 15(2): 122–139.

Rice RE (1993) Media appropriateness: using social presence theory to compare traditional and new organizational media. *Human Communication Research* 19(4): 451–484.

Ryan T, Allen KA, Gray DL, et al. (2017) How social are social media? A review of online social behaviour and connectedness. *Journal of Relationships Research* 8: e8.

Sallnäs E-L (2005) Effects of communication mode on social presence, virtual presence, and performance in collaborative virtual environments. *Presence: Teleoperators and Virtual Environments* 14(4): 434–449.

Satici SA, Uysal R and Deniz ME (2016) Linking social connectedness to loneliness: the mediating role of subjective happiness. *Personality and Individual Differences* 97: 306–310.

Schiffrin H, Edelman A, Falkenstern M, et al. (2010) The associations among computer-mediated communication, relationships, and well-being. *Cyberpsychology, Behavior, and Social Networking* 13(3): 299–306.

Short J, Williams E and Christie B (1976) *The Social Psychology of Telecommunications*. London: John Wiley & Sons.

The Harris Poll (2020a) *Connection, Abridged*. Available at: https://theharrispoll.com/the-harris-poll-digital-economy-report-download/

The Harris Poll (2020b) Zoom parenting and the rise of permissibility. *The Harris Poll*, 8 April. Available at: https://theharrispoll.com/zoom-parenting-and-the-rise-of-permissibility/

Tseng F-C, Huang H-C and Teng C-I (2015) How do online game communities retain gamers? Social presence and social capital perspectives. *Journal of Computer-Mediated Communication* 20(6): 601–614.

Valkenburg PM and Peter J (2007) Online communication and adolescent well-being: testing the stimulation versus the displacement hypothesis. *Journal of Computer-Mediated Communication* 12(4): 1169–1182.

Valkenburg PM and Peter J (2013) The differential susceptibility to media effects model. *Journal of Communication* 63(2): 221–243.

Wamsley L (2020) *As Hanging Out Gets Difficult, More People Are Turning to Social Video Games*. NPR.Org. Available at: https://www.npr.org/2020/03/19/818350972/as-hanging-out-gets-difficult-more-people-are-turning-to-social-video-games

Wei R and Lo V-H (2006) Staying connected while on the move: cell phone use and social connectedness. *New Media & Society* 8(1): 53–72.

Williams KL and Galliher RV (2006) Predicting depression and self-esteem from social connectedness, support, and competence. *Journal of Social and Clinical Psychology* 25(8): 855–874.

Wong M (2020) Hidden youth? A new perspective on the sociality of young people "withdrawn" in the bedroom in a digital age. *New Media & Society* 22(7): 1227–1244.

World Health Organization (2020) *Advice for Public*. Available at: https://www.who.int/emergencies/diseases/novel-coronavirus-2019/advice-for-public

Yang C, Brown BB and Braun MT (2013) From Facebook to cell calls: layers of electronic intimacy in college students' interpersonal relationships. *New Media & Society* 16(1): 5–23.

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