Family and Friend Communication over Distance in Canada During the COVID-19 Pandemic

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During the COVID-19 pandemic, communication technologies have allowed people to maintain connections with their loved ones over distance. At the same time, we do not yet have a deep understanding of if and how communication needs amongst family and friends change as a result of physical distancing and travel restrictions and how technologies could be better designed to support these needs. For these reasons, we conducted an exploratory study to investigate the use of communication technologies and family communication needs during the first fourth months of the COVID-19 pandemic in Canada. We used contextual interviews with 18 participants and an open-ended survey with 12 respondents. Our results show that people began the pandemic with a period of *shifting and trialing* new communication practices; this included increased communications with family and friends. People tried to recreate in-person situations with large group video calls beyond the typical two-household connection found pre-pandemic. This created challenges related to *control and participation*, and saw people explore ways to increase a sense of shared *atmosphere* over distance with efforts to increase *physicality*. Yet large amounts of technology use generally did not persist as participants abandoned many forms of online interaction over time in a form of *technology detachment* and sometimes *cleanse*. These results point to design lessons for times of extreme disconnection between family and friends, such as during a pandemic, where control, participation, and atmosphere receive deep consideration.

CCS CONCEPTS • Human-centered computing~ Human computer interaction (HCI)~ Empirical studies in HCI

Additional Keywords and Phrases: Family communication, Domestic technology, Video communication, Asynchronous communication, COVID-19 pandemic

1 INTRODUCTION

Within Canada, like many other countries, the coronavirus (COVID-19) has changed the way in which people are able to connect with and see family and friends. In mid to late March 2020, the COVID-19 pandemic caused provinces within Canada to introduce travel restrictions and recommend physical distancing measures (e.g., staying 2 metres/6 feet away from people outside one's household members) in order to reduce virus transmission [18]. The net result was that people tended to stay 'close to home' and reduce in-person interactions with family and friends who they did not live with. A plethora of literature already documents the non-pandemic communication routines and needs of family and friends and how communication technologies should be designed for domestic life during times when people are able to travel and see each other in person. However, we have little formal understanding of how family communication needs change (if at all) as a result of travel restrictions and physical distancing during pandemic times and what implications this has for

the design of domestic communication technologies.

As such, we conducted an exploratory study with 30 middle class participants in British Columbia, Canada. The goal was to explore the communication practices and technology needs of people for connecting with their family and friends with COVID-19 physical distancing measures and travel restrictions in place. This included interviews with 18 people and an open-ended survey with 12 people from June to early August 2020. Within Canada, this represents the third and fourth month of people experiencing physical distancing measures and travel restrictions; thus, participants could describe and reflect on their communication needs from early-on in the pandemic, as well as their current needs several months into it (if any had changed). With multiple vaccines for COVID-19 now developed and being deployed, there is the chance that we are on the cusp of reaching post-COVID-19 lifestyles with a return to pre-pandemic family communication routines over the next year. This could mean that knowledge of family communication routines and technology needs during a pandemic time period are less relevant. Yet there is a large chance that the future may bring new viruses that require isolation or other situations that cause extreme disconnection amongst family and friends for large numbers of people. Similarly, COVID-19 vaccines may take time to distribute to populations, not everyone may be able to take them, or virus strains may mutate and require new vaccines. Thus, it can be very valuable to have documented knowledge of family communication needs and routines during the COVID-19 pandemic, and lessons for how technology should be designed to support such needs. Of course, it is also the case that the effects of the pandemic may last for years to come as people may feel long-term effects from possible social isolation brought on by the pandemic. This may make technology design lessons from the pandemic relevant for years to come. Such lessons may even be more broadly applicable to other types of distance separation by family and friends. To summarize, the focus of this paper is to understand: how family members and friends communicated when communication mostly depended on technology, what lessons could be learned from pandemic society, and what social needs are unanswered with current technologies. We draw out insights for designing future domestic technology for connecting families or individuals in a pandemic society or individuals who do not have the opportunity for frequent in-person communication such as immigrant families.

Our results revealed four main themes when it came to family and friend communication during the pandemic. The first theme was *shifts and trials* of new communication practices, including increasing the number of remote family and friends that one communicated with using technology and increased willingness to try new technologies. The second theme was *control and participation.* Here we saw many participants turn to the use of large group video calls (e.g., 4-40 people), as opposed to paired connections, to feel connected with those they could not see in person. Yet they struggled with distractions, conversational challenges, and varying device capabilities, which all limited participation and took control away from users. The third theme related to *atmosphere and physicality* and the desire by people to feel like they were in locations other than their home, or in the same home as their remote family or friends. This was done through game playing, as well as the incorporation of physical objects for shared meals or coffee/tea chats. Yet, again, there were challenges in creating shared atmospheres due to the technology. The fourth theme related to many participants growing tired of screen-based technologies and high degrees of family/friend communication. This caused many to go through a period of *technology detachment* and, for some, a technology '*cleanse'*. Together our four themes point to new ways of thinking about technology design for family and friend communication that considers video connections of larger numbers, better support for creating a sense of shared atmosphere over distance, the incorporation of physicality to increase feelings of closeness, and opportunities to move away from screen-based design solutions. Across all of these areas, an overarching theme relates to the idea of moving beyond designs that are predominantly focused on paired-connections of two homes/two individuals.

2 RELATED WORK

2.1 Family and Friend Communication Needs and Routines

There is a large volume of literature on family communication during pre-pandemic society, which offers a valuable comparison to our study results. From this work, we know that people stay connected and aware of their family and friends at different frequencies and level of detail, often based on the relationship [48,59]. The desire for connection and information may come and go depending on life happenings (e.g., marriage, having children) [48,59]. People typically want to know information about people's recent and upcoming activities, locations, and health/well-being [48]. Family and friends use varying technologies to stay in touch (e.g., mobile text messaging, video, and audio calls) and the choice of technology is often based on the person and the relationship as some people find different technologies to be more convenient to use [59]. For example, couples often use text messaging during the day to inform each other of their activities and whereabouts [24], while adult siblings tend to communicate through less frequent ad-hoc text messaging [10]. Older adults tend to be more comfortable using phone calls to connect [1,59]. We also know that people sometimes feel obligated to communicate with family and friends over distance if remote individuals desire too much connection [54]. Synchronous communication tools (e.g., phone, video chat) are often preferred for emotional-based conversations, while asynchronous tools are ideal for coordinating schedules [9,11,50,59]. People prefer in-the-moment sharing of information where sharing is targeted [54] and dislike feeling obligated to communicate [32,54]. Social media connects large volumes of family and friends, despite creating challenges with intergenerational communication [45].

Despite this rich span of research, we do not know how family needs and technology use changes during pandemic times involving physical distancing and restrictions on travel. This includes moments in time when large volumes of people are unable to connect in-person with people that they might routinely travel to see, or those who live relatively close to them in the same city. Other life situations such as being in a long-distance relationship or being away from family due to military or remote work [24,39] are similar in that people are apart from their loved ones, sometimes for long periods of times; however, during such situations the number of people affected is much smaller than pandemic times that affect the populations of entire countries. Thus, vastly larger groups of people are experiencing disconnection from family and friends at the same time. This brings periods of rapid trials and testing with communication technologies, not typically seen in non-pandemic life.

2.2 Video Communication by Family and Friends

Studies of non-pandemic society show that family and friends enjoy using video chat because they like to see each other when communicating over distance [1,8,11,34,38]. For example, couples in long distance relationships often use video communication in order to see each other and create feelings of co-presence by leaving video links open [24,38]. Researchers have also found video chatting to be easier for children to connect with extended family compared to the phone [1,20]. Studies have shown value in augmenting video chat calls with shared media, such as online videos [20] and television shows [42]. Family and friends have also been shown to want to share experiences and activities together over distance and use video chat to mediate such needs [1,8,11,28,37,38]. Indoor activities include, for example, cooking with a parent [8], watching a movie together as a couple [8], dining together between pairs [47,60], and seeing major life events such as weddings, funerals, and birthday parties [43]. Outdoor activities include family members viewing children's play time [35] and exploring new locations [40,53]. Across all of this literature, we primarily see video chat being explored for paired connections; that is, video links between two homes or locations (e.g., a grandparents' home connecting to their grandchildren, a single person joining a family at an outdoor picnic from their home). Thus, we do

not see situations where three or more homes or locations are connecting together in instances of a joint video call across, for example, grandparents, grandchildren, aunts/uncles, cousins, friends. We build on the prior literature with explorations of family and friends connecting amongst large groups, upwards of 40 people, across more than three locations during pandemic times. This reveals new challenges with control and participation in video calls.

Although video is a rich medium for connecting family and friends, it comes with challenges. Research has shown that video calls can be privacy intrusive sometimes and cause family and friends to not feel comfortable sharing what is happening in their home as well as their appearance [8,38]. Video communication can be challenging when trying to multitask while sharing an activity over distance [8]. Video calls are also challenging due to limited fields of view and large amounts of camera work (e.g., orienting and moving the camera) [8,35]. When watching activities over distance, remote family members often feel more like an observer than someone who can actually interact with remote family/friends [35,40]. Remote family and friends tend to focus their interactions on collocated people rather than remote ones [43]. Overall, the concerns raised in the prior work predominantly relate to paired homes or individuals being connected. We build on these challenges to understand issues with connections that include larger groups of people connected simultaneously, as well as times when people may feel an even stronger need to be connected with others because of health concerns and anxiety brought on by a pandemic.

2.3   Designs for Family and Friend Communication

Researchers have explored a plethora of designs for connecting family and friends over distance. There are too many to enumerate in any one paper; however, we draw attention to two main types of applications which are relevant to our study and the types of information and activities that became important to participants during the pandemic.

Arguably one of the first types of research designs to be created for domestic communication are awareness appliances. Such devices allow people to share specific information with a remote loved one. First, prototypes have focused on passive awareness sharing where information is collected through sensing and shared. For example, interconnected rings track and share heartbeats between two people [61] or interconnected beds sense and share sleep information [16]. Second, prototypes have been designed for families to share subtle information through explicit acts. For example, information can be shared via interconnected photo frames [12], cups [14], slippers [13], pillows [22], inflatable vests for hugs [44], gloves for simulating touch [58], hand-holding devices [23], or mobile devices for a partner's pulse [61]. Interaction on one person's object causes changes on the other person's object; thus, many focus on paired connections between only two individuals and we do not see how devices might need to be designed for connecting more than pairs. Some awareness appliances have provided the ability to message either through text or voice, sometimes for group messaging [55] and other times for paired connections [29]. Awareness devices are one possible technology that can be used to help keep people aware of family and friends, however, as research prototypes, these types of systems were generally unavailable for people to use during the pandemic. We return to this point and the potential value of awareness appliances in our discussion section.

There have also been a variety of video-communications systems designed for families. For example, systems have been designed for sharing books and media between parents and children over distance [62,63]. Always-on video media spaces have been designed to connect grandparent-grandchild homes and were found to make family members feel more connected, have more to talk about, and feel a part of each other's life [37]. Researchers have also designed systems to allow people to share the same activity over distance in the outdoors (e.g., hiking) through wearable cameras [52] and telepresence robots [27]. Systems have even explored support for activities such as shared dining [47,60]. Again, the reality is that none of these systems were available for the public to use during the pandemic, despite their possible value.

We return to them as part of our discussion section and assess their usefulness during pandemic society. As design artifacts, they provide an understanding of how to connect pairs of homes or individuals, but do not explore broader connections that might happen when people in three or more homes or locations want to connect together as a larger group. We explore these ideas more in our discussion section.

2.4 Working from Home and an Overuse of Technology

Our study also touches on aspects of working from home. Prior research has shown that, in general, many people in developed countries are able to work from home [15,51]. One survey showed that 80% of employees want to work from home in the United States at least some of the time [2]. The results of a nine-month long field study done with 249 employees working from home for call centers in China showed a 13% increase in productivity and 9% increase in work time due to fewer breaks and sick days. Studies have shown that working from home can be a successful method that benefits employees by bringing flexibility, a lack of commute time, and the ability to be with family members [6]. It can also be beneficial to companies by sometimes producing more productive employees and a lower cost for physical space and facilities [6]. However, working from home is not without challenges. People often use time and space to organize their days [59]. The usage of portable devices such as tablets and laptops at home for both personal and work use can cause conflicts between work and family time and lead to stress, burnout, and an absence in family activities [17]. The use of mobile devices at home has caused some employees to feel they are never off-duty [17]. Sometimes too much technology can make people feel overconnected and like they have lost control over their time [25,41,56]. People sometimes feel the need to unplug and disconnect from others [3,4,30]. As such, systems have been designed to provide moments of solitude and alone time [21,49]. Much of this research has suggested reducing the use of mobile phones [1,33,49]. While most of the aforementioned studies focus on efficiency in work and how it affects people's performance, in our study we explored the effects of working from home on family/friend communication during a time period where children were forced to be home schooled or out of daycare due to closures.

3 EXPLORATORY STUDY PROCESS

We designed an exploratory study to learn about people's routines and activities for connecting with their family and friends during the pandemic. We wanted to understand how family communication practices and needs may have changed since pre-pandemic society across a range of relationship types. The study was approved by our ethics board.

3.1 Participants

We iteratively recruited 18 participants (9 women, 9 men, age range =20-47, avg age~34) for in-depth semi-structured interviews. As we interviewed, we added more participants to our sample until we reached data saturation. We recruited participants through snowball sampling, emails, and the usage of social media platforms such as Twitter, Facebook and Instagram. We selected interview participants based on their background information (shared to us via email) including gender, age, occupation, and the number of people in their household where we purposely picked people in order to have a range of backgrounds and demographics. Participants were all from the same geographic region in British Columbia, Canada, considered middle class, and had a variety of occupations, e.g., engineer, software developer, lecturer, pharmacist, graduate student, and chiropractor. Some of our participants also experienced living in a different country far from their family and friends who frequently used only technology to connect with their close contacts. Two people were off work temporarily because of the pandemic. Most of our participants experienced a switch to working from home during the pandemic. Five participants lived as a couple with a partner; four lived with a partner and children

(ages varied from babies to school-aged; one had shared custody of their children); four lived with roommates; two were adult children living with their parents; two lived alone; and, one lived with an adult sibling. We purposely recruited across a range of ages and living situations so we could get a diverse spread of data; this comes with the caveat that we do not have large numbers of participants in any one age group or life situation. This means our results are able to surface user needs and routines, but not the frequency at which they would occur across people in society as a whole.

We recognized that some people may be interested in participating in the study but unable to commit a contiguous block of time for an interview, given additional challenges brought on by the pandemic, or they may not be comfortable in interviews over video chat as a method. As such, we recruited people for a survey option. We used the same process as described above for recruiting survey respondents, e.g., when telling people about the study, we offered them the ability to complete the survey or interview. In total 12 participants responded to the survey (7 male, 5 female). Ages ranged from 25 to 64 (~avg 40). Three participants lived as a couple; four lived with a partner and children (ages varied from babies to teenagers); three lived with roommates; and two lived alone. Participants had different occupations such as hairdresser, designer, lecturer, engineers, manager etc.

For all of our participants, the COVID-19 pandemic forced the area within which they lived to introduce travel and physical distancing restrictions. The following timeline describes the restrictions faced by our participants and when our study was conducted:

- **March 2020:** The COVID-19 virus began to create increased case numbers in Canada and it was declared a pandemic.
- **End of March to May 2020:** All participants had international travel closed and were told to avoid in-person contact with people outside of their household group. Schools were closed or switched to remote learning. Bars, gyms, and dine-in options for restaurants were closed. Our participants typically did not leave their home aside from necessities such as getting groceries or going to work (if considered essential services and they were unable to work from home).
- **End of May 2020:** Businesses began a gradual re-opening and social circles were allowed to increase albeit slightly. Generally speaking, participants restricted the number of people they saw in person to only those they lived with as well as very select others (e.g., grandparents, a caregiver, close friends). If they saw anybody else, they tried to follow physical distancing guidelines of staying 2 meters (6 feet) apart.

All interviews and surveys were completed between June and August 2020, which meant that participants could describe and reflect on the time period in which they faced the harshest of restrictions, as well as a short period of time afterwards when some restrictions were lifted.

3.2 Method

We designed open-ended questions for our interviews and survey in order to understand if and how communication practices may have changed since the pandemic began, how technology was being used for communication, and what challenges participants were facing in staying connected with their family and friends. We explored different social circles of family and friend connections including 1) those people participants lived with, 2) close family/friends who the participant did not live with, and 3) extended contacts. These three groups were based on the groups described in the related work [49,59]. Here we asked questions about each type of social grouping. Example questions included, "How has physical distancing due to COVID-19 affected your activities with these people [example: close family and friends]", "How did you connect with [people in social group] before the pandemic?", "How do you connect with [people in social group] now?", "Have you tried using technology in any new ways since the pandemic started?," "Please tell us about a

memorable time when you connected with these people over distance since the pandemic started. What technology did you use and what did you share/talk about?" All the interviews were done remotely over Zoom or Skype due to restrictions on in-person interviews set by the government and our university. The interviews lasted 25 to 60 minutes. As mentioned, we created a survey to collect data from additional participants. The survey was designed in Survey Monkey and contained the same open-ended questions as the interviews. The total number of questions in the survey including background information was 30 questions; respondents took between 15 and 30 minutes to complete the survey. The only difference between the survey and interviews was that with the interviews we could ask follow-up questions and probe more deeply into participants' responses. We conducted pilot tests on our survey questions and updated their wording in order to ensure that respondents could understand each question without us being present. Both interview and survey participants completed an informed consent form prior to their participation in the study and were given the option to withdraw at any point in time. Participants did not receive compensation for their participation in the study.

3.3 Data Collection and Analysis

All interviews were audio recorded and notes were taken during each session. All audio files were transcribed, and the survey answers were extracted. The collected data was analyzed using NVivo software. We analyzed both interview and survey data together using open, axial and selective coding, in addition to affinity diagramming to uncover the main themes. One researcher coded the data and themes and codes were reviewed, discussed, and iterated on with a second researcher. These included "changes in face-to-face communication", "group video calls as a socializing method", "group video calls and games", and "activities for wellbeing", along with sub-themes such as, "increases in in-home communication", "increases in remote communication", "challenges with working from home", "video calls during eating/drinking", "video calls for exercise", and "reducing screen time." Further analysis revealed selective coding themes around shifting and testing of routines; control and participation; atmosphere and physicality; and, technology detachment and cleanse. We focus our results sections on these themes. Throughout our data collection and analysis procedures, all data was kept confidential and anonymous. Quotes are reported with P# for interviewees and S# for survey respondents.

4 SHIFTING AND TESTING

The first main theme that emerged in our analysis relates to the idea of *shifting and testing* of family communication needs and technologies. Before the COVID-19 pandemic, all of our participants had a set of 'normal' ways in which they interacted with family and friends, including who they interacted with and how, whether this was done in-person or remotely through technology, or some of both. Yet for everyone, there was a clear and distinct phase at the beginning of the pandemic (typically the first month) that constituted the shifting of such routines and explorations of what level of connection they needed and with whom in order to feel as though their desired levels of family and friend connection were achieved. Other research has reported on how family and friends try out new communication technologies and the pains of adoption and getting systems to work [1,8,38]. The difference we saw with our study was a much broader and faster period of shifting and testing of routines and technologies with far more people at the same time, given that everyone was forced into similar social and travel restrictions. We illustrate this theme by describing how in-person communication with household members was heightened and how online communication rapidly increased initially with those family and friends living outside of one's home.

First, participants said that they naturally began communicating more with family members or roommates that they

lived with since they were spending more time at home with them. There was also a recognition that talking about the pandemic and its effects was an important part of early pandemic life. Participants wanted to learn how their household members felt about the situation and jointly discuss what they should be doing to cope. Such conversations were not always easy. Participants that were parents described a struggle with explaining the changes in life to their children without scaring them. Conversations sometimes shifted from more 'normal' topics of everyday life (e.g., school activities, extra-curricular activities, friends) to explanations of why they were not able to go to school or see their friends in person, and how they needed to be cautious and change hygiene (e.g., handwashing).

> "It was difficult because first, kids, they don't understand the situation. They don't understand how big, how bad, how serious is that thing. You don't want to scare them. You don't want them to be scared of the future... But, at the same time, you want them to be informed because they need to wash their hands. They need to be more careful." -P14, Lives with Partner and 1 School Age Children, Age Range 35-44

Working from home helped our participants have more flexibility with their personal duties and worktime, which in turn increased communication opportunities with collocated family members or roommates. For example, they could make fresh food quickly for their lunch and enjoy it with their family. Laundry could be done quickly during a work break so they could do more with their kids in the evening. However, participants had to negotiate, test, and try out the timing and ways in which they communicated with their household members as spending more time at home was not without its challenges. This was especially the case for families with children who used to go to school or daycare but now were at home. Participants had to help children understand that sometimes the parents had to be working at home and, during these times, they may not be available to talk with their children or do activities. This contrasts the prior literature on working from home where children were not typically affecting routines as they were in school or daycare [6].

Quick changes between work and personal time were sometimes distracting and hard to manage because it was not always clear when a person was free to talk to household members. Participants said that they lost out on commute times that allowed them to mentally transition from work to personal life. To help manage children, some participants created a schedule where each parent could take longer breaks and engage the child(ren) by playing board games or helping them with home schooling. After the few first weeks, some families decided to increase their level of in-person contact and had grandparents come over to take care of the kids as it became too difficult to manage work and children throughout the day.

> "Also, keeping them [kids] entertained, so we bought some board games. Any time that I or [my wife] had a break, we were playing with [our child] those two board games that we bought, which was very good. We bonded even more than before. " -P14, Lives with Partner and 1 School Age Children, Age Range 35-44

Second, participants tried shifting their communication from in-person get-togethers to online communication with close family and friends that they did not live with (e.g., parents, siblings, close friends). This, again, involved periods of testing and deciding who to contact and how. All participants described increased technology-mediated communication, shifting from weekly or monthly phone calls, video calls, or in-person visits to daily or weekly calls with those they were close to. For many participants, this included connecting with their parents who were typically in their 60s to 80s. They were especially concerned about this demographic due to reports of COVID-19 having higher fatality rates for older adults.

"I wanted to make sure that my parents get enough social interaction... I value social relationships more than before, with the parents are one of the deepest ones." -P8, Lives with Partner, Age Range 24-34

Communication through technology focused heavily on the use of video calls with platforms such as Zoom, Discord, Skype, and FaceTime, though some family and friends relied on the phone instead. Participants tended to rely on messaging applications like FaceBook Messenger and WhatsApp for connecting with family or friends who they were not as close to in terms of their relationship. Some of these people ended up becoming closer contacts with more frequent communication because of the pandemic. Participants often described the increase in communication as a reaction to not knowing what the future was holding and a form of human connection that could help them be stronger mentally and prepared for what was next to come. Those participants who had family living far away (e.g., in another country) saw conversations shift from focusing on family life and activities to what was happening in that country in relation to COVID-19 (e.g., case numbers).

"I think the first few weeks was hard for us, because we really didn't know what was happening... I would say the first two weeks there was a lot of video calls going back home, trying to understand what's happening in this country. Is it a real thing or is it just a panic." -P3, Lives Alone, Age Range 25-34

Participants described a general willingness by their family and friends to try out various forms of online communication, including different types of video conferencing software. This was especially the case for older adults such as grandparents so they could connect with their grandchildren virtually. For example, P13 told us about an online picture album they made for their toddler and shared with the grandparents prior to the pandemic. Before the pandemic, the grandparents did not pay much attention to the album but after the pandemic started, the grandparents started to interact with the album more and learned how to use video calls to see their grandchild.

Participants also tried out new ways of working physical activities into their routines while incorporating technology to connect with family and friends. For example, some participants tried to do group fitness sessions using video calls with friends so that they could still have the experience of group workouts and socializing, but these online sessions were generally short lived. Participants gave up due to privacy issues while using video during workouts. They found it hard to organize a group of friends and sometimes felt uncomfortable or picky about which friends they were okay working out with virtually. This was because they did not feel completely comfortable on camera while working out (e.g., because of exercise clothing, body movements). One set of parents in the study created a routine for working out with their adult child over distance using a video call. As seen in other related work [37,46], one of the main issues that still existed for these activities was camera work and challenges with where to locate the camera so that people could easily see each other when working out together. Given these challenges, participants began to abandon technology-mediated exercising with family/friends. We describe this more in the section 'Technology Detachment and Cleanse.'

5 CONTROL AND PARTICIPATION

The second main theme that emerged in our analysis encompasses the idea of *control and participation* in family and friend communication. Here we refer to communication where people are able to participate as they like and there is an orderly and established set of procedures to facilitate communication. This also relates to people having the right tools, resources, and skills to communicate with others online. In contrast, we also found issues of inequity where people did not have a desired level of control over their communication with others and, as a result, could not participate in an exchange due to relationship or power dynamics brought on by the setup of the communication technology, as well as

a lack of understanding of how to use a technology or having inferior hardware or software which makes participation difficult. Such challenges have been reported in prior work on video calls where some people require large amounts of scaffolding in order to keep a connection going [1,38]. In our study's case, such inequities and a loss of control did not have easy solutions because the number of people involved in video calls was much larger than that in the related work. This left people feeling like they were not really a part of the call all the time. In other cases, they were simply unable to connect with family/friends.

This theme resonated most strongly with communication during video calls between family and friends and became evident as the size of group video calls grew beyond the paired home-to-home connections that prior work reports on in pre-pandemic life [1,8,11,34,38]. Participants described using group video calls that ranged from having three people all the way to forty in the call, though most included individuals from 3-6 households. Group calls were common especially in the first few weeks of the pandemic where recommendations to physically distance and avoid travel were most stringent. In these cases, phones, tablets, and laptops were used to host video calls. During the pandemic, people experimented with calling a more diverse set of family/friends who were not usually the recipients of video calls from our participants before the pandemic. Others experienced calls more frequently. The goal of the calls was for our participants to feel like they were 'with' their friends and family since they couldn't be with them in-person, as well as catch-up on how they were doing.

> "We talk a lot more about the pandemic: our observations about how ourselves and other people are behaving, politics, speculation about the future. I think I'm connecting more often with people who live far from me. So we can share more day-to-day stuff." -S10, Lives with Partner, Age Range 25-34

While these types of large group video calls were valued by participants and their family/friends, the calls did not always work well. This related to challenges with control and not being able to fully participate in the call as desired. The 'newness' of large group video calls meant there were typically not established procedures in terms of who should talk and when, and what kinds of activities would occur in the call. This made such calls often confusing and somewhat chaotic to be a part of. First, group video calls were easily distracting and this distraction led to undesirable levels of participation for some family or friends. Participants said it was sometimes hard to maintain the same level of focus and attention that they would have if visiting in-person or in smaller group video calls (e.g., calls between two homes as described in prior literature [1,8,11]). This was mostly due to seeing different atmospheres and surroundings and facing distractions in their own location (e.g., children asking for something). Group calls of more than four people also tended to be challenging since typically only one person could speak at a time (in order to be audible) and side conversations were not possible like when in-person. This meant that people could not participate in conversations like they might desire, and they tended to lose control over their own participation.

> "I find it, a lot of us on one session can be quite distracting, you know, trying to talk. And then you don't know when the person's talking, and you get preoccupied with whatever's going on in someone else's home." – P14, Lives with Partner and 1 School Age Child, Age Range 35-44

Group video calls could also become noisy and hard to manage. For example, P3 told us about a memorable time during the beginning of the pandemic where 40 of his extended family members had a group call together. It was exciting for him to see so many of his extended family members from various countries, yet he felt the virtual space was sometimes 'crowded' and he was not always sure what was going on. Another issue that emerged in such situations surrounded new video chat users. New users did not know the culture that common users of video calls had gained,

such as muting the mic when not speaking. This created excess noise and confusion and created a loss of 'order.'

> "You can imagine meeting up to 40 people on your desktop all talking at the same time, because they were using Zoom for the first time and they did not know where to find the mute button." -P3, Lives Alone, Age Range 25-34

Another issue with group video calls was that the software for them was not mobile device-friendly. Participants found it hard to see everyone's video feed on their phone's screen if there were more than two people in a call. This created inequities between people in the call as those who used tablets or laptops had an easier time seeing everyone when compared to people using mobile phones.

> "My parents use their phones to call me. Every time they put the phone on the dining table and talk to me when they are having lunch. They sit at the opposites of the table, so I cannot see them at the same time because the camera view is limited. So either I just see one of them, or I speak to the air." – S1, Lives with Roommate, Age Range 25-34

For people with family and friends in different time zones, the timing of group video calls led to some family and friends missing out on the calls. Participants commented that they wanted to include more people but it was hard to synchronize call times across time zones, especially given the increase in number of people being called at a single time with group calls. This meant there were more time zones and schedules to synchronize as opposed to the video calls they had before the pandemic with only one other household (and only one time zone difference to consider). Again, this points to challenges with controlling one's participation in a group video call, and associated challenges with equity: some family/friends may be more favorable for one to call because their schedules or time zones align, which might leave others more socially disconnected. Prior research has pointed out the challenge with time zones and people's efforts to find mutually agreeable times for synchronous contact [10]; yet in our study's case, people could not synchronize their schedules as they were attempting to connect with larger sets of people.

6 ATMOSPHERE & PHYSICALITY

The third main theme that emerged in our analysis was the idea of *atmosphere* and *physicality* in family and friend communication. Prior work on video communication for major life events has described the importance of a shared atmosphere between locations, e.g., dressing up while using a video call to connect into a remote wedding [43]. In these situations, a person or small group is normally connecting into a 'special event' location, such as a church. In our case, people were connecting from their homes. Given this, they tried to mimic the atmosphere of in-person locations outside of their home, as well as trying to achieve a similar atmosphere across one or more homes that were connecting together. One method that helped create a sense of shared atmosphere some of the time was the incorporation of physical objects at one or both locations, if possible. We saw the theme of atmosphere and physicality resonate most strongly in terms of first *gameplay* and, second, in terms of *food and drink sharing*; we describe each next.

6.1 Game Play

First, to create more engagement and activities to do during video calls, some of our participants used video calls with built-in game applications such as "HouseParty" or they used a shared screen to display party games such as "Jackbox." This could be done with screen sharing on Zoom or Discord during a video call where family/friends could see the shared screen and play the game using their phone as an input device. Games included online versions of Trivia, Pictionary,

Heads Up and other party games. The goal was to replicate the atmosphere of in-person social gatherings such as group board game playing by focusing on digital games online.

> "My partner's cousin organized a hosted trivia night through Zoom. So fun. Afterwards, my partner and I realized we could run music trivia ourselves with Spotifty and Zoom share computer sound. So we did that with a few friends and by ourselves as well. I also remember playing Decrypto through a combination of Discord and Google Docs." -S10, Lives with Partner, Age Range 25-34

While gameplay was fun and engaging for participants during the first few weeks of the pandemic, the frequency of play tended to reduce quickly (within a few days or a couple of weeks) for most participants. They said this was because the atmosphere was not the same as playing board games in-person. Participants felt a pressure to talk only when they needed to which contrasts when people are in the same place playing in-person. When playing games and socializing in-person, participants said they often have private side conversations with the person sitting next to them or across from them at a table. This was not possible for group video calls and participants said they missed having these conversations while engaging in a game over video chat. As a result, the games felt less engaging compared to when they used to play together in-person where a key component of the activity was conversations with others.

In some cases, gaming sessions included physical objects or the imitation of in-person games such as playing cards over a video call, Bingo, etc. However, it was challenging for our participants to show objects such as cards over camera views in addition to showing the people at the table. Thus, in this case, incorporating physicality into the experience did not help create a better atmosphere; it usually just led to frustration.

Some participants took to playing online collaborative video games to connect with family and friends rather than using games that involved video calls. This included multiplayer sports games, e.g., Rocket League, and social simulation games such as Animal Crossing where avatars represent each person. These types of games turned into a habit for some of our participants. Participants valued the well thought out structure found in these games and the fact that the games had built-in tasks to complete. These games shifted the atmosphere of the joint activity from connecting different areas in the physical world (e.g., two or more homes) to bringing participants to a joint simulated world online. Thus, the atmosphere was automatically the same for any family or friends connecting in to play the game together, and they could perform joint activities, in particular, if it was a cooperative game.

> "...What helped me survive was other networks, my old friends, my people that I play video games with, which I didn't use to do. Yeah, so old friends that we didn't talk to each other much before COVID, well now, we've got again connected...So it's usually cooperative games, or there are different types. Usually, it should have a social aspect. There's no doubt. So it's not fully competitive ones. There are those that actually cooperate with each other" -P8, Lives with Partner, Age Range 25-34

6.2 Food and Drink Sharing

Second, participants tried to create similar atmospheres across video call connections by focusing some calls around eating or drinking. This was participants' attempt to mimic going out to a restaurant or bar with friends or family members. Yet because people joining the group video call were not in the same space having the same experience—drinking similar drinks, having similar food—participants said it was harder to simulate the feeling of being in-person at a gathering. The atmosphere and ambiance of people's homes was different than a typical restaurant or bar.

> "The other thing, the ambience itself. Like, sitting in a bedroom is a lot different from sitting outside in a bar.

The ambience matters." -P10, Lives with 3 Roommates, Age Range 25-34

Another issue was that people had to prepare the food and drinks themselves either prior to a video call or during it, as opposed to being waited on by restaurant or bar staff. This was especially an issue with virtual lunch times where participants would meet with friends who were co-workers. Participants said that it did not feel as natural as sharing lunchtime during office hours in the same place. They said it felt more like a meeting and less like a social event. Moreover, not everyone actually took the time to make and 'bring' a lunch, which sometimes created awkwardness. Thus, the incorporation of physical artifacts into the experience (in the form of food or drinks) posed challenges.

"Being at the office, if we're going to have lunch together, you have your lunch ready or lunch together, versus being at home, I guess. It's so complex just sitting at home in front of your computer. I hadn't cooked lunch together or whatever. And so, it didn't seem as natural to think and have lunch at the same time. A few times people join and said, 'I haven't had lunch, so I'm just coming here to say hi, but I have to go on cook actually." -P4, Lives with Partner and 2 School Age Children, Age Range 35-44

Some participants simulated in-person coffee/tea times with friends and this was more successful at creating a sense of shared atmosphere, mostly due to the simplicity of what was needed. The simplicity of the beverage being just coffee/tea meant that everyone had basically the same experience when drinking. For some, these video calls turned into a habit and they would have morning coffee time with close friends on a regular basis. This gave them time to catch up on life and learn how everything was going for each other. These video calls had a special value for them because it was with a small number of close friends, e.g., 2-4 people. P4 told us that making a coffee was an easy task to do and did not need much preparation in comparison to making a meal.

"[having coffee with friends] that's different than the office. Like, 'Oh, I don't have to have a lot. I just need to have a coffee.' So we connect in the morning. I have a coffee. This is really four good friends of mine, that we also have a group on WhatsApp." -P4, Lives with Partner and 2 School Age Children, Age Range 35-44

One family with young children saw their grandparents create an interactive teatime for entertaining their grandkids. P6 told us his mom would setup a table while the grandfather would start a puppet show for the grandkids. Other adult family members could also join the teatime, but it was not a necessity.

"My mom basically set it up. She would set it up to tea. It was more for her grandchildren so she would set it up in her living room and then have either her laptop, I think mainly her phone though. Yeah, mainly just have her phone propped and my dad would be in there with this puppet monkey and whatnot. So, they'd sit around the table." -P6, Lives Alone, Age Range 25-34

In addition, participants celebrated holidays and events with their remote family or friends over video chat. For example, this included video calls on Mother's Day, Easter, and other celebrations like birthdays, baby showers, and convocations. To enhance the experience, participants sometimes augmented the video call with physical objects to help create atmosphere at the remote location. For example, one participant organized a gift box to be delivered to a close friend's home as a baby shower gift from a group of close friends. When the package was delivered, her friend started a group video call that included the senders of the gifts and the recipient. This let them see the recipient's reaction and gratitude for the gifts. Other participants told us about instances where gifts were not sent, and, instead, just shown over the video feed. For example, P3 made a handmade greeting card for his mother-in-law and, instead of sending it to her,

he shared the moment online by calling and showing the card to her. This made the moment memorable because he could see the reaction on his mother-in-law's face when she saw the card.

> "Once I sent flowers to my fiancé using an online flower store and we shared the moment through WhatsApp video call." -S15, Lives with Sister's Family (Adult sister, Husband and their 3 Children), Age Range 25-34

7 TECHNOLOGY DETACHMENT AND CLEANSE

The final theme that emerged in our analysis was the idea of *technology detachment and cleanse* in family and friend communication. At the beginning of the pandemic, social media, mobile messaging groups, and video communication had an important role to play in family and friend communication. Yet as weeks passed, nearly all participants shifted from a heavy usage of technology and 'testing and trying' out new routines for family/friend communication to a stage of detachment. Sometimes this even came in the form of a 'cleanse' where participants drastically reduced their use of screen-based devices to connect with others.

For example, some participants used social media as a way to express themselves and feel united with friends. Early-on in the pandemic they shared more frequently about their daily activities such as preparing a meal, working out, and taking care of themselves while staying at home. Two of our participants used online streaming platforms such as Instagram Live for creating entertaining content for friends such as live streaming musical performances and a comedy act. They both said they wanted to contribute to their social circle and feel connected with others.

> "I was so active at the beginning on social media and then I slowed down. I don't know why. I think I saw that as it was a way of connecting with people through Instagram Live." -P6, Lives Alone, Age Range 25-34

These performances were short lived though and did not continue for different reasons. First, participants' well-being fluctuated both physically and mentally and some people did not feel well enough to be creative and in front of a camera broadcasting themselves. Others felt that the new methods they were using to connect with others no longer felt 'normal' enough for them to become a routine.

> "I think many people started to do those things. Then after a while, they realized that, 'Oh, this is going to be a long journey. It is a new normal thing. Let's be normal. Let's act normal.'"-P14, Lives with Partner and 1 School Age Child, Age Range 35-44

While some engaged more with technologies such as their phones and social media, others felt overwhelmed at points to the extent of quitting the use of social media or leaving their phones for several hours unattended. They felt too much pressure to follow what their friends were posting and were receiving too many asks to join campaigns or social media challenges. For some, their mobile phone was a distraction from what they were engaged in, especially for university/college students who now had to take classes online.

> "...I was like, 'I need to stop going to Instagram.' Because I was spending a lot of time at home, and it was like a lot easier to be on my phone. Yeah, that's why I just deleted Instagram, mostly because of quarantine, and I'm really happy that I did... I think mostly it was because I was at home, because the classes were online. I would see myself in the middle of the class, just grabbing my phone and going into social media. When school was in person, I couldn't do that." -P2, Lives with Parent, Age Range 18-24

As a result, some participants reduced their use of technology in their personal time because of perceived over-use

of technology during work time. This caused some to want to escape the use of technology and be more involved in activities that did not require technology so they could mentally rest. This included physical activity, playing board games with children, or practicing music while on breaks in-between meetings and work sessions. Some participants felt like they were 'getting used to' the situation after several weeks and no longer had the desire to stay connected with as many people so social media use and group video calls lessened.

> "It started, at the beginning of the pandemic, I think communication was more frequent and more casual. And then sort of up until now, as time went on, it started becoming less frequent maybe because we're kind of getting used to this whole situation, and I guess we're not feeling as lonely, or we're getting used to it. We're establishing our own routines and we're feeling less lonely, and we're feeling, I guess, less like we need to check in on each other as often." -P9, Lives with Partner and Roommate, Age Range 25-34

As mentioned, participants who tried to use video calls to share exercise and physical activities over distance with remote family and friends typically abandoned such activities because the technology was not ideal. Instead, participants started creating new routines of walking outside in their neighborhoods, running, or doing new outdoor sports such as buying bicycles and cycling as a family. One couple created a routine for working out at home with an app for video-guided exercises.

> "Something that we used to do more often was really going to cafes and restaurants. That is one thing that we could no more do so. We replaced it by actually taking walks in the neighborhood, in the parks in the neighborhood." -P12, Lives with Adult Sister, Age Range 35-44

Some participants struggled with feeling close to remote family/friends using technology and abandoned it in favour of modified get-togethers in-person for those living in the same city. For example, some participants described seeing select family members or friends in a parking lot from their parked cars or having picnics outside, if they lived close enough to travel to see one another. In these situations, they would maintain an appropriate physical distance from one another while still being in-person. Compared to pre-pandemic meet-ups, participants had to carefully think of where to meet aside from their own homes, and what precautions they would need to take once there.

8 DISCUSSION

Our overarching goal in this research was to explore if and how family/friend communication needs and technology use changed during the COVID-19 pandemic in Canada. While uncovering these changes, our analysis revealed four themes that are relevant for family communication technology design during times of extreme social disconnection, such as that during a pandemic. These include *shifting and testing* of communication routines, *control and participation* challenges, the relevance of *atmosphere and physicality*, and *technology detachment and cleanse.* In this section, we summarize our findings and compare them to the prior literature on pre-pandemic family communication routines and use our themes as starting points for implications for design.

8.1 Shifting and Testing New Communication Activities

First, our results showed that families faced an initial period of *shifting and testing* of communication routines. This saw interactions with household members increase since people spent more time at home. Communication amongst household members (e.g., family, roommates) was not always easy given the need to balance working from home with family interactions and transitioning between work and personal life. Participants reported challenges with being

interrupted for communication while having to work from home. Such problems are known in the literature [17,57]; however, the difference with our study was that children were at home due to home schooling and likely exacerbated the challenge of interruptions and a desire for more communication. This raises design opportunities for considering how people migrate between work and personal life at home, and how others around the home (including children) might be able to judge people's availability for communication. Interestingly, a plethora of research already explores how people maintain awareness of others in workplaces and judge their availability for interaction (e.g., [5,7,19,26]). Design solutions to mitigate such challenges explore various forms of media spaces and messaging systems that indicate preferences for interaction and availability [5,7,19,26]. We are cautious that we do not necessarily want to throw more technology at a domestic challenge that is highly social in nature though. Yet there could be the possibility for design solutions that can help people better manage the boundaries between work and home life and family communication. While it is unlikely that there is a direct translation of work-based research systems for use in home settings given the very different environment and social norms, it is possible that ideas from workplace settings may be able to spur thoughts for domestic settings in order to better manage family communication challenges associated with more people being home at the same time. The challenge is designing technologies that fit within the context of homes, while reflecting the varied types of relationships.

Second, results showed that people increased their social circles and connected with more people remotely than they normally did before the pandemic using technology. Again, this was part of a *shifting and testing* phase to see what worked well and what level of communication was desirable. This included connecting with weaker ties more often and connecting online with people who one might normally see in-person. Video chat was the go-to technology as people predominantly tried to recreate in-person situations through forms of group video calls, akin to people coming together in someone's home or meeting together in a restaurant or other venue. This aligns with research that has explored ways of trying to support shared activities over distance through new types of video communication systems (e.g., [27,47,52,60]). Thus, our study validates the prior literature; when the need became very strong for people to connect with more family and friends over distance during the pandemic, there was a strong desire to participate in activities with remote people using video streaming technologies. Yet the difference we saw in our study compared with the related work is that prior work predominantly focuses on connections between *two* locations, e.g., a single home to a single home, or a home to an outdoor location (e.g., [8,27,52]). Our study points strongly to the need to connect multiple locations (beyond just two) together.

8.2   Supporting Control and Participation

Our findings point to the need for design efforts to continue to expand the ways in which large groups of people can come together across a diverse set of locations in video calls. As mentioned, people connected with larger groups using video chat than before the pandemic, including typically 3-6 households. Yet this introduced challenges around control and participation in the video call and suggests that the types of systems that have been designed as part of prior research to support family connections over distance will not suffice for the kinds of situations outlined in our study. This is because most research prototype systems are predominantly designed for paired connections of two people or two households (e.g., [47,52,60]); instead, new thinking is needed to re-envision group-based video chat technologies. When it comes to large group video calls, design work needs to consider ways of giving people broader control such that participation can be more equitable across people in a call.

First, this design challenge includes creating video calling systems for large groups such that people are able to easily see everyone in a call, regardless of the device they are using. This may involve thinking beyond grids of video feeds

that might vary in size depending on the device and screen real estate. Instead, designers could, for example, consider using mobile devices as portals into a 360-degree space that shows family and friends around the caller when one's phone is rotated in different directions. Second, software for supporting large group video calls should explore designs that move away from typical workplace meetings that tend to rely on only one person talking at a time. When it came to conversations by family and friends in group video calls, participants wanted to have side conversations with people where this might include varied volumes (e.g., normal talking vs. whispers) and the ability to talk one-on-one or in smaller ad-hoc groups within the larger group. Commonly used video chat systems like Zoom provide the ability for people to join 'breakout rooms' to have subgroup conversations, but such features force side conversations to be pre-planned as opposed to the fluid ways that our participants wanted to move between side conversations amongst individuals within a large group of people. One possibility might involve being able to engage in side conversations with people whose video feeds are located close together in a video call. As is now available in Zoom, users could drag their video to be close to different people at different times. There may also be possibilities to add spatialized audio to group video calls where people can choose to have audio played near or far away. And, of course, there are likely many more possible design ideas; this is but one idea to illustrate the main point.

8.3   Supporting Atmosphere and Physicality

Prior work raised the design challenge of creating a shared sense of atmosphere across video links when connecting to view major life events, such as seeing weddings, graduations, and birthday parties [43]. We found similar findings with our participants where shared *atmospheres* were important between locations, however, in our case, creating an atmosphere was about mimicking a location that people were unable to travel to in-person, or the feelings and activities associated with an in-person event such as a games night. Those who augmented video calls with games found it challenging and most abandoned such practices because the technology did not make it easy to have the same types of conversations while playing as people were used to when playing board and card games in-person. Efforts became overly focused on the game itself. On the other hand, participants who wanted to exclusively focus on gaming with little desire for conversation did so with large success using online collaborative or competitive games. This illustrates that while such online games continue to be a large success, even in pandemic society, the games that people are used to playing together in-person such as board games and card games still do not have strong technological support for play over distance. Yet people would like to participant in such activities over distance. These findings also point to the strong role that audio can play when connecting family and friends over distance. As found in our study, people often quickly turn to video solutions to see their family or friends, however, audio plays a critical role in making people feel close and audio-based conversations are a strong component of any connection. In our results, this was seen with the large focus on audio-based conversations during game play accompanied by video chat.

The incorporation of *physicality* and physical objects into a video call was one way that participants tried to create a stronger sense of shared atmosphere. For example, gifts sent to a remote home created a feeling like it was an in-person birthday party. The incorporation of drink items that were the same at multiple locations (e.g., coffee or tea) were relatively successful at making people feel like they were sharing in an in-person moment. Incorporating other physical objects was not always easy though. For example, it was very difficult if not impossible to incorporate physical game board games, cards, and gaming pieces into experiences. These findings suggest value in design directions that look at augmenting video calls with physical objects and nudging users to make use of physicality as part of the call. For example, board games could be designed with physical pieces that move based on the movement of remote pieces in another household's home. Dishes for drinking or eating could be augmented with sensors to detect and share

information. For example, a video call with "Mom" might only be able to begin once an adult child brings a cup given to her from her mother near the video calling device. While these are but simple examples, they illustrate the main point of trying to encourage family and friends to incorporate physical objects in their calls as a way to create stronger feelings of a shared atmosphere across locations.

8.4   Technology Detachment and Cleanse

Lastly, over time, many of our participants began to reduce the amount of connection they had with remote family and friends to levels more similar to their pre-pandemic life. Some felt they were overusing technology and had too much screen time. Some wanted to return to a more 'normal' way of living that did not involve large group video calls with an emphasis on looking at a relatively small screen. Across the family communication literature, there are a wealth of other types of technologies in the form of awareness appliances that are designed to look like and sometimes even be domestic artifacts. (e.g., [12,14]). They provide family members with awareness information that lets them know if another person is okay or present in a particular location, e.g., a lamp that shows remote presence. Of course, our participants were unable to try out such technologies since they are not commercially available. Yet the desire by some participants to shift away from technology with screens suggests strong value in devices such as awareness appliances. They have the advantage of not requiring large amounts of interaction and users typically do not need to look at a screen to gain information about remote family or friends. The challenge is that many have been designed for paired interactions across the related literature (e.g., [12,13,14,22]); thus, our results point to a need to re-envision how awareness appliances may present information across a broader spectrum of people, or how multiple devices may be used in conjunction with one another. For example, this may require exploring how an awareness device such as a picture frame can be easily changed to show information from more than one family member. It may also involve design explorations into interconnected physical artifacts in the home. For example, imagine a series of ornaments hung on a Christmas tree where each is connected to some type of status information (e.g., presence at home or not) from a large number of different remote family members. Again, these are but simple examples meant to illustrate the point and further thought is needed to consider the specific types of information that should be presented and for whom.

9   CONCLUSION

Our work contributes an understanding of family/friend communication and technology use during the COVID-19 pandemic in Canada and lessons for future technology design. Our results showed changes in the frequency of communication and who people communicated with and new ways that technology could play a role in feeling connected with others with an emphasis on connecting in real time across larger groups of people than pre-pandemic. We saw creative new ways that friends and family tried to stay in touch including group video calls and technology for socializing such as playing games, hanging out, sharing dining times, etc. We also saw that participants engaged in physical activities for their wellbeing and some even withdrew from technology. Our findings point to time periods involving family members shifting and trying out new communication practices and technologies, as well as technology detachment and movement away from screens. We also raise design challenges to support larger group calls than just connections across two households, which is the dominant theme in the related literature. This will require further explorations of ways to support control and participation in video calls, and means to create shared atmospheres, possibly through the incorporation of physical artefacts.

Our study is limited in that it primarily focuses on one particular area of the world, the province of British Columbia, Canada. The restrictions around social contact and travel during the COVID-19 pandemic were largely similar between

this region of North America and other Western countries, with variations in terms of what venues were open (e.g., restaurants) and how messaging was delivered to the public from government and organizations to provide recommendations on how social interactions should occur to promote health and safety. These factors could affect how people chose to engage with family and friends in-person and over distance. Countries with more relaxed recommendations and policies around social interaction may see individuals use technology less while engaging in more in-person exchanges. Future research would find value in exploring different countries of the world. Our study also looks at a fairly broad cross section of demographics and life situations, with a notable emphasis on participants in their late 20s to early 40s. All participants were also of the middle class. Thus, our results focus on the behaviors of this demographic who have access to technology and are generally well educated. Future work should continue exploring other demographics, e.g., older adults, families facing situations such as divorce or shared custody of children, other social classes and regions of the world. Our work provides a foundation for understanding what activities might occur in other types of families; thus, it can act as a point of comparison. Lastly, our study provides a snapshot of one time period within pandemic society; future work should continue to explore how society adapts and changes over time.

10 ACKNOWLEDGMENTS

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