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Empirical Article

Parents' use of digital technology for social connection during the COVID-19 pandemic: A mixed-methods studyREBECCA NOWLAND,¹  LARA MCNALLY¹ and PEGGY GREGORY² ¹*School of Community Health and Midwifery, University of Central Lancashire, Preston, UK*²*School of Computing Science, University of Glasgow, Glasgow, UK*

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Introduction

The COVID-19 pandemic (2020–2021) resulted in isolation due to social distancing rules and lockdowns, during which technology was used to enable families and friends to maintain contact. Despite loneliness being high in parents, little is known about which parents are more likely to experience loneliness and strategies to support them.

Method

This mixed-methods study examines which parents were lonely during the pandemic and how digital technologies were used to reduce loneliness and social isolation. Data were collected during the first UK lockdown from May to July 2020 via an online survey ($N = 145$) and follow-up interviews ($n = 13$).

Results

Loneliness reported during lockdown was greater than retrospective reporting of loneliness for all respondents, but it was higher in single parents, those caring for children with specific needs, and those with lower household incomes before and during lockdown. Parents rapidly adapted to and experimented with using technology for social connection during the lockdown, which helped to reduce feelings of isolation and loneliness. Video calling was found to be useful for making connections and enhancing social presence, but parents also experienced anxieties and difficulties with its use. There were mixed views about technology use; some were keen to continue using technology for socializing after the lockdown ended, but for others, it was only a temporary measure.

Conclusion

Although technology was invaluable during the pandemic, it was not a panacea, and the way parents used it was influenced by their approach to technology and existing social behaviors and networks.

Key words: Loneliness, COVID-19, parents, pandemic, digital technology, social connection, social media.

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INTRODUCTION

The COVID-19 pandemic, which resulted in worldwide social distancing and lockdown in 2020–2021, has had vast implications on people's social connections. There is evidence that social distancing and lockdown has resulted in increased loneliness, which in turn has been connected to increases in depression and anxiety (McQuaid, Cox, Ogunlana & Jaworska, 2020). These increases in loneliness have been greatest in those with lower household incomes (McQuaid, Cox, Ogunlana & Jaworska, 2020) and those separated or divorced (Groarke *et al.*, 2020). Loneliness has been associated with poor mental and physical health (Ong, Uchino & Wethington, 2016; Wang, Mann, Lloyd-Evans, Ma & Johnson, 2018) and is associated with early mortality (Holt-Lunstad, Smith, Baker, Harris & Stephenson, 2015) and suicide (McClelland, Evans, Nowland, Ferguson & O'Connor, 2020). Thus, it is important to address these increases in loneliness and isolation because there are health implications of prolonged feelings of loneliness.

Definitions of loneliness

Loneliness has been defined widely in research literature as a negative subjective experience resulting from a discrepancy

between desired and perceived or actual social relationships (Perlman & Peplau, 1981). The deficiency in social relationships can be related to the quantity or quality of those relationships (Cacioppo, Cacioppo & Boomsma, 2014). While loneliness is associated with social isolation (i.e., having little or no social contact with others), it is not a requirement for feeling lonely; loneliness is distinct from social isolation and can be experienced because of social isolation, but it can also be experienced when a person is not socially isolated (Van Baarsen, Sniijders, Smit & Van Duijn, 2001). Further distinctions in the loneliness literature have been with temporary or situational loneliness and persistent or chronic loneliness. Evidence indicates that it is the prolonged experience of loneliness that is associated with health and well-being impacts (Qualter *et al.*, 2013; Shiovitz-Ezra & Ayalon, 2010).

What was unique about lockdown loneliness is that it was commonly experienced as a result of restricted face-to-face social contact due to social distancing rules, lockdowns, and/or self-isolation as a result of having COVID-19 symptoms. Lockdown loneliness has been defined by researchers as "loneliness resulting because of social disconnection due to enforced social distancing and lockdowns during the COVID-19 pandemic and similar other emergency situations" (Shah, Noguerras, van Woerden &

Kiparoglou, 2020). Lockdown loneliness may be different in nature to loneliness outside of lockdown in that it is experienced as an enforced isolation from others; it is a shared experience for many and may be a temporary negative experience. Although evidence on lockdown loneliness in the current pandemic is just emerging, researchers are making distinctions between chronic loneliness (feeling lonely often and always) and lockdown loneliness (feeling lonely during the past 7 days, ONS, 2020). While there are some recent trajectory studies indicating prolonged stable loneliness during this period (Bu, Steptoe & Fancourt, 2020), we do not yet have evidence for whether the loneliness experienced during this pandemic will have lasting impacts on loneliness and well-being.

Loneliness among parents during the COVID-19 pandemic

Evidence shows that the pandemic has had an impact on the mental health of parents (Patrick *et al.*, 2020). A recent survey in the UK by Ipsos MORI commissioned by the Royal Foundation reported that loneliness in parents during COVID-19 has risen from 38% reporting feelings of loneliness before the pandemic to 63% (Royal Foundation, 2020). This increase in the prevalence of loneliness in parents is more apparent in the most deprived areas, with parents in those areas being more than twice as likely as those living in the least deprived areas to say they feel lonely often or always (13% compared with 5%). Evidence from a diary study conducted in Germany indicates that loneliness during the pandemic has been higher in parents than non-parents (Buecker *et al.*, 2020), indicating that this is an important cohort to consider.

Loneliness has been shown to typically have high prevalence in parents, with national surveys (Action for Children, 2017) and longitudinal research studies (Luoma, Korhonen, Puura & Salmelin, 2019) showing that around a third of parents experience chronic loneliness. Despite this, much of the existing loneliness literature has focused on loneliness in undergraduate or elderly populations, so our understanding of loneliness in parents is limited. Importantly, little is known about which parents are at greatest risk of experiencing loneliness and what are appropriate and effective strategies to address loneliness in parents. There is some evidence to indicate that single parents, ethnic minority parents, and parents with children with specific needs or who have lower household income are at increased risk of experiencing loneliness (Nowland, Thomson, McNally, Smith & Whittaker, 2021). However, there are no epidemiological and few comparison studies in this area to be conclusive about these findings (Nowland, Thomson, McNally, Smith & Whittaker, 2021). Thus, it is important to build evidence about which parents are at increased risk of experiencing loneliness to target interventions to reduce loneliness in this population.

The role of technology in promoting social connection and reducing loneliness

During the pandemic, people became reliant on digital technology for social connection where face-to-face contact was not permitted. There has been some suggestion that digital technology

played a role during the pandemic in helping people with isolation and supporting reductions in loneliness (Shah, Nogueras, van Woerden & Kiparoglou, 2020). There is preliminary evidence from an event sampling study in the United States that digital technology during the pandemic helped to reduce loneliness more than in-person contact (Lewis, 2020). Thus, there is a need to capture data about the use of digital technology during the COVID-19 pandemic and its role in promoting social connection and overcoming isolation.

Digital technology offers vast possibilities for social connection with people, with the introduction of the World Wide Web, cheaper digital devices, and widespread Internet connectivity widening our possibilities for connection with others, developing friendships and creating a sense of belonging with others through virtual group membership (Zhao, Lu, Wang, Chau & Zhang, 2012). People are now able to form social groups with people with similar interests, conditions, and backgrounds, vastly widening opportunities for social connection. The more recent integration of cameras and video technology into digital devices and apps, and the enhancement of related software for ease of connection, has enabled people to remotely connect in more meaningful ways and with more social presence online (Bulu, 2012).

Reviews have demonstrated that social technology (e.g., technology facilitating social interactions and communication) impacts loneliness, but not always positively: technology use can be associated with increases and decreases in loneliness. In their review of the literature, Nowland, Necka, and Cacioppo (2018) highlight conflicting results and propose that there is a bidirectional and dynamic relationship between loneliness and technology use. They argue that technology can be a useful tool for enhancing existing relationships and forging new social connections, but when social technologies are used to escape the social world and withdraw from the “social pain” of interaction, feelings of loneliness are increased. They also argue that loneliness can determine how people interact with the digital world, suggesting that lonely people are more likely to use the Internet in a way that displaces time spent in offline social activities, thus exacerbating loneliness. Similarly, other reviewers have proposed an interpersonal-connection-behaviors framework (Clark, Algoe & Green, 2018) to explain the conflicting findings; focusing specifically on social networking, they argue that when sites are used to make meaningful connections, they can benefit users, but there are pitfalls such as isolation and social comparison that can hinder the creation of meaningful connections.

Evidence for effectiveness of digital interventions to reduce loneliness is sparse, and these studies have often focused on older adult populations. Recent reviews examining effectiveness show no evidence of positive impacts on loneliness. For example, a rapid review (Noone *et al.*, 2020) that focused on the use of video calling with older adults as an intervention for loneliness found only three quasi-randomized trials with little or no difference in loneliness than usual care. A further meta-analysis (Shah, Nogueras, van Woerden & Kiparoglou, 2021) examined effectiveness more generally of digital interventions with adults (over 18 years), finding only six studies and showing no evidence of positive impacts on loneliness.

Little is known about the potential mechanisms of technology use that lead to associated decreases and increases in loneliness

and why some people engage with technology in a way that reduces loneliness and others do not, because focus in the literature has typically been on associations between technology use and loneliness and/or other measures of well-being (i.e., anxiety and depression), this evidence base is largely cross-sectional (Nowland, Necka & Cacioppo, 2018), and there have been few qualitative studies. But some recent studies are beginning to reveal potential mediating factors, such as self-disclosure; those who are willing to discuss their feelings, anxieties, and problems online (Karsay, Schmuck, Matthes & Stevic, 2019) or who perceive that social technology offers opportunities for intimacy with others (Pittman, 2018) experience reductions in loneliness and stress. In contrast, being passive in online social networks has been associated with increased loneliness and reduced social capital (Frison & Eggermont, 2020). Other researchers have highlighted the role of social comparison and fear of missing out as mechanisms linking Internet use and loneliness and depression (Reer, Tang & Quandt, 2019).

Digital technology use to reduce loneliness in parents

There is evidence to indicate that new parents and those with children with specific health needs make use of online peer support as a social support mechanism. The use of social networking sites, such as Facebook, has been shown to be a support for new parents (Holtz, Smock & Reyes-Gastelum, 2015; Schrock, 2016), and online support groups have been shown to provide emotional and informational social support for parents with children with special health-care needs (DeHoff, Staten, Rodgers & Denne, 2016). Both face-to-face and online support is shown to provide shared experiences and reciprocity; trust and intimacy; and community connectedness and mental well-being for mothers of young children (Heaperman & Andrews, 2020). A recent review of Internet-based peer support for parents has revealed some gender differences in its effects: mothers gained emotional support, information, and membership in a social community and fathers gained support for the transition to fatherhood, information, and humorous communication (Niela-Vilén, Axelin, Salanterä & Melender, 2014). There is less in the literature about barriers to parents engaging with social technology, but some studies of parents with children with chronic disease or disability have found they are more likely to engage with online social support programs if the programs are structured and provide important and relevant information (Paterson, Brewer & Stampler, 2013; Saxena, Mitchell, Ehsan, Majnemer & Shikako-Thomas, 2020).

There have been few digital interventions designed specifically to target reductions in loneliness in parents, but there are some intervention studies focused on providing parenting support that have measured loneliness as an outcome and provide some indication of online strategies and interventions that may work to support reductions in loneliness in parents (Nowland, Thomson, McNally, Smith & Whittaker, 2021). In one telehealth intervention, which involved group e-meetings between a health-care professional and parents, mothers reported having good social networks but still spent most of the day alone with their children; so meeting others in the e-meeting made them feel less alone, and friends were made in the group (Nyström & Öhring, 2006).

However, in a similar intervention study involving an online discussion forum, there were no differences in loneliness found between the intervention group and the control group (Hudson, Campbell-Grossman & Hertzog, 2012). In a further intervention study involving technology-based peer support for new mothers at risk of postnatal depression, loneliness was measured as an outcome, but there was no difference in loneliness scores and/or change in loneliness scores (Shorey *et al.*, 2019).

The current study

The current study used a mixed-method design involving an online survey and qualitative interviews to understand how and why parents are making use of digital technology to connect with others and establish which parents may be at increased risk of experiencing loneliness and social isolation during COVID-19 social distancing and self-isolation. While the study focuses predominately on the experience of lockdown loneliness, experiences prior to the pandemic are examined retrospectively as a contrast in the survey, and participants explore changes in their experiences in the interviews. Given the time-sensitive nature of the data collection, a mixed-method design enabled the integration of two types of data, with qualitative findings providing explanation of the quantitative data (Fetters, Curry & Creswell, 2013). In the qualitative interviews, findings from the survey could be examined in more depth. The mixed-methods approach also enabled identification of which parents were experiencing high levels of loneliness during the pandemic to ensure that information-rich cases were included in the interviews (Patton, 2002).

The current study addresses the gap in the existing literature highlighted to further understanding of which parents are more likely to experience loneliness and how digital technology may be used by parents to support reductions in loneliness. Capturing information about uses of digital technology during COVID-19 is useful to inform strategies to promote social connectedness in lonely and isolated parents more generally. This work also enables a greater understanding of the barriers for parents in using digital technology and what may support technology use that leads to reductions in loneliness parent cohorts.

Research questions

1. Which parents are at increased risk of experiencing loneliness as a result of social distancing, lockdown, and self-isolation during the COVID-19 pandemic?
2. What technology are parents using and how are they using it to connect with other people and/or reduce feelings of loneliness and isolation during the COVID-19 pandemic?
3. What experiences and perceptions do parents have of using technology for social connection during the COVID-19 pandemic?

METHOD

Design

A mixed-methods study design collecting quantitative and qualitative data was used to provide an understanding of the experiences of parents in

using digital technology to connect with others during the COVID-19 pandemic. In this study, the quantitative data collected using an online survey was used to answer research questions 1 and 2; which parents were most vulnerable to experiencing loneliness during the pandemic and ways in which digital technology was being used to connect with others. Following completion of the survey, qualitative data, collected using semi-structured interviews conducted by telephone with a sub-sample of participants, were used to answer research question 3; the experiences, feelings, and opinions of parents about using digital technology for social connection. The mixed-method design enabled examination of which parents were experiencing high levels of loneliness using the online survey and allowed purposive sampling to select information-rich cases for the interviews (Patton, 2002).

Participants

Survey. The online survey was conducted between May 11 and June 7, 2020. During this period in the UK, people were on “lockdown” and required to remain at home, with only one health walk allowed per day. All non-essential shops were closed, and only key workers were required to attend work; others were told to work from home where possible. Participants were recruited via social media adverts on Facebook and Twitter and completed the survey online. Selection criteria included parents living in the UK with children under 16 years old living at home.

A total of 166 people attempted the survey, of whom 16 did not complete all the questions and five were not UK residents (who were removed from the data set due to differences in social distancing rules), resulting in 145 completed surveys. Of those surveys completed, 19 (13.1%) were completed by fathers and 126 (86.9%) by mothers. The mean age of parents for the survey was 39.53 ($SD = 7.45$), with an age range of 21–58 years. The majority of participants identified as British or English (88.3%), with others identifying as Scottish, Irish, Romanian, Canadian, Australian, or European nationalities (6.9%). Six (4.1%) participants had migrated to the UK, with their time living in the UK ranging from 10–19 years.

Of the 145 parents, 20 (13.8%) were single parents, 110 (75.9%) were married, and 15 (10.3%) lived with their partner. Just over half of the participants had household incomes above £40,000 (see Table 1). Most parents reported that their child/ren lived with them all of the time ($n = 127$, 87.6%), with 17 parents (11.7%) reporting that they had a shared access arrangement with their previous partner. Eighteen parents (12.4%) reported that at least one of their children had a specific need (i.e., chronic illness, disability).

Interview. Sixty-eight survey participants consented to be contacted by the researchers in the second stage of the study involving interviews and provided their contact details. Anonymity was protected by storing the contact details for interviews and data from the online survey separately. A sampling matrix was used to obtain a representative sample of participants for follow-up interview based on gender, migration, having children with specific needs, marital status, income, and ensuring a representation of negative and positive experiences with digital technology and/or use of digital technology in a novel/new way noted in open response questions. Using the sampling framework to ensure representation, a total of 27 parents were contacted by email to arrange an interview. Thirteen parents responded to the email and agreed to be interviewed, with the other 14 not responding to emails. All interviews were conducted by telephone and

were audio-recorded using a digital voice recorder. Interviews lasted between 17 and 51 min. All interviews were conducted with the parent alone (i.e., none were conducted with their partner present or were joint interviews of a couple).

Interviews were conducted with 13 parents aged 27–56 years (Mean age = 40.50, $SD = 8.28$), of which six (46.2%) were fathers, four (30.8%) were single parents (two fathers), eight (61.5%) were married, one (7.7%) lived with their partner, and three (30%) had children with specific needs. All interviewees identified as having British or English nationality; two had migrated to the UK, one who had been living in the UK for 18 years and the other for 19 years. Of the 13 interviewees, two (15.4%) had incomes between £10,001 and £17,640, three (23.1%) had incomes between £17,641 and £30,000, four (30.8%) had incomes of between £30,001 and £40,000, and four (30.8%) had incomes above £40,000. Demographic details for each parent interviewed can be found in Table 2.

Data collection

Survey. The online survey comprised demographic questions, loneliness measures, and questions about digital technology use.

Demographic information. Participants were asked to report their gender, age, marital status, and nationality and how long they had lived in the UK. Based on average UK household income and ONS definitions (Office of National Statistics, 2019), low income was defined as those at 60% of the median, with the UK median household income in 2019 as £29,400 (thus £17,640 indicated low household income) and was indicated by participants selecting from the following response categories: below £10,000, £10,001–£17,640, £17,641–£30,000, £30,001–£40,000, and above £40,000. Participants were asked to indicate how many children they had under the age of 16 years (with each child’s age) and whether their children lived some of the time at another parent’s address and had any additional/special needs.

Loneliness measures. A three-item loneliness measure (Hughes, Waite, Hawkey & Cacioppo, 2004) was used to measure loneliness. This included three statements about loneliness without directly mentioning loneliness (i.e., “How often do you feel that you lack companionship?”). Participants were asked to respond on a three-point scale (“hardly ever or never,” “some of the time,” or “often”) scored 1 to 3. Total loneliness scores were calculated by summing the responses to the three questions. Scores ranged from 3 to 9, with higher scoring indicating higher loneliness. Participants were asked to respond retrospectively to each item with how they felt before COVID-19 social distancing and how they felt currently during COVID-19 social distancing and self-isolation. Thus, in the current study there were two scores using the measure: (1) retrospective reported loneliness before COVID-19 lockdown and (2) reported loneliness during COVID-19 lockdown. In the current study, this scale had good reliability (Before COVID-19 – Cronbach’s $\alpha = 0.85$; During COVID-19 – Cronbach’s $\alpha = 0.82$).

Questions relating to digital technology use. Questions were designed by the authors to examine social technology use (see Appendix 0). To capture experiences during the pandemic in a timely fashion, no piloting of the measure was conducted. Participants were given a text description explaining that they were to think about how they have used technology to keep in contact with or share time with other people, rather than using technology for work meetings.

This was followed by a series of eight forced-choice questions (see Appendix 0) relating to

1. Technology parents used for social connection before and during the pandemic (responses involved selecting from a list of different technology uses)
2. Whether they have done any of the following things since the pandemic to stay connected to others: installed new apps, used technology in new and different ways, held a virtual party, pub night, meeting with family or friends

Table 1. Household income of participants

Household income	<i>n</i> (%)
Below £10,000	3 (2.1%)
£10,001–£17,640	8 (5.5%)
£17,641–£30,000	28 (19.3)
£30,001–£40,000	26 (17.9%)
Above £40,000	78 (53.8%)

Table 2. Interview participant descriptions

Participant No.	Age	Gender	UK resident	Nationality	Migrated to UK	Time in UK	Marital status	Household income	No of children	Child 1 age	Child 2 age	Child 3 age	Child 4 age	Shared access	Specific needs
1.00	27	Male	Yes	English	No		Married	Above £40,000	1	6 months				No	No
3.00	45	Female	Yes	British	No		Married	Above £40,000	2	13	11			No	No
9.00	33	Male	Yes	British	No		Married	£17,641–£30,000	2	5	0			No	No
8.00	34	Male	Yes	British	No		Married	£30,001–£40,000	3	12	10	3		Yes	No
35.00	50	Female	Yes	English	No		Married	Above £40,000	2	15	10			No	Yes
67.00	42	Female	Yes	British	No		Married	Above £40,000	2	12	9			No	No
74.00	35	Male	Yes	British	No		Single	£30,001–£40,000	2	8	6			Yes	No
79.00	40	Female	Yes	British	Yes	19 years	Married	£10,001–£17,640	4	15	14	12	7	No	Yes
82.00	39	Male	Yes	British	No		Living with partner	£17,641–£30,000	2	10	5			No	No
94.00	49	Male	Yes	English	No		Single	£30,001–£40,000	4	8	10	12	14	Yes	No
100.00	39	Female	Yes	British	Yes	18 years	Single	£10,001–£17,640	2	9	6			No	No
148.00	56	Female	Yes	British	No		Single	£17,641–£30,000	1	10				Yes	Yes
150.00	37	Female	Yes	British	No		Married	£30,001–£40,000	3	11	9	6		No	No

3. Whether their use of technology for social connection had changed during the pandemic (i.e., by selecting from the following response items: used more, used less, or stayed the same)
4. What times of the day they used technology (i.e., morning, afternoon, evening, etc.)
5. Whether their confidence to use technology for social connection has changed (i.e., by selecting from the following response items: increase in confidence, more anxious, or stayed the same)
6. Whether they usually found technology easy to use (yes, no, sometimes)
7. What made it difficult to use technology for social connection (by selecting from a list of barriers taken from a review of the literature, e.g., lack of time, expense, concerns about privacy and security, etc.)
8. Whether their technology use during the pandemic would change the way they would interact with technology (with response items as follows: Yes or No; if yes: given options use technology more, continue to use new apps, continue to use virtual socializing [i.e., meetings online, parties, pub nights])

Participants were also asked four additional open response questions: (1) how they may have used technology in novel or different ways; (2) if and how their confidence to use technology had changed; (3) if and how their technology use may change in the future; and (4) whether there was anything else they would like to share.

Interviews. A topic guide was designed for the interviews (see Appendix 0). The questions encouraged interviewees to discuss their experiences, thoughts, and feelings about using digital technology to connect with others during the lockdown restrictions and to discuss novel ways in which they were using digital technology. The interviews commenced with questions around family circumstances during COVID and impacts the pandemic had on contact with family and friends. This was followed by questions about experiences of loneliness and its causes during the pandemic. Finally, questions asked participants about their uses of digital technology to maintain contact with family and friends, what helped and what hindered the interactions during digital technology use, and whether their feelings about technology had changed and if and how they would use technology to maintain contact with others in the future. Interviews were conducted by telephone by two of the authors (PG and LM) and were audio recorded.

Ethics

The research received the approval of the university's ethics board (Reference: SCIENCE 0035) on May 7, 2020, and all respondents provided informed consent in accordance with the Ethical Standards of the Declaration of Helsinki. Consent was implied in the online survey by the selection of consent statements. Participants who wanted to be approached for an interview gave consent for this at the end of the survey, providing their contact details. Consent forms for the interviews were completed and returned to the researcher/s prior to the interview. All participants were given written information prior to taking part about the purposes of the study, how information would be used and stored, and how to withdraw prior to taking part. Participants did not receive any compensation for taking part in the study.

Data analysis

Quantitative data from the online survey was analyzed using descriptive (e.g., frequency analysis) and inferential statistics (e.g., ANOVA), and qualitative data from the open responses was analyzed using content analysis involving inductive category development (Elo & Kyngäs, 2008; Mayring, 2000, 2004). Inductive content analysis is recommended when there is not enough former knowledge about the phenomenon or if this knowledge is fragmented (Lauri & Kyngäs, 2005). Given that there is little research in this specific area, inductive content analysis was deemed appropriate to use to analyze the open survey responses.

Interview data were analyzed using thematic analysis (Braun & Clarke, 2006). Live coding of the interviews was conducted, which enables simultaneous manual coding while listening to audio recordings (Parameswaran, Ozawa-Kirk & Latendresse, 2020). During this process, each recording was listened to several times, and a summary table was created containing codes, notes, short descriptions, and selected quotations. Two authors coded a different set of interviews separately while jointly contributing to the table of codes and notes. They then met to discuss similarities and differences across the interviews and to identify themes.

RESULTS

Online survey

Loneliness. Mean scores for loneliness are displayed in Table 3; reported loneliness experienced by parents during lockdown was significantly higher than retrospective reported loneliness before lockdown ($t[142] = -7.28, p < 0.001$). Differences in loneliness in retrospective reported loneliness before and loneliness experienced during lockdown related to gender, marital status, and whether the parent had a child with a specific need were examined using repeated measures ANOVAs. There were no gender differences in loneliness ($F[1,141] = 0.26, p = 0.612$, partial $\eta^2 = <0.01$). Single parents had higher loneliness than those who were married or living with their partner ($F[1,140] = 10.43, p = 0.002$, partial $\eta^2 = 0.07$). Those caring for children with specific needs experienced higher loneliness than those who did not have children with specific needs ($F[1,140] = 4.83, p = 0.030$, partial $\eta^2 = 0.03$). There was no significant interaction between time and marital status or between time and caring for a child with specific needs, indicating that differences in loneliness between single and married parents and between parents caring for a child with specific needs and those who were not remained the same regardless of whether the reported loneliness related to retrospective reported loneliness or loneliness reported during lockdown (time \times marital status - $F[1,140] = 0.92, p = 0.339$,

Table 3. Mean loneliness scores

	Before COVID-19 social distancing		During COVID-19 social distancing	
	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>
All participants (<i>N</i> = 145)	4.62	1.64	5.68	1.91
Gender				
Mothers (<i>n</i> = 125)	4.56	1.62	5.68	1.91
Fathers (<i>n</i> = 19)	4.95	1.72	5.68	1.97
Marital status				
Married/living with partner (<i>n</i> = 125)	4.48	1.58	5.49	1.88
Single (<i>n</i> = 19)	5.47	1.74	6.89	1.73
Child with specific needs	5.22	1.83	6.56	1.72
Family income				
Below £17,640 (<i>n</i> = 10)	5.10	1.73	7.10	1.73
£17,641–£30,000 (<i>n</i> = 28)	5.04	1.86	6.15	1.90
£30,001–£40,000 (<i>n</i> = 26)	5.12	1.53	6.50	1.86
Above £40,000 (<i>n</i> = 78)	4.12	1.51	5.08	1.76

partial $\eta^2 = 0.01$; time \times specific need – $F[1,140] = 0.49$, $p = 0.486$, partial $\eta^2 < 0.01$).

Differences in loneliness by household income were examined using a repeated measures ANOVA. Using ONS definitions (Office of National Statistics, 2019), low incomes were those under £17,640 (combining the below £10,000 and £10,001–£17,640 response categories). There was a significant difference in loneliness between the household income groups ($F[3, 137] = 7.13$, $p < 0.001$, partial $\eta^2 = 0.14$), but no interaction effects between time and household income group ($F[3,137] = 50.08$, $p = 0.198$, partial $\eta^2 = 0.03$), indicating that differences in loneliness between the income groups remained the same regardless of whether the reported loneliness related to retrospective reported loneliness or loneliness reported during lockdown. Post hoc contrasts revealed that loneliness was lower in the highest household income group (incomes above £40,000) than the other income groups (below £17,640 = Mean Difference = -1.46 , SE = 0.49, $p = 0.019$; £17,641–£30,000 = MD = -0.97 , SE = 0.33, $p = 0.019$; £30,001–£40,000 = MD = -1.17 , SE = 0.33, $p = 0.033$). There were no significant differences in loneliness between other household income groups.

Social technology use. Changes in frequency of technology use for social connection during lockdown were reported by parents: 73.1% of parents were using technology more for this purpose, but 19.3% of parents reported that their technology use had stayed the same (0.7% reported that they were using technology less for social connection). Over half of parents (62.1%) reported that they had changed the ways in which they used technology for social connection: 71% had installed new apps, 68% were using technology in new ways, and 74% had held virtual meetings to socialize with friends and family. Increases in application use were notable among video calling apps (Zoom, Skype, and Houseparty) and certain social media apps (Twitter and TikTok) (see Table 4).

Content analysis of the open responses about new uses of technology for social connection revealed that most respondents ($n = 84/90$, 93.33%) were using video calling to hold virtual meetings (where Zoom was the predominate software used; $n = 51$). Video calling was used to hold quizzes ($n = 32$) for

general meetings and catch-ups with friends and family ($n = 11$). There was some use of video calling to maintain social activities that they usually attended ($n = 7$; i.e., music lessons, church groups) and hold birthday parties ($n = 4$). Where people made comments about video calling, these were mixed; just over half reported positive experiences (i.e., having fun, $n = 15/26$, 57.69%), and others reported negative experiences (i.e., practical issues, such as delays or people talking over each other in larger groups, making it feel unnatural and not like real-life communication, $n = 11/26$, 42.30%).

Parents differed in the times of the day they used technology to connect with others during social distancing (see Table 5). Around half of parents reported using technology to connect with others in the evening and a third on the weekend. Around a third of parents reported that they did not have a specific time of the day that they used technology to connect with others.

Difficulties that parents found with using technology for social connection are displayed in Table 6. The most common difficulties were not liking seeing themselves on the screen, it being different to real-life interaction, and a lack of time. Poor Internet connection was reported as a difficulty by 28.3% of parents. Only 16% of parents reported privacy or security as an issue when using technology for social connection, and only 11% had restricted access to a device because of needing to share with other family members.

More than half (58%) of parents reported that their confidence to use technology for social connection had not changed during social distancing, but 38.6% said that their confidence in using technology for this purpose had increased. A small minority of parents (1.4%) reported that they felt more anxious about using technology to connect with others during social distancing.

More than half (62.1%) of parents felt that the experience of using technology during the pandemic was likely to change the

Table 4. Frequencies of using digital technology type

	Retrospective reported use before lockdown %	Reported use during lockdown %
Facebook	78.3	80.1
Instagram	47.0	47.0
Twitter	22.9	32.5
WhatsApp	80.7	81.9
Text	73.5	78.3
Phone call	74.1	77.1
Zoom	1.2	57.2
Skype	10.2	24.1
Houseparty	1.8	21.1
Smule	0	0
Facebook messenger	68.7	74.7
Tik Tok	0.6	13.3
Snapchat	15.7	16.9

Table 5. Times of the day parents used technology for social connection

Time of the day	%
Morning	7.6
Afternoon	11
Evening	51.7
Weekend	29
No specific time of the day	32

Table 6. Difficulties parents found with using technology for social connection (in highest % order)

Problem	%
Don't like seeing self on the screen	36.6
Not real-life interaction	31.7
Lack of time	31
Poor Internet connection	28.3
Privacy/security concerns	16
Restricted access to device due to sharing	11
Age of the device	7.6
Expense	3.4
Difficulties/complications using technology	3.4

way they used technology in the future for social connection, but 31.7% felt it would not. Responses about changes to future use of technology centered on the values and benefits of “video socializing” (e.g., using video technology to meet up with people virtually), with some parents ($n = 41/60$, 63.33%) reporting that they will continue to make use of video calling to hold meetings or quizzes with family and friends who live a distance from them.

Interviews

Thematic analysis of the interviews resulted in three themes. The first theme, *This never would have happened without COVID*, is about feeling pushed by the situation into making communication changes. The second theme, *“Video socializing” is a meaningful alternative when face-to-face meetups are not possible*, is about the social presence of video socializing. The third theme, *There are problems with being so reliant on online communication*, is about the downsides of online communication.

Theme 1: This never would have happened without COVID. During lockdown, parents had to rapidly adapt to using technology, even if they had not used it before and were not confident. Within a very short period, they became completely reliant on online technology for all social contact outside the home; the situation altered the frequency and nature of their social interactions, and it also resulted in changing their relationships. Some deepened, while others drifted apart.

Using technology to communicate is a lifeline. The lockdown highlighted the importance of using technology to communicate with others, and many parents acknowledged that this was a lifeline:

“Facebook at times was like a lifeline because it made me feel not alone. People were still there, and other people’s lives were going on, and you could talk to other people but without having to engage with people in conversation.” (Parent 100, single female)

Another aspect to connecting with others online was that it gave parents a sense of belonging to a group, which was comforting. The feeling of belonging and camaraderie was closely linked to the alleviation of loneliness. One parent commented about her Facebook support group:

“Yes it alleviates loneliness . . . it’s that feeling that someone else is going through what you’re going through . . . it’s like having other women around, even though we talk about focussed things, it always goes off a bit and you tell them little things about your family. It’s more personal than medical. It’s that feeling of support, that you’re not alone.” (Parent 150, married female)

New and changing connections supported with the use of technology. Much of the online social contact that parents described was activity-focused and used as a way of filling the gap left by face-to-face activities with well-established social networks being stopped. But not all activities easily translate to an online format, so the need to use technology both created new opportunities for engaging with others and constrained what could

be done. For example, one parent described how her family normally did water sports with a wide group of friends, but that could not be replicated online, so their contact decreased.

There was also something about the unusual circumstance of lockdown that encouraged parents to be more experimental with making social connections. There were many examples of parents making new connections online including joining a neighborhood WhatsApp group, completing online courses, a 30-day song challenge in Facebook, and a clothes styling session on Facebook. Speaking about her involvement in the Facebook styling group, one parent said:

“It was so bizarre that it has happened, and it has been such a comfort to get a group of women to come together from all over the country . . . all over the world . . . I just thought that was amazing. Before lockdown it would never have worked to that degree.” (Parent 100, single female)

However, some mentioned the difficulty of making new connections online. One new parent, with an 8-month-old baby, said it had been hard to make new friends, and his wife had been feeling isolated because she hadn’t been able “to meet many new mums” (Parent 1, married male).

Technology was particularly useful for contacting distant relatives and friends. One parent said that his household had started regular Zoom calls with his wife’s family, who lived in another part of the country. As a result, they were speaking more regularly than normal. Several parents mentioned reconnecting with old friends from university and school. One explained how using WhatsApp group calls for the first time to connect with old school friends had revealed “different sides of people – it has brought us closer together” (Parent 82, male living with partner).

Several parents mentioned the importance of using technology to stay in contact with those who were shielding. In this case the need to reach out for social contact was mixed with a desire to check that friends and family were safe and well. Status feedback on online apps was mentioned as a useful source of information by one parent who checked on her elderly mother using Facebook Messenger:

“I always check Messenger in the morning to see if my mum is using it. If she is, I know she’s got up ok.” (Parent 35, single male)

Several parents talked about how their social relationships had changed and how technology played a part in that. One single parent explained how she had started doing a weekly cooking session with her sister during which they both cooked the same recipe while on a Skype video call:

“We’re both really struggling, so we hang out together . . . I wouldn’t normally speak to my sister every week, so I’ve grown that relationship.” (Parent 148, single female)

In contrast, another parent (Parent 6, married male) said he was disappointed that some close friends did not stay in touch during lockdown, particularly when his grandfather was ill in hospital. He felt isolated from his family, who lived more than 200 miles away, so “I tried to reach out to friends for help, but I often didn’t get replies.” However, he kept trying and as a result developed deeper friendships with other acquaintances. He also found a

virtual pub group, set up with some football playing friends, was particularly useful “*just to have normal chat.*”

Texting as a way of making frequent contact. The changing role of text communication during this period was highlighted by several parents who mentioned it as a light-touch, almost ambient, way of connecting with others. Some parents said they messaged their family, partner, and friends much more frequently during this period. One mother reported feeling lonely in a male-dominated household, and “*heavily relied on WhatsApp texts with my female friends*” (Parent 150, married female).

Parents highlighted that the advantage of texting is that the other party doesn’t have to be online or respond immediately, and communications can be short and frequent. Some parents used asynchronous messaging to avoid overburdening or interrupting others who they perceived might be busy with their own families. Texting therefore makes communication easier, and people can “*connect when they are available*” (Parent 74, single male). One parent commented:

“Technology enables immediate quick text conversation – you don’t have to keep the conversation going – it’s more about the frequency of contact. You have to make time for a phone call.” (Parent 94, single male)

COVID was a crunch point for learning to use technology. Quite a few parents said they had gotten better at using technology by being forced to use it to connect with others during social distancing:

“My husband always dealt with technology, so when I had to do it I felt a panic inside, I felt sick inside at the thought of doing it. But when I did it, it was such an accomplishment.” (Parent 100, single female)

Several parents reported learning new technical skills and being experimental by trying out completely new technologies.

“I’ve learnt more tech skills. New apps and new ways of doing things. Virtual Reality was a massive challenge and learning how to get that set up.” (Parent 148, single female)

The desire for some parents to keep in contact with their own parents, grandparents, and other older relatives during the lockdown meant they had to set up and teach their relatives to use digital technology. Despite the motivation to use technology, some families were not successful in engaging their older relatives with it. This was often a problem if the relatives lived at a distance, as it made it harder to help them:

“My mum’s a technophobe. They have no internet and no smartphone. I have to phone them on the land line. My parents haven’t even seen the new baby.” (Parent 6, married male)

Theme 2: “Video socializing” is a meaningful alternative when face-to-face meetups are not possible. Video calling was seen by some parents as enabling more meaningful connection than other technology because it had more visual cues for social communication and interaction than phone calls or text interaction. But parents also highlighted its difference to face-to-

face socializing, noting that it lacks important social cues that impact on the quality of the interactions and does not provide the same sense of social presence. For some, there was anxiety about using video calling, which centered on difficulties in large groups and seeing yourself on-screen. Parents’ feelings about how they wanted video socializing to be part of their lives in the future varied. Some hoped that it would continue, but for others using video technology was only a temporary measure, and they had no desire to continue to use it in the future.

Video socializing enables more meaningful connections but is not the same as face-to-face. Parents highlighted that video calling and participating or watching live video links provided more social presence than other technology. Being able to see people was thought to help with interaction and a sense of connection and intimate interaction:

“The big win is being able to see someone while talking to them ... It makes you feel like there’s someone in the house. You can be spontaneous. It’s something to look forward to.” (Parent 148, single female)

However, others said they felt that they couldn’t really connect with others, that they were not able to express truly how they were feeling when using video calling, and that this meant that interactions lacked the intimacy and freedom of speech that meeting in person has. For some there was a sense that video socializing was odd or different in some way:

“Used Skype/Zoom with parents – they are happy to do it and have fun with it but I find it weird ... still feels a bit alien to me.” (Parent 94, single male)

Some pointed out reasons for this, saying that video socializing lacks important or nuanced social cues and that it is difficult to read body language, making the interactions limited and at times awkward. There was a sense that some of the content or emotion that the other person was communicating was being missed.

This way of socializing also presented new issues with communication, with some saying that one person dominated the conversation and it is “*confusing when people talk at once*” (Parent 3). Turn taking in the conversation was more “*more prominent, so the conversation doesn’t flow so well, not so creative*” (Parent 18, married male). One parent mentioned that she felt responsible for keeping conversations flowing when meeting for birthdays with her family, and she felt an awkwardness when she stopped talking and it all went quiet.

Others highlighted that it was hard to build rapport and difficult to use humor when video calling but “*when face to face you can adapt to what engages people more easily*” (Parent 18, married male). Also, it does not give the same uplift or energy as face-to-face interaction, meaning that you need to do more video socializing “*to get the same reward*” (Parent 67, married female).

There is some anxiety about using video calling. Some parents expressed feelings of anxiety about using video calling. For most the anxiety was related to “*looking at yourself all the time*” (Parent 150, married female) on the screen while calling, which was “*daunting*” (Parent 82, male living with partner). Some of

these parents overcame their anxiety about using video calling, finding it hard at first but getting used to it with practice:

“It’s increased my confidence with video calling . . . I hardly ever did it. I used to feel very self-conscious if I did a video call but now I am very comfortable with Skype and sitting with my laptop or standing in the kitchen or whatever it has certainly increased my confidence and I will definitely be doing more of that.” (Parent 148, single female)

Anxiety and frustration were also expressed about the awkwardness of online group communication in video calls, especially large group calls. In these there was a need to focus on a single conversation, in contrast to meeting face-to-face at a party or group gathering where multiple smaller conversations can occur at the same time.

“It’s not real life is it, that’s what the point is. It is great for connection but . . . it’s judging people’s body language and things like that you struggle with on Zoom and umm things like, even like interrupting people. There’s been times I didn’t say something, and I was waiting for someone to stop speaking and you can’t judge it . . . I think that is where the anxiousness comes from because it doesn’t feel as natural as what a group situation would be.” (Parent 150, married female)

Feelings about future use of video technology to socialize are mixed. Some parents felt that online meetups and events had helped them socialize in a way that they could not do normally because of childcare restrictions or being tired in the evening and hoped that they would continue in the future. Others expressed a desire for technology to continue to evolve to enable more meaningful connection with others online. One parent had a desire to stay connected during the pandemic with her parents but found that they would not use it. She felt that if they “*could access something through the TV that would help them*” (Parent 150, married female). Another parent also mentioned the usefulness of having apps on a larger screen so “*everyone can see it and feel more in the room*” and the value of the Facebook portal smart camera following people around the room to make video calling more immersive:

“Facebook portal is great – if everyone had one – it would not be like looking through a keyhole, you would be in the living room with them.” (Parent 82, male living with partner)

One single parent of a child with special needs reflected on how attending events via video links had become more normal in the pandemic (Parent 148, single female) and been useful for attending support meetings that she usually wasn’t able to attend. But she also expressed a concern that in the future people could become too reliant on attending social events virtually because being on your own “*is not a happy way of being*,” is bad for mental health, and risks a gradual withdrawal from face-to-face contact:

“The more I stay away from people the more that may become the norm . . . there is a danger people could become

dependent on it [technology] and stop socialising, especially if they find social situations difficult and challenging, I think it would be very easy to not meet up on such a regular basis.” (Parent 148, single female)

Some of the parents that had used video calling to connect with family and friends felt that it was only useful during the pandemic and would not serve a purpose in their lives in the future, that it was really only “*plugging a gap*” (Parent 3, married female) or good as a “*backup*” (Parent 35, married female) but “*not a replacement for face-to-face communication*” (Parent 3, married female):

“It’ll do for now, that is the best way of saying it. It’s alright for the short term because we are only expecting it to be temporary . . . obviously we went from being face to face people to zoom people, it is a bit weird when you look at the screen and see six of your mates staring back at you and you miss that nuance . . . I think it is a necessary evil. Given a choice I would always do face to face. I am grateful for it. But if that’s what human contact is in the future I am out.” (Parent 1, married male)

Theme 3: There are problems with being so reliant on online communication. Parents highlighted several negative aspects of a reliance on online communication. Some disliked aspects of online culture, such as unsociable behavior and showing off, and were aware that they needed to monitor its impact on them. Several reported concerns for their well-being such as checking their phones too frequently or having too much screen time. Others found technology itself off-putting, reporting difficulties with setting it up or worries about security and privacy. Although these factors did not stop parents from using online tools, they dampened the enthusiasm for some and made them wary of becoming too dependent on technology for communication.

There is a need to monitor technology use. Parents expressed a sense that they needed to monitor their use of technology to protect themselves from potential harmful impacts. One parent reported that at the beginning of the lockdown she had increased her usage of Facebook so she could keep in contact with a wider group of friends and acquaintances, and initially she found it was a really good experience. However, after a month, both she and her husband deleted Facebook to protect themselves from negativity online:

“You can’t help but get into other threads . . . It’s hard to stay positive when you’re bombarded with all the bad stuff . . . because you see in your bubble that everything is alright, and then you can’t believe what people are doing and how they’re behaving.” (Parent 35, married female)

Another parent explained that although she had stopped using Facebook before the lockdown, she started again, but limited the amount of time she spent on it because she found that it was hard to manage the impact on her self-worth when she saw people show off online:

“People portray their best lives . . . It’s not real life, it’s what people choose to tell you . . . some people, even some good

friends, every time they put something on Facebook they really annoy me, painting a picture of their perfect lives, then I feel bad that I'm annoyed because they're my friends." (Parent 3, married female)

Others talked about the negative consequences of being judged by others:

"People start judging you for the posts that you share and like, and you get comments and likes very quickly like everyone is watching all the time." (Parent 79, married female)

Another said she had realized that she used Facebook for self-validation:

"When I had no comments to my Facebook posts, I felt negative. Then I realised it was about self-validation for me, so I have stopped posting and now share things privately." (Parent 94, single male)

Several parents mentioned unhealthy aspects of technology that they'd become more aware of because of the need to use it so much. For example, some said they looked at their phones "*too often*" and received "*too many messages*" (Parent 3, single female) or they found "*Facebook is really addictive*" (Parent 67, married female). Others mentioned concerns about extended screen time during the pandemic, highlighting how uncomfortable it could be to spend too much time in 1 day in front of a screen:

"Work is Zoom, church is Zoom, family is Zoom. I need some screen-free time. I have to pull back from it in the evening sometimes." (Parent 6, married male)

Aspects of using technology are off-putting. Several parents mentioned technical problems that impacted on their experience of communicating online, although none reported major technical hitches. Issues mentioned included "*not being able to get the camera to work at first*" (Parent 18), "*wifi freeze*" (Parent 3, married female, and Parent 6, married male), and "*occasional latency*" (Parent 148, single female). One parent described how she sometimes had to resort to other means of communication: "*when the connection drops, I fall back to the phone*" (Parent 18, married male).

Other parents mentioned aspects of technology that they found worrying. For some, privacy was a concern when using technology. One said:

"I'm convinced I'm being listened to sometimes, for instance, hedgehogs, one day I was talking about them and a minute later it popped up on my Google." (Parent 35, married female)

Another stated he was not on Facebook or Twitter because "*I don't like my details being online*" (Parent 18, married male). Others mentioned slightly different privacy issues related to video calls:

"People see into your home on video calling. With family it's fine, they can catch you in whatever state you are in, but with friends and colleagues it's different." (Parent 79, married female)

DISCUSSION

This study aimed to establish which parents may be at increased risk of experiencing loneliness and social isolation during lockdown and to understand how and why parents made use of digital technology to connect with others during this time.

Parents experiencing lockdown loneliness

Our findings indicate that on average, all parents experienced increased loneliness during the lockdown. However, loneliness levels were highest for those who had experienced higher loneliness before the lockdown, in particular single parents and those caring for children with specific needs, indicating that lockdown loneliness may have been more prevalent in those experiencing chronic loneliness prior to the pandemic. We also found that loneliness was lower in the highest household income group. These findings confirm those of previous literature that single parents, ethnic minority parents, parents with lower household incomes, and those with children with specific/additional needs are at greater risk of experiencing loneliness (Nowland, Thomson, McNally, Smith & Whittaker, 2021). Furthermore, our findings extend existing work by demonstrating that this health inequality in loneliness is also present during pandemics, i.e., enforced social isolation. Notably, parents who are already socially isolated have insufficient social networks or social support systems to draw on for support during enforced social isolation, whereas other parents, who are more strongly socially connected, can leverage their social contacts digitally during a crisis such as a lockdown period. Further evidence using social network analyses indicates that this may be the case, as those who had fewer close relationships reported increases in loneliness during the pandemic, whereas duration and frequency of interactions with close ties was associated with smaller increases in loneliness during this time (Kovacs, Caplan, Grob & King, 2021). This also links to theoretical understandings about social technology reducing loneliness only when it is used in a way that enables people to form new friendships or enhance existing ones (Nowland, Necka & Cacioppo, 2018).

Parents' technology use and loneliness

Our second and third research questions asked what technology parents used, how they used it, and what experiences and perceptions they had of it. We found that parents became reliant on using technology for social communication during the pandemic, with most parents reporting more frequent and changed use of technology for social connection. Nearly three-quarters of our respondents reported installing new apps. Most notable was the widespread use of video calling for socializing with friends and family during the pandemic, with increases in the use of video calling apps such as Zoom, Skype, and Houseparty, Zoom being the most widely used software. These findings confirm technology use trends in the wider population during the pandemic (Vargo, Zhu, Benwell & Yan, 2021). Most parents set up online social meetings during which they would predominantly sit and chat, although quizzes were commonly reported as part of these gatherings. There was also evidence of technology being

used to support social contact through activities such as playing music, walking, and cooking, or more experimental use of technology such as setting up virtual reality; these gave participants a sense of satisfaction and connection, probably because they mimicked the richness of normal social activities that are not purely based on conversation.

Video calling, was reported by parents as allowing them to experience the social presence of others, providing some comfort and relief from loneliness. This confirms the findings of other studies that social presence is an important factor in making technology more effective for social contact (Bulu, 2012). For instance, some parents noted that more immersive experiences were considerably better, such as bigger screens that everyone can see, and the Facebook Portal smart camera that follows people around the room. Even without these enhancements, several parents noted that being able to see people and spend time with them online were important ways of fulfilling the need for social connection. Over half of survey respondents reported they would continue to use video calling to meet up with distant friends and family.

Nevertheless, many parents highlighted problems with communicating through technology. Most common were finding interactions awkward, lack of nuanced social cues, difficulty in turn taking, discomfort about looking at yourself while talking, and problems in big groups with some people dominating the conversation. Some parents experienced anxiety when communicating with technology that surprised them, as it was unusual. There was a general sense that while online applications were better than nothing, they needed further development to allow people to communicate more naturally and with a greater sense of social presence. Some parents highlighted that video calling was not a sufficient replacement for face-to-face communication, which was needed to result in lasting impacts on loneliness. The degree of social presence is known to be associated with satisfaction with computer-mediated conferencing because it impacts on a person's socio-emotional experience (Gunawardena & Zittle, 2009). Social presence may be an important influence on whether people do find reductions in loneliness when they communicate with others on online (Clark, Algie & Green, 2018; Nowland, Necka & Cacioppo, 2018). Although the effectiveness of video calling to reduce loneliness has not been examined in a parent population, this has not been found effective in reducing loneliness in older adults in a recent rapid review (Shah, Noguera, van Woerden & Kiparoglou, 2020).

The asynchronous and ambient nature of many software apps were important and useful features for maintaining social connection with others during the lockdown. Looking after children during the pandemic was demanding on parents, and it was difficult to find time for social contact during the day. Being able to send short text messages, or maintain an ambient awareness of others, during long days at home was another form of social contact that parents found useful. This type of communication was heavily dependent on the parent having existing social networks that could support them. Some parents highlighted the value of using digital technology to attend social events remotely that they would normally be unable to attend due to tiredness or childcare difficulties. This indicates that digital technology may be useful for some parents who are isolated by nature of their childrearing responsibilities.

Technology was perceived as useful but second best to “the real thing.” Most respondents had mixed experiences, some good and some bad, and wanted to get “back to normal.” Having to use a different medium for communication changed some relationships. Many parents disliked the lack of authenticity and sensitivity to others that are prevalent in online culture, such as people's tendency to show off and to reveal only their perfect lives. For people who were not confident about making social connections, this was another barrier. We found that communication through technology often mirrored and amplified what was already going on. Parents who were socially confident and strongly networked were able to navigate the changes and challenges of switching to online of communication, but parents who already had problems found the barriers of using technology particularly hard.

Strengths and limitations of the current study

A strength of this study is that it focuses on a population that is known to have high loneliness (Action for Children, 2017; Luoma, Korhonen, Puura & Salmelin, 2019), which has typically been under-researched in the loneliness literature (Nowland, Thomson, McNally, Smith & Whittaker, 2021). The findings are informative about the types of parents who are at increased risk of experiencing loneliness, and they examine the potential of social technology as a resource to support those parents.

A weakness of the study is that it is cross-sectional and there is a reliance on retrospective reporting of loneliness. Thus, conclusions about the chronicity of the experience of loneliness in certain populations need to be made cautiously. The findings, however, do highlight inequalities in relation to loneliness in specific groups of parents (i.e., single parents and those caring for children with disabilities).

The study examines the experiences of parents during lockdown, when parents were physically isolated from other people, which may be different from their typical daily experiences, and this may diminish the generalizability of the results. However, the findings that parents' responses to using technology for communication are complex, context-dependent, and at times contradictory are important and useful insights for further studies.

Implications and future research

The findings in the current study suggest that targeted interventions with specific parents, i.e., single parents or those caring for children with specific needs, might be useful in reducing loneliness in parenthood. Ensuring that these parents are supported with social connections is essential because of the association between loneliness and poor physical and mental health (Ong, Uchino & Wethington, 2016; Wang, Mann, Lloyd-Evans, Ma & Johnson, 2018). Interventions involving digital technology may be useful to reduce loneliness in parents. Technology that involves some element of video calling but that tends to have more similarities to communication offline may be most effective. Digital interventions to reduce loneliness in parents are unlikely to work universally as these do not conform to individual preferences for social contact, and some parents will find aspects of online communication anxiety provoking.

CONCLUSION

All parents in the study experienced increased loneliness during the lockdown, but levels were highest for those who had previously experienced higher loneliness, in particular single parents and those caring for children with specific needs. Video calling was most useful at enabling social contact. Although technology was invaluable during the pandemic, it was not a panacea, and the way parents used it was influenced by their approach to technology and existing social behaviors and networks. This article makes three contributions: (1) It confirms that parental loneliness increased during the pandemic lockdown, (2) it provides in-depth insights of the experiences of parents using technology for social contact during the lockdown, and (3) it illustrates that technology for social connection can relieve feelings of loneliness but does not mitigate all the factors that influence parental loneliness.

AUTHOR CONTRIBUTIONS

All authors: Conceptualization, methodology, visualization, writing – reviewing, and editing. Rebecca Nowland: Supervision, project administration, funding acquisition, data curation, formal analysis, resources, and writing – original draft preparation. Peggy Gregory: Supervision, funding acquisition, methodology, investigation, formal analysis, and writing – original draft preparation. Lara McNally: Investigation, resources.

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ETHICS APPROVAL STATEMENT

The research received the approval of the university's ethics board (Reference: SCIENCE 0035), and all respondents provided informed written consent in accordance with the Ethical Standards of the Declaration of Helsinki.

CONFLICT OF INTEREST

The authors declare no competing interests.

DATA AVAILABILITY STATEMENT

The data that support the findings of this study are available from the corresponding author upon reasonable request.

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APPENDIX 1

SURVEY QUESTIONS ABOUT SOCIAL TECHNOLOGY USE

When we mention using technology for social connection and/or to reduce loneliness and isolation, we are interested in how technology has been used to keep in contact with others or share time with other people, rather than using technology for work meetings. You may, however, have used technology to meet up with work colleagues outside of work meetings (i.e., for tea breaks, evening meetings, etc.) – we are interested in that type of social contact rather than work-related contact in these questions.

Which technology do you use to stay connected with people and reduce your feelings of loneliness? (tick all that apply)

- a. Before COVID-19 social distancing and self-isolation
 - Facebook
 - Instagram
 - Twitter
 - WhatsApp
 - Text
 - Phone call

- Zoom
- Skype
- Houseparty
- Smule
- Facebook messenger
- Tik Tok
- Snapchat
- Other (please specify) _____

b. During COVID-19 social distancing and self-isolation

- Facebook
- Instagram
- Twitter
- WhatsApp
- Text
- Phone call
- Zoom
- Skype
- Houseparty
- Smule
- Facebook messenger
- Tik Tok
- Snapchat
- Other (please specify) _____

Do you think your use of technology for social connection has changed since you have been social distancing or self-isolating because of the COVID-19 pandemic?

- I have used technology more to connect with people or reduce loneliness.
- I have used technology less to connect with people or reduce loneliness.
- My use of technology to connect with people or reduce loneliness has stayed the same.

Have you done any of the following things since social distancing/self-isolation? (tick all that apply)

- Installed new apps to help me stay connected to others
- Used technology in a new and different way to stay connected with others
- Held a virtual party, pub night, meeting with family or friends
- Other (please specify) _____

If you have used technology in a new and different way (or a novel way) or downloaded new apps to help you stay connected to others or reduce feelings of loneliness or isolation, can you give us details of this use? (i.e., What did you use and why? What was the experience like?)

****Open text box****

Are there specific times of the day that you found you use technology more to stay connected to people or reduce your feelings of loneliness during the COVID-19 pandemic?

- Morning
- Afternoon

- Evening
- Weekends
- No specific times of the day

Do you usually find social technology (i.e., apps to stay in contact with others) easy to use?

- Yes
- No
- Sometimes

Has your confidence to use technology to connect with others changed since the COVID-19 pandemic?

- I have increased in my confidence about using technology to connect with others.
- I have been more anxious about using technology to connect with others.
- My confidence about using technology to connect with others has stayed the same.

If your confidence in using technology has changed, please tell us how.

****open text box****

What things make it difficult for you to use technology to connect with others or reduce loneliness?

- Lack of time
- Expense
- Find it difficult or complicated to use
- I don't like seeing myself on video calls
- Not like a real-life conversation
- Ethical reasons
- Concerns about privacy and security
- Sharing devices with other family members
- Device or equipment too old
- Poor Internet connection
- Other (please say why) _____

Do you think the experience of social distancing and self-isolation because of the COVID-19 pandemic will change the way you use technology in the future to communicate with others when you are no longer social distancing?

- Yes
- No

If you answered yes, how do you think will it change?

- I will use technology more than I did before to help me connect/communicate with people.
- I will continue to use new apps that I have used to connect with others.
- I will continue to use virtual socializing (i.e., meetings online, parties, pub nights).

We are really interested in finding out about how the experience of using technology to connect with others may

impact on how you will use technology for social connection in the future. If you think this has impacted on how you will use technology in the future, please tell us a bit more about how your use of technology will change in the future in the box below:

****open text box****

Is there anything else you would like to tell us about your experience of using technology to stay socially connected and reduce feelings of loneliness during the COVID-19 pandemic (e.g., any reflections on your experience, things that we haven't asked you that you think are relevant to using technology to connect with others as a parent, anything else you think is important)?

****open text box****

APPENDIX 2

INTERVIEW TOPIC GUIDE

1. Would you mind explaining to me what your family situation is during social distancing; who is isolating with you?
Prompts: If with family member, are they working, are you working? How has this impacted on your relationships? Are you key workers? Still working? etc.
2. Can you tell me about how social distancing during the COVID-19 pandemic has impacted on your contact with your family and friends?
Prompts: Have you felt you have needed to make contact with friends/family and why? Has contact increased/decreased?
3. Can you tell me about your experience of social distancing during the COVID-19 pandemic? **Prompts:** How have you felt during this time? What things have been difficult for you? Is there anything you have enjoyed?
4. Can you tell me about any times you have felt lonely during social distancing?
Follow-up question/s: What do you think it was that made you feel lonely on that occasion? What did you do on that occasion to overcome the feelings of loneliness?
5. Can you tell me about how you have used technology to connect with others during social distancing?

Prompts: What technology have you used and why? How did you find the technology use? Anything that helped you use the technology? Anything that made it difficult?

6. How do you think your use of technology to connect with others has changed since COVID-19?

Follow-up questions:

- a. Thinking about that technology use, can you tell me some things that worked well for you?
- b. How about things that didn't go so well with technology use?

Where parents have mentioned in the survey that they used technology in novel ways, we will ask some questions specific to that use referring to their responses in the question (i.e., can you tell us more about >>>> > that you mentioned in the survey).

- 7 Can you tell me about things that have made it difficult for you to use technology to connect with others?
- 8 Thinking about the technology you have used for social connection, were the apps and services that you used sufficient for your needs to connect or was there technology missing that would have been useful?
Prompt: Did you find that you wanted to be able to do something but there was not technology to enable you to do it or did the technology you used lack certain functions you needed?
- 9 How have you felt about having to stay in touch with people virtually rather than in person? **Prompt:** Do you ever prefer to use virtual socializing?
- 10 Do you think that there is anything about the experience of staying in contact with people using technology during social distancing that may change the way you use technology in the future?
Prompt: Will you keep doing some of the things with technology you have been doing during social distancing?
- 11 Do you think that your feelings about using technology for social connection has changed since social distancing?
Prompt: Has it changed your opinion about social media or your confidence about using it?
- 12 Is there anything else you would like to tell us about your experiences of using technology for social connection or to reduce loneliness during social distancing?