Remote Social Contact and Loneliness Among the Young-Old, Middle-Old, and Oldest-Old Adults During the COVID-19 Pandemic

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Abstract

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The importance of remote communication increased with the onset of the Coronavirus disease 2019 (COVID-19) pandemic in 2020. Previous studies have explored the effects of remote communication technology usage on loneliness of older adults classified as aged 65 and above as a whole. Because aging is a gradual process, several studies propose the existence of distinct age categories within the older adult population. However, little is understood about the association between the usage of remote communication technology and loneliness among different age groups within the older adult population during the COVID-19 pandemic. To address this knowledge gap, the study divided older adults into three age groups: young-old, middle-old, and oldest-old, and examined: (1) whether the frequency of remote social contact usage during the

COVID-19 pandemic differs among age groups of older adults, and (2) if the association between the use of remote social contact during the COVID-19 pandemic and loneliness differs among age groups of older adults. This study utilized nationally representative data from the National Social Life, Health and Aging Project (NSHAP), Round 3 and the COVID-19 Study. The regression results confirm that the frequency of remote social contact modes usage significantly differed across age groups. However, despite the significant association between in-person contact and lower loneliness observed across all age groups, the utilization of emails, texts, or social media messages among young-old adults was linked to higher levels of loneliness. Among oldest-old adults, an increase in the frequency of in-person contact was associated with phone call usage contributing to an increase in loneliness. These findings emphasize the importance for social work and related fields to enable safe in-person communication for older adults, considering their vulnerability to COVID-19. Furthermore, it is essential to develop accessible remote contact platforms, educate, and allocate resources to improve technology access for older adults, as technology becomes more vital for social connections despite physical limitations.

Introduction

The global spread of Coronavirus disease 2019 (COVID-19) in early 2020 resulted in significant changes in people's lives. Strict regulations needed to be implemented to combat COVID-19 due to its rapid transmission among people, including spread via group infections. Society strongly advocated for the use of masks and simultaneously introduced safety measures such as social distancing to reduce face-to-face interactions and the spread of the virus (Centers for Disease Control and Prevention, 2023). As a consequence, limitations arose regarding direct interactions with others.

Due to the necessity of maintaining physical distance during the COVID-19 pandemic, many individuals experienced an increase in psychosocial challenges like loneliness, social isolation, and depression (Dubey et al., 2020; Serafini et al., 2020). In particular, there was heightened fear of infection among older adults due to the increased mortality rate and greater risk of complications for those with pre-existing chronic conditions (Hadjistavropoulos & Asmundson, 2022). It was reported in the United States (U.S.) that approximately 80 percent of COVID-19-related deaths occurred in individuals aged 65 and older (Powell et al., 2020). Moreover, group infections were also reported in care facilities such as nursing homes. While nursing home residents make up less than 0.5 percent of the total U.S. population, they have accounted for around 25 percent of documented COVID-19-related deaths (Grabowski & Mor, 2020).

Amidst various psychosocial challenges, older adults are notably susceptible to loneliness, especially due to reasons such as the loss of a spouse, retirement, and the death of close friends or relatives (Fakoya et al., 2020). Loneliness, also known as perceived social isolation, is a distressing feeling that arises when one perceives that their social needs are not

being met in terms of the quantity or quality of their social relationships (Hawkley & Cacioppo, 2010). The COVID-19 pandemic exacerbated loneliness among older adults. In examination of data from the National Poll on Healthy Aging, loneliness doubled for older adults in the first months of the COVID-19 pandemic in the U.S. (Michigan Medicine, 2020). Loneliness is regarded as a serious public health risk for older adults in the U.S. as it is known to have various negative effects such as increased mortality, dementia, and other medical conditions (Czaja et al., 2021; Centers for Disease Control and Prevention, 2021).

To cope with the restrictions on in-person interactions imposed by the pandemic, remote communication methods and services were employed. Remote technologies, such as telehealth, were extensively utilized among older adults as well. Choi and colleagues (2022) found through investigating National Health and Aging Trend Study (NHATS) data that the use of telehealth for medical appointments with regular healthcare providers among older adults increased from 4.6 percent pre-pandemic to 21.1 percent during the pandemic. There is a growing number of studies exploring the effect of daily use of remote communication technologies on older adults during the COVID-19 pandemic. For instance, studies are being conducted to examine the impact of utilizing remote communication technologies in daily life on loneliness of older adults (Rolandi et al., 2020), as well as intervention studies aimed at promoting communication between older adults residing in long-term care facilities and their families (Ferdous, 2021; Fitri et al., 2021).

Hawkley and colleagues (2019) found an overall increase in loneliness after age 75 through their investigation of the National Social Life, Health, and Aging Project data and Health and Retirement Study data collected from 2005 to 2016. This increase in loneliness was associated with poor health, living alone or without a spouse/partner, and having fewer close family and friends. They also found that loneliness decreased with age through the early 70s,

after which it increased (Hawkley et al., 2019). As experiences vary across generations and aging is a progressive process, there are likely to be distinct characteristics within the older adult population. Instead of examining all adults aged 65 and above as a single group, several studies have categorized older adults into sub-groups based on age, commonly as young-old, middle-old, and oldest old, and explored differences among the groups (Lee et al., 2018; Hooyman & Kiyak, 2011). It can be anticipated that the effects of remote communication technologies on older adults during the COVID-19 pandemic may differ by the age group. Yet, there is a paucity of research that subdivides the age group of older adults to explore the impact of remote technology on each subgroup during the COVID-19 period.

The current study centers its investigation on loneliness as a psychosocial challenge among older adults during the COVID-19 pandemic. The study divides older adults into three age groups: young-old adults aged 65 to 74, middle-old adults aged 75 to 84, and oldest-old adults aged 85 and older, and examines how the use of remote social contact modes during the COVID-19 pandemic differs across these subgroups. Furthermore, it investigates how the association between the use of remote social contact and loneliness varies among the three age groups of older adults.

Background: Literature Review

Defining Older Adults

Older adults generally refer to individuals who have surpassed middle age and are typically experiencing or are at risk for age-related health changes, retirement, or other related life transitions (Hooyman & Kiyak, 2011; Williamson & Fried, 1996). Based on chronological age, the term "older adults" frequently refers to individuals who are aged 65 years and above (Hooyman & Kiyak, 2011). Though the exact evidence supporting this definition remains

uncertain (Orimo et al., 2006), and aging is indeed a biological inevitability throughout life (Hooyman & Kiyak, 2011), the age of 65 has long been conventionally used as the threshold to define older adults. Centers for Disease Control and Prevention (CDC) defines the older adult population as people aged 65 years or older (*Centers for Disease Control and Prevention*, n.d.). In the U.S., older adults over the age of 65 are eligible for programs such as those from the Social Security Administration (SSA), Medicare, senior discounts, and tax deductions (*Welcome to Benefits.gov | Benefits.Gov*, n.d.).

Recent advances in medical and health science have led to a rapid increase in the average lifespan. Life expectancy at birth for the entire U.S. population was 76.4 years in 2021 (Xu et al., 2022). In 1960, life expectancy in the U.S. stood at 69.7 years (Medina et al., 2020). However, projections indicate that by 2060, the overall life expectancy is expected to rise to 85.6 years (Medina et al., 2020). Additionally, Mather and colleagues (2015) found that older adults in the U.S. today exhibit reduced disability rates compared to previous generations leading to healthier and longer lives with a better quality of life. Globally, the number of individuals reaching their 100th birthday, referred to as centenarian, is increasing (Murata et al., 2023). Both individuals aged 65 and those aged 100 are uniformly classified as older adults. However, such standardized distinctions do not reflect the unique experiences of each generation in a changing society, nor do they consider the changes that occur as the human body gradually ages (Carr & Weir, 2017).

In the U.S., for example, several generations have been defined, and each generation is characterized by unique experiences and cultural influences (Enam & Konduri, 2018; Jones et al., 2003). For example, the Greatest Generation, born between 1901 and 1927, endured the hardships of the Great Depression and fought in World War II (Enam & Konduri, 2018).

Following them, the Silent Generation, born between 1928 and 1945, adhered to traditional values and exemplified strong work ethics (Enam & Konduri, 2018). Baby Boomers, born between 1946 and 1964, are presently in the process of transitioning into older adulthood. They lived through a notable post-war population increase and encountered cultural transformations during the 1960s and 1970s. (Enam & Konduri, 2018; Pruchno, 2012).

Furthermore, humans begin aging from the moment they are born, and this process is unavoidable (Hooyman & Kiyak, 2011). Since aging is the progressive deterioration of bodily functions over time, it is also associated with an increased prevalence of chronic diseases. (Green & Hillersdal, 2021). Therefore, it is difficult to regard individuals in early older adulthood and those in the end-of-life stage as having similar levels of physical activity due to the progressive nature of aging. Accordingly, there is a growing body of research suggesting the adoption of more precise age classifications instead of uniformly referring to individuals aged 65 and above as older adults (Carr & Weir, 2017; Singh & Bajorek, 2014; Ouchi et al., 2017; Toker et al., 2023).

Young-Old, Middle-Old, Oldest-Old

Acknowledging the diversity within older adulthood, aging research commonly classifies older adults into "Young-Old," "Middle-Old," and "Oldest-Old" stages, recognizing variations in health, functional abilities, and social support (Hooyman & Kiyak, 2011; Little & McGivern, 2016). Individuals categorized as young-old are in the early stages of older adulthood, typically between the ages of 65 and 74 (Hooyman & Kiyak, 2011). Those classified as middle-old are in an intermediate stage, typically aged 75 to 84, while individuals aged 85 and older are defined as oldest-old (Hooyman & Kiyak, 2011).

Young-old adults are relatively healthy (Mather et al., 2024), with many still engaged in

work (Jo & Lee, 2009), experiencing retirement (Min et al., 2023), involved in social activities (Jo & Lee, 2009), and capable of independent living (Wilmoth, 1998). Middle-old adults may require more assistance with daily activities (Cohen-Mansfield et al., 2013). Oldest-old adults often face more significant health challenges (Toker et al., 2023; Cohen-Mansfield et al., 2013), widowed (Koo, et al., 2017), and may require more support with activities of daily living (Hooyman & Kiyak, 2011). They are more likely to reside in long-term care facilities (Wilmoth, 1998) or receive assistance from caregivers (Carrera et al., 2013).

Previous studies have compared the differences observed among three age groups of older adults. Lee and colleagues (2018) found that young-old adults had the lowest admission rate to the emergency department compared to middle-old and oldest-old adults, but they had the highest discharge rate compared to the other two groups. Min and colleagues (2023) found out that oldest-old adults are likely to experience less severe mental health symptoms, such as depression, anxiety, loneliness, and perceived stress, compared to young-old adults. Rajani and Jawaid (2015) interpret this as the result of developmental adaptation process toward wisdom and maturation, becoming more resilient and shaping better coping strategies over time.

Loneliness and Social Isolation

Social isolation and loneliness are well-conceptualized in the literature and differentiated from each other. Social isolation is the objective state of having limited physical or social contact or interaction with others (de Jong-Gierveld et al., 2006; Matthews et al., 2016). Loneliness is the subjective experience of distress or dissatisfaction resulting from perceived social isolation or a lack of meaningful connections with others (de Jong-Gierveld et al., 2006; Matthews et al., 2016). One can experience social isolation without feeling lonely, while conversely, individuals may have social connections yet still feel lonely if they perceive those interactions to be

unsatisfactory (de Jong-Gierveld et al., 2006; Matthews et al., 2016).

Both social isolation and loneliness can negatively impact mental and physical health. Research indicates that loneliness is associated with negative health outcomes such as higher rates of depression (Erzen & Çikrikci, 2018; Moeller & Seehuus, 2019), anxiety (Moeller & Seehuus, 2019), substance abuse (Ingram et al., 2020; Tsai et al., 2022), and suicidal ideation (McClelland et al., 2020; Stravynski & Boyer, 2001). Loneliness is also linked to poor sleep quality (Griffin et al., 2020), weakened immune function (Hawkley & Cacioppo, 2003), and increased inflammation in the body (Jaremka et al., 2013). Additionally, social isolation is connected to increased levels of stress (Cacioppo & Hawkley, 2003), depression (Ge et al., 2017), anxiety (Simões et al., 2020), and cardiovascular issues (Grant et al., 2009).

Older Adults and Loneliness

Older adults are vulnerable to experiencing loneliness. Risk factors for loneliness among older adults include retirement, loss of loved ones, and physical health challenges which may lead to mobility issues (Fakoya et al., 2020). Social network size of older adults tends to decrease over time, which may increase their sense of loneliness (Ayalon & Levkovich, 2019).

Loneliness has detrimental effects on the health of older adults. Research has shown that loneliness is associated with negative health outcomes among older adults (Czaja et al., 2021; Ong et al., 2016). Czaja and colleagues (2021) found out that loneliness among older adults was strongly linked with depression and self-ratings of health. Ong and colleagues (2016) demonstrated that loneliness is associated with increased mortality in older adulthood. Moreover, loneliness in older adulthood may negatively impact cognitive decline (Cardona & Andrés, 2023) and increase risk of developing conditions such as Alzheimer's diseases and other forms of dementia (Ren et al., 2023). Salinas and colleagues (2022) found, through their 10-year cohort

study, that lonely adults, with a mean age of 73, had a higher 10-year dementia risk compared to adults who were not lonely.

COVID-19 Pandemic and Loneliness

The outbreak of the COVID-19 global pandemic in 2020 brought significant changes to everyday life (Pai & Vella, 2021). Due to the highly contagious nature of the virus, governments and health authorities implemented social distancing measures to reduce its spread (Lonergan & Chalmers, 2020). However, these measures had posed significant psychosocial challenges, particularly regarding loneliness (Palgi et al., 2020). The lack of in-person social support systems, increased stress, and uncertainty about the future contributed to feelings of loneliness (Smith & Lim, 2020). Luchetti and colleagues (2020) found that there was an increase in loneliness during the acute phase of the outbreak, and individuals living alone and those with at least one chronic condition reported feeling lonelier. Self-isolation caused by the COVID-19 pandemic elevated loneliness, and loneliness was strongly associated with greater depression and suicidal ideation (Killgore et al., 2020).

Impact on Older Adults

The COVID-19 pandemic posed challenges for vulnerable populations, including older adults. Cudjoe and Kotwal (2020) demonstrated, through their examination of National Health and Aging Trends Study (NHATS) data, that before the pandemic, more than 40 percent of older adults experienced loneliness. The COVID-19 pandemic exacerbated the situation, with community centers closed, nursing homes terminating visitation, and grandparents unable to visit their grandchildren (Cudjoe & Kotwal, 2020). Moreover, the fear of death negatively affected older people, given that age and chronic medical conditions are known to act as risk factors for severe illness from COVID-19 (Parlapani et al., 2020).

Age discrimination was intensified by the COVID-19 pandemic, impacting access to information, health care services, and support to informal caregivers and family advocates (Lebrasseur et al., 2021). During the COVID-19 pandemic, online resources and digital technologies have played a crucial role in daily life, including telehealth services or online communication tools. However, despite the increasing number of older adults going online, the majority still require assistance when navigating digital technologies (Lebrasseur et al., 2021). The lack of access to online resources among older adults heightened vulnerability in circumstances such as the COVID-19 pandemic (Lebrasseur et al., 2021; Xie et al., 2020).

Technology Use and Older Adults

In contrast to the stereotype that older adults may not be familiar with technology, many of them today are proficient in using digital tools and devices (Mitzner et al., 2019; Pang et al., 2021). Moreover, services for older adults that incorporate technologies such as sensors to alert their caregivers in case of incidents like falls (Wagner et al., 2021), or AI companions that provide conversation assistance (Berridge et al., 2023), are becoming increasingly common, especially for older adults living alone. While older adults may be less inclined to adopt new technologies compared to younger generations (Moxley et al., 2022), research suggests that their willingness to embrace technology does not decrease significantly when they perceive the benefits it offers (Moxley et al., 2022).

Studies show that the adaptation and willingness to embrace technology are higher among young-old adults compared to middle-old or oldest-old adults (Anderson & Perrin, 2017; Vroman et al., 2015; Lissitsa et al., 2022). Anderson and Perrin (2017) found that 82 percent of young-old adults reported Internet use. Generational differences, including age, digital literacy levels, and educational attainment, contribute to disparities in technology usage among older

adults (Lissitsa et al., 2022).

Since the onset of the COVID-19 pandemic, social distancing measures have limited face-to-face interactions, prompting an increased reliance on remote communication technologies (Brooks et al., 2020). The dependence on these technologies has grown more significant as the period of required self-isolation has extended (Douglas et al., 2020). In this period, significant progress has been made in the development and adoption of technologies like Zoom and telehealth, which facilitate video communication and services (Volmar et al., 2023; Feldkamp & Pokryfky, 2022). In particular, older adults in long-term care facilities faced restrictions on in-person visits (Thompson et al., 2020). As a result, several studies have explored various intervention strategies aimed at enabling communication with family members and friends without physical contact (Ferdous, 2021; Boamah, 2021). With the technological assistance provided by caregivers in care facilities, studies have shown that video calling with families and friends has a positive effect on older adults, showing a decrease in anxiety, increased morale, and reduced feelings of loneliness and isolation (Fitri et al., 2021, Naudé et al., 2022)

Meanwhile, numerous studies investigated whether remote modes of contact positively improve the social connection of older adults. Yu and colleagues (2021) found out that internet use among older adults was associated with decreased loneliness over an eight-year period and more social contact. Rolandi and colleagues (2020) investigated Social Networking Sites (SNSs) use among older adults and found out that individuals trained for SNSs use showed a lighter reduction in social contacts compared to pre-pandemic lockdown levels. Chopik (2016) demonstrated that higher social technology use was associated with reduced loneliness of older adults and described the potential of technology to cultivate well-being among older adults. On

the other hand, Dhakal and colleagues (2023) reported that information and communication technologies (ICTs) may not decrease loneliness among older adults. In some studies, phone contact was associated with higher levels of negative affect among older adults living alone (Fingerman et al., 2021), and remote social contact was not sufficient to replace in-person contact among older adults (Hawkley et al., 2021)

Study Purpose

Previous research has found that different age groups of older adults show different characteristics. In particular, compared to oldest-old adults, young-old adults were relatively healthier, more engaged in social activities, more adept at using technology, and better able to utilize technology as well. Prior studies have often examined older adults as a whole to understand the technology use and the association with their health outcomes. However, little is understood about the association between remote communication technology usage and loneliness among different age groups within the older adult population during the COVID-19 pandemic. This study aimed to examine whether there are differences in the utilization of remote social contact modes, and their effect on loneliness during the COVID-19 pandemic across three age groups of older adults: young-old, middle-old, and oldest-old. By comprehending the difference, the study hopes to provide insights that can guide social work practices or policies to better approach their tailored needs.

Aims/Hypothesis

This study examined the following aims.

Aim 1: The differences in the frequency of remote social contact usage among age groups of older adults during the COVID-19 pandemic.

Aim 2: The distinctions in the association between remote social contact use and

loneliness among different age groups of older adults during the COVID-19 pandemic.

Aim 3: The differences in the association between remote social contact use and loneliness based on the frequency of in-person visits for each age group of older adults during the COVID-19 pandemic.

The following hypotheses were formulated with the guidance of extant literature. Firstly, there will be significant differences in the frequency of usage of remote social contact modes among the three groups of older adults. Specifically, young-old adults are expected to use emails, texts, or social media messages and video calls more frequently than other two groups. Secondly, the usage of remote social contact modes will be associated with lower levels of loneliness among the groups of older adults. As previous studies explored, in-person contact is expected to be associated with lower loneliness, and after controlling for this factor, significant associations between remote social contact modes and loneliness are anticipated in each age group of older adults. Lastly, the use of remote social contact will be negatively associated with loneliness when in-person visits are infrequent.

Methods

Study Design

This correlational study used data from Round 3 and the COVID-19 Study, Public-Use, from the National Social Life, Health and Aging Project (NSHAP), supported by the National Institutes of Health (R01AG021487; R37AG030481; R01AG033903; R01AG043538; R01AG048511). This is a publicly available dataset. The data is de-identified, and the researcher does not have access to any identifying information.

NSHAP is the first population-based study of health and social factors on a national scale, which aims to understand the well-being of older, community dwelling individuals in the

U.S. (Waite et al., 2022). Participants were selected through a probability sample of U.S. adults meeting the age criteria (Waite et al., 2022). NSHAP examines the interactions among physical health, illness, medication use, cognitive function, emotional health, sensory function, health behaviors, and social connectedness (Waite et al., 2022). It is designed to provide health providers, policy makers, and individuals with useful information and insights into these factors, particularly on social and intimate relationships (Waite et al., 2022).

The COVID-19 sub-study data was collected in the Fall of 2020 and administered to NSHAP Round 3 respondents, who were born after the year 1965 (Waite et al., 2022). Data was collected through a web survey, phone interviews, or paper-and-pencil mail back instrument (Waite et al., 2022). The questionnaire was designed for respondents in the NSHAP main study, on whom considerable background information is already available (Waite et al., 2022). All respondents to the NSHAP Round 3 (2015-16) main study were invited to respond to the COVID-19 sub-study questionnaire (Waite et al., 2022). The study consisted of a brief self-report questionnaire designed to investigate the impact of the coronavirus pandemic on the lives of older adults (Waite et al., 2022).

Data

Age Group

This study sampled NSHAP respondents aged 65 years or older from Round 3 and the COVID-19 Study data who were interviewed in 2015. The samples were divided into three groups, which are young-old of ages from 65 to 74, middle-old of ages from 75 to 84, and the oldest-old of ages 85 and older (Hooyman & Kiyak, 2011). Table 1 shows sample size for each group.

Table 1
Sample Size for Each Group of Older Adults – young-old, middle-old, and oldest-old

Age Groups	Sample Size	Proportion
Young-Old (65-74)	740	0.42
Middle-Old (75-84)	747	0.42
Oldest-Old (85+)	245	0.16
Total	1,762	1.00

Modes of Social Contacts

The study modified existing variables from the NSHAP data to address the research questions. Questions were asked separately for each mode of social contacts. The modes of social contacts are (1) phone calls, (2) emails, texts, or social media messages, including Facebook messages, (3) video calls, such as Zoom, FaceTime, other online videos, and (4) in-person visits, including visits through windows.

The use of each mode of social contacts in the NSHAP data was evaluated by questioning respondents about the frequency of their social contacts with non-household family and friends since the onset of the pandemic. Specifically, respondents were asked, "Since the start of the pandemic, during a typical week, how often have you had (social contact mode) with family/friends?" Responses were recorded on a scale ranging from 0 to 4, with each value representing a different frequency: 0 (Never), 1 (Less than once a week), 2 (About once a week), 3 (A few times a week), and 4 (At least daily).

Follow-up questions inquired whether the frequency of social contact increased, decreased, or remained unchanged compared with the pre-pandemic period. Specifically, respondents were asked, "Compared to before the pandemic, would you say this is…" Responses were recorded on a scale ranging from 1 to 5, with each value representing a different frequency: 1 (A lot less often), 2 (A little less often), 3 (About the same), 4 (A little more often), and 5 (A lot

more often).

Modification of Variables. To assess the overall usage of different modes of social contact among respondents with both non-household family and friends during the COVID-19 pandemic, this study developed modified variables for each mode. This was accomplished by combining two variables that measured contact separately with family and friends, and then dividing the combined values by two to calculate an average.

The variables measuring changes in social contact compared to the pre-pandemic period were dichotomized into two categories. Hawkley and colleagues' (2021) article was used as the reference. The variables examining the remote modes of social contacts were dichotomized as decreased or about the same remote social contact during the COVID-19 pandemic versus increased remote social contact during the COVID-19 pandemic. The dichotomous variable for in-person social contact is set as decreased in-person contact versus increased or about the same in-person social contact during the COVID-19 pandemic.

Loneliness

The NSHAP data measured loneliness by the 3-item UCLA loneliness scale, which was designed to assess subjective feelings of loneliness (Hughes et al., 2004). Three items are asked as (1) During the past month, how often did you feel that you lack companionship? (2) During the past month, how often did you feel left out? (3) During the past month, how often did you feel isolated from others? The scale ranges from 0 to 3: 0 (never), 1 (hardly ever), 2 (some of the time), 3 (often).

Demographic Characteristics

Respondent's Race/Ethnicity. The race and ethnicity variable in the NSHAP data was classified into four categories. These categories include (1) White, (2) Black, (3) Hispanic, non-

Black, and (4) Other. According to NSHAP variable coding rules, if an individual identified their race as White and their ethnicity as non-Hispanic, they were coded as White. If they identified their race as Black, they were coded as Black. If they identified their ethnicity as Hispanic and did not identify their race as Black, they were coded as Hispanic, non-Black. Individuals who did not fit any of these categories were coded as Other.

Respondent's Education Attainment. NSHAP data classified respondent's education attainment into four categories. These are (1) below high school completion, (2) completed high school or obtained an equivalent degree, (3) received vocational certifications, completed some college coursework, or obtained an associate's degree, (4) bachelor's degree or higher level of education attainment.

Respondent's Gender. The gender variable in the NSHAP data was assessed using a self-report measure. Respondents were asked to select their gender from the options male or female.

Table 2 displays the basic demographic characteristics for the samples by age groups and the significance test results of the variables between the groups. The chi-squared test results showed that there were no significant differences in the distributions of gender or race/ethnicity between the age groups of older adults. However, educational attainment was significantly different between the age groups, χ^2 (6) = 26.83, $p < .001$. Young-old adults tended to have higher levels of educational attainment than the other two age groups. When examining the percentage of participants with less than a high school degree, young-old adults showed the lowest proportion (8.92%), compared to Middle-Old adults (11.11%) and Oldest-Old adults (17.45%).

Table 2

Demographic Characteristics by Age Group (N (%)), NSHAP Round 3 and the COVID-19 Study

Variables	Total	Young-Old	Middle-Old	Oldest-Old	Significance Test (p-value)
Gender					$\chi^2(2) = 1.92$, $p = .383$
Male	785 (44.55)	340 (45.95)	332 (44.44)	113 (41.09)	
Female	977 (55.45)	400 (54.05)	415 (55.56)	162 (58.91)	
Race/Ethnicity					$\chi^2(6) = 4.24$, $p = .644$
White	1,319 (75.20)	554 (75.17)	558 (75.00)	207 (75.82)	
Black	233 (13.28)	100 (13.57)	93 (12.50)	40 (14.65)	
Hispanic, non-Black	155 (8.84)	65 (8.82)	73 (9.81)	17 (6.23)	
Other	47 (2.68)	18 (2.44)	20 (2.69)	9 (3.30)	
Education Attainment					$\chi^2(6) = 26.83$, $p < .001$
< High school	197 (11.18)	66 (8.92)	83 (11.11)	48 (17.45)	
High school/Equiv	370 (21.00)	142 (19.19)	156 (20.88)	72 (26.18)	
Voc/college/assoc	605 (34.34)	281 (37.97)	247 (33.07)	77 (28.00)	
Bachelors or more	590 (33.48)	251 (33.92)	261 (34.94)	78 (28.36)	

Data Analysis

The statistical analysis was conducted in four stages in order to answer the research questions and hypotheses. In the analysis, statistical software STATA MP version 18.0 (StataCorp, College Station, TX) was utilized. First, a linear regression was carried out to examine whether there are differences in the frequency of social contact modes among the three age groups of older adults during the COVID-19 pandemic. Second, the study developed five linear regression models to assess whether the usage of social contact modes is associated with loneliness among all age groups of older adults during the COVID-19 pandemic. Third, the study divided the samples into three age groups of older adults to examine whether the association between the usage of social contact modes and loneliness differs among young-old, middle-old, and oldest-old adults. Lastly, an interaction term was included to examine the association between remote social contact use and loneliness during the COVID-19 pandemic, based on the frequency of in-person visits for each group of older adults. Missing data were excluded from the

data analysis. The following are details about the variables used in the regression analysis.

Independent Variables

In this study, each mode of social contact was regarded as an independent variable. As described in the Measurement section above, the variables that examined the comparison of each mode of social contact between the pre-pandemic and during the COVID-19 pandemic were dichotomized. Table 3 presents the coding of the variables.

Table 3
Independent Variables

Variables	Coding
Remote mode of social contact Phone calls Emails, texts, or social media messages Video calls	0: decreased or maintained use of remote mode of social contact with family and friends compared to pre-pandemic 1: increased use of the mode of remote social contact with family and friends compared to pre-pandemic
In-person visits	0: decreased in-person visits with family and friends compared to pre-pandemic 1: maintained or increased in-person visits with family and friends compared to pre-pandemic

Dependent Variable

The 3-item UCLA Loneliness Scale was used as the dependent variable in this study. The summary score was computed by adding the three items. The variable ranges from 0 to 9, with higher scores indicating a higher level of loneliness (Hughes et al., 2004; Hawkley et al., 2021).

Control Variables

The following variables served as control variables in this study.

Gender. Several studies explain the association between loneliness and gender. (Boehlen et al., 2022; Borys & Perlman, 1985; Barreto et al., 2021). Gender was coded as a dummy

variable, with male participants coded as 0 and female participants coded as 1.

Race/Ethnicity. Race/Ethnicity variable was controlled for, as studies show that people from individualistic cultures report a higher level of loneliness (Barreto et al., 2021; Kannan & Veazie, 2023). The variable was represented as a set of dummy variables. Black, Hispanic (non-Black), and Other were coded as separate dummy variables, with White participants serving as the reference group.

Education Attainment. Studies suggest the association between educational attainment and loneliness among older adults (Bishop & Martin, 2007; Fierloos et al., 2021). The education attainment variable was operationalized as a set of dummy variables. Participants who reported below high school completion, completion of high school or obtaining an equivalent degree, receiving vocational certifications or completing some college coursework or obtaining an associate's degree, or obtaining a bachelor's degree or higher level of education attainment were coded as separate dummy variables, with below high school completion serving as the reference category.

Frequency of In-Person Contacts. A previous study found that in-person contacts played an important role in reducing loneliness of older adults during the COVID-19 pandemic (Hawkley et al., 2021). The frequency of in-person contacts was included as a control variable to mitigate the potential for alternative explanations regarding the association between modes of remote social contact and loneliness among different age groups of older adults.

Results

Regression analysis was conducted to assess group differences on the key study variables (Table 4). The evaluation controlled for demographic characteristics that may influence the results. The young-old group was set as the reference. A significant difference was found in

loneliness scores between the young-old and middle-old groups (B = -0.28, p < .05). However, there was no significant difference between the young-old and oldest-old adults for loneliness scores (B = -0.01, p = .969).

Linear regression tests were conducted to address the first research question and hypothesis, aiming to find out differences in the frequency of remote social contact usage. Table 4 shows that the frequency for the modes of social contact with non-household families and friends during the COVID-19 pandemic significantly differs between the groups of older adults. The results supported the first hypothesis, showing a significantly higher frequency of email, text, social media messaging, and video call usage among young-old adults compared to the other two groups.

Specifically, for emails, texts, or social media messages, the frequency of use among the age groups of older adults was the highest with young-old adults (M = 2.19, SD = 1.25). The use of video calls for social contact was less frequent overall. The mean frequency score did not exceed 1, which falls between 0 (Never) and 1 (Less than once a week). Young-old adults (M = 0.78, SD = 0.98) used video calls significantly more frequently than middle-old adults (M = 0.59, SD = 0.81, B = -0.19, p < .001) and oldest-old adults (M = 0.42, SD = 0.74, B = -0.33, p < .001). However, middle-old adults (M = 2.45, SD = 0.88, B = 0.22, p < .001) and oldest-old adults (M = 2.40, SD = 0.94, B = 0.16, p < .05) used phone calls significantly more than young-old adults (M = 2.23, SD = 0.94).

Table 4

Distributions of Study Variables by Age Groups, NSHAP Round 3 and the COVID-19 Study

Variables	Total	[1]Young-Old	Middle-Old	*B (SE)*	*p*-value	Oldest-Old	*B (SE)*	*p*-value
Loneliness	2.88	3.00	2.72	- 0.28	*p*<.05	2.96	- 0.01	*p*=.969
	(2.43)	(2.52)	(2.39)	(0.13)		(2.30)	(0.17)	
Frequency								
Phone calls	2.35	2.23	2.45	0.22	*p*<.001	2.40	0.16	*p*<.05
	(0.92)	(0.94)	(0.88)	(0.05)		(0.94)	(0.06)	
Emails, texts	1.90	2.19	1.88	- 0.30	*p*<.001	1.21	- 0.89	*p*<.001
	(1.34)	(1.25)	(1.35)	(0.07)		(1.31)	(0.09)	
Video calls	0.64	0.78	0.59	- 0.19	*p*<.001	0.42	- 0.33	*p*<.001
	(0.88)	(0.98)	(0.81)	(0.05)		(0.74)	(0.06)	
In-person visits	1.29	1.25	1.28	0.04	*p*=.416	1.41	0.16	*p*<.05
	(0.89)	(0.86)	(0.89)	(0.05)		(0.95)	(0.06)	

Note. Demographic characteristics (gender, race/ethnicity, education attainment) are controlled.
[1]Young-Old is the reference group.

Before addressing the second research aim, which examines the association between remote social contact usage and loneliness among different age groups of older adults during the COVID-19 pandemic, linear regressions among all age groups of older adults were conducted. This preliminary analysis aimed to determine if there is an association between each mode of social contact and loneliness among older adults. Five regression models were tested, and the results for each model are indicated in Table 5. The samples consist of adults aged over 65, not divided by age groups, and the key predictors are dichotomous variables as displayed in Table 3. Variables of gender, race/ethnicity, and educational attainment are controlled.

Model 1 indicates that increased phone call usage with non-household family and friends during the COVID-19 pandemic compared to pre-pandemic is positively associated with loneliness ($B = 0.31$, $p < .05$). Additionally, as depicted in Model 2, more frequent use of emails, texts, or social media messages was also positively correlated with loneliness among older adults ($B = 0.62$, $p < .001$). Contrarily, the utilization of video calls was not significantly associated with loneliness. However, an increase or maintenance in in-person visits was significantly

associated with reduced loneliness (B = -0.81, p < .001). When controlling for the in-person visits variable, only the use of emails, texts, or social media messages remained significantly associated with higher loneliness among older adults (B = 0.50, p < .01) (Model 5).

Table 5

Linear Regression Models Examining Predictors of Loneliness Among Adults Aged 65 and Older, NSHAP Round 3 and the COVID-19 Study

Variables	Model 1	Model 2	Model 3	Model 4	Model 5
Control Variables					
Gender [a]					
Female	0.70***(0.12)	0.68***(0.12)	0.72***(0.12)	0.68***(0.12)	0.66***(0.12)
Race/Ethnicity [b]					
Black	-0.15 (0.18)	-0.22 (0.18)	-0.17 (0.19)	-0.15 (0.18)	-0.22 (0.19)
Hispanic, non-Black	-0.17 (0.23)	-0.12 (0.23)	-0.01 (0.23)	-0.20 (0.23)	-0.15 (0.24)
Other	0.17 (0.38)	0.20 (0.38)	0.24 (0.38)	0.15 (0.37)	0.20 (0.37)
Education Attainment [c]					
High school/Equiv	0.12 (0.24)	0.14 (0.24)	0.23 (0.25)	0.11 (0.23)	0.24 (0.25)
Voc/college/assoc	0.38 (0.22)	0.37 (0.22)	0.50* (0.23)	0.30 (0.22)	0.43 (0.23)
Bachelors or more	0.59** (0.22)	0.54* (0.23)	0.65** (0.23)	0.40 (0.22)	0.52* (0.24)
Freq. In-Person Visits	-0.17* (0.07)	-0.20** (0.07)	-0.19** (0.07)	-0.15* (0.07)	-0.13 (0.07)
Key Predictors [d]					
Phone Call, increased	0.31* (0.14)	---	---	---	0.05 (0.15)
Emails/Texts, increased	---	0.62***(0.14)	---	---	0.50** (0.16)
Video Call, increased	---	---	0.24 (0.15)	---	-0.11 (0.17)
In-Person Visits, increased or maintained	---	---	---	-0.81***(0.12)	-0.74***(0.13)

* p < .05, ** p < .01, *** p < .001 (two-tailed tests).
Reference group: [a] Male, [b] White, [c] <High school
[d] Dichotomous Variables

To address the second research aim regarding whether the increased use of each mode of social contact is differently associated with loneliness within each age group of older adults, this study developed three separate regression models. Table 6 displays the results for the young-old, middle-old, and oldest-old adult groups. The usage of remote social contact modes was associated with higher levels of loneliness, and this association was only significant among young-old adults. In the young-old group, the increased use of emails, texts, or social media

messages was positively associated with loneliness ($B = 0.74$, $p < .01$). However, maintaining or increasing in-person visits during the COVID-19 pandemic compared to pre-pandemic was negatively associated with loneliness ($B = -0.81$, $p < .001$). None of the remote modes of social contact were significantly associated with loneliness in the middle-old and oldest-old groups.

Table 6

Linear Regression Models Examining Predictors of Loneliness by Age Groups, NSHAP Round 3 and the COVID-19 Study

Variables	Model 1: Young-Old	Model 2: Middle-Old	Model 3: Oldest-Old
Control Variable			
Freq. In-Person Visits	-0.19 (0.11)	-0.13 (0.11)	-0.03 (0.14)
Contact Mode			
Phone Call, increased	-0.16 (0.25)	-0.29 (0.23)	-0.23 (0.38)
Emails/Texts, increased	0.74** (0.26)	0.38 (0.25)	0.21 (0.46)
Video Call, increased	-0.14 (0.25)	-0.08 (0.26)	-0.14 (0.45)
In-Person Visits, increased or maintained	-0.81*** (0.20)	-0.61**(0.20)	-1.15** (0.34)

* $p < .05$, ** $p < .01$, *** $p < .001$ (two-tailed tests).

Note. Demographic characteristics (gender, race/ethnicity, education attainment) are controlled.

This study further examined whether the relationship between remote modes of social contact and loneliness differ by the frequency of in-person visits during the COVID-19 pandemic within each age group of older adults. Table 7 displays the interaction term between phone call use and the frequency of in-person visits. A statistically significant interaction effect was observed in the oldest-old group ($B = 1.06$, $p < 0.01$). This indicates that for oldest-old adults with more frequent in-person visits, increased use of phone calls was positively associated with loneliness during the COVID-19 pandemic. Conversely, for oldest-old adults with decreased use of phone calls, more frequent in-person visits were negatively associated with loneliness.

Table 7

Linear Regression Models Examining Interaction Effect of Phone Call and In-Person Visits on Loneliness by Age Groups, NSHAP Round 3 and the COVID-19 Study

Variables	Model 1: Young-Old	Model 2: Middle-Old	Model 3: Oldest-Old
Control Variable			
Freq. In-Person Visits	-0.27* (0.13)	-0.20 (0.12)	-0.17 (0.18)
Contact Mode			
Phone Call, increased	-0.52 (0.41)	-0.07 (0.39)	-0.78* (0.69)
Emails/Texts, increased	0.72** (0.26)	0.34 (0.25)	0.30 (0.45)
Video Call, increased	-0.14 (0.25)	-0.08 (0.26)	-0.19 (0.45)
In-Person Visits, increased or maintained	-0.81*** (0.20)	-0.62**(0.20)	-1.25*** (0.34)
Phone x Freq. In-Person	0.28 (0.25)	0.28 (0.25)	1.06** (0.40)

* $p < .05$, ** $p < .01$, *** $p < .001$ (two-tailed tests).

Note. Demographic characteristics (gender, race/ethnicity, education attainment) are controlled.

There was no statistically significant interaction found between the use of email, text, or social media messages and the frequency of in-person visits. This lack of significant interaction was consistent across all age groups of older adults (Table 8).

Table 8

Linear Regression Models Examining Interaction Effect of Email/Text and In-Person Visits on Loneliness by Age Groups, NSHAP Round 3 and the COVID-19 Study

Variables	Model 1: Young-Old	Model 2: Middle-Old	Model 3: Oldest-Old
Control Variable			
Freq. In-Person Visits	-0.20 (0.13)	-0.16 (0.12)	0.00 (0.18)
Contact Mode			
Phone Call, increased	-0.16 (0.25)	-0.28 (0.23)	-0.22 (0.38)
Emails/Texts, increased	0.69 (0.41)	0.19 (0.43)	-0.10 (0.88)
Video Call, increased	-0.14 (0.25)	-0.09 (0.26)	-0.17 (0.46)
In-Person Visits, increased or maintained	-0.82*** (0.20)	-0.61**(0.20)	-1.15** (0.34)
Email/Text x Freq. In-Person	0.04 (0.25)	0.14 (0.27)	0.21 (0.52)

* $p < .05$, ** $p < .01$, *** $p < .001$ (two-tailed tests).

Note. Demographic characteristics (gender, race/ethnicity, education attainment) are controlled.

Table 9 also reveals that there was no statistically significant interaction found between the use of video calls with non-household family and friends and the frequency of in-person

visits among older adults during the COVID-19 pandemic.

Table 9

Linear Regression Models Examining Interaction Effect of Video Call and In-Person Visits on Loneliness by Age Groups, NSHAP Round 3 and the COVID-19 Study

Variables	Model 1: Young-Old	Model 2: Middle-Old	Model 3: Oldest-Old
Control Variable			
Freq. In-Person Visits	-0.27* (0.13)	-0.12 (0.11)	0.00 (0.18)
Contact Mode			
Phone Call, increased	-0.17 (0.25)	-0.29 (0.23)	-0.22 (0.38)
Emails/Texts, increased	0.74** (0.26)	0.19 (0.25)	-0.18 (0.46)
Video Call, increased	-0.66 (0.44)	-0.08 (0.47)	-0.46 (0.93)
In-Person Visits, increased or maintained	-0.86*** (0.20)	-0.61**(0.20)	-1.15** (0.34)
Video x Freq. In-Person	0.40 (0.28)	0.12 (0.30)	0.20 (0.50)

* $p < .05$, ** $p < .01$, *** $p < .001$ (two-tailed tests).

Note. Demographic characteristics (gender, race/ethnicity, education attainment) are controlled.

Discussion

Utilizing nationally representative data, this study is one of the first to investigate the relationship between the usage of remote social contact modes and loneliness among the three age groups of older adults during the COVID-19 pandemic. In addressing the research aims, there were findings that aligned with the hypotheses, as well as those that did not. Firstly, when comparing the frequency of remote modes of social contact use during the COVID-19 pandemic across age groups of older adults, as hypothesized, young-old adults significantly more frequently used emails, texts, or social media messages and video calls to communicate with family and friends than the other two groups. However, in the case of phone calls, the frequency was higher among the oldest-old group, in contrast to what was observed with emails, texts, or social media messages, and video calls. Phone calls are considered an easier method of remote communication compared to others, requiring less technological knowledge and skills (Brewer et al., 2016), and they are also more accessible for illiterate individuals (Friscira et al., 2012).

Brewer and colleagues (2016) explain that as older adults age, they are more likely to develop chronic health conditions or disabilities such as macular degeneration, advanced osteoarthritis, and severe tremors. With these conditions, phone calls can be more accessible than videos or texts, which may account for the higher frequency of phone call usage among the oldest-old adults.

The findings regarding the relationship between the usage of remote modes of social contact and loneliness differed from what was hypothesized. This study predicted that older adult's use of remote social contact modes to communicate with family and friends during the COVID-19 pandemic would be associated with lower loneliness. However, even before dividing older adults into three age groups and controlling for in-person social contact, the use of phone calls as well as the use of emails, texts, or social media messages were found to be associated with higher loneliness. After dividing the age groups and controlling for the in-person variable, it was found that there was a statistically significant association between the use of emails, texts, or social media messages and higher levels of loneliness only in the young-old adult group. When exploring the interaction between in-person contact and the use of remote modes, the moderating effect of in-person contact frequency on the relationship between phone call usage and loneliness was observed in the oldest-old group regarding phone call use. As the frequency of in-person contact increased, phone call usage appeared to contribute to an increase in loneliness.

Previous literature has demonstrated the high effectiveness of interventions through video conferences on reducing loneliness among older adults during the COVID-19 pandemic (Naudé et al., 2022; Brown & Greenfield, 2021; Shapira et al., 2021). However, there was no statistically significant association found in this study. This study attributes the cause to the infrequent use of video calls in the daily lives of older adults. The mean frequency score for the

use of video calls among older adults fell between "Never" and "Less than once a week," indicating a lower frequency of use compared to other modes of social contact. Given the overall infrequent use of video calls in the daily lives of older adults, the reported increase in video call usage during the pandemic might have been too minimal to impact loneliness among them.

Previous studies have highlighted perceived barriers among older adults that hinder their utilization of video calls (Moyle et al., 2018; Yoon & Paek, 2023). Kalicki and colleagues (2021) also found out that physical barriers such as internet connectivity, affordability of cellular plans, access to video-capable devices, or lack of caregiver assistance have also made it difficult for older adults to use video calls easily. As previous intervention studies suggest, if video communication indeed improves the psychological well-being of older adults (Naudé et al., 2022; Brown & Greenfield, 2021; Shapira et al., 2021), it would be essential to implement interventions to educate and support older adults to use the technology. With COVID-19 restrictions easing but the pandemic persisting, aiding older adults in effectively utilizing video communication would be necessary. Educational programs and technological support provided by institutions like local senior centers or community health workers would enhance accessibility. Furthermore, it is important to note that the data used for analysis in this study is from the year 2020. As four years have passed and there has been an increase in the technology and usage of video calls, the impact of video call usage on the psychological well-being of older adults may differ at present.

Secondly, it turned out that the young-old adults showed significantly higher usage of emails, texts, or social media messages and video calls compared to other two age groups in communicating with their family and friends during the COVID-19 pandemic. It would be important to assess whether there is significant practical demand for this technology among the

middle-old and oldest-old adults. If there is substantial demand, intervention to narrow the usage gap would be necessary. Studies have shown that young-old adults tend to be more familiar with technology from an earlier age compared to the other two groups (Petrie & Darzentas, 2020; Gudala et al., 2022) and also exhibit relatively higher educational attainment, which may affect access to technology (Hülür & Macdonald, 2020). If these differences are causing disparities, there will be a need for the development of user-friendly and convenient services tailored to older adults, which can enhance accessibility to remote social contact technology.

Furthermore, this study confirmed that in-person contact is associated with lower loneliness during the COVID-19 pandemic as supported by previous studies (Hawkley et al., 2021; Green et al., 2021). In this study, young-old adults had the highest usage of emails, texts, or social media messages among the three age groups of older adults, while in-person visits were significantly lower compared to the oldest-old adults. Perhaps it is because the oldest-old adults may have a heightened need for in-person interaction with family or friends due to heightened risk of frailty and higher demand for informal care compared to the young-old adults (Zwar et al., 2022).

It is speculated that the association between usage of emails, texts, or social media messages and higher loneliness among the young-old adults may stem from the constraints on in-person interactions during the COVID-19 pandemic. It is possible that technologically adept young-old adults, faced with restrictions on in-person contacts, opted to use remote modes of social contacts. Nonetheless, these remote modes were unable to fully substitute for in-person interactions (Hawkley et al., 2021). Not being able to engage in in-person contact by necessity versus choice might have led individuals to use methods such as texting, potentially exacerbating feelings of loneliness stemming from the absence of in-person interaction.

Many studies emphasize the importance of in-person communication among older adults. (Macdonald et al., 2021; Choi et al., 2022). Currently in 2024, COVID-19 regulations, including those concerning social distancing, gathering limitations, and mask mandates, have been considerably relaxed compared to 2020. Nevertheless, older adults continue to express concerns and fears regarding vulnerability to COVID-19 infection (Cocuzzo et al., 2022; The National Council on Aging, 2024). The pandemic situation is ongoing without a complete end in sight. Older adults will continue to be more vulnerable to the virus. It would be important to create a safe environment where older adults can safely engage in in-person meetings.

Limitations

This study has the following limitations. There are constraints associated with the secondary data utilized in this study. First, the NSHAP data is based on surveys conducted in English. Therefore, people who are not proficient in English are fundamentally excluded from research. Second, when examining the racial background of samples aged 65 and older, more than 75 percent were non-Hispanic White. Race categorization included White, Black, non-Black Hispanic, and Other. Asians were not categorized separately. Asian individuals are known to have strong family ties (Chokkanathan, 2024) and they may exhibit different characteristics. Furthermore, as this data focuses on English-speaking Americans, there is a substantial likelihood that immigrant older adults who speak languages other than English were excluded. If individuals have family and friends in their home country, they might choose remote communication methods more often (Miyawaki & Hooyman, 2023), resulting in fewer in-person meetings, which could lead to different patterns. Third, the data used was collected in 2020, during the early stages of the COVID-19 pandemic. At present, COVID-19 regulations have relaxed somewhat compared to the initial stages, and there has also been notable progress in

remote social contact methods like Zoom or telehealth. Since the onset of COVID-19 about four years ago, the observed patterns may appear differently, reflecting the changes over this period. Lastly, due to the smaller sample size of oldest-old individuals compared to the other two groups, the reliability of the results may be lower.

The constraints associated with the analysis of the research are outlined as follows. First, it is not possible to determine causality. Although there was an association between text usage and higher loneliness among young-old adults, it remains unclear whether more texting led to loneliness or if loneliness contributed to using more text. Moreover, the frequency of utilizing remote contact methods in everyday life generally did not exceed approximately once per week, except for phone calls, which were used more than once a week. Despite significant restrictions on gatherings during the COVID-19 pandemic, in-person visits still occurred about once a week, whereas video call usage was notably lower. The extent of such usage might have been too minimal to generate significant associations in the analysis. Nevertheless, this study's findings are significant as they reveal that the frequency of using remote social contact modes and the association between using these modes and loneliness varied by age group among older adults during the COVID-19 period, suggesting the need for tailored approaches to address these differences.

Implications

Previous studies have generally explored technology usage among older adults aged 65 and above as a whole. This study stands out in its investigation of the association between the use of remote social contact modes during the COVID-19 pandemic and loneliness among older adults, categorizing them into three age groups. A distinction was observed in which young-old individuals exhibited relatively higher usage of remote contact technology compared to the

oldest-old. Additionally, across all groups of older adults, in-person contact was associated with lower loneliness, reaffirming the importance of in-person communication.

The implications for practice of this study are, first, the need to assess whether there are disparities in technology accessibility among older adults by age group and the necessity for appropriate interventions. Especially in the ongoing pandemic situation, where the importance of technology utilization is heightened, such disparities could exacerbate health inequalities. Social workers and social work researchers can assess and advocate for the development and introduction of more accessible platforms for older adults, which can lower the entry barriers to using remote technology. For instance, Brewer and colleagues (2016) developed a new email system interface for older adults based on the design of traditional phones, which are relatively familiar and accessible to them. They conducted a four-week field-based user study and found that their system increased online accessibility for older adults who previously could not use email especially due to late-life disabilities or insufficient computer skills. Additionally, social workers can provide training to older adults who have difficulty accessing remote technology or create and distribute manuals to assist them. If older adults do not have devices like computers or an internet connection to use remote technology, social workers can help by connecting them with appropriate community resources.

Second, although the utilization of video calls in daily life was very low and did not significantly affect loneliness, various intervention studies have demonstrated the effectiveness of video calls. It is anticipated that increasing the usage of video calls will be necessary for them to be effective for older adults during periods of restricted in-person activities. Establishing a system that supports older adults would be advantageous in facilitating seamless utilization when necessary. Social workers can assist older adults in adapting to and utilizing video calling

technology. This can include providing in-home education and training for older adults on how to use video calling apps, covering tasks such as setting up an account, making calls, and navigating through different features. Their caregivers or family members, who are proficient in technology, can be invited to assist older adults. These caregivers or family members can address potential technical issues encountered by older adults to facilitate video call usage. Social workers can further deliver psychological support and encouragement throughout the process to boost older adults' confidence. They can address concerns, alleviate fears, and celebrate success, as learning to use new technology can be daunting for older adults.

Lastly, in-person interactions are beneficial for older adults in reducing loneliness. As the pandemic prolongs, continuous support is needed to enable older adults to engage in in-person meetings without fear of contracting the virus. The National Council on Aging (2022) recommends several measures for senior centers to achieve this. Firstly, they suggest hosting programs in larger spaces to ensure adequate social distancing. Additionally, offering outdoor programs can provide a safe environment for older adults to gather. Integrating technology, such as using cameras to project the program instructor onto a large screen, allows participants to maintain safe distances while still engaging in activities. Furthermore, clear communication about senior center safety protocols is essential to reassure older adults and encourage their participation.

Social workers may advocate for local or federal governments to allocate resources to senior centers, enabling them to adapt their infrastructure for larger spaces to accommodate programs and outdoor activities. This could involve funding renovations, acquiring equipment like cameras and screens, and providing staff training on new technologies. By actively advocating for these initiatives, social workers play a vital role in ensuring that senior centers

receive the necessary resources to enhance their services for the older adult population. This advocacy directly contributes to advancing social work within communities and ultimately leads to better support for older adults.

In future research, exploring the patterns of remote modes of social contact usage among Asian Americans or immigrants, which were not addressed in this study, could potentially mitigate the social exclusion of vulnerable populations from societal attention. Additionally, given that approximately four years have elapsed since the onset of the pandemic, it would be meaningful to investigate whether there are age-related differences in usage patterns or psychosocial challenges perceived by older adults. Through this exploration, there is potential to identify the specific needs of older adults by age group and lay the groundwork for supporting individuals who remain socially excluded with insufficient support. Additional research is suggested to explore the long-term effects of interventions aimed at enabling older adults to use remote technology in their everyday lives. These interventions can include education, device distribution, and the creation and dissemination of manuals. If effective, it could propose a way for older adults to remain socially connected through remote technology, even when experiencing reduced physical accessibility for in-person contact.

Conclusion

This study examined the use of remote contact modes and their association with loneliness among older adults during the COVID-19 pandemic, analyzing by age groups of young-old, middle-old, and oldest-old. Young-old adults exhibited a higher frequency of using remote modes of social contact compared to the other two groups. Communicating with family and friends through emails, texts, or social media messages was significantly associated with higher loneliness among young-old adults. Ultimately, since in-person contact was associated

with lower loneliness across all age groups, social work practice should focus on developing support mechanisms that enable older adults, considered more vulnerable to COVID-19, to safely engage in in-person contacts with their family and friends. Furthermore, efforts are needed in the field to mitigate the gap in technology usage among different age groups of older adults. Access to technology has become increasingly important since the onset of COVID-19, as it provides a crucial means for maintaining social connections despite physical limitations. This study calls for further research and social work support to improve older adults' access to remote technology through accessible platform development, education, and resource allocation.

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