

COVID-19 팬데믹시기 미국 고령층 외로움과 기술활용능력 자기평가 간 관계 연구*

Loneliness and Self-rated Technology Use Competency
among Older Americans during the COVID-19 Pandemic

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(초록)

미국에서 지역사회 거주 노인 20% 이상은 사회적 고립감을 경험하고 있다. 사회적 고립감은 흡연과 같은 공중보건을 저해하는 위험요인이다. 미국 고령자 40% 이상이 경험하는 고독감은 사회적 고립과 밀접한 관련성이 있다. 본 연구 목적은 COVID-19 팬데믹 동안 미국 농촌지역 거주 노인이 스스로 평가하는 기술활용능력과 외로움 간 상관관계를 분석하는 것이다. 연구자료는 2020년 9월 1일부터 2021년 1월 15일까지 미국 동북부의 한 주 농촌지역 거주 노인을 대상으로 우편 설문조사를 통해 수집하였다. 총 192명이 응답하였고, 이중 무응답 자료를 제외하고 최종적으로 활용된 분석자료는 180명이다. 연구 결과는 기존 연구에서 확인된 노인 외로움과 관련된 요인들을 재확인하였다. 기술 활용에 대한 긍정적인 태도와 인식이 좋은 정신 건강과 삶의 질과 관련성이 있었다. 특히, 기술활용능력

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에 대한 자기평가가 높은 응답자는 새로운 기술을 배우는 기회에 대해 높은 관심을 보였다. 이는 기술활용이 농촌지역 노인들의 외로움 감소에 중요한 역할을 할 수 있음을 시사하고 있다. 본 연구결과를 통해 농촌지역 거주 노인을 위한 신기술 평생학습 증진 정책과 기술활용능력 향상 교육프로그램 활성화를 고독감 감소 대응 방안으로 제안하였다.

주제어: 외로움, 고독감, 농촌 노인, COVID-19 팬데믹, 기술 활용 능력 자가평가

(Abstract)

Social isolation affects over two-in-ten community-dwelling older adults, posing significant public health risks comparable to smoking. Additionally, more than four-in-ten U.S. adults over 60 report loneliness, closely linked to social isolation. This study explores the benefits of self-rated technology use competency and other correlates of loneliness among older people in a rural area of a northeast state in the U.S. during the COVID-19 Pandemic. Data was collected from community-dwelling adults over the age of 65 using mail surveys between September 1 2022 and January 15 2021. One hundred ninety-two (192) people responded. The final analysis included information from one hundred eighty (180) participants. Results confirmed previously identified loneliness correlates among older people. Results also show that mental-health-related quality of life can be improved by a positive attitude or perception towards technology use. Participants with high self-rated technology use competency are interested in more opportunities to learn new technologies. Policy changes addressing lifelong learning on novel technology for older adults in a rural community can support this, while decreasing levels of loneliness.

Key words : Loneliness, social isolation, older adults in rural areas, COVID-19 Pandemic, self-rated technology use competency

I . Background and significance

Social isolation and loneliness are two different constructs. Social isolation may be a personal choice but it can be detrimental to the person's physical and mental health. Older people who are geographically isolated and have fewer resources are more at risk of social isolation. However, this is less of a threat if they are able to maintain social integration (the state of being connected to others) (Pilemer & Glasgow, 2000).

Cornwell and Waite (2009) argued that loneliness should be regarded differently from social isolation. Social isolation is an objective situation; the absence of relationships with other people. Loneliness is a subjective perception or feeling of being isolated. Social isolation and loneliness can be harmful to anyone's well-being, especially a vulnerable population with limited resources.

According to the Gerlarch et al. (2024), more than 30% of people age 50 to 80 report feeling lonely. Older adults living in rural areas may

experience even higher rates of loneliness. There are notable regional differences: the prevalence of loneliness in Appalachia was 37% (Southerland et al., 2024), and it was 51% in small rural area and 59% in large rural areas in a western U.S. state (Abshire et al., 2022).

Most older people are women, and many older women have not had the opportunity to engage with new technology in their life time. Additionally, in this study sample, there are more female respondents. Golaszewski et al. (2022) found that women with greater social isolation and greater loneliness had a higher risk of incident heart disease compared with women with less social isolation and less loneliness from the data with community residing US women aged 65 to 99-year-old. Lyu et al. (2024) also reported the connection between the social isolation change and the cardiovascular disease (CVD) and stroke with a nationally representative longitudinal data in US. The existence of the association between depression social isolation and loneliness in older adults reported (Gerlach et al., 2024). In addition, the cognitive decline associated with the social isolation change based on the data from the 2006 to 2020 waves of Health and Retirement Study (HRS) (Lyu et al., 2024).

The U.S. surgeon general raised awareness about loneliness and isolation as an epidemic (Office of the U.S. Surgeon General, 2023). Loneliness is a major public health challenge among older adults, considered to be as harmful

as smoking (Seitz, 2023; National Academies of Sciences, Engineering, & Medicine (NASEM), 2020).

About 24 percent of community-dwelling people over 65 are regarded as socially isolated and 43 percent of people over 60 and older reported feeling lonely in the U.S. (NASEM, 2020). According to a Pew Research Center survey conducted in early 2018, before the COVID-19 pandemic, one-in-ten Americans reported feeling lonely or isolated from those around them all or most of time (Bialik, 2018, Dec 3). During the pandemic, the government mandated shutdown and social distancing increased the levels of those feelings. Utilizing technology such as a smartphone or Zoom can provide social connectedness for all of us.

According to Pew Research, from 2012 to 2021, the number of people 65 and older who own a smartphone increased dramatically from 13% to 61%. There was also an increase in the ownership of a tablet or computer from near zero to 44% (Faverio, 2022).

Another important issue is digital divide between rural areas and urban areas. According to Environmental and Energy Study Institute (EESI), 100/10 Mbps services at 97.8% for urban areas and 66.8% for rural areas. Almost 13% of American do not have access to broadband. “The majority of people without access to reliable broadband live in rural areas or on tribal lands, living these already disadvantage communities even further behind.”

(Snead & Tolbert, October, 2021, p. 3).

It was well documented with empirical data the increased use of technology, such as video calls for family interactions and the Internet, during the stay-at-home period of the COVID-19 pandemic. This technology played a significant role in enhancing communication during this time (Pew Research Center, 2025). Thus, technology use such as a smartphone or computer can be a good way to provide social connection for everyone and increase quality of life. There have been many studies exploring the link between technology use and feeling lonely (Karavidas et al., 2005; Wagner et al., 2010; Wilson, 2018).

However, little is known about the self-rated level of competency in smart phone and computer use among older people and loneliness. This concept is vital in understanding how individuals navigate and utilize technology effectively to maintain social connections. Therefore, this study explored this new area. Instead of measuring the actual use, this study focuses on how the subjective perceived technology use competency can serve as a coping mechanism to mitigate the effects of feeling lonely among older people.

1. Theoretical framework

We adopted the transactional stress and coping framework as our theoretical perspective for this study (Lazarus & Folkman, 1984).

According to this framework, individual and environmental stressors can impact one's quality of life, as indicated by factors such as loneliness, which is the outcome measured in this study. This perspective underscores the significance of an individual's subjective evaluations when encountering various challenges within their surroundings. The framework was used in many studies during the COVID-19 pandemic, but there are a limited number of studies with older adults in the U.S. (Clifford et al., 2024).

The degree of stress experienced and the strategies employed to cope with a particular situation depend on two levels of assessment: primary and secondary appraisal (Lazarus & Folkman, 1984). Within this framework, stress arises from a perceived disparity between the primary appraisal (the assessment of an event's significance as stressful) and the secondary appraisal (the evaluation of one's capacity to cope with the situation).

Typical approaches for managing stress involve utilizing coping strategies derived from spiritual, physical, and social avenues (Mui & Kang, 2006). Studies indicate that employing this range of coping resources can yield beneficial outcomes for mental health, such as mitigating the risk of depression (Judge et al., 2010, Mui & Kang, 2006). Consequently, these techniques can be adapted to address feelings of loneliness and possible stress arising from social distancing or social isolation. Thus, this

framework is well-suited to explore the relationship between feeling lonely and self-rated technology use competency among older people during the COVID-19 pandemic (Shoenmakers et al., 2015).

Given the lack of research literature on this topic, this study's research question is whether there is any association between feeling lonely and self-rated technology use competency using the stress and coping framework.

II. Methods

1. Research design

This was a correlational study to explore the association between self-rated technology use competency among rural community-dwelling adults over 65 years old and their level of feeling lonely. This research project was conducted in a rural community near the lead researcher in the northeastern United States.

2. Participants

The participants in this study were adults 65 years or older who were living in the community, not in long-term care facilities. One hundred ninety-two (192) people participated from October 2020 to March 2021, during the COVID-19 pandemic. In order to follow lockdown guidelines, any follow up was done

via a phone conversation to address any questions from the participants. The final analysis included information from only 180 participants due to missing values and unusable responses.

3. Data collection procedure

A combination of snowball and convenience sampling was employed in this study. Institutional Review Board (IRB) approval (Study Protocol # 00002585) was obtained in September 2020. Participant recruitment was done in collaboration with the local county Office for Aging, which serves about 17,000 older residents and family members. Data were collected from a non-metropolitan area in a northeastern state in the US.

All participants were provided with \$40 gift cards to incentivize individual participation in this quantitative mail-survey. The gift cards and "Thank you" notes were sent by first-class mail and over 90 percent of the participants acknowledged receipt, also by mail. All of the envelopes and stamps were provided. This method was chosen over face-to-face surveys and follow up because of the COVID-19 pandemic.

From the initial 192 cases, 12 were excluded from the final analysis. This was due to missing data, surveys completed by significant others on behalf of the participants because of disabilities or physical obstacles, or participants who could

not be reached for clarification on unclear responses.

4. Data Analysis

Data analysis was conducted using the IBM SPSS 28 Statistics program. The participant demographic characteristics, stress factors, coping factors, and self-rated technology use competency information were summarized with percentage or mean and standard deviation. The average difference of demographic variables was tested with an independent t-test or Chi-square test.

5. Research Instruments

1) Loneliness

In order to measure the participant's subjective feelings of loneliness, the 6-item De Jong Gierveld Loneliness Scale was employed with permission from the original author. This was developed to measure the participant's subjective evaluation of social participation or isolation (De Jong-Gierveld & Van Tilburg, 2006). The cut-off points for the 6-item scale are: 0-1 = not lonely; 2-6 = lonely. Among the 180 participants, the mean was 2.02 (SD = 1.68). Almost every other respondent reported feeling lonely (51.7%); 87 people had a loneliness scale of 0 or 1, whereas 93 people had a higher loneliness score.

This is a substantially higher percentage than

was found in a study with a national representative sample. Reliability of the 6-item scale from this study is .72, which is similar to the Cronbach's alpha coefficients from three national surveys in Europe (.70 to .76) (De Jong-Gierveld & Van Tilburg, 2006).

2) Demographic variables

Socio-demographic variables such as age, gender, racial background, education, and marital status, were used as controls.

3) Stress factors

(1) *Anxiety about Aging*

This study selected five (5) items related to psychological concerns from the 20-item Anxiety about Aging Scale in order to assess participants' psychological concerns regarding aging. One of the questions was "I expect to feel good about myself when I am old" (Lasher & Faulkender, 1993). This was measured with a 5-point Likert scale (1 = Strongly disagree to 5 = Strongly agree).

(2) Depression

The five-item Geriatric Depression Scale (GDS) was used to measure the manifestation of depressive symptoms. A score of 2 and above indicated clinical depression (Hoyl et al., 1999).

4) Coping factors

The social network level was counted to

measure coping factors. Most respondents had some number of children, relatives, and friends close by in their community. The level of social network was measured as the sum of three questions about the respondents' interactions with their social network, including family members, relatives, and friends in the community. These interactions include the frequency of meetings or conversations. Subjective physical health status was also reported, where "1" equated to poor health and "5" equated to excellent health. Income was measured using an 11-point Likert scale. Respondents were asked to report their annual income, ranging from 1 (= \$6,000 or less) to 11 (= \$100,001 or more).

This study employed questions related to **self-rated technology use competence** instead of **digital literacy** or **technology literacy**. Digital literacy and technology literacy have been discussed in educational settings (Hitchcock et al., 2019). Digital literacy is considered a "complex and contested term" and is defined as "the ability to participate in a range of critical and creative practices that involve understanding, sharing and creating meaning with different kinds of technology and media" (Hague, 2020, p.3). Digital literacy is a construct focused more on the objective knowledge and skills someone possesses in utilizing digital technologies (Oh et al., 2021) and would be measured with a different instrument such as the Mobile Device Proficiency Questionnaire (Roque & Boot, 2018).

Technological literacy is defined as "the ability to use, manage, assess, and understand technology" (International Technology Education Association, 2000, p. 9).

On the other hand, we measured **self-rated technology use competence** as compared to their peers with two items: Compared to your peers, how would rate your ability to use smartphone applications for such activities as sending text messages, watching videos, listening to radio, or playing games? Compared to your peers, how would you rate your ability to use computer software programs such as Microsoft Word or Excel? The participants were asked to rate their level from 1 (very low) to 10 (very high). If they had no experience using a smartphone or computer, they were asked to mark 1 (very low) as their response.

III. Results

This study found that self-rated technology use competence affects loneliness when controlling for income, depression, level of social network, and physical health.

Selected characteristics of participants are shown in <Table 1>. The average age of all participants was 73.7 years old, with a range from 65 to 95. Reflecting the general population, there were more women participants than men (70% vs. 29.4%); one person chose neither. Most participants identified themselves

<Table 1> Sample (n = 180) characteristics with descriptive results

Variables and Categories	Mean (SD) or Frequency (%)
Overall Social Loneliness (0 = least lonely to 6 = most lonely)	2.02 (1.68)
Not lonely (0 - 1)	87 (48.3%)
Lonely (2-6)	93(51.7%)
Socio-demographic variables	
Age (65-95, Median Age = 73)	73.7 (6.58)
Gender	
Female	126 (70%)
Male	53 (29.4%)
Race	
Black/African American	2 (1.1%)
Asian American	1 (0.6%)
Native American	1 (0.6%)
White	171 (95%)
Mixed Race	1 (0.6%)
Other	2 (1.1%)
Prefer not to answer	2 (1.1%)
Education	
Up to High school	58 (32.2%)
College graduate or more	121 (67.2%)
Refused to answer	1 (0.6%)
Marital Status	
Married	80 (44.4%)
Single/Never Married	20 (11.1%)
Separated or Divorced	24 (13.3%)
Living together	6 (3.03%)
Widowed	45 (25%)
Prefer not to answer	5 (2.8%)

<Table 1> Sample (n = 180) characteristics with descriptive results (continued)

Variables and Categories	Mean (SD) or Frequency (%)
Stress Factors	
Level of Aging Anxiety (Sum of 5 items Aging Anxiety, range 5 to 25)	10.67 (3.61)
Depression (range 0 to 5)	0.68 (1.1)
Coping Factors	
Level of Social Network (range = 3 to 18, sum of three questions about social network)	13.8 (2.6)
Overall Self-rated Physical Health Status (1 = Poor to 5 = Excellent), 87.8% rated from Good, Very Good, and Excellent - 42.2 % rated from Very Good and Excellent	3.34 (.79)
Annual Income Level	
\$15,000 or less	23 (12.8%)
\$15,001 to \$25,000	33 (18.3%)
\$25,001 to \$35,000	25 (13.9%)
\$35,001 to \$50,000	20 (1.1%)
\$50,001 to \$75,000	37 (20.6%)
\$75,001 to \$100,000	18 (10.0%)
\$100,000 or more	20 (11.1%)
Not sure	4 (2.2%)
Self-rated technology use competence compared to peers	
Ability to use smartphone applications (1 = Very Low to 10 = Very High, Median = 6)	5.56 (3.19)
Ability to use computer software programs (1 = Very Low to 10 = Very High, Median =5)	5.02 (3.07)

as White (95%).

More than 3 in 5 participants (67.2%) had a college education or more. The level of education attainment among this study sample is significantly higher than the national level of educational attainment, which was 29.3% in 2018 (Federal Interagency Forum on Aging

related Statistics, 2020) or 33% in 2021 (Administration for Community Living, 2022).

The marital status of participants was 44.4% married, 25 % widowed, 13.3% separated or divorced, 11.1 % single or never married, 3.03% living together and 2.8% preferred not to answer. Among the general population in 2022,

57.4% were married, 20.9% widowed, 15.2% divorced, and 6.6% were never married (Loo & Brown, 2024).

Group comparisons were performed between people whose scores indicated they were not lonely and those whose scores indicated they were lonely. <Table 2> shows the results of those comparisons using either t-test or chi-square test.

According to independent samples t-test results, there are no group differences in age and income levels. According to chi-square test results, there were significant group differences in binary gender categorization and level of education. A significantly higher percentage of women felt lonely (31.8%) than men (19.6%) ($\chi^2 = 6.46$, $df = 1$, $p < .05$ confirmed). The 38.5% of respondents with a college or higher education who felt lonely was significantly higher than the 13.4% of respondents with up to a high school education who did ($\chi^2 = 3.85$, $df = 1$, $p = .05$ confirmed). Binary categorization of race and marital status showed no statistically significant group differences between people whose scores indicated they were not lonely vs those whose scores showed they were lonely.

Those feeling lonely had higher average scores on Aging Anxiety ($M = 11.86$ vs. $M = 9.4$; $t = -4.85$, $p < .001$), lower levels of social network ($M = 12.7$ vs. $M = 15.0$; $t = 6.63$, $p < .001$), lower levels of self-rated physical health status ($M = 3.16$ vs. $M = 3.54$; $t = 3.29$, $p < .001$), and higher levels of depression ($M =$

1.09 vs. $M = 0.25$; $t = -5.47$, $p < .001$), which are intuitively expected results.

With the two items tested for **related self-rated technology use competency compared to peers**, the respondents who reported that they do not feel lonely rated their capacity of using either a computer or a smartphone higher. However, there is a statistically significant different perception on the ability to use smartphone applications ($M = 6.1$ vs. $M = 5.1$; $t = 2.11$, $p < .05$), but not on the ability to use computer software programs ($M = 5.3$ vs. $M = 4.8$; $t = 1.02$, $p = .31$).

<Table 2> Group comparisons between the people whose scores indicated they were not lonely vs. those whose scores indicated they were lonely

<Table 3> highlights the results of the zero-order Pearson's r correlations. Loneliness was significantly associated with overall self-rated physical health status, level of aging anxiety, level of social network and level of depression. Thus, the respondent who was feeling more lonely rated lower in self-rated health ($r = -.319$, $p < .001$); higher in level of aging anxiety ($r = .450$, $p < .001$); had a lower level of social network ($r = -.494$, $p < .001$); and a higher level of depressive symptoms ($r = .550$, $p < .001$).

Multicollinearity among these correlates was further assessed with tolerance statistics and an examination of the variance inflation factor (VIF; Mertler & Vannatta, 2002). VIF values ranged from 1.086 (lowest) to 2.168 (highest)

<Table 2> Group comparisons between the people whose scores indicated they were not lonely vs. those whose scores indicated they were lonely

	Not lonely (0-1) (n =87)	Lonely (2-6) (n =93)
Socio-demographic variables		
Age (average) ^{a. n.s.}	73.5 (6.52)	73.9 (6.6)
Gender (%) ^{b. *}		
Female = 1	69 (38.5%)	57 (31.8%)
Male = 0	18 (10.1%)	35 (19.6%)
Race (%) ^{a. or b. n.s.}		
Other = 0	4 (2.2%)	5 (2.8%)
Identified as White = 1	83 (46.1%)	88 (48.9%)
Education (%) ^{b. *}		
Up to high school = 0	34(19%)	24 (13.4%)
College and higher = 1	52 (29.1%)	69 (38.5%)
Marital Status ^{b. n.s.}		
Single or Never Married = 0	9 (5%)	11 (6.1%)
Other = 1	78 (43.3%)	82 (45.6%)
Stress Factors		
Aging Anxiety (range 5 to 25) ^{***}	9.4 (3.2)	11.7(3.6)
Depression (range 0 to 5) ^{***}	0.25 (0.44)	1.09 (1.36)
Coping Factors		
Level of Social Network (range = 3 to 18) ^{***}	15.0 (1.8)	12.7 (2.7)
Overall Self-rated Physical Health Status (range 1 to 5) ^{***}	3.54 (0.74)	3.2 (0.8)
Annual Income level (1 = \$6,000 or less to 11 = \$100,001 or more) ^{a. n.s.}	7.58 (2.15)	7.78 (2.31)
Self-rated technology use competence compared to peers		
Ability to use smartphone applications (range 1 to 10) [*]	6.1 (3.1)	5.1 (3.2)
Ability to use computer software programs (range 1 to 10) ^{n.s.}	5.3 (3.1)	4.8 (3.1)

Note. ^a t-test statistics or ^bChi square statistics were used; ^{n.s.} Not Significant; [†] $p < .10$. ^{*} $p < .05$. ^{**} $p < .01$. ^{***} $p < .001$.

<Table 3> Correlations with selected variables

Variables	1	2	3	4	5	6
1. Age	-					
2. Overall self-rated physical health status	-.063	-				
3. Aging anxiety	-.048	-.339***	-			
4. Level of social network	-.060	.189*	-.349***	-		
5. Depression	-.081	-.277***	.393***	-.343***	-	
6. Loneliness	-.008	-.319***	.450***	-.494***	.550***	-

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

and all of them were < 10 , indicating that multicollinearity was not a problem.

Regression analysis revealed that the equation explained 48.5% of the variance (adjusted R-squared = .446) in levels of loneliness ($F(12,161) = 12.629$, $p < .001$). Correlates of levels of loneliness included aging anxiety, depression, social network, and self-rated technology use with computer software programs compared to peers. The level of depression (Standardized

Coefficients = .380, $p < .001$) is the most powerful negative correlation for feeling lonely, followed by the level of social network (Standardized Coefficients = -.281, $p < .001$), the level of aging anxiety (Standardized Coefficients = .195, $p = .004$), and the ability to use computer software programs (Standardized Coefficients = -.153, $p = .047$).

It is interesting that smartphone use is not statistically significant on the level of feeling

<Table 4> Results of regression analysis

	Unstandardized B	SE	β (Standardized Coefficients)	P value
(Constant)	2.016	1.754		.252
Socio-demographic variables				
Age	.017	.016	.063	.313
Gender (0=Male, 1=Female)	-.080	.226	-.022	.723
Race (0=Other, 1 = White)	-.302	.473	-.038	.524
Education (0=up to high school, 1 = college and higher)	.427	.231	.119	.066
Marital Status (0=Single/Never Married, 1 = Other)	.201	.352	.035	.570

<Table 4> Results of regression analysis (continued)

	Unstandardized B	SE	β(Standardized Coefficients)	P value
Stress Factors				
Aging Anxiety (range 5 to 25)	.090	.031	.195	.004
Depression (range 0 to 5)	.574	.105	.380	<.001
Coping Factors				
Level of Social Network	-.183	.043	-.281	<.001
Overall Self-rated Physical Health Status	-.214	.140	-.101	.128
Annual Income Level	.086	.055	.112	.118
Self-rated technology use competence compared to peers				
Ability to use smartphone applications	.057	.044	.109	.194
Ability to use computer software programs	-.085	.043	-.153	.047
R ² (Adjusted R square)	.485 (.466)			

lonely and the relationship is positive. This may be related to smartphone use having limited benefit (Greco, J. 2024, June 6). Having a computer and using a computer can be more beneficial than a smartphone for older adults in reaching out to resources such as AARP's online classes and information sessions. This study further found that self-rated technology use competency related to computer software use negatively affects loneliness when controlling for income, depression, the level of social network, and physical health.

IV. Discussion

This study addresses important contemporary

issues, linking loneliness and self-rated technology use competency in older adults in the context of COVID-19 Pandemic. Specifically, the background and practice data of the sample of older Americans are very valuable.

The stress and coping model provides variables that can be measured by self-evaluation, which is ideal for the situation caused by the COVID-pandemic lockdown and for people who were isolated or living in a rural area. Being that this study was conducted in the middle of the pandemic, its results will provide data to corroborate findings from other studies done during the same period.

Including a level of computer or online use assessment during regular meetings with health care professionals, such as at annual checkups

with primary care providers, will be helpful for preparing a plan to allow older adults some control over their situation when they are more isolated in the community, or for introducing technology-related resources in the community. Empowering people can start with including their perceptions and assessments. Older people who embrace technology may have more capacity to be connected with other members in the community. Therefore, an assessment of their self-rated technology use provides important information to community agencies working with older adults and their support network.

In addition, since many older people are eager to learn new information continuously, some providers may need to overcome their ageism, which assumes that older adults are resistant to learning or adapting to new technology or information (Mace et al., 2022).

Another consideration is the gap in the deployment of fixed advanced telecommunications capability in urban vs rural areas. The FCC reported 2019 statistics for deploying fixed terrestrial 25/3Mbps services at 98.8% for urban areas and 82.7% for rural areas (Federal Communications Commission, 2021, p.20).

This study adds to the growing body of research on the relationship between technology use and loneliness among older adults, particularly in rural areas, by emphasizing the role of self-rated technology use competency. While previous studies have identified various factors contributing to loneliness in older

populations, such as aging anxiety, depression and the level of social networks, this study findings uniquely highlight the mental-health benefits of having a positive self-assessment toward technology. This study underscores that older adults who feel more competent with technology are not only less lonely but also more eager to engage in further technology learning opportunities. This self-perception and enthusiasm to continue learning suggest that enhancing technology use among older adults could be a key intervention in addressing loneliness in rural communities, where social isolation and loneliness tend to be more pronounced.

V. Implications and Conclusion

The recommendations from the U.S. surgeon general report, and the unique approaches and efforts by ministries in England and Japan can be used in the U.S. to recognize loneliness as a social issue and to improve social connectedness. Feeling lonely is a signal that it is time to regain social connections. In order to provide novel technologies to everyone, old and young, we need to understand each of their needs, wants, and preferences.

There should be proactive and critical government initiatives in address loneliness and social isolation among old adults. For example, England appointed a dedicated minister to fights

against loneliness in 2018 (Graciela Dias, 2021).and Japanese government established the Office for Measures to Combat Loneliness (Yoshida, 2022) and Isolation in 2021 (Inoue et al., 2021; Yoshida, 2022). Moreover, Japanese government allocated six billion yen (USD \$54.6 million) to nonprofits working on loneliness-related issues (Graciela Dias, 2021).

It was encouraging a bill in US, the Addressing Social Isolation and Loneliness in Older Adults (SILO) Act of 2023 was introduced in the House of Representatives as H.R.2692 on April 18, 2023, and referred to the Subcommittee on Work and Welfare on December 17, 2024. In the Senate, it was introduced as S.3437 on December 7, 2023, and referred to the Committee on Finance. However, both bills remain in committee and have not progressed further in the legislative process (H.R. 2692, 2023).

Technology has been regarded as a tool for better social connections. However, some older people with physical or mental health challenges, with limited financial means, and/or who are living in relatively more rural areas are not always able to get the benefits of novel technology.

Like all of us, older people will derive benefits from a higher level of technology literacy. Equipping seniors with more technological literacy and closing the gap between different age groups and different geographical locations such as rural vs. urban

will require exploring where older people are in their perceptions. Older people in a community are likely to be under-screened or less assessed (or not at all) for technological literacy, either due to a lack of awareness or the unavailability of opportunities and attention, or because of social ageism (Mace et al., 2022).

Based on anecdotal feedback from the lead author's local senior center, older people want to learn more about new technology. Some of the participants in this study said they would like to have continuing education opportunities related to new technology, offered as public education for older people as we have for K-12. Perhaps ageism in society translates into a reluctance to provide learning opportunities to the older population (Mace et al., 2022). This would be similar to a classroom situation with a teacher who believes the students cannot learn, thereby creating an environment where learning cannot happen.

Interventions for this population should focus on fostering positive experiences with technology and address possible challenges or misconceptions that might hinder their use of novel technologies. This study findings suggest that offering lifelong learning programs specifically tailored to the unique needs of older adults, especially in rural areas, could reduce loneliness and improve overall quality of life. This could involve providing accessible, ongoing training in digital tools, tech-support and resources to ensure that older adult not only

have the opportunity to learn but also feel confident in their ability to do so. These interventions could be coupled with community-based organization support systems that encourage social interaction and use of technology, further reducing social isolation and improving mental well-being.

Recently, in Korea, low birth rates and an aging population have led to an increase of small rural towns where older adults experience higher level of social isolation and loneliness, similar to the situation in the United States. Therefore, the lifelong learning program presented in this study could be adapted to fit Korean culture, combined with transportation service and ongoing access to technological information - especially during this time of rapid technological change, such as the rise of AI. This approach can help prevent the exclusion of older adults in rural areas from technology-based services and ensure more equitable access to any new services.

AAPR Senior Class is helpful. However, some older people with fixed incomes who have no internet access or computer access cannot use this service. There should be a meaningful outreach effort to older adults living in rural area.

Policy makers, advocates such as AARP, national data, and human service providers at all levels are coming to the same conclusions related to Aging in Place: All people want to stay in their homes as long as they can live

independently. In order to fulfill their wants and needs, new technological advances can play an important role in connecting people even as they live by themselves. Understanding their levels of perception about their own technology use capacity is another important part of the social determinants of health. Thus, the provision of any novel technology requires an effort to find out where the older person is in terms of their needs to employ the technology. This would create a customized and tailored approach to addressing their needs.

Happiness is closely related to the social connections in people's life. The improvement of self-rated technology use competence can happen via active, customized, and genuine interventions through community members, the faith community, and existing services such as Meals on Wheels. This would be helpful in creating opportunities for the social relationships and connections that can improve happiness (Waldinger & Schulz, 2023).

There should be national level data collection efforts about the level or prevalence of isolation among older adults, which is likely to be higher than the prevalence of feeling lonely because some people chose to be isolated and some people do not feel lonely. However, as a preventative measure, there should be more resources to address those who are lonely, and those resources should be available and accessible by older adults. To deliver these resources, a collaboration between community-

based organizations and academia is helpful for reaching out to certain older adults who appreciate the value of research and are willing to contribute and support the research efforts. This can be one of many creative ways to reach older adults who are isolated or are disconnected from other people or their community, which can lead to more connectedness among older people, and can lead to more happiness (Waldinger & Schultz, 2023).

So many new technologies come and go, we all need good information to make informed decisions. First, there is a need for more effective ways of introducing the existence of new services (Lee & Coughlin, 2015). It is important to provide evidence-based results showing the benefits of using novel technologies. Finally, tech-support from peers, family, and community-based service providers is a critical component to increase competency and improve quality of life.

Ethics statement

This study involving human participants was reviewed and approved by the institution affiliated with the authors. The participants provided their written informed consent to participate in this study.

Declaration of Interest Statement

There is no potential conflict of interest.

There are no relevant financial or non-financial competing interests to report.

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