Older Adults' Preferences for Caregiving AI Chatbots to Improve Well-being and Social Connectivity

Brooke Wolfe, Yoo Jung Oh, Hyesun Choung, Xiaoran Cui, Joshua Weinzapfel, R. Amanda Cooper, Hae-Na Lee, Rebeca Lehto

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Abstract

Background: The increasing number of older adults who are living alone poses challenges for maintaining their well-being, as they often need support with daily tasks, healthcare services, and social connections. However, advancements in artificial intelligence (AI) technologies have revolutionized healthcare and caregiving via their capacity to monitor health, provide medication and appointment reminders, and companionship to older adults. Nevertheless, the adaptability of these technologies for older adults are stymied by useability issues. This study explores how older adults use and adapt to AI technologies, highlighting both the persistent barriers and opportunities for potential enhancements.

Objective: The study purpose was to provide deeper insights into older adults' engagement with technology and AI. The technologies currently used, potential technologies desired for daily life integration, personal technology concerns faced, and overall attitudes towards technology and AI are explored.

Methods: Using mixed-methods, participants (N = 28) completed both a semi-structured interview and surveys consisting of health and well-being measures. Participants then participated in a research team facilitated interaction with an AI chatbot, Amazon Alexa. Interview transcripts were analyzed using thematic analysis, and surveys were evaluated using descriptive statistics.

Results: Participants ranged in age from 65 to 84 years. Digital devices were most commonly used for entertainment, health management, professional productivity, and social connectivity. Participants were most interested in integrating technology in their personal life for scheduling reminders, chore assistance, and for providing care to others. Challenges in using new technology included commitment to learning, a lack of privacy, and a worry about future technology dependence. Overall, their attitudes coalesced towards early adapters, those wary, and those who were resisters of technology and AI.

Conclusions: To ensure that AI technologies effectively support older adults, it's essential to foster ongoing dialogue among developers, older adults, families, and their caregivers, focusing on inclusive designs to meet older adults’ needs.

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Conclusions: To ensure that AI technologies effectively support older adults, it's essential to foster ongoing dialogue among developers, older adults, families, and their caregivers, focusing on inclusive designs to meet older adults' needs.

Keywords: Older Adults; Technology Use; AI Chatbots; Well-being; Social Connectedness.

Introduction

Both global life expectancy and the aging population have continued to increase in recent years.[1] As of 2023, 1 billion people in the world were aged 60 years or older and numbers are expected to rise to 1.4 billion by 2030.[2] This trend presents challenges for maintaining the well-being of older adults, many of whom choose independent living while requiring assistance with daily tasks and healthcare routines, as well as support to stay socially connected.[2-3]

Advancements in artificial intelligence (AI) technologies have transformed numerous sectors, including healthcare and caregiving (e.g., supporting people with dementia)[4]. AI tools are now being used to monitor health, provide reminders for medication and appointments and even for offering companionship through conversational agents.[5, 6]

Despite the growing interest and potential in leveraging AI for older adult populations, challenges remain, particularly regarding the suitability of these technologies for older adults. One major issue is the limited accommodation for the unique needs of older adults, such as user-friendliness for those with limited experience using digital resources.[7] Security and privacy concerns are also significant barriers that can hinder older adults' willingness to adopt AI agents for personal healthcare.[8] Lastly, limited research on their long-term effectiveness underscores the need for more studies to ensure these technologies are sustainably introduced and adopted by older people. [4, 5]

Acknowledging the need for a personalized, older adult-friendly system that addresses the challenges and needs of older adults in their daily lives, this study aims to explore older adults' current use, challenges, and desired needs associated with AI technology, specifically focusing on caregiving chatbots. As a result, this study seeks to provide groundwork that will inform the development of AI technologies tailored to improve well-being of older adults.

AI Technologies in Healthcare and Caregiving for Older Adults

While older adults use technology less frequently and in fewer ways than younger individuals, they are still capable of engaging with specific technologies that meet their needs.[9, 10] Voice-based chatbots, for example, have been shown to help with medication adherence and reducing loneliness and social isolation, provided they are designed with older users in mind. [8, 11, 12]

The rapid advancement of multimodal large language models (LLMs) like ChatGPT suggests that many existing barriers for conversational agents in health and well-being may soon be overcome.[13, 14] These advancements are expected to enhance conversational competence, domain-specific information, and personalization. Such progress can potentially address older adults' concerns with existing technologies and improve their experience using these technologies. While previous studies have explored older adults' needs and concerns regarding technology use and the requirements for technology to assist aging through input from stakeholders like care professionals, technology designers, and policymakers, these insights have not been fully reflected in the development of technology.[15, 16] Additional insight into older adults' preferences for using technology is needed to tailor technological tools to benefit older users.

Social Support and Older Adults' Health and Well-being

AI technology carries potential as a source of social support that is greatly needed among the most vulnerable older adult population. Approximately a quarter of older adults live in social isolation and approximately a third of older adults' experience loneliness.[17, 18] Loneliness is associated with many negative consequences including poor mental and physical health, lower self-rated well-being, and disrupted sleep quality.[19] Among older adults specifically, loneliness is also associated with reduced physical activity, impaired cognition, dementia progression, nursing home placement, and higher mortality rates. [20] Older adults with limited social networks and low social engagement are at greatest risk.[21] AI chatbots may provide a valuable source of companionship and social support, potentially addressing loneliness. The current study explores the technologies older adults currently use, what they are interested in integrating into their daily lives, the challenges they face, and their overall attitudes towards technology and AI. To examine these topics, four research questions are addressed:

RQ1: In what ways do older adults report utilizing technology and AI?
RQ2: What technology and AI are older adults interested in integrating into their daily life?
RQ3: What concerns and challenges do older adults report about technology and AI use?
RQ4: What are older adults' attitudes towards technology and AI?

Methods

Participant Recruitment and Data Collection

A mixed-methods cross-sectional descriptive design was used. Institutional Review Board (IRB) approval was received before study recruitment was initiated. Participants were recruited using a community SONA pool, a research participation system, managed by a large midwestern university. Participants needed to meet the following criteria: (a) at least 65 years-old, and (b) able to complete the interview in-person at the university site. The SONA system posted a short synopsis of the study including the inclusion criteria, compensation for participants for completing the study qualification survey and interview (i.e., $50 USD cash or Amazon gift card), and researcher contact information. Participants selected an interview date and time via the SONA system. Once a time was selected, a member of the research team reached out to confirm the interview schedule, provide instructions for the interview location and parking, and to answer any questions.

After arriving for their interview, participants completed informed consent and then completed surveys that included demographics, health and well-being measures on either an iPad or paper, depending on personal preference. The participants then completed the interview with two members of the research team. One member led the interview by asking protocol questions, and the other team member facilitated the participant's interaction with an AI chatbot, Amazon Alexa. Pseudonyms are used in reporting the qualitative findings.

Statistical Analysis

Descriptive statistics were used for analyzing the surveys. A thematic analysis of the interview data was conducted following phases of reflexive thematic coding, which included data familiarization, systematic coding, generating initial themes, developing and reviewing themes, refining and naming themes, and writing the manuscript.[22] To ensure the robustness of our analysis, we used five verification procedures: referential adequacy, peer debriefing, negative case analysis, audit trail, and exemplar identification.[23, 24] Initially, we split the data to achieve referential adequacy and, after reaching saturation in the first half, we analyzed the second half of the data and did not find any new themes.[25] The first and fourth author held two peer debriefing meetings to resolve differences and reach consensus on all themes. Continuous peer debriefing occurred throughout the analysis, and labels for the findings were determined collaboratively. We refined our analysis to account for all data, meeting the standard for negative case analysis.[23] Detailed notes were kept (i.e., an audit trail), informing both the analysis and the selection of exemplars. [24]

Survey Measures

The study collected data on the following measures: demographics, general health status, BRFSS Disability Questions, loneliness (Three-item Loneliness Scale), life satisfaction (The Satisfaction With Life Scale), digital literacy (Digital Health Technology Literacy Assessment Questionnaire), AI literacy, and interests in AI chatbot features for caregiving assistance, reported in Table 1.[26, 27, 28, 29, 30]

Results

Survey Findings

Among 28 participants, the average age was 70.6 years (SD = 5.5), ranging from 65 to 84. More than half identified themselves as women (57.1%, n = 16) and married or living with partners (60.7%, n = 17). The remaining participants were widowed/divorced/separated (28.6%, n = 8) or never married/single (10.7%, n = 3). Most participants were living with their partner (60.7%, n = 17) or their partner and adult children 7.1% (n = 2). Some participants reported that they were living alone (28.6%, n = 8). Almost all participants were White (89.3%, n = 25), followed by Asian (7.1%, n =2), and Black/African American (3.6%, n =1). Most participants were currently unemployed or retired (75.0%, n = 21). The highest level of education obtained by participants was as follows: 42.9% (n = 12) had completed high school, a GED, or some college, while 57.1% (n = 18) were college graduates or had attained a higher level of education. Participants' household income levels were under $50,000 (25.0%, n = 7), between $50,000 and $100,000 (35.7%, n = 10), between $100,000 and $150,000 (28.6%, n = 8), and above $150,000 (3.6%, n = 1).

Table 1 presents a detailed report of participant profiles, including older adults' health factors, technology and AI use, challenges, knowledge, and their intention to adopt AI features to support daily health routines. Participants' average health status was 3.6 (SD = 0.9) which was deemed to be good (from 1 being poor to 5 being excellent), and 32.1% (n = 9) reported that they are limited in activities due to physical conditions. Average loneliness felt by the participants was 4.1 (SD = 1.6)[Range: 3-8] which indicated that participants felt lonely some of the time. Life satisfaction was 3.9 (SD = 0.7)[Range: 2-5] meaning that participants generally were satisfied with their lives.

Most participants were generally familiar with using technology. For chatbot use, 64.3% (n = 18) reported that they have previous used AI chatbots. Participants were generally comfortable with interacting with a chatbot (M = 3.8, SD = 1.0, range: 2-5). Regular use of technology devices was mostly related to smartphone (92.9%, n = 26) and desktop use (75.0%, n = 21), followed by iPad/tablet (46.4%, n = 13). Other types of technology included smartwatch (14.3%, n = 4), robot vacuum cleaner (17.9%, n = 5), and robot lawnmower (3.6%, n = 1). For regular application use, 75.0% (n = 21) used social media, 71.4% (n = 20) used online shopping, 64.3% (n = 18) used banking and streaming services, 57.1% (n = 16) health application, and 39.3% (n = 11) used customer service chatbots. Participants reported that they face challenges using technology devices never (7.1%, n = 2), rarely (21.4%, n = 6), sometimes (57.1%, n = 16), often (10.7%, n = 3), and always (3.6%, n = 1). 32.1% (n = 9) reported that they don't have much knowledge about AI and 67.8% (n = 19) reported to have knowledge about AI.

When participants were asked if there were any AI chatbots' caregiving features they may be interested in adopting, appointment reminder was rated the highest (89.3%, n = 25), followed by information access such as news or weather (78.6%, n = 22), emergency assistance (78.6%, n = 22), health monitoring (75.0%, n = 21), daily medication reminders (75.0%, n = 21), fall detection and alert notifications (64.3%, n = 18), interactive entertainment (60.7%, n = 17), social connection (60.7%, n = 17), shopping management (60.7%, n = 17), physical activity encouragement (46.4%, n = 13), home automation control (46.4%, n = 13), mental health support (39.3%, n = 11), customized health tips and reminders (39.3%, n = 11), daily routine assistance (39.3%, n = 11), memory aids (39.3%, n = 11), dietary assistance (32.1%, n = 9), and

language and communication (7.1%, n = 2).

Qualitative Findings

Older adults discussed their current and desired use of technology and AI in their daily lives. These discussions were depicted alongside key concerns and challenges that impacted the degree to which participants were willing to accept and integrate these technologies. These considerations informed the construction of three distinct attitudes towards technology and AI. These findings respond to four research questions outlined.

RQ1: Current Technology/AI Use

The most common technologies participants mentioned are digital devices such as smart phones, smart watches, computers, and radios (see Table 1). These technologies were used for a range of purposes, including entertainment, health management, professional productivity, and social connectivity, illustrating that older adults used these technologies to enhance their quality of life, manage health, and mitigate social isolation.

Digital devices

Many participants reported using a combination of digital devices—smartphones, smartwatches, and computers—that are often integrated. For instance, Everett mentioned, “I have an iPhone, and iMac and iPad.” These interconnected ecosystems facilitated a convenient and useable community of digital devices that allowed for older adults to engage online. Additionally, older adults commonly used radio applications and devices to listen to stories, news, and music. Dennis expressed, “You know, I hear all these things on the radio. I listen to the radio every day.” The digital devices utilized by older adults facilitated their existing implementation of these technologies for social interaction, entertainment, health management, and aiding in productivity. Each of these applications are overviewed in Table 2.

RQ_2: Interested Integration

Older adults also reflected on areas of their lives where they were not currently using technology but would consider the addition of technology as helpful. Participants communicated that technology would be beneficial for scheduling reminders, chore assistance, and providing care to others. These categories illustrate how older adults desired to use technology to maintain their independence and manage daily tasks more effectively. These findings offer insights into the type of tasks proposed as helpful, outlined in Table 3.

RQ_3: Concerns and Challenges

Older adults specified several concerns and challenges that influenced their use of technology and AI. These barriers impacted their adaptation to new devices and their ongoing worries about the technology already associated with their routines.

Commitment for Learning

Most older adults articulated that the time and energy to learn new technology was not a worthwhile investment. Patricia remarked, “I'm sort of like this with technology, I use what I have to use...Now, if I wasn't retired, I'd be embracing it a thousand percent because it would be necessary. But yeah, I don't need to be.” Patricia differentiated the time period of retirement as

one in which people no longer needed to keep up with innovations. Instead, she reiterated that her current utilization was a level that she was comfortable continuing at. Other older adults shared this view, like Sandra who limited her activity on social media, stating:

> "I use Instagram and Facebook, but I just review it. It turns out every time I try to say anything on it, I don't say what I mean. I said happy anniversary to somebody once, but I sent them a picture of a pizza. If that gives you an idea why I don't type on Instagram."

Sandra focused on completing online tasks that matched her skill level with the tool. She wanted to review the content to stay connected on interpersonal updates but following miscommunication with the addition of a meme, she limited her participation. Older adults like Patricia and Sandra were motivated to utilize technology with their current abilities but did not prioritize (re)allocating time and effort to using new technologies or to improve their capacity with existing offerings.

Lack of Privacy

Another concern that older adults expressed was how AI technologies could threaten their personal privacy. Given the growth of technology throughout their lifetime, and the rapid change of the AI landscape in the last few years, many stated concerns about insufficient regulation regarding these digital tools. Anthony conveyed this uneasiness, saying:

> "Part of the problem, I think, is people don't realize how much of their rights they're signing away when they just click through or the acknowledge or whatever...With digital data, some of its okay, I'm not worried about the fact that I've got, you know, this Google doc or that Google Sheet or whatever...[B]ut what do you think about what's going on in your household? And you know, and think about some things, some artificial intelligence in this instance that's listening and maybe sending information all the time about everything."

Anthony compared content that had a minimal need for privacy with parts of his life he considered deserving of more extensive restrictions. Anthony was one of multiple older adults who questioned if bringing technology into their home was worth the risk of sharing information and communication about their household with technology companies. Often older adults were not only worried about their own privacy but also articulated that these considerations were likely not considered by other, less technologically knowledgeable older adults.

Dependence on Technology

Older adults also discussed their fear of technology replacing their performance of daily tasks that would ultimately lead to cognitive decline. This concern was shared among older adults who were concerned that technology was an assistant for laziness and that relying on these tools reflected a negative moral character. Exemplifying this, Gwen explained:

> "Probably as I get older, I might could use some more support. But I also feel that I'm a big believer if you don't use what you have, you lose it, so if I don't use the knowledge I

> have, or the memory I have, or some of that, then it just goes off because you're not helping that muscle to keep developing."

Gwen offers an analogy of exercising her brain with tasks that keep her mind active. This analogy leaves technology as a cheat tool that limits this exercise from taking place. Older adults integrated the language of exercise while expressing their worries that technology would replace the routines they had in place to support their brain health.

Overall, older adults expressed their concerns with learning new technologies, the lack of privacy related to the implementation of these technologies, and the impact that these devices would have on their health. These concerns informed how older adults were oriented towards technology and AI regarding their willingness to utilize these digital devices.

RQ_4: Attitudes towards technology

Older adults reported having diverse attitudes towards technology and AI. These orientations influence the degree to which older adults were willing to engage with technology and the attributes they described technology with. The orientations ranged from *adapters* who were willing and able to use a range of technology to support their life to *resisters,* who were adults who articulated their aversion to integrating technology into their daily lives. The adaptor and resister orientations represented the opposing positions and incorporating aspects of both orientations, some older adults described a *wary* disposition.

Adapters

Adapters to technology and AI encompassed participants who were most willing and excited to merge digital devices into their everyday routines. Many older adults embraced the positive attributes and the assistance that technology brought to their lives. For instance, Christine remarked:

> "When you stop and think about what my parents had to do to get through a day, I'm almost embarrassed that my life is so easy. It's like Thursday's the day to turn on the robotic vacuum cleaner. And I think, okay, I don't even have to remember to put on the dishwasher. You know, you're just embarrassed that people had to physically do this work and take up all day. And it's so easy for us...Our last two homes, we did have thermostats we could do with our phone and, you know, all of that. [W]e use Ring. You gotta love Ring. You don't really want to talk to strangers at the door, so we use a lot of different tools."

Christine's remark highlights the extent to which she has integrated technology into her life, including the use of automation and smart home devices. Many older adults emphasized how the use of technology decreased the burden of once time-consuming tasks which was a reward for integrating new digital tools. Technologies were so integral to some older adults' lives that one participant reflected, "Sometimes I think she's [Alexa] my best friend" (Deborah). Deborah

was one of multiple older adults utilizing generative AI systems like Alexa for interpersonal connection. This connection fostered regular connection such that a friendship connection grew. Adapters of technology integrated technology and AI into their daily routines with such enthusiasm that the benefits of such adaptation were clear to older adults.

Wary

Some older adults were hesitant to utilize technology or were unsure of the advantages that integration of digital devices would bring to their life. Most older adults with this orientation were utilizing new(er) technologies but were less confident about their usage of the digital devices. For instance, Raymond compared his technology knowledge with his wife's, stating:

> "I think she's [wife] less afraid of making a mistake... She's just not as afraid as me. I'm always a little wary of it, I go by the rule that if it's not broken, don't fix it, you know. But that doesn't get you any further ahead. But it keeps you at that level rather than falling back, but I don't move ahead."

Gregory emphasized the caution with which approaches new technologies. Gregory concluded that he felt more comfortable continuing to use technology in the same way as before instead of learning or incorporating new interfaces. This was a sentiment shared by other older adults like Clarence, who shared:

> "I tend to view it [artificial intelligence] as a negative because you know, if you click on a couple articles, then all of a sudden you're being fed all these articles and it can support a view that maybe you were just interested in, but then all of a sudden it's giving you, you know stuff that supports maybe someone else's point of view, it wasn't really yours. But the more you're inundated with this information the more you tend to believe it."

Clarence pointed out how AI could facilitate access to information consistent with his worldview yet also overwhelmed him with content inconsistent with his perspective. For Clarence, AI was central to targeted algorithm manipulation that impacted what he saw online. This belief left Clarence, and many others, feeling skeptical about AI and the application of the tool in his life. When introduced to other benefits of using AI, Clarence pondered, "Oh, like reminders for medications and workout schedules and meal suggestions...I didn't realize that that stuff was out there, but I pretty much eat salad and chicken and that's, you know, fruits and vegetables, healthy diet." This participant was among a group of older adults who were interested in learning about previously unknown aspects of technology and AI that might support their daily routines, while also acknowledging some concerns about adopting new technologies. These older adults were hesitant to adopt new technologies but were not opposed to learning about new features or watching important others use the digital devices.

Resistant

The final orientation towards technology and AI were older adults who were resistant to the adoption and integration of digital devices in their lives. Participants with this orientation reported that they avoided learning new technologies and often wished that they could return to a time in their life before these advancements. Speaking on this, Donna articulated:

> "I basically don't like it... I also think it takes away from personal interaction, which is harmful to humanity... I don't like it. I kind of rather go back to, you know, people farming and taking care of themselves. I'm a homesteader, so I really don't like technology very much. I know we use it every day and it is helpful in that way. But I basically don't like it.... I kind of basically ignore it and don't use it if I don't have to. If I have to, then I have to. But if I don't need to, then I don't."

Donna articulated a sense of nostalgia and skepticism towards technology, positioning these advancements as contrary to traditional ways of life. Ultimately, she expressed an aversion to technology and AI as she concluded that she would only use these devices when necessary. This orientation was shared by other older adults who were unwilling and/or unable to incorporate technology and AI. This sentiment was central to one participant's perspective because this resistant orientation had led to him losing his job. Raymond recounted:

> "And when I turned 62, they said, we really can't keep you... You can get Social Security if you want, or you can get a job, but we can't keep you. And part of the criticism I heard about me was I wasn't technologically savvy enough and I didn't have any interest."

Raymond reflected on the termination of his position related to his unwillingness to integrate new technologies. Raymond recounted that he remained focused on completing his job with the tools he learned on when training as an accountant and was indifferent to studying new adaptations of software that he was able to apply to his work. Resisters encompassed older adults who were satisfied with their current knowledge and who were unwilling to consider future integrations regardless of the possibilities that technology and AI offered to their life.

Discussion

Principal Results and Comparison with Prior Work

The first research question aimed at understanding the current use of technology and AI by older adults. All older adults were using some form of technology, and most were using a combination of smartphones, smartwatches, and computers in their daily routines. Older adults specified that their current use of technology aided them in social interaction, entertainment, health management, and assisted them in productivity tasks. This is consistent with findings from past research, which has documented similar uses of technology among older adults. For example, the use of digital devices for maintaining social connections, such as through social media and video calls.[31] Similarly, the use of technology for health management, including fitness trackers and health apps has been widely reported.[32] The second research question was

focused on what technology older adults would be interested in learning and integrating into their life. These results were crowdsourced from older adults to ensure that any future AI technology tools could incorporate aspects of technology that were interesting and helpful. Participants articulated that helpful technology would provide schedule reminders, help with laborious chores, and reduce their caregiving load by monitoring loved ones. These findings are consistent with prior research, which has highlighted older adults' interest in practical, supportive technologies. For example, previous studies have shown that older adults value technologies that enhance their independence, such as devices that provide medication reminders or manage daily schedules.[33, 34] Interestingly, although we aimed to examine the use of technology to benefit older adults' health and wellbeing, many participants expressed interest in technology to monitor others' health and lighten the load of informal caregiving. This reflects both the diversity of health and independence in older age and the need to develop technologies that can be applied by older adults both for their own well-being and to monitor the health of others.[35, 36]

Related to the third research question, our results revealed that the notable barriers to technology and AI use were related to older adults' lack of commitment to learning new technology, privacy concerns, and fear of becoming too dependent on technology. Older adults have expressed hesitancy to learn new technology, mentioning that the time and energy required do not seem worthwhile. Such hesitancy is often linked to their perception of high learning effort expectancy.[37] This suggests that some older adults view mastering a new system as overly demanding. Thus, to address the perception that technology is too demanding for older adults, it's essential to enhance the perceived ease of use. Providing clear, step-by-step guides on how to use these technologies can play a crucial role in making them more accessible and less intimidating for this demographic. Another barrier found in our study, privacy concerns, has been brought up in previous studies as significant barriers of technology adoption.[8, 38, 39] Especially for voice-based systems, older adults reported that they are not comfortable with devices that may have access to and store their personal conversations.[8, 38] Lastly, some of our participants expressed fear that reliance on technology may replace their performance of daily tasks, leading to cognitive decline. Similar concerns were reported in previous research where older adults reported skepticism about using technology potentially deterring their memory.[40]

Finally, our findings of the fourth research question reveal that not all older adults are resistant to technology and AI. Rather, the spectrum of technology adoption among older adults can be broad, encompassing adapters, weary, and resistant individuals. Previous studies have found that these variations could be influenced by individual factors such as age, education, and other sociodemographic factors. For instance, familiarity with technology was not a significant barrier for relatively young older adults (aged 65 to 75 years) who are already active users of smartphones, whereas older adults aged > 75 years were more likely to face barriers towards adopting technology.[8]In addition, evidence shows that higher education and living with a spouse/partner were positively associated with increased use of information communication technology.[41] Therefore, to encourage greater adoption of new technologies, such as AI-based

communication systems, it is crucial to consider individual factors and tailor solutions to meet the diverse circumstances of older adult users.

Limitations

Limitations for all studies should be considered. First, this study did not distinguish between age groups of older adults including young-old (65-74), old-old (75-84), and oldest-old (over 85 years old).[36] The age of older adults likely impacts their orientation and willingness to accept new technologies. For instance, some participants in the sample worked in offices before the widespread integration of computers. Learning technology as a requirement of one's employment might impact the way that older adults view technological advancement compared to others who only voluntarily interacted with technologies throughout their adulthood. Future researchers might differentiate between age groups to examine how the orientations outlined are applicable across sections of older adults.

Additionally, older adults routinely experience stereotypes and stigma related to agism.[41, 42] This agism might limit an individual's willingness to adapt a learning mindset with new technology given the vulnerability in labeling a knowledge deficient. Examining how stereotypes serve as barriers for older adults integrating technology and seeking support would inform researchers on how to decrease the spread of this harmful communication and combat the negative implications of the messages through public health campaigns targeted at empowering technology use for members of this community.

Conclusions

Despite the increasing interest and potential benefits of using AI technology for older adult populations, significant challenges persist in the current technology landscape. The current study aimed to deepen our understanding of how older adults adapt to and interact with technology and AI while also identifying challenges and opportunities for improvement. Our findings suggest a critical need for developing more personalized and aging-friendly systems that can be successfully integrated into older adults' daily lives. Moving forward, it is essential to keep the dialogue open between developers, older adults, and their family and care team to ensure that the design of AI technologies are inclusive and supportive to older adults.

Conflicts of Interest

None declared.

Abbreviations

AI: Artificial Intelligence

References

1. World Health Organization. WHO methods and data sources for life tables 1990-2019. 2020. Retrieved July 29, 2024. URL: https://cdn.who.int/media/docs/default-source/gho-documents/global-health-estimates/ghe2019_life-table-methods.pdf?sfvrsn=c433c229_5
2. World Health Organization. Mental health of older adults. WHO. 2023. Retrieved

November 15, 2023. URL: https://www.who.int/news-room/fact-sheets/detail/mental-health-of-older-adults
3. Teo RH, Cheng WH, Cheng LJ, Lau Y, Lau ST. Global prevalence of social isolation among community-dwelling older adults: A systematic review and meta-analysis. Archives of gerontology and geriatrics 2023; 107: 104904. DOI: 10.1016/j.archger.2022.104904
4. Ruggiano N, Brown EL, Roberts L, Framil Suarez CV, Luo Y, Hao Z, Hristidis V. Chatbots to support people with dementia and their caregivers: Systematic review of functions and quality. J Med Internet Res 2021; 23(6): e25006. DOI: 10.2196/25006
5. Sapci AH, Sapci HA. Innovative assisted living tools, remote monitoring technologies, artificial intelligence-driven solutions, and robotic systems for aging societies: Systematic review. JMIR Aging 2019; 2(2): e15429. DOI: 10.2196/15429
6. Rodríguez-Martínez A, Amezcua-Aguilar T, Cortés-Moreno J, Jiménez-Delgado JJ. Qualitative analysis of conversational chatbots to alleviate loneliness in older adults as a strategy for emotional health. In: Healthcare Dec 2023; 12(1): 62. MDPI. DOI: 10.3390/healthcare12010062
7. Chou YH, Lin C, Lee SH, Chang Chien YW, Cheng LC. Potential mobile health applications for improving the mental health of the elderly: A systematic review. Clin Interv Aging 2023: 1523-1534. DOI: 10.2147/CIA.S410396
8. Gudala M, Ross MET, Mogalla S, Lyons M, Ramaswamy P, Roberts K. Benefits of, barriers to, and needs for an artificial intelligence–powered medication information voice chatbot for older adults: Interview study with geriatrics experts. JMIR Aging 2022; 5(2): e32169. DOI: 10.2196/32169
9. Hülür G, Macdonald B. Rethinking social relationships in old age: Digitalization and the social lives of older adults. Am Psychol 2020; 75(4): 554. DOI: 10.1037/amp0000604
10. Olson KE, O'Brien MA, Rogers WA, Charness N. Diffusion of technology: Frequency of use for younger and older adults. Ageing Int 2011; 36(1): 123-145. DOI: 10.1007/s12126-010-9077-9
11. Latikka R, Rubio-Hernández R, Lohan ES, Rantala J, Nieto Fernández F, Laitinen A, Oksanen A. Older adults' loneliness, social isolation, and physical information and communication technology in the era of ambient assisted living: A systematic literature review. J Med Internet Res 2021; 23(12). DOI: 10.2196/28022
12. Marziali RA, Franceschetti C, Dinculescu A, Nistorescu A, Kristály DM, Moşoi AA, Broekx R, Marin M, Vizitiu C, Moraru SA, Rossi L, Di Rosa M. Reducing loneliness and social isolation of older adults through voice assistants: Literature review and bibliometric analysis. J Med Internet Res 2024; 26: e50534. DOI: 10.2196/50534
13. OpenAI. GPT-3.5-turbo-0125 model. 2023. URL: https://platform.openai.com/docs/models/gpt-3-5
14. Kocaballi AB, Sezgin E, Clark L, Carroll JM, Huang Y, Huh-Yoo J, Kim J, Kocielnik R, Lee YC, Mamykina L, Mitchell EG, Moore RJ, Murali P, Mynatt ED, Park SY, Pasta A, Richards D, Silva LM, Smriti D, Zubatiy T. Design and evaluation challenges of conversational agents in health care and well-being: Selective review study. J Med Internet Res 2022; 24(11). DOI: 10.2196/38525
15. Elavsky S, Knapova L, Janiš K, Cimler R, Kuhnova J, Cernicky T. Multiple perspectives on the adoption of SMART technologies for improving care of older people: Mixed methods study. J Med Internet Res 2024; 26. DOI: 10.2196/45492
16. Peek STM, Wouters EJ, Luijkx KG, Vrijhoef HJ. What it takes to successfully implement technology for aging in place: Focus groups with stakeholders. J Med Internet Res 2016; 18(5): e98. DOI: 10.2196/jmir.5253
17. National Academies of Sciences, Engineering, and Medicine. Social isolation and

loneliness in older adults: Opportunities for the health care system; 2020. ISBN: 978-0-309-67100-2
18. Chawla K, Kunonga TP, Stow D, Barker R, Craig D, Hanratty B. Prevalence of loneliness amongst older people in high-income countries: A systematic review and meta-analysis. PLOS One 2021; 16(7). DOI: 10.1371/journal.pone.0255088
19. Park C, Majeed A, Gill H, Tamura J, Ho RC, Mansur RB, McIntyre RS. The effect of loneliness on distinct health outcomes: A comprehensive review and meta-analysis. Psychiatry Res 2020; 294: 1-13. DOI: 10.1016/j.psychres.2020.113514
20. Ong AD, Uchino BN, Wethington E. Loneliness and health in older adults: A mini-review and synthesis. Gerontology 2016; 62(4): 443-449. DOI: 10.1159/000441651
21. Dahlberg L, McKee KJ, Frank A, Naseer M. A systematic review of longitudinal risk factors for loneliness in older adults. Aging Ment Health 2022; 26(2): 225-249. DOI: 10.1080/13607863.2021.1876638
22. Braun V, Clarke V. Using thematic analysis in psychology. Qual Res Psychol 2006; 3(2): 77–101. DOI: 10.1191/1478088706qp063oa.
23. Kidder LH. Research methods in social relations. Rinehart and Winston; 1981. ISBN 9781118764985
24. Lincoln YS, Guba EG. Naturalistic inquiry. Sage; 1985. IBSN-13: 978-0803924314
25. Corbin J., Strauss A. Basics of qualitative research: Techniques and procedures for developing grounded theory. Sage; 2008. ISBN: 9781412906449
26. Centers for Disease Control and Prevention. A data users' guide to the disability questions included in the behavioral risk factor surveillance system. 2020. URL: https://www.cdc.gov/brfss/data_documentation/pdf/BRFSS_Data_Users_Guide_on_Disability_Questions_2018-508.pdf
27. Hughes ME, Waite LJ, Hawkley LC, Cacioppo JT. A short scale for measuring loneliness in large surveys: Results from two population-based studies. Res Aging 2004; 26(6): 655-672. DOI: 10.1177/0164027504268574
28. Diener E, Emmons RA, Larsen RJ, Griffin S. The satisfaction with life scale. J Pers Assess 1985; 49(1): 71–75. DOI: 10.1207/s15327752jpa4901_13
29. Yoon J, Lee M, Ahn JS, Oh D, Shin SY, Chang YJ, Cho J. Development and validation of digital health technology literacy assessment questionnaire. J Med Syst 2022; 46(2): 13. DOI: 10.1007/s10916-022-01800-8
30. Kaur A., Chen, W. Exploring Artificial intelligence (AI) literacy among older adults. Study Health Technol Inform 2023; 306. DOI: 10.3233/SJTO230589
31. Chopik WJ. The benefits of social technology use among older adults are mediated by reduced loneliness. Cyberpsychol Behav Soc Netw 2016; 19(9): 551–556. DOI: 10.1089/cyber.2016.0151
32. Heart T, Kalderon E. Older adults: Are they ready to adopt health-related ICT? Int J Med Inform 2013; 82(11): e209–e231. DOI: 10.1016/j.ijmedinf.2011.03.002
33. Mitzner TL, Boron JB, Fausset CB, Adams AE, Charness N, Czaja SJ, Dijkstra K, Fisk AD, Rogers WA, Sharit J. Older adults talk technology: Technology usage and attitudes. Comput Human Behav 2010; 26(6): 1710–1721. DOI: 10.1016/j.chb.2010.06.020
34. Vaportzis, E, Giatsi Clausen M, Gow AJ. Older adults' perceptions of technology and barriers to interacting with tablet computers: A focus group study. Front Psychol 2017; 8: 1687. DOI: 10.3389/fpsyg.2017.01687
35. Dodge HH, Du Y, Saxton JA, Ganguli M. Cognitive domains and trajectories of functional independence in nondemented elderly persons. J Gerontol A Biol Sci Med Sci 2006; 61(12): 1330-1337. DOI: 10.1093/gerona/61.12.1330
36. Min SH, Topaz M, Lee C, Schnall R. Understanding changes in mental health symptoms

from young-old to old-old adults by sex using multiple-group latent transition analysis. GeroScience 2023; 45(3): 1791-1801. DOI: 10.1007/s11357-023-00729-1
37. Barnard Y, Bradley MD, Hodgson F, Lloyd AD. Learning to use new technologies by older adults: Perceived difficulties, experimentation behaviour and usability. Compute Human Behavior 2013; 29(4): 1715-1724. DOI:10.1016/j.chb.2013.02.006
38. Bonilla K, Martin-Hammond A. Older adults' perceptions of intelligent voice assistant privacy, transparency, and online privacy guidelines. In: Sixteenth Symposium on Usable Privacy and Security (SOUPS 2020) Aug 2020.
39. Wang S, Bolling K, Mao W, Reichstadt J, Jeste D, Kim HC, Nebeker C. Technology to support aging in place: Older adults' perspectives. In: Healthcare Apr 2019; 7(2): 60. MDPI. DOI: 10.3390/healthcare7020060
40. Vroman KG, Arthanat S, Lysack C. "Who over 65 is online?" Older adults' dispositions toward information communication technology. Comput Human Behav 2015; 43: 156-166. DOI: 10.1016/j.chb.2014.10.018
41. Giles H, Gasiorek J, Davis SM, Giles J. Communication for successful aging: Empowering individuals across the lifespan. Routledge; 2021. ISBN: 9780429330681
42. Marques S, Mariano J, Mendonça J, De Tavernier W, Hess M, Naegele L, Martins D. Determinants of ageism against older adults: A systematic review. Int J Environ Res Public Health 2020; 17(7): 2560. DOI: 10.3390/ijerph17072560

Table 1. Participant Profiles (N = 28)

		Mean (SD) or %(n) [Range]
Health factors		
Health status		3.6 (0.9)
Limited in activities		32.1 (9)
Use Alexa as an assistive technology		3.6 (1)
Loneliness		4.1 (1.6)[3-8]
Life satisfaction		3.9 (0.7)[2-5]
Technology use		
Smartphone use		96.4 (27)
AI chatbot use	Amazon Alexa	35.7 (10)
	Google Assistant	21.4 (6)
	Apple Siri	32.1 (9)
	Facebook Messenger Bot	10.7 (3)
	ChatGPT	7.1 (2)
	Copilot	3.6 (1)
Comfortable interacting with chatbots		3.8 (1.0)[2-5]
Regular technology use	Smartphone	92.9 (26)
	Desktop/Laptop	75.0 (21)
	IPad/Tablet	46.4 (13)
	Smartwatch	14.3 (4)
	Robot vacuum cleaner	17.9 (5)
	Robot lawnmower	3.6 (1)
Regular application use	Social media	75.0 (21)
	Online shopping	71.4 (20)
	Banking service	64.3 (18)
	Streaming service	64.3 (18)
	Health application	57.1 (16)
	Customer service chatbots	39.3 (11)
Challenges using technology devices	Never	7.1 (2)
	Rarely	21.4 (6)
	Sometimes	57.1 (16)
	Often	10.7 (3)
	Always	3.6 (1)
Knowledge about AI	Don’t have much knowledge	32.1 (9)
	Have knowledge	67.8 (19)
AI chatbots’ caregiving features interesting in adopting	Appointment reminder	89.3 (25)
	Information access (e.g., news, weather)	78.6 (22)
	Emergency assistance	78.6 (22)
	Health monitoring	75.0 (21)

	Daily medication reminders	75.0 (21)
	Fall detection and alert notifications	64.3 (18)
	Interactive entertainment	60.7 (17)
	Social connection	60.7 (17)
	Shopping management	60.7 (17)
	Physical activity encouragement	46.4 (13)
	Home automation control	46.4 (13)
	Mental health support	39.3 (11)
	Customized health tips and reminders	39.3 (11)
	Daily routine assistance	39.3 (11)
	Memory aids	39.3 (11)
	Dietary assistance	32.1 (9)
	Language and communication	7.1 (2)

Table 2. *Current technology use reported with exemplars.*

Current Technology Use	***Exemplar***	
Social Interaction: Technology helps older adults maintain social connections through social media, email, and video calls, combating feelings of	I guess, I'm in a LGBT and also Friendship Group... It's a group of gay people, primarily men who meet once a month at a different restaurant, just a Friendship	It's just kind of our normal, when they [grandchildren] come over and then Sunday, you know, church stream ...I would say I went more in person before the pandemic...more so before the

isolation.	group to explore a different restaurant... But they're going to go to [restaurant name] this week, so I thought I'd give that place to try. Very excited". (Raymond)	pandemic. Yeah. And we've all changed our habits I think since then. Totally. (Christine)
Entertainment: Older adults engage with technology content, like streaming movies, listening to music, and playing games to stay mentally active.	...it's radio. Sometimes you can, it just gives out the full like the visual. Kind of like a video version of the news as well. So, it just depends on what you want, you know, like, you can ask ABC news. (Cherly)	Well, most of my downtime I probably spend on YouTube because there's a terrific history and documentary channels that I follow, and you know how to do things a certain way... I [also] read all my news and everything on online with. I go to a bunch of different websites so I can get a wider perspective on what people are thinking. (Ingrid)
Health Management: Technologies can assist older adults in health-related tasks, such as scheduling doctor's appointments, tracking fitness, and managing medications efficiently.	I wear hearing aids and they've got Bluetooth on them, so, you know, I can listen to music through my phone and stuff like that. (Sandra)	I set my phone as soon as I've eaten, and I reset it for two hours intervals. And then it has a reminder on it to take my vitamins. (Gwen)
Assisted Productivity: Older adults use devices for professional activities like remote work, scheduling, and task management.	She's a good reminder-er. I mean, I've got to tell her to, feel free to tell me to hurry up and send out Easter cards, because Easter cards really have to be sent out really soon. Yeah. So, it's lots of little things to. You know, can I put egg shells down the garbage disposal and she's No no no no no no, don't do that. I didn't really remember that I couldn't do that. I knew I couldn't put bones down there or meat down there, but I didn't know about egg shells, so. (Deborah)	So, there's a lot of communication on my phone to them [church group]. I'm in a group of about 500 people, and there's usually things going on with them. Like, right now, we have a friend who's in the hospital dying, so we're making arrangements for him. Just a lot of arranging. You know, I'm a connector person... I'm the head of a couple groups, so sometimes people contact me through email, ... It's a Christian group and there's about 500 people... (Donna)

Table 3. *Desired technology use reported with exemplars.*

Desired Technology Use	Exemplar	
Scheduling Reminders: Older adults want some tools to help them stay organized by reminding them of tasks and events, thus supporting their daily routines and commitments.	[I use] auto bill pay I never go to the bank. Everything is auto paid. It's, I mean prescriptions. I only take one, but, you know, it just pops into your thing [phone]. (Mary)	...at work and I do have a medication [reminder], and some reminders on my phone that remind me to turn in my time sheet or a medication reminder. Yeah, reminders that I need to take my medication, a second medication. (Joyce)
Chore Assistance: Older adults are interested in technologies that simplify and automate daily chores to enhance convenience and reduce effort, such as vacuuming, mowing, driving, cleaning, and cooking.	I would love to not have to mow my lawn. If that was automated, that would be awesome. See, I would love not to have to cook. That would be great. Basically, I'd like to live in the Jetsons... It would be great to have somebody take your dishes and not have to do that. There's only, you know, as you get older, there's certain things that you really just are sick of doing putting the dishes in the dishwasher, taking them out, cleaning them, all that kind of junk. (Ingrid)	So, you know, if something would just automatically cook my food for me, just what I want for dinner without it being Grubhub or Uber Eats or something. Yeah, just, you know, my own food because I like my own cooking. Yeah, it somewhere is the magic to just make it happen. (Christine)
Caregiving Monitoring: Older adults expressed interest in technology / AI that would assist them in observing, supervising, and managing the care of others in their life. Participants clarified that they might want caregiving assistance in the future, but at this point, they were focused on completing care tasks for others including their own parents or partner.	More support? Not yet. I can see where it might be. Might be coming in ten, 15 years, but as of now, I can't. I mean, I drove here... [but] a device for who could tell if I if I had fallen down without me having to hit a button or anything... but that that's something we would. Yeah. I'd be interested in. (Timothy)	It has to do with my caregiving...I'm always trying to find things that might help. My mom and I found online I heard a story on the radio about this company called LEC, and it's this little box and it's got this head on it, like with a camera. And you talk to it and it, like, lights up, it points at you and has a screen, and you can ask it questions and you can have what I was hoping it would do is while I go, I'm gone, like running errands or I'm on the road or whatever I can call in, see my mom and check on her and talk back and forth. And but it failed miserably. It one thing that really we I packed up and

		sent it back within 24 hours. My mom couldn't understand it because it talked too fast. (Dennis)