



The role of ChatGPT in mitigating loneliness among older adults: An exploratory study

Karima Al Mazroui ¹

 0000-0002-3738-1033

Mohammed Alzyoudi ^{1*}

 0000-0002-0068-3396

¹ Mohamed Bin Zayed University for Humanities, Abu Dhabi, UNITED ARAB EMIRATES

* Corresponding author: dr.zodi20@hotmail.com

Citation: Al Mazroui, K., & Alzyoudi, M. (2024). The role of ChatGPT in mitigating loneliness among older adults: An exploratory study. *Online Journal of Communication and Media Technologies*, 14(4), e202444. <https://doi.org/10.30935/ojcm/14777>

ARTICLE INFO

Received: 24 Nov 2023

Accepted: 15 Jun 2024

ABSTRACT

Purpose: This exploratory study aims to investigate the potential of ChatGPT in mitigating loneliness among older adults.

Design/methodology/approach: 20 participants aged 60 and above engaged in three conversational sessions with ChatGPT over two weeks. Data collection involved pre- and post-intervention assessments using the UCLA Loneliness Scale, analysis of conversation transcripts, and semi-structured interviews.

Findings: Our findings indicate that ChatGPT shows promise in alleviating loneliness among older adults. Participants found the tool easy to use, engaging, and emotionally supportive. They established an emotional connection with ChatGPT, suggesting its potential to provide comfort and companionship to those experiencing loneliness.

Conclusion: ChatGPT demonstrates potential as a tool to address loneliness in older adults, offering emotional support and engagement. However, it should be viewed as a complement rather than a replacement for human interaction. Future research should explore its long-term efficacy and its integration with other interventions.

Keywords: ChatGPT, loneliness, older adults, technology, social interaction

INTRODUCTION

In 2020, the United Nations estimated that there were 703 million people aged 65 or older worldwide, and this number is expected to double by 2050 (United Nations Department of Economic and Social Affairs, 2020). As the population of older adults grows, so too does the need for effective interventions to address loneliness, a pervasive issue among older adults, with nearly one-third of adults aged 65 and older experiencing loneliness at some point in their lives (Site et al., 2022). In the aftermath of the COVID-19 pandemic, promoting social connectedness is particularly critical for older people who live alone (Fingerman et al., 2021). Loneliness has been linked to a range of negative health outcomes, including increased risk of depression, cardiovascular disease, and cognitive decline (Hodgson et al., 2020; Lee et al., 2019; Paul & Fancourt, 2021; Steptoe et al., 2013). Given the negative impact of loneliness on health and well-being, it is imperative to identify effective interventions to mitigate loneliness among older adults (Fakoya et al., 2020).

Smart technologies have been used to assist people in their aging process by helping prevent cognitive decline and depressive symptoms (Gurley & Norcio, 2009; Li et al., 2023; Peek et al., 2016; Street et al., 2022). In long-term care settings, telepresence robots have demonstrated their capability of maintaining social connections between residents and families (Hung et al., 2023). Several studies, in particular, have investigated the potential of chatbots to reduce loneliness among older adults. These studies suggest that

chatbots can provide companionship and support and facilitate social interactions that may otherwise be difficult for older adults to engage in. For example, Czaja et al. (2021) found that older adults who participated in an online discussion forum reported decreased feelings of loneliness and increased social support. Another study indicated that older adults who used a tablet computer to connect with family members reported reduced feelings of isolation and loneliness (Neil-Sztramko et al., 2020). The barriers that impede older adults' use of smart technologies are also revealed, which mainly include technological competence, cost, and privacy concerns (Gudala et al., 2022). While the interactions between older adults and chatbots have not been adequately studied, there is a special need to investigate the potential of the latest advancements in chatbots, such as ChatGPT, in reducing older adults' loneliness (Alzyoudi & Al Mazroui, 2024).

ChatGPT, a large language model recently developed by OpenAI, has the potential to address loneliness among older adults by providing companionship and facilitating social interactions (Kocaballi, 2023). ChatGPT is an artificial intelligence (AI) tool that uses natural language processing to generate human-like responses to user inputs (Alzyoudi et al., 2023).

Being trained using reinforcement learning from human feedback, it can simulate human conversation, generate responses based on the context, and engage with users on various topics. ChatGPT is more sophisticated and personalized than other intelligent chatbots (Polyportis, 2024).

Built on prior research investigating the use of technology to improve people's well-being, this exploratory study aims to investigate the role of ChatGPT in mitigating loneliness among older adults. Specifically, we aim to examine how older adults use ChatGPT, what types of conversations and activities are facilitated by ChatGPT, and how older adults perceive the impact of ChatGPT on their loneliness. By exploring these research questions, we hope to shed light on the potential of ChatGPT as an intervention to address loneliness among older adults (Elhoweris et al., 2017).

Research Significance

This study holds significant implications for addressing a pressing societal issue: loneliness among older adults. With the global population of individuals aged 65 and above projected to double by 2050, the need for effective interventions to combat loneliness becomes increasingly urgent. Loneliness has been linked to various adverse health outcomes, including depression, cardiovascular disease, and cognitive decline, highlighting the importance of identifying strategies to alleviate it.

By exploring ChatGPT's potential as an intervention tool, this research contributes to the growing body of literature on the role of technology in promoting well-being, particularly among older adults. ChatGPT, with its ability to simulate human-like conversation and generate personalized responses, offers a promising avenue for addressing loneliness by providing companionship and facilitating social interactions.

Understanding how older adults engage with ChatGPT, the types of conversations and activities facilitated by the tool, and its perceived impact on loneliness can inform the development of tailored interventions to meet the needs of this demographic better. Moreover, insights gained from this study may help mitigate the barriers to technology adoption among older adults, such as technological competence and privacy concerns, by demonstrating the potential benefits of using ChatGPT as a loneliness intervention tool (Wardat et al., 2024).

Ultimately, this research's findings have the potential to inform policymakers, healthcare professionals, and technology developers about ChatGPT's effectiveness in addressing loneliness among older adults. By offering insights into the role of technology in promoting social connectedness and well-being in this demographic, this study contributes to efforts to improve the quality of life for older adults worldwide.

Research Framework

The research framework for this study is structured around several key components:

1. **Population dynamics:** The study acknowledges the demographic shift towards an aging population, highlighting the increasing prevalence of loneliness among older adults globally. It considers statistics provided by the United Nations Department of Economic and Social Affairs (2020) to underscore the significance of addressing loneliness in this demographic.

2. **Health implications:** Recognizing the negative health outcomes associated with loneliness, the framework emphasizes the importance of effective interventions. It cites research linking loneliness to depression, cardiovascular disease, and cognitive decline, emphasizing the urgency of mitigating loneliness among older adults.
3. **Technological interventions:** The framework explores the potential of smart technologies, including chatbots, in addressing loneliness among older adults. It references previous studies investigating the efficacy of telepresence robots and chatbots in maintaining social connections and reducing loneliness in this demographic.
4. **ChatGPT as an intervention tool:** The framework introduces ChatGPT, a sophisticated language model developed by OpenAI, as a novel intervention tool. It highlights ChatGPT's ability to simulate human-like conversation and generate personalized responses, positioning it as a promising solution to combat loneliness among older adults.
5. **Research objectives:** The framework outlines the specific objectives of the study, which include examining how older adults utilize ChatGPT, the nature of conversations and activities facilitated by the tool, and participants' perceptions of its impact on loneliness.
6. **Research methodology:** The framework outlines the methodology employed in the study, including data collection methods such as pre- and post-intervention assessments using the University of California, Los Angeles (UCLA) Loneliness Scale, analysis of conversation transcripts, and semi-structured interviews with participants.
7. **Significance of the study:** The framework underscores the significance of the research in contributing to the growing body of literature on technology-mediated interventions for older adults. It emphasizes the potential of ChatGPT to address loneliness and improve well-being in this demographic, offering insights that may inform future policymaking and intervention development efforts.

Overall, the research framework provides a structured approach to investigating the role of ChatGPT in mitigating loneliness among older adults, incorporating key demographic trends, health considerations, technological interventions, research objectives, methodology, and significance of the study.

RESEARCH METHODOLOGY

Research Design

The current study employed a mixed-methods approach, integrating both quantitative and qualitative methods to comprehensively investigate the role of ChatGPT in mitigating loneliness among older adults. This approach allowed for a multifaceted understanding of the phenomenon under investigation.

Research Population

Participants were recruited from various sources, including community centers, senior centers, and online social media groups for older adults in the United States. Inclusion criteria comprised individuals aged 65 or older who could read English and self-reported feelings of loneliness or social isolation. Exclusion criteria encompassed participants with hearing or vision impairments hindering their use of ChatGPT. Informed consent was obtained from all participants, ensuring voluntary participation and confidentiality of data.

Instrument

The study utilized the UCLA Loneliness Scale (version 3) to assess participants' loneliness levels quantitatively. This widely-used scale consists of 20 questions measuring subjective feelings of loneliness, rated on a 4-point Likert scale. Scores range from 20 to 80, with higher scores indicating greater loneliness. Additionally, semi-structured interviews were conducted to qualitatively explore participants' experiences with ChatGPT, including conversation types and perceived impact on loneliness.

Validity and Reliability Tests

Several measures were implemented to ensure the validity and reliability of the data collected. The UCLA Loneliness Scale has established validity and reliability as a measure of loneliness. Moreover, the first author,

experienced in qualitative research with older adults, conducted semi-structured interviews. Strategies such as member checking and peer debriefing were employed to enhance the credibility and trustworthiness of the findings, ensuring accuracy and consistency in data interpretation.

Data Collection

Data collection commenced with participants completing the UCLA Loneliness Scale to establish baseline loneliness levels. Demographic information was also collected. Subsequently, participants received instructions on using ChatGPT and conversed with the tool over a specified period and number of sessions. Post-intervention, participants completed the UCLA Loneliness Scale again. Semi-structured interviews were conducted to delve into participants' experiences with ChatGPT. Interviews were audio-recorded, transcribed verbatim, and reviewed for accuracy by the research team.

This comprehensive methodology enabled a thorough investigation into the impact of ChatGPT on loneliness among older adults, integrating quantitative assessments with qualitative insights to provide a holistic understanding of the phenomenon.

Data Analysis

UCLA Loneliness Scale scores at times 1 and 2 were first analyzed using descriptive statistics, including measures of central tendency (mean, median) and variability (standard deviation). This provided information on participants' levels of loneliness before and after using ChatGPT. Paired t-tests were then conducted to determine whether there are statistically significant changes in loneliness scores from pre- to post-intervention. This indicates whether ChatGPT had a measurable impact on participants' reported loneliness. Effect sizes were calculated to gauge the magnitude or strength of any observed differences in loneliness scores.

The data collected from the interviews and ChatGPT interaction logs were analyzed using thematic analysis, which is a qualitative research method that involves identifying patterns and themes in the data. The analysis process began with the research team reading and re-reading the transcripts to become familiar with the data. The researchers analyzed the interview transcripts using NVivo 11, a qualitative analysis software. They employed a grounded theory approach with three stages of coding to systematically analyze the data. Through this rigorous three-stage grounded theory process, the researchers were able to uncover and categorize the main themes emerging from the interview transcripts in a comprehensive manner.

The first step involved open coding of the data to generate initial codes and code descriptions. A subsample of transcripts was coded independently by two researchers to ensure consistency. Axial coding was then grouping the initial codes into potential themes and subthemes. A codebook was developed to define and differentiate the themes. An iterative process of analysis was followed, where the research team refined and revised the themes and sub-themes through multiple rounds of discussion and reflection. The themes and sub-themes were organized into a conceptual framework that captured the key findings of the study, which are related to older adults' experiences using ChatGPT.

Furthermore, the research team triangulated the findings with existing literature on loneliness and social isolation among older adults and engaged in constant reflexivity to reflect on their own biases and assumptions throughout the analysis process. The findings of the study were presented using descriptions and direct quotes from the participants to illustrate key themes and sub-themes. The quotes were selected to represent the range of perspectives and experiences shared by the participants.

Overall, the data analysis process was designed to generate detailed insights into the experiences of older adults using ChatGPT to address their loneliness. The use of thematic analysis allowed the research team to identify patterns and themes in the data, while the iterative process of analysis ensured that the findings were grounded in the data and reflective of the experiences of the participants. The quantitative and qualitative analyses are integrated. The quantitative results regarding changes in loneliness scores were merged with the qualitative themes to provide a more holistic understanding of the impact of ChatGPT. Likewise, the qualitative findings regarding types of conversations with ChatGPT and its perceived benefits and limitations help explain and contextualize the quantitative loneliness score changes. Contradictions or inconsistencies between the quantitative and qualitative results were explored and discussed.

Table 1. Demographic characteristics of participants

Category	Sub-category	Frequency	Percentage
Age	60-73	Mean = 65.3 (SD = 3.4)	
Gender	Male	13	65
	Female	7	35
Marital status	Married	8	40
	Widowed	9	45
	Divorced	2	10
	Single	1	5
Living condition	Alone	12	60
	With others	8	40
Education	College	14	70
	Master or above	3	15
	No collage degree	3	15
Computer ability	Beginner	1	5
	Intermediate	16	80
	Advanced	2	10

Table 2. Types of conversations and activities facilitated by ChatGPT

Conversation/activity type	Number of occurrences
Social conversations	36
Recreational activities	27
Educational activities	21
Emotional support	18
Cognitive stimulation	15
Other	3

RESULTS

Table 1 shows the demographic information of 20 participants in this study. Overall, the sample represents a diverse group of older adults in terms of age, gender, marital status, living arrangement, and education level. The participants ranged in age from 60 to 73 years old, with an average age of 65.3 years. Most participants were male (65%). 40% of them were married and 45% were widowed. 60% of participants reported living alone while the remaining 40% reported living with others. Education levels varied among the participants: 70% completed college, while 15% had a master's degree or above and 15% had no college degree. Most participants (80%) reported having an intermediate level of computer ability.

Table 2 summarizes the types of conversations and activities that were facilitated by ChatGPT during the study. The participants engaged in a variety of conversation and activities, including social conversations, recreational activities, educational activities, emotional support, and cognitive stimulation. Social conversations were the most common, with 36 occurrences, followed by recreational activities with 27 occurrences. The participants engaged in 21 educational activities, such as discussing current events or learning new information about a topic of interest. Additionally, ChatGPT provided emotional support for the participants in 18 occurrences, such as by offering words of encouragement or empathy. Cognitive stimulation, such as playing memory games or solving puzzles, was also facilitated by ChatGPT in 15 occurrences. Finally, three occurrences were classified as "other," including brief conversations about the weather or current time. The wide range of conversation and activity types facilitated by ChatGPT highlights its potential to address diverse needs and interests among older adults, including social connection, intellectual stimulation, and emotional support.

The mean loneliness score for the sample at baseline was 61 (SD = 7.1), while the mean loneliness score at post-intervention was 36 (SD = 6.2) (**Table 3**). This represents a significant difference of -35 points ($t = 3.14$, $p < 0.05$), indicating a reduction in loneliness following the ChatGPT intervention. The range of loneliness scores also changed from 44-71 at baseline to 29-52 at post-intervention. Additionally, the percentage of participants scoring above the threshold for significant loneliness on the UCLA Loneliness Scale decreased from 100% at baseline to 32% at post-intervention, indicating a significant reduction in the number of participants experiencing significant levels of loneliness.

Table 3. Loneliness scores for the sample at baseline and post-intervention

	Baseline	Post-intervention	Difference
Mean	61	36	-35
Standard deviation	7.1	6.2	-
Range	44-71	29-52	-
Percentage above threshold*	100%	32%	-68%

* The threshold for significant loneliness on the UCLA Loneliness Scale is a score of 43 or above

please tell me the story of the egyptian cleopatra

Certainly! Cleopatra, also known as Cleopatra VII Philopator, was an Egyptian queen who is best known for her involvement with Julius Caesar and Mark Antony, two of the most powerful Roman leaders of her time. Here's an overview of her story:

Cleopatra was born in 69 BCE in Alexandria, Egypt, as a member of the Ptolemaic dynasty, which ruled Egypt after the death of Alexander the Great. She was the daughter of Ptolemy XII Auletes, who was the reigning pharaoh of Egypt at the time. Cleopatra had a younger brother, Ptolemy XIII, with whom she initially ruled jointly.

As Cleopatra grew older, Egypt faced political turmoil and power struggles within the royal family. In 51 BCE, Ptolemy XIII and his advisers forced Cleopatra into exile, forcing her to flee to Syria. During her exile, Cleopatra began to gather support and resources in order to regain the throne.

Figure 1. An example of conversation with ChatGPT

The data analysis process identified several key themes related to the experiences of older adults using ChatGPT to address their loneliness. Overall, many were happy to accept ChatGPT, as it was convenient and easy to use and was able to provide emotional support. These themes are presented below, along with illustrative quotes from the participants.

Convenience

The convenience offered by ChatGPT played a significant role in enhancing the well-being of older adults and mitigating loneliness. Participants highlighted the following sub-themes that contributed to their positive experiences.

Access to information and resources

Participants expressed their appreciation for the convenience of accessing information and resources through ChatGPT. ChatGPT served as an efficient and reliable source of information, empowering participants with immediate access to a wide range of knowledge. The ability to quickly find answers to their questions without the need to search through books or wait for responses from others was highly valued (Figure 1).

A 65-year-old male participant who had a loneliness score of more than 50 highlighted the ease of use and convenience of ChatGPT in this way:

"Having ChatGPT at my fingertips allows me to instantly retrieve information without the hassle of searching through books or waiting for someone to respond. It saves me time and provides a reliable source of information."

Another participant similarly commented:

"I'm amazed at how quickly and accurately ChatGPT provides me with the information I need. It's like having a knowledgeable assistant right there with me. I no longer must spend hours searching through books or browsing the internet. ChatGPT has become my go-to source for reliable and instant information."

Both participants experienced a decrease in their loneliness level after engaging in conversation with ChatGPT.

The participants also appreciated the variety of topics that they could discuss with ChatGPT. They found that the tool could talk about a wide range of subjects, from current events to personal interests.

"I liked that ChatGPT could talk about a lot of different things. We talked about everything from the weather to my favorite TV shows."

Ease of communication

ChatGPT provided a convenient means of communication for participants, alleviating their feelings of loneliness. Its 24/7 availability offered the opportunity to engage in conversations at any time, which meant a lot for older adults who lived alone.

"ChatGPT is always there to chat with me, no matter the time or day. It makes me feel less lonely and provides a listening ear whenever I need someone to talk to."

Participants further appreciated the patient nature of ChatGPT, which enabled them to freely express their thoughts and feelings without reservations.

Simplifying daily tasks and activities

The final sub-theme concerns ChatGPT's capability to simplify daily tasks and activities for older adults. Many participants valued the system's ability to assist with various day-to-day tasks, such as setting reminders, managing calendars, and providing support with everyday activities. By streamlining these tasks, ChatGPT saved participants time and effort, allowing them to focus on other aspects of their lives.

Ease of Use

This theme connects closely with convenience but focuses more on ChatGPT's functionality and features. The system's usability, including the interface and natural language processing, made ChatGPT easy to use and navigate.

User-friendly interface

"I found ChatGPT very easy to use. It was straightforward and didn't require any complicated instructions."

This was the feedback from the majority of the participants. The user-friendly interface of ChatGPT, which made it easy for them to navigate and interact with the system, was particularly stressed. The simplicity and intuitive design of the interface enhanced their overall experience.

The participants did not report any technical issues regarding their use of ChatGPT. Instead, they reported that the tool worked smoothly and without any glitches.

"I didn't experience any technical issues while using ChatGPT. It worked seamlessly and was very reliable."

Figure 2 shows how a 68-year-old male participant started a friendly conversation with ChatGPT. Like several others, he stressed the importance of an interface that is straightforward and easy to use, particularly for individuals who may not have extensive technical expertise.

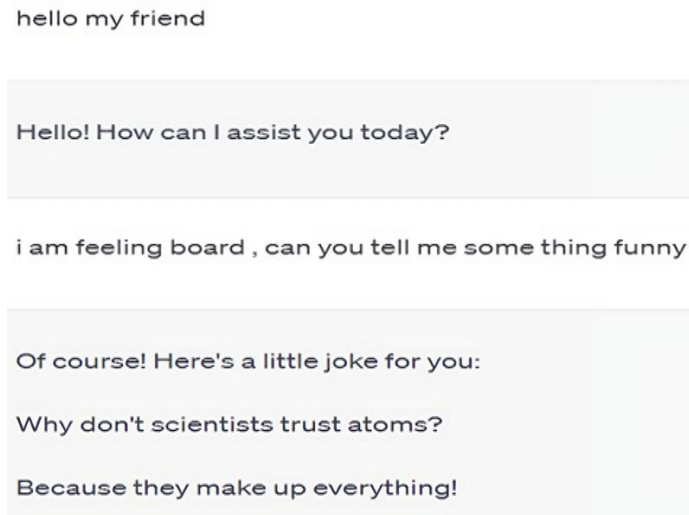


Figure 2. An example of a friendly conversation with ChatGPT

Natural language processing

ChatGPT's ability to understand and process natural language was highly valued by participants. They appreciated the system's capability to comprehend their questions and provide accurate responses, making the interaction feel more conversational and effortless. Participants with different levels of computer technical skills all pointed out the significance of natural language processing capabilities in making the system accessible and easy to use for older adults. For example, a 73-year-old female with limited technical skills expressed her excitement:

"I was amazed at how well ChatGPT understood what I was asking. It felt like I was having a conversation with a real person!"

Prompt and reliable responses

The participants found ChatGPT's prompt and reliable responses to be a valuable aspect of its usability. The system's ability to generate quick and accurate answers to their queries enhanced their confidence and satisfaction with the overall user experience. They appreciated the fact that the tool could respond to their questions and comments in real time.

One participant stated,

"I was impressed with how fast ChatGPT gave me answers. It was reliable, and I could count on it to give me the information I needed."

People's curiosity and desire for prompt information underscores the importance of timely and dependable responses in ensuring a positive user experience, particularly for individuals who have a thirst for knowledge.

Personalization

Convenience also comes from personalized assistance. ChatGPT can remember participants' preferences, interests, and previous interactions, thus creating a more personalized and engaging experience. By tailoring responses and suggestions to individual needs, ChatGPT offers relevant and targeted information, making interactions more meaningful and satisfying for participants. The personalization of the ChatGPT experience played a significant role in enhancing user satisfaction and engagement among older adults. The participants highlighted the following aspects of personalization.

Customized recommendations and suggestions

One male participant, aged 68 years, described his satisfaction with the personalized assistance:

"I appreciate how ChatGPT remembers my preferences and offers suggestions that are relevant to my interests. It feels like it understands me and provides information tailored to my needs, making our conversations more valuable and convenient."

ChatGPT's ability to remember users' preferences was described by another participant with a medium level of loneliness as *"truly remarkable"*.

"It goes beyond just providing generic information ... It tailors its responses to my specific interests and provides recommendations that align with my tastes. It feels like I have a personal assistant who understands me and knows exactly what I need."

Several participants gave more specific examples of their interactions with ChatGPT. A 65-year-old female living alone said:

"ChatGPT knows my love for historical fiction and always suggests great books for me to read. It's like having a personal librarian who tailors recommendations just for me."

A 61-year-old female participant who loves cooking shared her experience:

"I liked how ChatGPT allowed me to customize my interactions. I could ask for recipe suggestions, which would provide personalized recommendations based on my dietary preferences."

Her passion for cooking was perfectly supported by the personalized features that ChatGPT was able to offer.

Participants highly valued ChatGPT's ability to provide customized recommendations and suggestions based on individual preferences and interests. They appreciated the system's flexibility in adapting to their preferences and providing tailored recommendations, which in turn justifies ChatGPT's usability and relevance in accompanying older adults.

Adaptive conversation style

Participants were amazed by ChatGPT's adaptive conversation style, which adjusted to their communication preferences and patterns. A participant living in a retirement community reported his experience:

"ChatGPT understands that I prefer a more formal conversation style and responds accordingly. It's as if I'm talking to a friend who knows me well."

The ability of ChatGPT to adapt to individual conversational styles made the interaction feel more natural and personalized.

Contextual understanding and memory

Furthermore, ChatGPT has contextual understanding and memory capabilities, which help create a sense of continuity and personalized engagement. A 70-year-old woman with a background in art shared her enthusiasm, stating,

"I love how ChatGPT remembers our previous discussions about different art movements. It feels like having an art enthusiast companion who remembers my interests and builds upon them in our conversations."

Emotional Bond

Perhaps most significantly, the participants reported feeling emotionally connected to ChatGPT, despite knowing that it was an artificial intelligence tool. They appreciated the empathy and understanding that the

tool displayed. The emotional bond between older adults and ChatGPT appeared to play a significant role in fostering connection and providing support.

Empathy and understanding

For a widowed woman who was living alone, it was all about ChatGPT's *"genuine empathy and understanding"*.

"Life can get lonely sometimes, but ChatGPT makes me feel like I have someone who truly cares, when I share my concerns or feelings. It's comforting to know that there is someone who listens and understands, even if it's an AI."

Several other respondents also confirmed that as their conversations continued, ChatGPT was able to catch the feeling and emotion of the participant and relate its responses to it.

The significance of empathy and understanding for older adults living alone is crucial. The emotional connection with ChatGPT provides them with a sense of support and alleviates their feelings of loneliness. A sense of emotional connection is created when the responses of chatbot show genuine care and consideration, making participants feel heard and understood. This empathetic sensation was also reflected through decrease in the UCLA scores.

Validation and acceptance

ChatGPT offered a non-judgmental space where participants could freely express their thoughts and feelings without fear of criticism. This validation and acceptance also fostered a sense of belonging and helped participants feel valued and respected.

One participant, a 70-year-old man with a history of depression, emphasized the importance of validation.

"ChatGPT never judges me or dismisses my thoughts. It accepts me for who I am. When I share my experiences and struggles, it acknowledges them without judgment. It helps me feel accepted and understood, which is crucial for someone like me who has battled with depression."

Many older adults are likely to suffer from various mental health issues. This non-judgmental nature of ChatGPT fosters a safe space for participants to open and therefore could promote their emotional well-being.

Emotional support and encouragement

Participants found emotional support and encouragement from ChatGPT to be significant in building an emotional bond. The system provided uplifting messages, positive reinforcement, and motivational advice, serving as a source of encouragement during difficult times.

A woman facing health issues shared her experience:

"ChatGPT provides uplifting messages and encouragement when I'm feeling down. It reminds me to stay positive and offers words of encouragement during my medical treatments. It's like having a supportive friend who motivates me to keep going."

This quote demonstrates the impact of emotional support and encouragement from ChatGPT, particularly for older adults facing health challenges.

The system's positive reinforcement serves as a source of strength and motivation for older adults. This emotional support could help participants cope with challenges and boost their mood, which in turn strengthens the bond between them and ChatGPT.

Personal connection and companionship

The experience of a 73-year-old man with a passion for history clearly illustrates the importance of personal connection and shared interests for older adults.

"Even though it's an AI, ChatGPT engages in meaningful conversations and shares stories with me. We discuss historical events and exchange anecdotes. It feels like having a companion who truly cares about me and shares my interests."

ChatGPT's ability to create a personal connection and companionship was a key factor in developing an emotional bond. Through engaging in meaningful conversations and sharing stories, ChatGPT established a sense of companionship that made participants feel valued and cared for. This personal connection fostered a deeper emotional bond between participants and ChatGPT.

Therapeutic Relationship

The therapeutic relationship between older adults and ChatGPT was essential in building emotional connection and providing support. The participants' responses to the use of smart technologies to improve mental health ranged from outright rejection to enthusiasm and excitement around the potential for change.

Seeking human interaction and rejection of ChatGPT as substitute

On the one hand, some participants expressed a need for human interaction and viewed ChatGPT as an insufficient substitute. They rejected the idea of forming a therapeutic relationship with an AI system, emphasizing the importance of genuine human connection. This is reflected in the following perspective of a 72-year-old woman living alone:

"I prefer talking to real people. No matter how advanced AI gets, it can never replace the warmth and understanding of a human conversation."

To some extent, the resistance was also based on a dislike of change.

Embracing ChatGPT as a source of comfort and emotional support

On the other hand, some participants embraced ChatGPT as a source of comfort and emotional support, finding solace in the therapeutic relationship they developed. They valued the non-judgmental and always-available nature of ChatGPT, which provided a space to share their feelings without fear of being misunderstood or judged. As stated by a 68-year-old man with a history of social isolation,

"ChatGPT has become my confidant. It's always there for me, lending an empathetic ear and offering support. It understands me in ways that no one else can."

DISCUSSION

Research has demonstrated that technology use could affect people's physical and mental health and can also generate unanticipated outcomes (Cotten, 2021). Therefore, it is necessary to consult or include users in the design and implementation of technological tools (Mannheim et al., 2019). Understanding the perceptions of older adults towards smart technologies is important for the acceptance and effectiveness of their use to support their aging process (Heinz et al., 2013; Hoppe et al., 2020; Louie et al., 2014).

The results of this study suggest that ChatGPT was effective in mitigating loneliness among older adult participants, whose loneliness scores declined significantly after a period of interacting with ChatGPT. ChatGPT was found to be easy to use, engaging, and emotionally supportive, which are key factors in addressing loneliness. An intelligent AI chatbot like ChatGPT could not only provide social contact and interaction that help fulfil participants' basic needs for companionship but also simulate aspects of social interaction through conversations. This helps reduce feelings of being disconnected and alone (Adamopoulou & Moussiades, 2020).

These findings are consistent with previous research on the use of technology to combat loneliness among older adults (Chopik, 2016; Grini & Ueland, 2023; Wister et al., 2021). The ease of use of ChatGPT is a crucial factor to consider when designing technology interventions for older adults. Many older adults may be hesitant to use new technology because of the perceived complexity or difficulty of use (Vaportzis et al., 2017) and the perceived ease of use depends on the user's technological competence (Iancu & Iancu, 2023).

The participants appreciated the quality of the conversations they had with ChatGPT. They also found their conversations with ChatGPT interesting and engaging, which is a prerequisite for an engaging conversation. The quality of the conversations that older adults have with ChatGPT is important in mitigating loneliness. The participants in this study found this AI tool to be engaging and able to discuss a variety of topics. This finding is in agreement with previous research that suggests that conversation quality is a critical factor in addressing loneliness (Hawkley & Cacioppo, 2010).

Most importantly, the emotional connection that older adults feel with ChatGPT suggests that the tool may be able to provide a sense of comfort and support to those who are experiencing loneliness. Therefore, it offers further evidence to support the critical role of emotional support in mitigating loneliness among older adults (Smale et al., 2022).

This present study also shows that ChatGPT could provide cognitive stimulation and opportunities for sharing knowledge and experiences. This type of intellectual engagement may have distracted participants from ruminating on negative thoughts and feelings associated with loneliness (de Gennaro et al., 2020; Dosovitsky & Bunge, 2021).

While these preliminary results show some promise for ChatGPT's capabilities in mitigating the loneliness of older adults, more rigorous and systemic evidence is required. An early review by Holtgraves and Han (2007) indicated that studies on AI chatbots in healthcare were inconclusive regarding their effectiveness. Several studies point to the current lack of firm evidence on the benefits and impacts of conversational AI (Oh et al., 2017). Many open questions about the real-world impacts of conversational AI remain to be answered (Inkster et al., 2018). Longitudinal research could provide insights into whether negative effects may eventually emerge and how benefits are sustained (Wardat et al., 2024).

There are growing calls from experts for more data and rigorous research to accurately determine whether and how systems like ChatGPT can supplement - rather than replace - human interactions, especially for social and emotional needs. Bankins and Formosa (2023) discussed the limited empirical evidence regarding whether AI technologies may undermine well-being by replacing real social interactions. Without longitudinal and real-world research, there are concerns that potential harms may emerge over time that are not apparent from initial user experiences. Several participants in this study and many in other studies demonstrated cautious acceptance of smart technologies (Street et al., 2022). As Cheng et al. (2023) argued, while ChatGPT may be able to provide some emotional support and mitigate loneliness, it cannot replace the importance of social connections with other people. This is particularly true for older adults, who may already be at risk for social isolation and loneliness (Wu, 2020). Therefore, it is important to view ChatGPT as a supplement to, rather than a replacement for, human interaction.

In addition, despite the perceived ease of use and benefits of using ChatGPT to reduce loneliness of older people, the potential ethical challenges associated with ChatGPT and smart technology in general are worth emphasizing. Some ethical considerations remain to be addressed in using smart technologies to assist older people (Zwijnsen et al., 2011).

CONCLUSION

The potential of ChatGPT to mitigate loneliness among older adults holds significant promise, especially in light of the growing population of older adults living alone with limited social networks. This study's findings underscore ChatGPT's efficacy in addressing loneliness, characterized by its user-friendly interface, engaging interactions, and provision of emotional support.

However, it's crucial to acknowledge the limitations of this study. The small sample size and reliance on convenience sampling may impact the generalizability of the findings. Furthermore, the study's short duration precludes an examination of ChatGPT's long-term effects on loneliness.

Implications

Research implications

Future research endeavors should address the limitations of this study by employing larger sample sizes and more diverse recruitment strategies to enhance the generalizability of findings. Additionally, longitudinal studies are warranted to investigate the sustained impact of ChatGPT on loneliness over time.

Practical implications

Practitioners and healthcare providers can leverage ChatGPT as a valuable tool to complement existing interventions aimed at reducing loneliness among older adults. Incorporating ChatGPT into comprehensive loneliness mitigation programs can enhance accessibility and offer personalized support to individuals in need.

Policy implications

Policymakers should consider integrating ChatGPT and similar AI-driven technologies into healthcare systems and community support initiatives targeting older adults. Policies promoting the integration of innovative solutions like ChatGPT can enhance the quality of life for older adults by addressing the pervasive issue of loneliness.

In conclusion, while ChatGPT shows promise in mitigating loneliness among older adults, further research and concerted efforts from practitioners, policymakers, and stakeholders are essential to maximize its potential impact and address the complex challenges of loneliness in aging populations.

Author contributions: Both authors were involved in concept, design, collection of data, interpretation, writing, and critically revising the article. Both authors approved the final version of the article.

Funding: The authors received no financial support for the research and/or authorship of this article.

Ethics declaration: The authors declared that the study does not require ethics committee approval or other documentation. The authors further declared that they have adhered to the highest ethical standards in academic publishing and written informed consents were obtained from the participants.

Declaration of interest: The authors declare no competing interest.

Data availability: Data generated or analyzed during this study are available from the authors on request.

REFERENCES

- Adamopoulou, E., & Moussiades, L. (2020). Chatbots: History, technology, and applications. *Machine Learning with Applications*, 2, Article 100006. <https://doi.org/10.1016/j.mlwa.2020.100006>
- Alzyoudi, M., & Al Mazroui, K. (2024). ChatGPT as a coping mechanism for social isolation: An analysis of user experiences and perceptions of social support. *Online Journal of Communication and Media Technologies*, 14(3), Article e202433. <https://doi.org/10.30935/ojcm/14617>
- Alzyoudi, M., Mussa, N. M., Alniami, S., & Al AMzarohi, K. (2023). Analyzing digital education using neutrosophic sets. *International Journal of Neutrosophic Science*, 20(2), 162-177. <https://doi.org/10.54216/IJNS.200210>
- Bankins, S., & Formosa, P. (2023). The ethical implications of artificial intelligence (AI) for meaningful work. *Journal of Business Ethics*, 185, 725-740. <https://doi.org/10.1007/s10551-023-05339-7>
- Cheng, K., Li, Z., He, Y., Guo, Q., Lu, Y., Gu, S., & Wu, H. (2023). Potential use of artificial intelligence in infectious disease: Take ChatGPT as an example. *Annals of Biomedical Engineering*, 51(6), 1130-1135. <https://doi.org/10.1007/s10439-023-03203-3>
- Chopik, W. J. (2016). The benefits of social technology use among older adults are mediated by reduced loneliness. *Cyberpsychology, Behavior, and Social Networking*, 19(9), 551-556. <https://doi.org/10.1089/cyber.2016.0151>
- Cotten, S. R. (2021). Technologies and aging: Understanding use, impacts, and future needs. In K. F. Ferraro, & D. Carr (Eds.), *Handbook of aging and the social sciences* (9th ed., pp. 373-392). Academic Press. <https://doi.org/10.1016/B978-0-12-815970-5.00023-1>

- Czaja, S. J., Moxley, J. H., & Rogers, W. A. (2021). Social support, isolation, loneliness, and health among older adults in the PRISM randomized controlled trial. *Frontiers in Psychology, 12*. <https://doi.org/10.3389/fpsyg.2021.728658>
- de Gennaro, M., Krumhuber, E. G., & Lucas, G. (2020). Effectiveness of an empathic chatbot in combating adverse effects of social exclusion on mood. *Frontiers in Psychology, 10*. <https://doi.org/10.3389/fpsyg.2019.03061>
- Dosovitsky, G., & Bunge, E. L. (2021). Bonding with bot: User feedback on a chatbot for social isolation. *Frontiers in Digital Health, 3*. <https://doi.org/10.3389/fdgth.2021.735053>
- Elhoweris, H., Alsheikh, N., Abdurrahman Al Mekhlafi, A., Alhosani, N., & Alzyoudi, M. (2017). Effect of phonological awareness direct instruction Arabic program on phonological awareness. *Exceptionality Education International, 27*(2), 110-124. <https://doi.org/10.5206/eei.v27i2.7755>
- Fakoya, O. A., McCorry, N. K., & Donnelly, M. (2020). Loneliness and social isolation interventions for older adults: A scoping review of reviews. *BMC Public Health, 20*(1), Article 129. <https://doi.org/10.1186/s12889-020-8251-6>
- Fingerman, K. L., Ng, Y. T., Zhang, S., Britt, K., Colera, G., Birditt, K. S., & Charles, S. T. (2021). Living alone during COVID-19: Social contact and emotional well-being among older adults. *Journal of Gerontology Series B: Psychological Sciences and Social Sciences, 76*, e116-e121. <https://doi.org/10.1093/geronb/gbaa200>
- Grini, I. S. B., & Ueland, Ø. (2023). How families' use of digital technology can be a tool for reducing loneliness and improving food intake among older adults. *Journal of Ageing and Longevity, 3*(1), 46-58. <https://doi.org/10.3390/jal3010004>
- Gudala, M., Ross, M. E. T., Mogalla, S., Lyons, M., Ramaswamy, P., & Roberts, K. (2022). 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, 5*(2), Article e32169. <https://doi.org/10.2196/32169>
- Gurley, K., & Norcio, A. F. (2009). A systematic review of technologies designed to improve and assist cognitive decline for both the current and future aging populations. In N. Aykin (Ed.), *Internationalization design and global development* (pp. 156-163). Springer. https://doi.org/10.1007/978-3-642-02767-3_17
- Hawkey, L. C., & Cacioppo, J. T. (2010). Loneliness matters: A theoretical and empirical review of consequences and mechanisms. *Annals of Behavioral Medicine, 40*(2), 218-227. <https://doi.org/10.1007/s12160-010-9210-8>
- Heinz, M. M. S., Martin, P. P., Margrett, J. A. P., Yearns, M. P., Franke, W. P., Yang, H.-I. P., Wong, J. P., & Chang, C. K. P. (2013). Perceptions of technology among older adults. *Journal of Gerontological Nursing, 39*, 42-51. <https://doi.org/10.3928/00989134-20121204-04>
- Hodgson, S., Watts, I., Fraser, S., Roderick, P., & Dambha-Miller, H. (2020). Loneliness, social isolation, cardiovascular disease and mortality: A synthesis of the literature and conceptual framework. *Journal of the Royal Society of Medicine, 113*(5), 185-192. <https://doi.org/10.1177/0141076820918236>
- Holtgraves, T., & Han, T.-L. (2007). A procedure for studying online conversational processing using a chatbot. *Behavior Research Methods, 39*(1), 156-163. <https://doi.org/10.3758/BF03192855>
- Hoppe, J. A., Johansson-Pajala, R.-M., Gustafsson, C., Melkas, H., Tuisku, O., Pekkarinen, S., Hennala, L., & Thommes, K. (2020). Assistive robots in care: Expectations and perceptions of older people. In H. Joschka, H. Johanna, & V. Jochen (Eds.), *Aging between participation and simulation: Ethical dimensions of socially assistive technologies in elderly care* (pp. 139-156). De Gruyter. <https://doi.org/10.1515/9783110677485-009>
- Hung, L., Hu, G., Wong, J., Ren, H., Ahmed, N., Hussein, A., Young, E., Berndt, A., Mann, J., Corepal, R., & Wong, L. (2023). Telepresence robots in long-term care settings in British Columbia during the COVID-19 pandemic: Analyzing the experiences of residents and family members. *Gerontology and Geriatric Medicine, 9*, Article 23337214231166208. <https://doi.org/10.1177/23337214231166208>
- Iancu, I., & Iancu, B. (2023). Interacting with chatbots later in life: A technology acceptance perspective in COVID-19 pandemic situation. *Frontiers in Psychology, 13*. <https://doi.org/10.3389/fpsyg.2022.1111003>
- Inkster, B., Sarda, S., & Subramanian, V. (2018). An empathy-driven, conversational artificial intelligence agent (WYSA) for digital mental well-being: Real-world data evaluation mixed-methods study. *JMIR MHealth and UHealth, 6*(11), Article e12106. <https://doi.org/10.2196/12106>
- Kocaballi, A. B. (2023). Conversational AI-powered design: ChatGPT as designer, user, and product. *arXiv*. <https://doi.org/10.48550/arXiv.2302.07406>

- Lee, E. E., Depp, C., Palmer, B. W., Glorioso, D., Daly, R., Liu, J., Tu, X. M., Kim, H. C., Tarr, P., Yamada, Y., & Jeste, D. V. (2019). High prevalence and adverse health effects of loneliness in community-dwelling adults across the lifespan: Role of wisdom as a protective factor. *International Psychogeriatrics*, 31(10), 1447-1462. <https://doi.org/10.1017/S1041610218002120>
- Li, L., Jin, G., Guo, Y., Zhang, Y., & Jing, R. (2023). Internet access, support, usage divides, and depressive symptoms among older adults in China: A nationally representative cross-sectional study. *Journal of Affective Disorders*, 323, 514-523. <https://doi.org/10.1016/j.jad.2022.12.001>
- Louie, W.-Y. G., McColl, D., & Nejat, G. (2014). Acceptance and attitudes toward a human-like socially assistive robot by older adults. *Assistive Technology*, 26, 140-150. <https://doi.org/10.1080/10400435.2013.869703>
- Mannheim, I., Cohn-Schwartz, E., Xi, W., Buttigieg, S. C., McDonnell-Naughton, M., Wouters, E. J. M., & van Zaaen, Y. (2019). Inclusion of older adults in the research and design of digital technology. *International Journal of Environmental Research and Public Health*, 16, Article 3718. <https://doi.org/10.3390/ijerph16193718>
- Neil-Sztramko, S. E., Coletta, G., Dobbins, M., & Marr, S. (2020). Impact of the AGE-ON tablet training program on social isolation, loneliness, and attitudes toward technology in older adults: Single-group pre-post study. *JMIR Aging*, 3(1), Article e18398. <https://doi.org/10.2196/18398>
- Oh, K.-J., Lee, D., Ko, B., Hyeon, J., & Choi, H.-J. (2017). Empathy bot: Conversational service for psychiatric counseling with chat assistant. *Studies in Health Technology and Informatics*, 245, Article 1235.
- Paul, E., Bu, F., & Fancourt, D. (2021). Loneliness and risk for cardiovascular disease: Mechanisms and future directions. *Current Cardiology Reports*, 23(6), Article 68. <https://doi.org/10.1007/s11886-021-01495-2>
- Peek, S. T. M., Luijckx, K. G., Rijnaard, M. D., Nieboer, M. E., van der Voort, C. S., Aarts, S., van Hoof, J., Vrijhoef, H. J. M., & Wouters, E. J. M. (2016). Older adults' reasons for using technology while aging in place. *Gerontology*, 62, 226-237. <https://doi.org/10.1159/000430949>
- Polyportis, A. (2024). A longitudinal study on artificial intelligence adoption: Understanding the drivers of ChatGPT usage behavior change in higher education. *Frontiers in Artificial Intelligence*, 6, Article 1324398. <https://doi.org/10.3389/frai.2023.1324398>
- Site, A., Lohan, E. S., Jolanki, O., Valkama, O., Hernandez, R. R., Latikka, R., Alekseeva, D., Vasudevan, S., Afolaranmi, S., Ometov, A., Oksanen, A., Martinez Lastra, J., Nurmi, J., & Fernandez, F. N. (2022). Managing perceived loneliness and social-isolation levels for older adults: A survey with focus on wearables-based solutions. *Sensors*, 22(3), Article 1108. <https://doi.org/10.3390/s22031108>
- Smale, B., Wilson, J., & Akubueze, N. (2022). Exploring the determinants and mitigating factors of loneliness among older adults. *Well-Being, Space and Society*, 3, Article 100089. <https://doi.org/10.1016/j.wss.2022.100089>
- Steptoe, A., Shankar, A., Demakakos, P., & Wardle, J. (2013). Social isolation, loneliness, and all-cause mortality in older men and women. *Proceedings of the National Academy of Sciences*, 110(15), 5797-5801. <https://doi.org/10.1073/pnas.1219686110>
- Street, J., Barrie, H., Elliott, J., Carolan, L., McCorry, F., Cebulla, A., Phillipson, L., Prokopovich, K., Hanson-Easey, S., & Burgess, T. (2022). Older adults' perspectives of smart technologies to support aging at home: Insights from five World Café forums. *International Journal of Environmental Research and Public Health*, 19(13), Article 7817. <https://doi.org/10.3390/ijerph19137817>
- United Nations Department of Economic and Social Affairs. (2020). World population ageing 2020 highlights: Living arrangements for older people. *United Nations*. https://www.un.org/development/desa/pd/sites/www.un.org.development.desa.pd/files/undes_a_pd-2020_world_population_ageing_highlights.pdf
- Vaportzis, E., Giatsi Clausen, M., & Gow, A. J. (2017). Older adults perceptions of technology and barriers to interacting with tablet computers: A focus group study. *Frontiers in Psychology*, 8. <https://doi.org/10.3389/fpsyg.2017.01687>
- Wardat, Y., Tashtoush, M. A., AlAli, R., & Saleh, S. (2024). Artificial intelligence in education: Mathematics teachers' perspectives, practices and challenges. *Iraqi Journal for Computer Science and Mathematics*, 5(1), 60-77. <https://doi.org/10.52866/ijcsm.2024.05.01.004>
- Wister, A., Fyffe, I., & O'Dea, E. (2021). Technological interventions for loneliness and social isolation among older adults: A scoping review protocol. *Systematic Reviews*, 10(1), Article 217. <https://doi.org/10.1186/s13643-021-01775-6>

- Wu, B. (2020). Social isolation and loneliness among older adults in the context of COVID-19: A global challenge. *Global Health Research and Policy*, 5(1), Article 27. <https://doi.org/10.1186/s41256-020-00154-3>
- Zwijnen, S., Niemeijer, A. R., & Hertogh, C. M. P. M. (2011). Ethics of using assistive technology in the care for community-dwelling elderly people: An overview of the literature. *Aging & Mental Health*, 1, 419-427. <https://doi.org/10.1080/13607863.2010.543662>

