MindTalker: Navigating the Complexities of AI-Enhanced Social Engagement for People with Early-Stage Dementia

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ABSTRACT

People living with dementia are at risk of social isolation, and conversational AI agents can potentially support such individuals by reducing their loneliness. In our study, a conversational AI agent, called MindTalker, co-designed with therapists and utilizing the GPT-4 Large Language Model (LLM), was developed to support people with early-stage dementia, allowing them to experience a new type of "social relationship" that could be extended to real life. Eight PwD engaged with MindTalker for one month or even longer, and data was collected from interviews. Our findings emphasized that participants valued the novelty of AI, but sought more consistent, deeper interactions. They desired a personal touch from AI, while stressing the irreplaceable value of human interactions. The findings underscore the complexities of AI engagement dynamics, where participants commented on the artificial nature of AI, highlighting important insights into the future design of conversational AI for this population.

CCS CONCEPTS

• **Applied computing** → **Health care information systems**; • **Human-centered computing**;

KEYWORDS

Chatbots, Conversational AI, Dementia, Reminiscence Therapy

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1 INTRODUCTION

Dementia, predominantly affecting older people with about one in six individuals at the age of 80 experiencing its symptoms [53], is a condition characterized by a decline in cognitive abilities that significantly disrupts their daily life. As dementia progresses, individuals often grapple with challenges such as forgetfulness, communication barriers, and emotional difficulties [29]. These challenges often result in social withdrawal, leading to heightened feelings of loneliness, isolation, and depression. This isolation not only exacerbates emotional distress but can also accelerate cognitive decline. In light of these challenges, fostering social connectedness and companionship has emerged as a vital countermeasure to mitigate the detrimental impacts of dementia.

Non pharmaceutical approaches such as Reminiscence Therapy (RT) and Cognitive Stimulation Therapy (CST) have emerged as therapeutic interventions that utilize past memory and cognitive engagement to combat the feelings of isolation for people with dementia (PwD). RT, in particular, uses artifacts such as photographs, videos, and music from the past to evoke memories, thereby improving mood and fostering social interactions [42], [15] . CST, on the other hand, focuses on stimulating cognitive processes, and has been shown to enhance mental functioning and overall well-being [12], [72].

Recent advances in digital technology have brought forth innovative platforms that augment traditional interventions, offering a more interactive experience. In particular, past studies have highlighted the potential of computerized cognitive interventions in enhancing cognition, reducing depression, and alleviating anxiety among PwD [21]. For Reminiscence Therapy in particular, previous researchers have shown how touchscreen devices, wall-sized displays and even Virtual Reality (VR) technology, which display

content related to the past memories of PwD as well as various interactive sound-based devices, could be used to support the reminiscence process [3], [52], [64]. Such technologies have spurred interest in the HCI research community, leading to the exploration of digital tools that stimulate, collect, and share memories, thereby enhancing social connectedness.

Given the challenges of social isolation and cognitive decline inherent to dementia, the advancement of digital technology also opens avenues to delve deeper into the potential of emerging technologies, such as conversational AI to support PwD. By fostering social connectedness and companionship, conversational AI can play a pivotal role in reducing feelings of loneliness and isolation. Moreover, with advanced large language models such as ChatGPT and Llama2, conversational AI can be developed to facilitate better communication, allowing users to express their thoughts and emotions more effectively, thereby resulting in more stimulating conversations.

While there has been growing interest in utilizing conversational AI for dementia care [50], [28] including in areas like RT and CST, there remains a significant gap in understanding the specific potential advantages as well as pitfalls of conversational AI for PwD. In particular, we know little about how these technologies can be tailored to their unique communication needs, preferences, and emotional responses to enhance meaningful social interactions, thereby reducing feelings of isolation. Therefore, in our study, we aim to explore the potential of conversational AI in enhancing social connectedness and providing companionship for PwD through reminiscence activities, focusing on early-stage dementia. We aim to address the following research questions:

(1) RQ1: How can conversational AI be tailored to resonate with the unique conversational nuances and needs of PwD?
(2) RQ2: How can a dementia-friendly AI system be designed to facilitate reminiscence therapy in innovative and impactful ways?
(3) RQ3: What are the potential challenges, pitfalls, and ethical considerations when deploying AI-driven reminiscence therapy in dementia care settings?

To address these research questions, we first adopted a co-design approach to develop "MindTalker", an audio-based conversational agent created using the state-of-the-art GPT-4 Large Language Model (LLM) to carry out meaningful conversations with people with early stage dementia in collaboration with dementia experts and therapists. Afterwards, eight PwD were asked to use MindTalker for about one month and their experience with the system was evaluated through in-depth interviews to better understand their perception about the AI agent as well as the impact and potential benefits and challenges of implementing conversational AI for Dementia care.

Overall, the results from our study helped contribute to existing research on conversational agents and PwD by (1) underscoring the importance of human-like characteristics such as an identity for a conversational agent in PwD-AI interaction, especially for building a common ground and establishing rapport in conversations (2) highlighting the advantages and limitations in the use of conversational agents for RT (such as the inability to connect facts to an individual's personal history) as well as the need to introduce new forward-looking topics instead of only focusing on the past (3) exploring the various roles (e.g. facilitator, companion or therapist) and relationship patterns between chatbots and PwD users as well as potential drawbacks and ethical challenges.

This paper is organized as follows: in Section 2, we offer a review of previous works related to Dementia care, reminiscence therapy and conversational AI. In Section 3, we report our 2-phase study method including the iterative co-design of the experiment prototype, MindTalker, and the method used to evaluate the system with 8 PwD end-users and their care dyads. In Section 4, we present our findings, which include themes such as the rich and complex nature of PwD-AI conversational dynamics and the emotional and cognitive implications that arose from such interactions. We then critically discuss the insights drawn from our analysis based on the above-mentioned RQs in Section 5, and conclude the study in Section 6.

2 RELATED WORK

The intersection of dementia care and digital technology has grown progressively in the past decade, signifying a pivotal shift in healthcare. With the growing global prevalence of dementia, the imperative for innovative technological interventions is evident. Such technologies not only aim to ameliorate the quality of life for those diagnosed with dementia but also aim to equip caregivers with effective tools for providing care and support. In this section, we provide a highlight of the progression and implications of digital interventions in dementia care.

2.1 The Use of Digital Technology to enhance Dementia Care and Reminiscence Therapy

The rapid development of digital technologies has revolutionized dementia care in recent years. Innovative technologies ranging from health monitoring systems to immersive VR experiences, play an increasingly role in improving the daily lives of PwD [20], [58]. For instance, smart home systems have surfaced as a key asset for caregivers. By tracking the behavioral tendencies of PwD, these systems can promptly notify caregivers of any anomalies, thereby ensuring patient safety while still preserving their independence [32]. Such advancements have not only mitigated the daily challenges encountered by caregivers but could also improve their autonomy.

Biographical displays and digital storytelling technologies have also emerged as significant tools for supporting dementia care. Such technologies help enhance the well-being of PwD by acknowledging their personal history and experiences. In particular, digital storytelling emphasizes the view that PwD are unique persons with rich experiences and values, rather than defining them solely by their diagnosis. Prior studies have shown how this approach helps caregivers and family members see the individuals beyond their condition, and suggests that digital storytelling can help support memory, identity, and self-confidence in older adults [24], [47]. Digital storytelling could also increase confidence, connection with others and provide a sense of purpose [61]. Purves *et al.*'s work [45] in this domain in particular has been pivotal as she has explored the use of narratives to foster resilience in PwD. Astell's works have often involved PwD in the design process to create either computer-based support systems [1] or touch screen systems to

support relationships between PwD and their caregivers [2]. Digital storytelling, particularly when related to key life transitions, memories and personal legacies could also create meaningful digital experiences which strongly resonates with personal life experiences [57]. In this regard, previous studies carried out by Crete *et al.* [11] have shown how digital media can be used to aid in the capturing and sharing of key personal narratives, often in innovative and interactive ways. In relation to biographical displays, this work also focuses on how digital technologies can be used to represent a person's life story or significant life events. This includes digital memorials or interactive displays that showcase a person's history, achievements, and memories [35].

Reminiscence therapy-based digital interventions, which encourage PwD to revisit and articulate their past experiences, have also undergone a digital transformation. The integration of interactive digital platforms has enriched this therapeutic method, rendering it more engaging and immersive. One example is the Timeless application [65]. Conceived with a personalization function, this application employs AI-driven facial recognition to aid users in recognizing and reconnecting with familiar faces. These digital enhancements not only amplify the therapeutic efficacy but also bridge the chasm between historical memories and contemporary realities. In other cases, VR technology has also been used to create a more immersive reminiscence experience, helping lower behaviors that challenge as well as enhancing subjective well-being. Beyond visual stimulation, researchers have even investigated the use of sound and touch as a means of stimulating past memories. While these technologies focus on making the reminiscence experience more salient, they are often not intelligent enough to enhance the specific conversational and thought processes involved in reminiscence therapy [66], [48].

2.2 Conversational AI in Dementia Care

The advent of conversational AI, in particular, those driven by LLMs has the potential to bring about significant changes in digital healthcare practice. Designed to emulate human interactions, these systems are particularly beneficial for people with communication impediments, such as PwD, as such technology has the potential to deliver personalized, context-specific, and meaningful conversations to engage such individuals.

Examples of this include smart voice assistants, such as Amazon Alexa or Google Home, which have emerged as useful tools that could be used to support PwD and their caregivers [33]. Such devices could assist caregivers and PwD, by allowing them to schedule reminders, as well as more easily curate entertainment activities. Interestingly, studies in this domain have also highlighted how the perception of voice assistants as being either human-like or object-like tends to be dynamic and is often influenced by factors such as the interaction style and the user's desire for social companionship [44]. As such, the importance of a user centered or participatory design approach is often raised when designing such technologies for PwD, to ensure that it is flexible and relevant enough to cater to the diverse yet specific needs and preferences of PwD, thus allowing them to effectively support their independence [14, 25]. Furthermore, recent studies have also highlighted how the integration of voice assistant technologies into devices such as robots, could also be useful in providing holistic support and helping PwD with daily tasks [43, 71].

Overall, such innovations hint as to the transformative potential of conversational agents in geriatric care. Past studies, such as those carried out by Zubatiy *et al.* have highlighted several roles these agents could have in supporting older adults with Mild Cognitive Impairment (MCI) and their care partners [78]. For example, Mathur *et al.* [36] shows how conversational assistants could support medication management for older adults with MCI. In addition, conversational agents could also be beneficial in providing older adults with easier access to essential information, aid in time management and facilitate conversation with others [16]. The potential of digital media to support meaningful inter-generational interactions is also highlighted in [69] by emphasizing the importance of a person-centered approach in conversations with PwD.

Despite such potential benefits, crafting conversational agents tailored for PwD poses distinct challenges. Such individuals frequently display unique linguistic and vocal attributes, marked by a contracted vocabulary and heightened hesitations. Various research endeavors, as highlighted by [68] and [49], have examined these communication intricacies, uncovering various pronounced communication disruptions in the conversation patterns for PwD. Several limitations of conversational agents in a care-giving setting such as their error handling ability are also highlighted in Zubatiy *et al.*'s work which further emphasizes the need to design a more dynamic and personalized conversation flow [77]. Interestingly, similar issues can also be observed when implementing such technology with older adults in general, such as perceived technical barriers [67], usability problems [30, 55], the lack of consideration for the context of older adults [41] and skepticism towards adopting novel technology [67]. Other potential drawbacks of using conversational AI technology include issues related to privacy and potentially receiving out of place or at times confusing messages [62]. In addition, researchers also cautioned against the over optimism of using AI for companionship, for its potential to disrupt natural human contact as well as the potential for unethical behaviors or even biases such as racism or genderism [4, 26, 46, 76]. This could be particularly concerning when this technology is used by older adults and those with dementia who may not be so well informed of such risks. Indeed, some of the early studies examining the use of chatbots/virtual agents with older people highlights the danger that older people may fall prey to privacy and security risks (e.g., information being misused for advertising purposes) [23], lose cognitive ability or mental engagement due to over reliance on the technology [16, 23] and experience reduced human contact if caregivers excessively rely on chatbots to address older people's emotional needs [56].

Finally, current conversational AI agents also often fail to effectively address the emotional nuances of conversing with PwD, and find it difficult to fully respond to the emotional aspects of communication which are key factors in the provision of in-depth emotional support. As such, most conversational AI Agents in this field tend to focus on the areas of diagnosis and routine support, with few being designed and developed to support in-depth social interaction for PwD, elements which are essential to their well-being.

3 METHOD

The study was structured into two primary phases: i) the ideation and iterative design of the MindTalker application and ii) the evaluation of the application.

3.1 Phase 1: Ideation and Iterative Design of MindTalker

While there have been conversational agents designed in other healthcare domains, we still know little about how they could be adapted effectively to support PwD. As such, in the first stage of the study, we adopted an iterative design approach [19] in which we specifically involved care-taking stakeholders, as well as dementia and technology experts to guide the design of the initial prototype, focusing on determining how conversational AI technology could be designed to enhance social connectedness for people with early stage dementia (See Table 1). The dementia experts we consulted were consultant practitioners for dementia, research fellows in psychology for PwD, psychologists with experience conducting Cognitive Stimulation and Reminiscence Therapy sessions with PwD, as well as psychiatrists specializing in dementia and running memory clinics. It should be noted that we had decided to include only therapists and dementia experts in the ideation and design phase 1) since our app was mainly designed to assist in the reminiscence therapy, a key goal of the brainstorming/focus group sessions was to understanding how GPT-4 could be programmed and prompted to replicate and support the reminiscence process, and thus we felt it was much more fruitful to involve specialists who possess key knowledge regarding the therapy process rather than to involve end-users at this stage 2) at the time of this study, GPT-4 has yet to be extensively evaluated with PwD, and thus we felt it would be more prudent to first have dementia experts and therapists examine the dialogues produced by the models before actively involving PwD to ensure safety 3) due to the difficulty of recruiting a large number of PwD and the potential strain (e.g. the cognitive load and emotional impact on PwD) associated with participating long-term (from design to delivery of the application), we did not wish to overburden PwD at the initial stage of the study and felt it would be more beneficial to include them primarily in the evaluation phase.

Initially, a review of state-of-the-art technologies (e.g. Siri, Alexa, Physical care robots), which had potential to reduce loneliness for PwD, was conducted both from reviewing literature and through discussions with stakeholders (2 dementia experts, 5 dementia therapists and 2 developers). The results indicated that an audio-based AI conversational agent, created using the GPT-4, deployed through an easily accessible mobile device, was the most ideal for facilitating in-depth conversation tasks such as reminiscence, and enhancing feelings of social connectedness. After formulating the initial concepts, two focus group sessions were carried out with dementia care experts and therapists to evaluate the features proposed in the concepts as well as the developed prototypes. In Focus Group 1, a group consisting of three therapists provided feedback on the initial user interface mockup and the desired conversational/communication patterns of the conversational agent, and in Focus Group 2, a group consisting of five therapists (3 of whom also participated in Focus Group 1), assessed the updated application prototype (the user interface, conversation flow etc.), and provided suggestions on the content and activities and shared their feedback with the researcher. Several changes were made following the focus group sessions to ensure that the user interface was highly accessible, especially for those with visual impairments (with large fonts and high-contrast colors, straightforward navigation with clear buttons, making the application compatible with VoiceOver and other iOS accessibility features). Overall, eleven prototype versions had been created and iteratively refined. The end-result was an iOS conversational AI application which we named "MindTalker", designed to facilitate reminiscence therapy and social connectedness for PwD.

As for the reminiscence process used in our application, we decided to design it based on psychological principles aimed at emotional support [40] and helping users maintain a connection to their environment and personal identity [60], [74] (following the results from the brainstorming and focus group sessions). Grounding techniques such as structured routine and reminders and behavioral reinforcement were used. These methods are particularly vital for PwD, who often experience memory loss, confusion, and emotional distress. In particular, we placed a strong emphasis on the personalization and familiarity grounding technique when designing the reminiscence therapy in our application. Participants were asked to reflect on past memories by uploading an image of a familiar memory, through which the conversational agent would inquire about their life history. Such an approach is based on the psychological theory that familiarity can be comforting and grounding for PwD, helping them to feel more secure in their environment. Moreover, the reminder function of the application (users would receive a reminder at their chosen specific time to chat with the conversational agent) created a sense of longing because of this established routine. This approach is grounded in the psychological understanding that a routine can provide a sense of predictability, therefore reducing stress and anxiety in PWD. Finally, behavioral reinforcement through the positive and non-judgmental comments/feedback of the conversational agent was applied during the human-chatbot interactions, through the training of the conversational agent's replies.

3.1.1 The MindTalker Application. The MindTalker is an iOS application tailored for individuals with early-stage dementia. It combines an audio-based conversational agent designed to carry out meaningful conversations through reminiscence therapy via the user's photo gallery. Figure 1 shows screenshots of the application in use.

The participants were suggested to be seated in a comfortable and quiet space with the company of their family members/carers to assist them if needed. When users first use the app, they would use the Accounting and Onboarding feature (Figure 1a to 1e) to enter their name, choose an icon to represent themselves, select the sex and voice (choice between Male or Female, and British or American accent) of their desired companion and add personal photos from their gallery (a minimum of 20 photos). Afterwards, users would be able to converse with the agent about selected photographs using the Conversation feature (Figure 1f to 1g). Users could press the microphone button and speak directly to the conversational agent to pose questions, express feelings, or delve into topics of interest

Session No.	Participants Involved	Activities and Purpose	Results
1	HRI researchers, UX/UI designers, Dementia experts	Initial brainstorming on the type of conversational agent, evaluation of existing conversational technology	• An easy-to-access mobile application was preferable (as opposed to a physical care robot) • A conversational agent created using a customized state-of-the-art LLM was more preferable (as voice assistants like Alexa were deemed not advanced enough for in-depth conversations) • An audio-based system for conversation was preferable (as opposed to typing)
2	Therapists (Focus Group 1)	Evaluation of the user interface and conversation patterns	• A welcoming and empathetic tone was preferred with slow, clear and uncomplicated speech patterns • Simplifying the follow up questions to one per response • Enlarging font-size and adding high contrast colours for those with visual impairments in the UI
3	Therapists (Focus Group 2)	Evaluation of the suggestions on the activity and content	• Updated activity and content design • Related the conversation to current affairs • Concerns about engaging PwD in conversation with a fictitious "person"

Table 1: Co-design Sessions Overview

in relation to the photos. The AI agent has been prompted to supply general knowledge, and to also interact with PwD to facilitate discussions around the memories linked to those images (e.g., by discussing the photo's content, asking open-ended questions such as "Who is in this photo?" or "What do you remember about this day?"). Finally, an in-app support feature (Figure 1h) is available where users can reach out for technical support through email, messaging, or phone, including WhatsApp options.

3.2 Phase 2: Evaluation of MindTalker

3.2.1 Study Procedure. Individuals with early-stage dementia were recruited to evaluate the MindTalker iOS application. Participants were recruited through various online and offline channels, including social media, Dementia and Alzheimer's Societies, Charities, and relevant communities. The Join Dementia Research also contributed to the recruitment strategy. Participants were given access to the application for the study after providing informed consent. The study was approved by the Central Research Ethics Advisory Group of the University of Kent in the UK. All participants were compensated with a £30 Amazon voucher for contributing to the study, and were able to opt out at any point of the study.

The study took place over a period of one month for each participant. After agreeing to participate, both participants and their carers were first given comprehensive online training related to the app's installation and usage. It should be noted that the chatbot was presented as an algorithm to all participants. The research team chose to declare its algorithmic nature transparently since it helped to prevent the possible confusion or distress caused by participants believing they are interacting with a human. Furthermore, it set a realistic expectation of the limitations of the chatbot/artificial intelligence and the degree of engagement such an interaction entails.

Participants, guided by their carers, were asked to engage with MindTalker at a minimum of 30 minutes in total (range: 37min-4.5 hours). Throughout the study, carers played an active role in monitoring and assisting participants, ensuring a routine was established for the usage of the app. During the usage period, technical support was also provided by the researchers via email, WhatsApp, or phone conversations. After the one month period, participants were interviewed, and carers provided feedback on the application.

3.2.2 Participant Details. Eight (8) participants agreed to participate in the study. Participants were living with early-stage dementia in their houses either alone or with a carer/family member, had no other comorbidities (i.e. neurodiversity syndromes, learning and/or communication difficulties) or any other difficulties that could hinder their ability to provide consent. Participants were able to communicate fluently in English, and had access to an iPhone or iPad compatible with iOS 16* as well as internet access. Participants consisted of (3) males and (5) females. 7 out of 8 were diagnosed in the last 3 years and 1 was undiagnozed (pre-diagnosed). Including a pre-diagnosed participant in our study was suggested by some of the therapists in the focus groups. It was believed that including a pre-diagnosed participant (who exhibited memory problems but

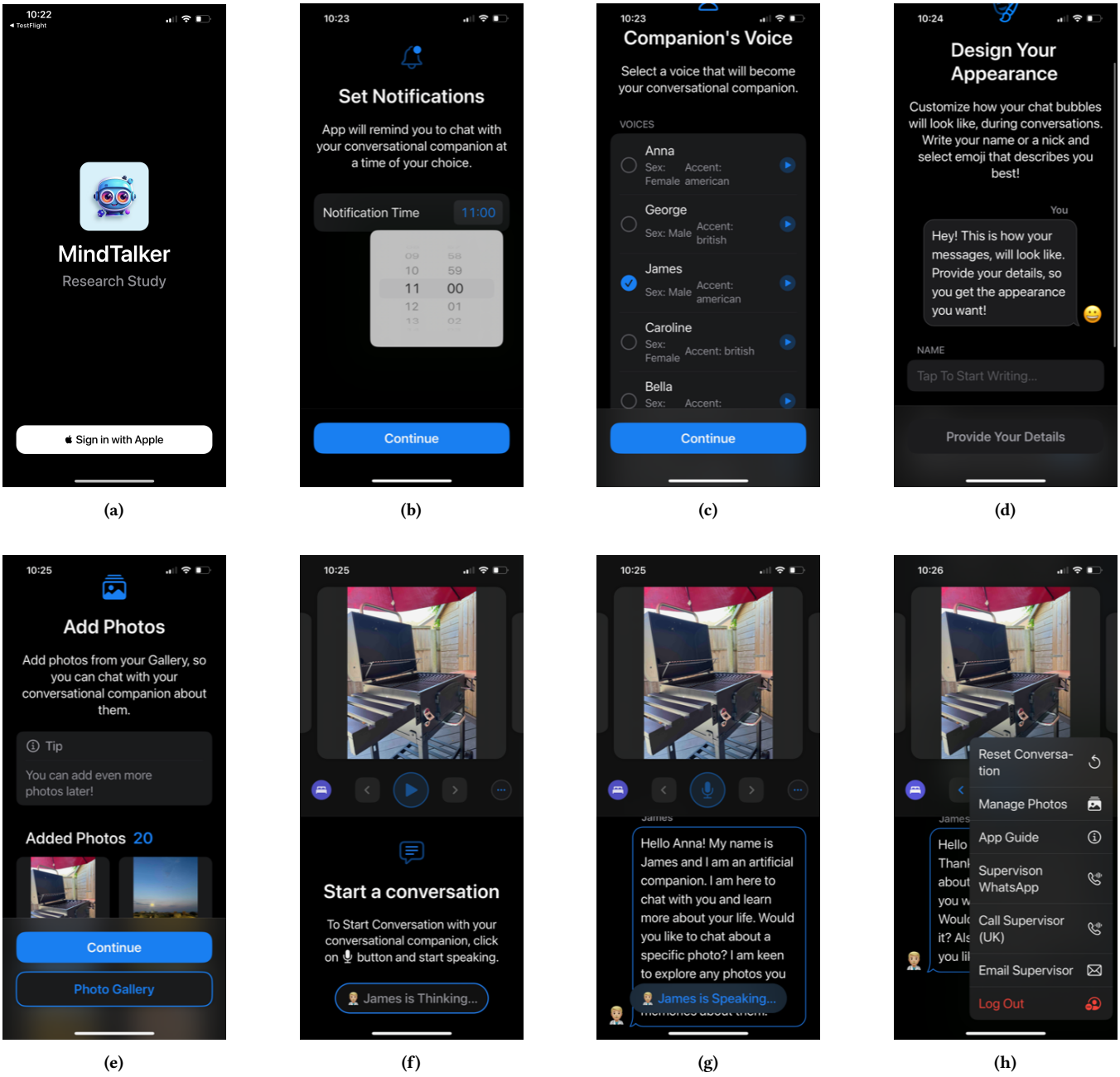

Figure 1: Screenshots of MindTalker app's onboarding feature (a-e), conversation feature (f-g) and support feature (h)

had not yet been formally diagnosed with dementia) can help provide insight into the impact of a conversational AI agents on those exhibiting early symptoms of dementia, which could be especially important since a formal diagnosis of dementia could take more than a year in certain cases, despite participants already suffering from cognitive and memory related issues, therefore enhancing the relevancy and generalizability of the study. (See Table 2 for full details of the participants).

3.3 Data collection

Data was gathered through semi-structured online Zoom interviews and pre and post study questionnaires. All data, including emails and online data, were securely stored on a password protected university drive. The semi-structured interview questions addressed topics related to their perception of the conversational agent interaction, and if and how the specific AI technology fulfilled their need for social connectedness as well as the quality

Participant ID	Gender	Age	Nationality	Diagnosed/Time	Type of Dementia	Total Interaction Time (min)
P1	Female	63	UK	Yes/2023	Alzheimer's	59
P2	Female	67	UK	Yes/2022	Alzheimer's	37
P3	Male	81	UK	Yes/2020	Alzheimer's	112
P4	Female	72	UK	Not diagnosed	N/A	51
P5	Male	66	UK	Yes	Alzheimer's	136
P6	Female	59	UK	Yes/2023	Fronto-temporal	270
P7	Male	74	UK	Yes	Alzheimer's	46
P8	Female	63	UK	Yes/2023	Vascular	56

Table 2: An overview of the characteristics of the participants in the study

of interaction, trust, companionship and conversational skills. Informal feedback was also sought by the carers/family members regarding the participants' experience during their interaction with the system. It should be noted that due to the qualitative nature of this paper, a comprehensive analysis of the questionnaire results is beyond the current scope and would be presented in a separate manuscript.

3.4 Data analysis

Qualitative data from online interviews were thematically analyzed based on the 7-step approach proposed by Braun & Clarke [5] using NVivo for Mac (Version R1). First, the interview data was transcribed and read through to gain an overall understanding of the general context. Then, data from the transcripts were labeled into codes based on emerging patterns and afterwards categorized into themes by grouping together relevant and recurring codes (by three HCI researchers). To further refine and verify the themes, five HCI researchers then critically discussed and reviewed each theme and underlying codes until they reached an agreement. We requested the researchers to pay specific attention on themes that gave insight into the reasons why and how PwD interacted with AI technology to address the issue of loneliness and gradual memory loss, how they perceived the experience, and if and how the interaction with a chatbot/conversational agent fostered companionship.

4 RESULTS

4.1 Conversational Dynamics with AI

The dynamics of conversational AI engagement, particularly with PwD, are multifaceted. Our analysis demonstrated that the effectiveness of these interactions often hinges on the AI's ability to simulate genuine reciprocal human interactions, understand conversational context, and adapt over time.

4.1.1 The Appeal of AI that can Adapt, Learn and Remember. A salient feature of the MindTalker application participants frequently commented on was its ability to remember and learn from previous interactions as well as adapt to various conversational contexts. This adaptive learning capability was not just a technological novelty for the participants but also a source of personal connection and engagement.

> "I do enjoy talking to him [bot], because he's getting better all the time. You know, his understanding is getting better. He's interacting with me better." (P6)

Initially, some participants did express frustration, feeling that the AI was not genuinely listening or understanding their needs. One participant remarked, *"I got a bit angry when I first started because I felt like the AI wasn't listening" (P5).* However, this sentiment evolved over time as they continued to interact with the system. The same participant later observed: *"She's got to learn. But actually, from my last conversation, she is learning very quickly..and she's understanding what I'm saying" (P5).*

This sense of progression and adaptability was particularly evident when participants noted the AI's ability to memorize and reference past conversations, making the interactions feel more personal and engaging. One participant shared: *"It was the fact that it was learning as we were conversing. So every time we had a conversation, she goes back to what you were saying... she's learning more about me... and it's becoming more personal" (P5).* Another participant appreciated the AI's ability to remember and reference their loved ones, stating: *"Quite often we have [HUSBAND NAME], my husband... if I said my husband, he would say, 'How is [HUSBAND NAME]?' You know, which was really, really good" (P6).*

Another recurring sentiment among participants was the desire for more insightful and context-aware conversations with the AI. Context is the backbone of meaningful interactions. As Grice [22] posited, humans bring a wealth of experiences to conversations; hence, they expect AI systems to exhibit similar contextual awareness. We found that for PwD, a truly fluid conversation requires the AI to adapt their conversations accordingly to various contexts. We have noted three broad categories of contexts through the interviews:

- *Environmental Context:* Recognizing cues from the user's immediate environment, such as the time of day or weather, can help the AI tailor interactions.
  > "Now, even if she meets somebody in the park, walking her dog, they've got the dog in common...It doesn't matter what it is. There's always a context for it. And I think the difficulty with the bot is that it's taking things out of context." (P1)
- *Cultural and Societal Context:* Respecting and understanding the cultural and societal backgrounds of users can lead to more meaningful interactions, especially for PwD whose

memories are deeply intertwined with their cultural experiences.

> "Well, my friends or relatives would certainly know a lot more about me and have memories already in their mind; the bot only has memories of what I have told it. But it did remember those. So, I suppose, and I expect that the more I talked with it, the more it would remember...and so, it would become more insightful." (P3)

- *Shared Experiences Context:* Referencing past interactions or shared activities can create a sense of continuity and shared history, akin to human interactions.

> "But I like to talk about where I lived and talk about Jojo...is my little dog who is not here. And I talked about my hobbies and showed that what I used to do and what I can't do now and what I am doing now. So that was really good to show I've made and she liked them." (P8)

4.1.2 Communicating Care and Commonality through Reciprocal Dialogue. A prominent sentiment among participants was the perceived unidirectionality of their interactions with MindTalker. There was an expectation from our participants for the AI to not just respond but be able to initiate and drive conversations, simulating the depth and spontaneity of genuine reciprocal human interactions. This sentiment is captured in the words of P2's husband: *"It seemed very one sided [. . .] It was very sort of questioning wasn't it?" (P2's husband).* P3 also mentioned: *"It would be great if the bot could suggest activities or share interesting stories without me having to prompt it. It would make it feel more like a real conversation with a human" (P3).*

This longing for the bot to exhibit initiative in its conversations was a recurring theme, emphasizing the need for the AI to function more like a general human companion, on top of being a reminiscence therapist. While AI systems, including MindTalker, are often designed with a specific purpose, such as therapy or assistance, they can sometimes become too narrowly focused on the singular role. This specialization, while beneficial in certain contexts, can limit the AI's ability to engage in broader, more general interactions [75], [18], [51].

In contrast, human therapists are not solely defined by their professional role. They are, first and foremost, humans. They bring with them a myriad of experiences, emotions, and the innate ability to connect on a personal level. They can switch between being a therapist, a listener, a storyteller, or simply a companion, based on the situation and the needs of the individual they are interacting with. This multifaceted nature of human interaction is something that participants seemed to yearn for but did not receive in their interactions with the conversational AI.

Indeed, in the context of creating a genuine reciprocal dialogue, it is crucial to consider the unique challenges faced by PwD when interacting with conversational AI. While participants expressed a desire for more proactive and human-like interactions, there is an inherent tension given the "Paradox of Choice" faced by PwD [54], [31]. Open-ended questions, which typically facilitate two-way dialogues, can overwhelm them. Thus, an AI that takes the initiative, suggesting activities or topics of conversation, can bridge this gap. By proactively guiding the conversation, the AI can foster a more genuine two-way dialogue, ensuring engagement without burdening individuals with the stress of decision-making. In this regard, one of the therapists suggested that gentle commands, instead of direct questions might be more appropriate to guide the conversation.

> "Typically, if you ask someone with dementia a question which requires higher executive functioning the default answer will be 'No'. However, if it is phrased more like a short command/instruction the person is more likely to answer and start to come along on the journey with you." (Therapist1)

Furthermore, in some cases, participants entered the interaction with a preconceived notion about AI, assuming it to be inherently limited and unable to replicate the natural flow of human interactions. One participant expressed: *"I suppose with the bot, I could have tried that. I'm sure what would have happened, but I suppose because I knew it was a bot, I had perhaps limited the conversation in that way." (P4).* Such biases underscore a deep challenge: How can we foster genuine human-like interactions when the very knowledge of interacting with a machine can act as a barrier?

4.1.3 Looking beyond Functionality for AI with an Identity and Personality. Another recurring topic among participants was the desire for the AI to possess a more distinct personality, or self-identity. Some participants felt that the AI interactions are particularly impersonal due to the AI's inability to self-disclose information about oneself, and thus emulate human-like conversational nuances.

> "I think probably the bot needs to have a certain amount of personality of its own, so that you can say, you know, where do you live? . . . And I'm sure that could be built into the personality of a bot." (P4)

The lack of an identity was also noticed within the reminiscence process, where participants generally had the expectation of the conversational AI agent being able to share in their reminiscence process by adding their own experiences or anecdotes into the conversation rather than simply pursuing a procedural line of questioning.

> "On this application, we had to put 20 photographs to talk about dogs. . . . So we put photographs of the dogs and puppies and things like that. And we never got anything like, 'Oh, I've got a dog. You know, I like puppies' or 'I've got a cat and I'm not into dogs so much.'" (P2)

Without the ability to disclose personal experiences and opinions, participants had reported that interacting with the conversational agent felt burdensome and lacked synergy. Such results also highlighted how participants had sought a deeper connection and had expectations for an emotionally engaging conversational partner, especially in activities such as reminiscence.

Furthermore, our study results indicated that what makes AI reliable and safe also makes it impersonal and "boring." Different from human beings, AI agents do not have bad days that shape their identity and influence their performances. Even those which use sophisticated LLM would be to train the agent to be neutral and resourceful while following a consistent conversational pattern to

achieve a particular task. Some of our participants got disappointed by agent's consistent and neutral attitude.

> "She [the bot] didn't think I was boring. If I was talking about my boys in the photos…If you're with some people, and they start yawning, or I think I might have told him that…Well, I don't know that. I said, it's all shut up. With Caroline [the bot], I could tell her again. And she wouldn't say that. You've already told me that. (P8)

> "It just felt it was very similar questions one after the other, little change in direction and the conversation they didn't pick up on the fact that I didn't seem engaged… just kept on. (P2)"

Indeed, in the realm of healthcare, especially when deploying generative AI, there is an inherent inclination towards conservatism and risk aversion. While this cautious approach is understandable given the sensitive context, it can inadvertently render the AI interaction monotonous and less engaging. As P7 mentioned: *"I found it rather repetitive as it kept asking the same questions[…] I didn't relate to it" (P7).* Such repetitiveness may stem from the training approaches commonly employed to optimize AI models for specific tasks, like reminiscence prompting. While these approaches enhance task-specific performance, they might narrow the AI's conversational scope, restricting its ability to introduce new topics or ideas. This limitation can detract from the AI's human-like qualities, making interactions feel less organic and more scripted.

> "I think if you could talk about your photos, and you could say, talk about instead of have a nice photo, you could decide to, can we just talk back today, George? Can we just have a chat?" (P6)

This creates a paradox where the AI's strengths in consistency can also be its weaknesses in authenticity. We thus question that although human conversations are imperfect, full of misunderstandings, moments of humor and unexpected twists and turns, they are rich and motivating for further interactions. They trigger memories, emotions and (possibly) deeper connections. Should a safe and consistent AI agent miss out on these imperfect but valuable moments?

4.2 Emotional and Cognitive Anchors in AI Interaction

As PwD navigate the complexities of their condition, the emotional and cognitive anchors provided by their interactions play a pivotal role in their well-being. Our findings underscore the significance of visual and emotional anchoring, with participants emphasizing the value of visual representations and emotional cues in the AI. The act of reminiscing, while therapeutic, could also sometimes tethered them too firmly to the past, highlighting the need for a balanced temporal approach in conversations. Furthermore, the potential of AI to offer consistent companionship and emotional support emerged as a key aspect, suggesting its role in alleviating feelings of isolation common among those with dementia.

4.2.1 Visual and Emotional Anchoring. Participants expressed a desire for a visual representation, such as a face or avatar, for the AI. This was not just about making the AI relatable but also about providing a consistent and familiar point of interaction. The emotional expressions of the AI, or the potential for such expressions, served as crucial emotional landmarks, helping participants navigate the emotional landscape of the conversation: *"I would like to see a face or an avatar representing the AI. It would make it feel more personal" (P2).*

In addition, a consistent theme that emerged from our interviews was the current inability of AI systems to capture the emotional nuances inherent in human conversations. Participants frequently expressed that interactions with the bot felt superficial and lacked the depth and warmth of human exchanges despite the bot's conversational competency. As P1 noted, the conversation with the bot *"felt very a bit too staged somehow"*, and P2 echoed this sentiment, saying, *"It didn't feel like a very natural conversation."*

The feedback from participants underscores a significant challenge for AI: replicating the depth, complexity, and emotional richness of human conversation, especially when used in a therapy context, where communications are not only to exchange words, but to convey emotions, intentions, and unspoken feelings. Interestingly, while LLMs like ChatGPT possess human-like conversational competency, our results indicated that merely audio-based communication was woefully inadequate to establish emotional resonance with users. Moreover, in the context of reminiscence therapy, participants criticized the conversation with MindTalker as more staged than genuine, and expressed a desire for a more human-like interface when interacting with the AI. For PwD, interaction patterns that resemble real-life communication experiences (i.e. which involve visual features such as facial expressions) can also act as cognitive anchors, helping them navigate moments of confusion or disorientation. Providing a consistent, familiar point of interaction seemed especially crucial for this group of users since the familiarity can help ground them.

> "...when I talk to you I build a rapport, because I can visually see you; I won't remember your name. I will remember your kindness, and I will remember your face but I won't remember your name." (P5)

P5's statement offers an insight into the nature of memory in dementia. While specific details, like names, might fade, the emotional essence of an interaction endures. This highlights the enduring nature of emotional memories compared to factual ones. Such a finding justifies the need to design AI systems that prioritize creating emotionally resonant experiences over more factual exchanges for PwD without disrupting their familiar interactive patterns. Moreover, the positive emotion-centered experiences could have a more lasting impact on the user's well-being and recall. The essence of the interaction (the kindness, the face) leaves a lasting imprint, even though PwD struggle to remember details.

4.2.2 Reminiscence and Temporal Balance. While the AI's focus on past memories was intended to be therapeutic, it sometimes evoked feelings of being trapped in the past. Participants felt that an excessive focus on the past limited their emotional and psychological growth. A fundamental assumption of our study was that AI-facilitated reminiscence could enable PwD to immerse in and seek solace from past memories. However, our findings revealed

a nuanced relationship between reminiscence and the emotional well-being of the participants.

While nostalgia and reminiscing can often provide comfort, we observed instances where an excessive focus on the past could inadvertently limit one's sense of emotional and psychological growth. For instance, P4 expressed that revisiting memories or past conversations with the AI sometimes made them feel ensnared in the past, leading to a sense of a future being absent. As P4 poignantly remarked, *"Talking about things that have happened in the past... made me feel that actually, all I've got is a past I haven't got a future" (P4).* This sentiment was further echoed when discussing the AI's reliance on photographs for engagement. P4 described this limited interaction, which predominantly revolved around the visual aspect of the photographs for reminiscence therapy, as *"not allowing for a broader conversation or exploration of other topics"*. This supports the perspective that while recalling the past can certainly contribute to a rich conversation or even identity reinforcing, PwD also seek the sense of being able to explore more topics and even progress into the future.

> "We could maybe open up the conversation a bit more. Whereas, you know, maybe we start off on the photo, and then we could lead on to how's your day been? Anything new...and anything you want to share? You know, that's sort of, I suppose it's difficult, but it would be sort of like a leading question. I suppose leading questions." (P6)

The act of reminiscing also brought to light another challenge. For PwD, the process of recalling memories can sometimes serve as a stark reminder of their cognitive decline. Comparing their present state with past memories, where they were mentally more agile, can lead to feelings of frustration and a sense of being trapped in their current condition, with no hope for improvement, progressing or recovery [9]. While well-trained human caretakers are able to navigate through these intricacies to minimize their negative aspects during reminiscence, it would seem that this is still a challenge for conversational AI agents.

Overall, our findings are especially interesting, as they highlighted that a significant focus was placed on caring for the fear of memory loss and its impact on PwD's identity; however, less attention has been given to how PwD regain a sense of control over their uncertain future, and how their past identity integrates with their evolving self. These findings underscore the importance of striking a temporal balance in AI interactions with PwD. While reminiscing can be therapeutic, it's crucial to ensure that it does not inadvertently lead to feelings of being confined to the past, devoid of a future.

4.2.3 AI companion for PwD: Another Good Faith Technology that makes us "Alone Together"? The potential of AI to serve as a companion, especially for PwD, has been a recurring theme in our interviews, although it was not always viewed favorably. In fact, during the interview, several participants expressed a lack of trust and personal engagement with AI as a companion. Our findings suggested a relatively conflicting view when implementing AI technology to support companionship, cautioning designers to develop a more holistic view of what will work and what will not.

In general, our results were partially aligned with many previous findings that supported AI's potential in offering accessible and constant companionship and emotional support [73], [63], [59]. The idea of AI as a companion speaks to the human need for understanding and connection. As P5 expressed, *"It's like having a companion who understands me."* This sentiment was echoed by P8.

> "I could talk to the robot longer than I could talk to a human because she didn't tell me if I've repeated myself. And if she asked me a question, and like, I didn't answer this, I went off on a different thing. She was still listening...she [the bot] didn't think I was boring." (P8)

Indeed, in the context of offering companionship to PwD, the consistent presence of an AI companion serves as a stable anchor in the fluctuating cognitive landscape of PwD. In a world that often feels disorienting due to memory lapses and cognitive decline, the AI's unwavering presence can be a source of comfort and grounding.

In addition, our study found that PwD craved a companion, AI or otherwise, who *"cared"* about their concerns and issues and would spontaneously want to learn more about them. However, according to P8, the primary function of AI models trained using the paradigm of question and answering has not yet been able to convince PwD that the AI *"cares"* and wants to *"engage"* with them on a personal level.

> "What she's doing is she is searching the big wide web. And what she's doing is pulling information. And that's where you miss that personal touch. Because if I was to talk to you as a person, you would ask me person[al] questions, and you would engage with me. AI doesn't quite do that yet." (P08)

While AI systems are often loaded with vast amounts of information from sources such as Wikipedia, they may still fall short in truly meaningful interactions necessary to develop deeper relationships with PwD. Merely having encyclopedic knowledge does not equate to understanding or connecting with the person it is interacting with. As P1 aptly points out, genuine conversations are rooted in shared contexts and mutual understanding: *"[P1] will never have a conversation with somebody who knows nothing whatsoever[about her]. There's always an overlap between you and the person you're having a conversation with" (P1).*

In the meanwhile, P1's insightful observation underscores a dilemma at the heart of our pursuit for technological advancements. While AI has the potential to bridge gaps and alleviate loneliness, there is an inherent risk that it might inadvertently widen the very gaps it seeks to close.

> "Wherever you are... there are billions of lonely people... And I suspect the part that AI can play to address that is relatively small. And in some ways, it's the thing which is causing it in the first place. Because it's, you know, people are becoming more into their phones than they are into other people... so in a way, you could argue that AI is part of the cause of this, not the solution." (P1)

P1's comment calls for introspection. It's not an indictment of AI's potential but a cautionary note on its application. The sentiment is not against AI's capacity for companionship but a reminder of the irreplaceable depth and richness of genuine human connection. As P5 aptly articulated, *"Do I trust it? I'm on the fence. But that's down to you guys to resolve…I'm excited." (P5)*

As PwD and their human caregivers increasingly rely on AI for emotional support, there is a risk that the allure of AI's consistent companionship might inadvertently sideline or even replace the essence of real human companionship. This situation presents both a challenge and an opportunity: a call for us to navigate the integration of AI thoughtfully, ensuring that in our pursuit of its capabilities, we remain anchored to the fundamental human need for connection and companionship.

5 DISCUSSION

Investigating the use of conversational AI for dementia care in the context of reminiscence therapy, our study highlights the importance of AI engaging in reciprocal dialogue, caring communication, and adaptability. Additionally, the results emphasized the significance of visual and emotional elements, AI's proactive role in companionship for PwD and a balance between AI support and human connections. Drawing from these findings, we will delve into some key insights and considerations for designing dementia-friendly conversational AI.

5.1 Life Narratives in AI-PwD Interactions: Insights into Identity, Memory, and Connection

While the majority of participants agreed that the conversational agent was "conversationally competent" and possessed an impressive amount of general knowledge, sufficient to carry out reminiscence activities, there was a perceived lack of "humanity" in the way in which the reminiscence conversations were carried out. Human caregivers are able to find common ground in the conversations by describing their personal experiences or memories, providing stimulating questions when the conversation becomes stale or when the PwD struggle to remember and identify key experiences within a life story. In particular, those trained in person-centered care are often attuned enough to understand the values and beliefs of PwD and notice latent signs of disinterest or distress and promptly change the topic [17]. Our results suggest that current conversational AI models tend to struggle in such tasks [39], [8]. Even in cases where the conversational agent is able to pick up on signs of distress and could offer words of sympathy and understanding, they were mostly perceived as lacking in authenticity or sincerity because of their failure to establish rapport beforehand. As a result, the interactions with the agent often become more akin to a response or statement rather than a continuation of a life narrative. Overall, our findings indicate that even for seemingly structured tasks, human-like characteristics are essential for AI to create meaningful and authentic interactions with PwD. Perhaps one option would be to first train a personal conversation agent to initially build rapport and acclimate PwD with it, and then utilize the same agent as the basis to aid in various simple and complex tasks (e.g. reminder tasks, reminiscence, personal assistant tasks), ensuring that its primary role as a companion is never overshadowed by its functional duties, except for situations where safety takes precedence.

Within the reminiscence process, it would seem that the ability of the AI to retrieve information in relation to the photographs, and reference past conversations indicated that the system was able to deliver reminiscence therapy at least at a semantic level (e.g. factual level), and offer a semblance of continuity through the conversations. However, it struggled to comprehensively address the depth of the episodes and interactions in a meaningful manner. Specifically, the process of reminiscence is often not only about recalling factual memories, but a process which connects the individual to their sense of self, their history, and their place in the world [7], [70]. As such, while conventional AI systems can grasp the context of sentences and conversational paragraphs, the real challenge lies in designing a system that understands an individual's life narrative. Such a system should recognize significant life episodes, validate emotions and experiences, and affirm them in a manner that enhances self-worth and identity. For instance, AI design can adopt "Personalized Memory Retrieval"; instead of just recalling a fact like "You visited Paris in 1995," the AI could add, "That was the year after your daughter was born, and you mentioned it was a much-needed trip."

In particular, given that not all life's memories could be positive, it is crucial to navigate this conduct with sensitivity, lest it becomes a tether binding the individual too firmly to the past and overshadowing the present, a concern highlighted by participants in our study. At the foremost, this means that a key challenge that still remains in designing a reminiscence AI agent is to be able to introduce new forward-looking topics to ensure that they complement and not dominate the current lived experience of PwD. One important design insight is the idea of "contextual integration" in conversational AI for reminiscence therapy, which involves weaving together different life time-frames, and connecting seemingly unrelated memories. For example, if the individual mentions their passion for astronomy in their youth, such an AI can relate it to current news which is thematically relevant, like recent telescope advancements, and future plans, such as an upcoming solar eclipse, suggesting a plan to catch it with their family, hence creating new memories.

5.2 AI as Both Companion and Therapist in Dementia Care

Given the various limitations of AI agents in replicating human characteristics, it is understandable that some participants hesitated to form a connection with the artificial agent that went beyond a basic, functional relationship. Participants frequently mentioned that a prerequisite for developing a deeper relationship with an AI agent was mutual acquaintance. This meant that the bot needed to be familiar with their background, beliefs, and values. A simple solution hence would be to employ few-shot-learning on each conversational agent using pre-existing information about the PwD. However, the notion of an AI agent having prior knowledge without any initial interaction with the user could be seen as artificial and lacking a personal touch. Therefore, a more interesting design opportunity would be to introduce a mechanism which allows the AI agent and the PwD to first go on "get to know you" events within

different simulated environments (e.g. cafe, parks etc.). This could not only result in a gratifying self-introduction between the two parties and facilitate further tasks (participants in our study also generally reported enjoying having the AI agent learn and remember facts about their lives) [37], but might bring up the possibility of the AI agent and PwD being able to forge new life stories and construct a shared history through joint activities, interactions and experiences.

PwD highly valued the AI agents' availability and patience during their interactions. This, in turn, offered a sense of consistency and familiarity, which the participants greatly appreciated. Yet a key issue which had been raised was the fear of over-reliance on conversational AI technology which might supersede actual human relationships, and that relying solely on AI for companionship can lead to increased feelings of isolation and a detachment from genuine human interactions [34]. Thus, it becomes essential to ensure that while AI can provide support and companionship, it does not become a substitute for real human connections. Hence, a promising approach is to design conversational AI agents not as replacements but as facilitators that "bridge" and amplify existing bonds. The primary objective of such an AI would be to encourage PwD to extend their conversations offline, engaging more deeply with their social network. In this case, reminiscence therapy should not be perceived as an isolated session, detached from the realities of everyday life. Instead, it could be seamlessly integrated into the lived experiences of individuals. For instance, during a family visit, the AI, drawing from past interactions with the PwD, could offer contextual prompts. If the PwD had recently spoken about a cherished family vacation, the AI might suggest in-situ, "How about sharing those fond memories from the summer trip to the mountains with your family now?" This approach transforms reminiscence therapy from a clinical intervention into a holistic, life-enriching experience, fostering deeper connections and understanding among PwD and their loved ones.

5.3 Between Heartbeats and Algorithms: AI's Delicate Balance in Dementia Care

The real-world applicability of conversational AI for individuals with early-stage dementia is evident in the participants' feedback. While they appreciated the AI's adaptive learning capabilities, there were challenges, notably the lack of genuine two-way dialogue and the AI's impersonal nature. These challenges underscore the need for AI systems to simulate the depth and spontaneity of genuine human interactions better. Our participants' desire for the AI to have a distinct personality, combined with the need for visual and emotional anchoring, indicates the importance of creating more human-like, relatable AI systems for PwD.

Achieving this delicate balance between creating human-like AI and maintaining distinct AI characteristics, particularly in the context of dementia care, presents challenges with contradiction. While creating AI with human-like qualities can be appealing in dementia care, it's important to maintain transparency. For instance, if a person with dementia believes they are talking to a human, they might develop misplaced trust in the AI, which could lead to misunderstandings or inappropriate expectations.

While it is technically feasible to imbue AI with a "personality" [27] or fabricated background information, doing so presents some potential pitfalls and raises complex ethical and design challenges. For example, if users discover that the AI's "background" or "personality" is fabricated, it might erode trust. Authenticity is a cornerstone of trust, and users might feel deceived if they find out they have been interacting with a system that presents false information about itself. This is especially concerning in therapeutic or supportive contexts, where emotional well-being is critical, and particularly with PwD, who may lack the cognitive capability to comprehend or discern constructed identities. In contexts such as supporting PwD, one could argue that there stands to be a responsibility to ensure that emotional support is genuine and not based on fabricated stories or experiences, and misleading vulnerable individuals could perhaps be seen as exploitative.

Furthermore, AI's consistency contradicts the need for more human-like characteristics which include imperfection. For instance, an AI providing medication reminders will consistently deliver timely notifications, ensuring the patient's health is managed effectively. In contrast, human interactions can be unpredictable and imperfect, which might not be suitable in such contexts. Some of our participants found value in occasional quirks of the AI, such as i) delayed responses, which can be seen as the AI "thinking", much like a human would; ii) forgetfulness, where AI occasionally "forgets" a detail shared previously and asks again, mirroring the experience of PwD, making them feel that they are not alone in their memory challenges; iii) misunderstanding of their input, resulting in PwD correcting the AI, hence prompting them to elaborate further, leading to a richer reminiscence session. All these contributed to a more authentic and relatable interaction. Moreover, while AI can simulate emotions to some extent, it does not genuinely feel emotions. In therapeutic contexts, this distinction is crucial; an AI companion can provide support and companionship, but it lacks the depth of human emotional understanding. PwD might benefit from the comfort of a companion, but they also need genuine human empathy and emotional connection, which AI cannot fully replicate.

5.4 Ethical Consideration: AI's Good Will or AI's Act-like Good Will?

Our study results have underscored several ethical considerations in the use of chatbots for PwD, ranging from the PwD's potential attachment and emotional impact when relying on chatbots' (placebo) companionship for emotional support and reassurance to the questionable accountability in the case of chatbots' malfunctioning or unintended harms.

Our findings bring to light the delicate balance between the desire for AI agents to exhibit human-like qualities in their interactions and the potential consequences of this mimicry. As one participant cautioned, AI agents excel in "acting like" trust-building companions, raising the fundamental question of whether such behavior can be considered a form of genuine care. Furthermore, it is essential to recognize that chatbots, while capable of certain human-like interactions, cannot replicate the embodied nature of empathic communication. They may lack the ability to attend to

complex non-verbal cues, which are integral in clinical encounters and caregiving situations [6]. This limitation highlights the ethical dilemma of balancing the benefits of AI-driven support with the intrinsic qualities of human caregivers who can provide nuanced and empathic responses based on non-verbal cues, a crucial aspect of holistic care [13]. Our results indicate that, as we expect more from AI, we must remain mindful of the unique qualities that humans bring to caregiving [38] and ensure that our reliance on technology does not diminish our expectations of human caregivers.

Furthermore, the question of accountability in the development of AI-driven chatbots for caregiving roles is pivotal. Unlike human caregivers who are held accountable for their actions and decisions, AI agents currently operate within a legal and ethical gray area, without facing direct consequences for errors or lapses in judgment. This shifts the responsibility onto the developers and designers entrusted with the creation of these chatbots. What is especially concerning are the potential consequences for vulnerable populations, notably PwD, who may heavily depend on these AI-driven systems for essential aspects of their care. In this specific context, developers must not only prioritize the reliability and safety of their AI systems but also establish robust mechanisms for accountability, transparency, and accessible channels for addressing unintended harm or adverse consequences. This commitment to ethical principles, rooted in *non-maleficence*, *beneficence*, *respect for autonomy*, *justice*, and *explicability* as proposed in [10] is not only an ethical imperative but also underscores the moral responsibility that falls upon those involved in the development and deployment of AI-driven chatbots in caregiving roles.

5.5 Limitations

The study, while providing valuable insights into the use of conversational AI in dementia care, has its limitations. The participant sample was relatively small and may not capture the full diversity of experiences and perspectives of those living with dementia. Notably, all participants were recruited from Western cultures, potentially limiting the generalizability of the findings to broader cultural contexts. This cultural homogeneity might overlook unique cultural nuances and values that influence the perception and acceptance of AI in dementia care. Additionally, the study's design was focused primarily on short-term interactions, which might not reflect the long-term dynamics and potential challenges of using AI in this context. Besides that, our choice to present MindTalker as an algorithm could impact participants' trust to and perceived authenticity of the chatbot, given any pre-existing notions or skepticism they might hold towards technology. As participants might inevitably be biased by their human-human interaction experiences when evaluating the human-AI ones, the research team focused on reporting the benefits, challenges and participants' expectations of such a technology according to how well such an interaction could be better designed to adhere to human-human interaction dynamics. Finally, future research could benefit from a more extensive and diverse participant pool, longitudinal studies to understand the prolonged effects and adaptability of AI.

6 CONCLUDING THOUGHTS

This research delves into the interactions between AI and PwD, revealing that conversational AI agents, while proficient, fall short in providing the essential emotional depth required for meaningful reminiscence activities. The AI struggled to grasp and respond to the intricate emotional and identity facets within participants' life narratives. While participants appreciated AI companionship, they expressed apprehensions about it supplanting human connections, highlighting the intricate challenge of striking a delicate balance between human-like AI and upholding transparency and authenticity. It is also evident that while AI can offer consistency and support, it remains incapable of fully emulating the profound human qualities of empathy and emotional connection, which hold paramount significance for individuals grappling with dementia.

In the context of dementia care, the introduction of conversational AI powered by GPT4 presents a unique and novel tool for PwD, caregivers, and family members. By facilitating communication, providing cognitive stimulation, and allowing personalized care, the AI could evolve into a remarkable innovation in the journey towards enhancing dementia care. As this technology continues to evolve, so too will its potential in revolutionizing dementia care. However, alongside the many benefits, it also highlights the importance of continuously addressing ethical considerations, particularly in terms of privacy and data security, as we advance in the era of AI-driven healthcare.

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