"I wouldn't like technology to give people a get out of jail free card": Caregiver Reflections on a Hypothetical AI-assisted Music Intervention for Dementia Care

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There is growing interest in using artificial intelligence (AI) to support people living with dementia. However, there has been little investigation into caregivers' perceptions of such tools, and how these may augment care, or introduce new challenges. To understand caregivers' hopes and fears about technologies in dementia care, we conducted focus groups in which we introduced fictional ideas for hypothetical future technologies that would monitor and respond to care recipients' emotional needs with music. We identified three key themes: 1) participants' thoughtful reflections on how technology could support care, 2) participants' need for connection and autonomy in care, and 3) how AI technologies could support the broader care network. We propose that AI technologies be employed to support social and emotional care if carefully designed to enhance caregivers' skills, cater to diverse user needs, carefully balance autonomy and assistance for the care recipient, and augment rather than replace human care.

1 INTRODUCTION

The number of people living with dementia worldwide is increasing [10], and as such, there is a growing need for options to support better care. People living with dementia may experience symptoms that place significant demands on family caregivers, who often provide care for people with dementia who are not in residential (or institutional) care homes [5]. Due to the complexity of dementia care, technologies that support caregivers and people living with dementia are increasingly being developed and investigated. Digital technologies in dementia care, and for older adults

more broadly, can support engagement and wellbeing [18, 19], social connection [53, 54] therapeutic goals [48], or provide assistance for daily activities [16].

Recent advancements in AI technologies promise to support care for older adults by automating some care tasks and using analytics to inform caregivers of adverse events. This can allow more time for one-to-one care [36]. For example, in assisted living environments, sensors can automatically provide care staff with information about residents' recent activities, sleep, or eating habits for early intervention to support health outcomes [52]. Assistive monitoring technologies, such as wearable and environmental sensors, have been trialled as tools to support people living with dementia and cognitive impairment, as well as caregivers and clinicians. These technologies aim to measure behavioural symptoms such as agitation, and improve quality of life [1, 20, 25]. Furthermore, reviews have found benefits of smart home technologies, such as sensors, for people living in the community, for improving activities of daily living, sleep, and for managing agitation [33]. Many of these technologies to date have focused primarily on monitoring for safety and assistance, rather than augmenting social and emotional care with personalised interventions.

While health monitoring and sensors lend themselves to automation in identifying and responding to health needs, it is less apparent how AI technologies should be used to support social and emotional care. To achieve this, AI technologies need to be designed to provide personalised strategies, which can augment existing technologies that use music and other arts-based techniques in response to social and emotional needs in dementia care [23, 24]. One recent review suggests that AI technologies can be used to provide emotional support and social facilitation, in addition to monitoring older adults' health [27]. Some AI technologies could be used for creativity, enjoyment, and fun [40]. Music, for example, is known to be a valuable way of engaging people with dementia [2, 11, 42], and can be supported by AI technologies that recommend appropriate songs to listen to [22]. In addition, technologies such as smart speakers have shown benefits for engagement and connection with healthy older adults, providing a conversational partner and connection with the outside world, as well as access to information and music [28]. While smart speakers and music technologies may serve a different purpose to sensors that monitor movement and analyse activity, they are often included in smart home infrastructure alongside sensors to provide an integrated system that caters to the diverse needs of independently living older adults [7, 41].

Despite these potential benefits, there has been some concern that sensor systems are not readily accepted by caregivers [26], and there are potential risks of such systems for depersonalisation, discrimination, dehumanisation, and disciplining via monitoring [38]. Home health monitoring systems do not always provide independence and safety, rather they can lead to care recipients feeling greater dependence on care providers [9]. These concerns for monitoring systems raise questions as to whether similar questions emerge for AI technologies that are used to respond to behavioural and psychological symptoms of dementia, as well as social and emotional outcomes. There is a need to ensure that the relational, intuitive human aspects of care are not replaced when integrating automated, AI-assisted systems [6]. Further, there is currently limited research investigating perceptions of such systems in dementia care specifically, from the perspective of family caregivers. There remains an opportunity to ensure these interventions are not used "on" people with dementia, but are instead used "by" them, or "with" a caregiver [16, 39].

In this paper, we aim to explore caregivers' perceptions of future AI-assisted technologies for dementia care. We report insights drawn from focus groups with caregivers of people living with dementia. The focus groups involved brainstorming and discussion about hypothetical AI-assisted technologies to support dementia care, such as a 'Magic Speaker' and 'Mood Tracking', and caregivers' hopes and fears for new technologies in dementia care. We contribute a novel investigation of caregivers' perceptions of potential future AI technologies in the context of dementia care. We identified four insights that can inform the design of future AI-assisted technologies in social and emotional dementia

care. First, AI systems can be designed to enhance caregivers' skills; second, dementia care technologies must cater to the diverse needs of multiple users; third, AI technologies must be designed to carefully balance autonomy and support for the care recipient; and fourth, AI technologies must be designed to augment rather than replace relational human care.

2 RELATED WORK

2.1 Technology for Supporting Dementia Care

Assistive technologies, such as monitoring devices, are commonly used in dementia care. One recent scoping review from Moyle et al. [33] highlighted how smart home technologies could support physical activity, activities of daily living, and better sleep for people living with dementia. The review also highlighted the potential for technologies to manage depression, and even agitation [33]. A similar systematic review from Husebo et al. [20] found that sensor technologies can have a range of potential applications in dementia care, such as aiding in management of behavioural and psychological symptoms. These technologies could be used by people living with dementia, caregivers, or in residential care settings, for safe and effective care. Further, both environmental and wearable sensors have been demonstrated to assist clinicians. Sensors can detect sleep patterns, physical activity, and activities of daily living, and when combined with observation, clinicians can use sensor data to evaluate optimal psychosocial interventions to improve quality of life [25]. Monitoring technologies for older adults with cognitive impairment can also improve quality of life and mental wellbeing, while simultaneously alleviating caregiver stress [1].

Recent research has revealed that staff in long-term care homes share simplistic, promissory ideas on how AI technologies could support care [36], yet there is limited knowledge of how caregivers would integrate and use such technologies. While some research has focused on the perspective of caregivers in formal care settings, the perception of these technologies by family caregivers remains unclear. Overall, prior research suggests that introducing sensor technologies in dementia care could have significant benefit; however, it is important that they align with the needs and preferences of people with dementia and caregivers. Importantly, Mort et al. [32] have noted that such monitoring systems pose a risk of removing agency from older people, if dependence on these types of technologies develops.

2.2 Technology for Supporting Social and Emotional Wellbeing

Where many monitoring technologies are used "on" people with dementia, technologies can be designed to be used by people living with dementia, or with a caregiver [16, 39]. HCI research in dementia promotes a critical view to designing technologies for dementia care, with less focus on deficit and decline, and emphasising design for creativity, engagement, and emotional expression [24]. For example, in the aged care setting, researchers have trialled a mobile application to promote shared interaction between people living with dementia and their visitors [34]. In the home setting, Unbehaun et al. [46] designed an interactive music game which was enjoyable and assisted with maintaining physical wellbeing, as well as for reminiscence and social interaction. In another example, communication and engagement between people living with dementia and their relatives was facilitated by a novel system that delivers digital messages via a printed postcard [45]. Finally, Houben and colleagues [17] designed interactive sound players to support people with dementia and caregivers, which fostered initiative, agency, and joyful moments for participants.

AI-assisted technologies can also support social and emotional care for people living with dementia, and older adults more broadly. While a recent review suggests that AI technologies can fulfil roles such as providing emotional support and facilitating social interactions [27], AI technologies may also be used for creativity, enjoyment, and fun [40]. For

example, technologies such as smart speakers can encourage engagement and connection for healthy older adults, providing a conversational partner and access to information and music [28]. While these findings show promise, more research is needed to understand how AI-assisted or automated technologies can effectively augment social and emotional wellbeing in dementia care, as well as how caregivers perceive these technologies.

2.3 Music Technologies in Dementia Care

Music technologies may be uniquely suited to supporting social and emotional dementia care. Music has been well-established as a powerful non-pharmacological tool for supporting dementia care [2, 8, 11, 42], and there has been recent interest in using technology to assist with using music in dementia care [4, 15, 19, 29, 35, 44, 48]. Caregivers and people living with dementia use music technologies often in their daily lives [47], suggesting that music-based tools could be an important avenue for supporting social and emotional care for dementia. In the home care setting, Houben et al. [17] designed interactive sound players to enable people living with dementia to listen to familiar everyday sounds at home, such as music or sounds reminiscent of past experiences like attending a concert or a memorable trip. Further, one recent study found that a music therapy-informed mobile application supported family caregivers in adding new strategies to their care repertoire, addressing everyday care needs, including alleviating agitation, and enhancing the relationship between caregivers and care recipients [48]. These findings may extend into residential aged care, with research suggesting interactive music technologies can promote enjoyment, shared engagement, and collaboration [14, 19, 21, 29–31].

Recent research has also started to examine AI and monitoring systems alongside music technologies. One review [49] investigated the effect of music on people living with dementia, as well as wearable and environmental sensor systems for monitoring individuals' emotional states. The authors suggested that future systems could combine sensors and music, for a system that assesses the emotional state of a person living with dementia and provides appropriate music for the context. While the findings of this review were promising, the authors also noted several challenges that needed to be addressed in future research. These include developing the necessary hardware and software required for such systems, as well as addressing ethical considerations related to data, consent, and the potential burden on caregivers [49]. Outside of dementia care, generative AI has been examined in the context of music-based reminiscence. In a recent study, older adults felt that generative AI could support music reminiscence, as long as they had a high degree of autonomy, and content could be personalised and relevant to their memories [22]. Taken together, these findings suggest that automated, AI-assisted tools can assist with using music in dementia care. Further research is still required however to understand how caregivers may use such technologies in their daily lives.

3 METHOD

The present analysis is part of a larger project exploring the design and implementation of a music-based mobile app to support dementia care. As part of this project, we recruited dyads comprised of a family caregiver and a person living with dementia or mild cognitive impairment. These participants used the mobile app in an 8-week field trial, which aimed to train caregivers to implement music-based strategies in dementia care [48]. After the trial, the caregivers were invited to join focus groups that had two aims: firstly, to involve the participants in co-designing an improved version of the mobile app (not reported here), and secondly, to critically investigate caregivers' perceptions of hypothetical AI technologies for dementia care. This paper presents findings based on the data collected for this latter aim. We created prompts that were fictional and deliberately provocative to assist participants to imagine potential future AI

Table 1. Participant demographics.

Caregiver pseudonym	Age	Relationship with care recipient	Time since care recipient diagnosis	Workshop
Dana	55-64	Partner	3 years, 5 months	1
Emma	65-74	Partner	7 months	2
Flora	45-54	Child	1 year, 3 months	1
Gloria	55-64	Partner	7 years	1
Kate	65-74	Partner	5 years, 10 months	2
Lawrence	75-84	Partner	4 years	2
Nina	45-54	Child	5 years	2

technologies. These were designed to gauge participants' views about AI in relation to music, wearable sensors, and broader use of AI in social and emotional dementia care.

3.1   Participants and Recruitment

Thirteen caregivers were invited to participate in the focus groups. Of these, seven caregivers participated in one of two scheduled focus groups. Caregivers were invited to bring the person they cared for if they chose; however, no care recipients participated. We scheduled two focus groups, which took place via Zoom.

Caregivers were initially recruited for the larger project via StepUp for Dementia Research (an online platform that connects volunteer participants to dementia researchers in Australia), and from a database of people who registered interest for related research opportunities at our university. Additional recruitment occurred via Facebook advertisement, the research project website, our university's internal staff newsletter, and emails distributed to community groups known to the researchers. Following the field study [48], caregivers were invited via email to join the focus groups.

The seven focus group participants (6 women, 1 man) ranged in age from 53 to 77 years (Mean = 62.9). Five caregivers were spouses or partners, and two were children of the person they cared for. Care recipients, who did not participate in this part of the study, were living with Alzheimer's disease, younger onset Alzheimer's, primary progressive aphasia, mixed Alzheimer's and Lewy bodies, or mild cognitive impairment. Table 1 shows participant demographics.

3.2   Procedure

Three participants attended the first focus group, and four attended the second. A semi-structured interview schedule was used for the focus groups, which ran for approximately 90 minutes. Two researchers facilitated the focus group discussion. One researcher, who was familiar to participants from the larger project, led the discussion. Another member of the project team attended to assist in taking notes and to ask follow up questions when required.

After asking participants for feedback for redeveloping the mobile application they trialled, we shifted the focus to hypothetical future technologies, presenting three discussion prompts, as shown in Table 2. Two of the prompts were fictional scenarios imagining a future in which AI automatically plays music to alleviate agitation ("Magic Speaker") and in which wearable sensors are used to track physiological indicators of mood variation ("Mood Tracking"). These represented exaggerated (and fictionalised) versions of the core ideas in the larger project. We did not explicitly prompt participants about AI, nor did we restrict the conversation to this topic. Rather, we focused the conversations around the context of using technology in dementia care, using the discussion prompts to initiate conversations. Further, we did not want participants drawing too heavily on other AI tools (e.g., ChatGPT) during discussions. By presenting these

Table 2. Focus group prompts

Label	Prompt
Magic Speaker	Imagine you had magic speakers that played exactly the kind of music you wanted to hear whenever you walked into a room (e.g., at home, in care, or anywhere else), and then changed the music selection as soon as you got bored or agitated or wanted to listen to something else. What are the words that come to mind about this?
Mood Tracking	Imagine that the person you care for had a wristwatch or bracelet that tracked their mood and sent you messages telling you to modify how you were talking or behaving in response to their mood changes. What are your thoughts about this? What would you like about it? What would you not like?
Hopes and Fears	What are your hopes and fears about future technologies that could help care for people with dementia? Is there anything you would like new technologies to be able to do? Is there anything you would not like technologies to do?

scenarios, we aimed to interrogate participants' views of technologies in dementia care, so that we can ensure future systems are designed sensitively and with consideration for caregivers' concerns and needs. A third prompt asked for more general reflections about participants' hopes and fears for future technology in dementia care, and allowed participants to explore broader ideas as well as ideas for AI-assisted technologies.

3.3 Analysis

Workshops were video and audio recorded. Audio recordings were professionally transcribed, then checked by the first author. We analysed the transcripts using Braun and Clarke's 6-phase approach to reflexive thematic analysis [3, 43]. After familiarisation with the transcripts (phase 1), the first author coded the data (phase 2). These codes were organised into initial themes (phase 3), and discussed and reviewed with the rest of the research team (phase 4). These initial themes were subsequently refined and named (phase 5), with further refinement during writing, and final discussions with the full research team (phase 6). The analysis was led by the first author, who has expertise in human-computer interaction and music psychology, and themes were discussed with the broader research team. The larger project involves an interdisciplinary team, including music therapists with substantial experience working with people with dementia and their caregivers, and HCI researchers with experience conducting research with older adults and in aged care environments.

4 FINDINGS

In this section, we present three themes: 1) Participants provided thoughtful reflections on how technology could support care, 2) Participants needed autonomy, human interaction and connection in care, and 3) AI technologies could support the broader care network.

4.1 Participants Provided Thoughtful Reflections on how Technology Could Support Care

When presented with the prompts, caregivers expressed uncertainty about the efficacy of these example systems. Caregivers reflected cautiously, about 1) the accuracy of such a technology, and 2) its usefulness. We will discuss this in two sub-themes.

4.1.1   Will it work? Caregivers were uncertain that automated systems would be accurate. Caregivers expressed uncertainty and concerns that future technologies such as the Magic Speaker and Mood Tracking concepts would actually work, even though they responded positively to the idea. Participants expressed disbelief that technology could be used to measure and manage their loved one's agitation, with Lawrence reporting a *'degree of scepticism'*, and Kate stating that *'I mean the concept is wonderful, but the first word that came to my mind was impossible.'* Lawrence drew on his experience of using smart home technology in a rural location, where the connectivity was not always reliable:

> *'Well in a sense I do that, with the smart home with light bulbs going on and things like that. And I don't find it very good because, when the system gets out of sync, you got to pull different systems together and that happens on a regular basis out in the country when you get a blackout and things like that'*

Nina also expressed a distrust that AI-assisted systems could interpret measurements accurately at all:

> *'I could imagine that it could interface with something like an Apple Watch, so that tracks mum's heart rate. So if she's getting agitated, I assume her heart rate will be going up, but how does it know that she's not excited and engaged about something, or on a walk?'*

In this quote, Nina highlights a key concern about artificial intelligence technologies: how do we know their interpretation of the data is correct? This concern about interpreting data correctly is particularly important to consider when sensor-based technologies are used to make predictions about people, and to recommend actions in response to the observed phenomena. If the predictions or interpretations are incorrect, the recommended response will not be appropriate, and could lead to harm. Communicating the highest possible degree of certainty around measurement accuracy could ease caregivers' scepticism and caution.

4.1.2   Will it be useful? Caregivers were uncertain that automated systems would lessen their stress. Further, caregivers discussed how technology could potentially add to their stress, particularly in response to the Mood Tracking prompt. Caregivers were concerned by the idea of *'technology telling [them] off'* (Flora), as caregiving is difficult enough without technology appearing to judge their daily caring strategies:

> *'I wonder too if there would be a risk that… you'd have an adversarial relationship with the technology. I get judged a hundred times a week for my failings…in terms of how I'm caring for my mum, and I don't need another voice telling me I'm doing things wrong.* (Nina)

This comment speaks to the stress that caregivers may be under. If not designed and used carefully—with consideration for both care recipients' and caregivers' needs—there is potential for technology to add to that stress. Flora expressed further concerns about technology use in care generally, highlighting the importance of maintaining connection with the care recipient and ensuring that systems do not replace human interaction.

> *'I wouldn't like technology to give people a get out of jail free card… you know… with young children, when… you throw an iPad in front of them…I could see that going to the extreme of an iPad becomes the carer.'*

This comment reflects broader concerns about the role of technology in caregiving, including parenting, and the potential for technology to be seen as a replacement rather than augmentation of human care. While technology can be designed to benefit caregivers and care recipients, a core fear articulated by Flora is that a device could become the carer, which would ultimately only benefit the caregiver. This suggests that technologies must be designed and implemented in a way that supports better connection and interaction between people, supporting rather than replacing the caregiver.

4.2 Participants Needed Autonomy, Human Interaction and Connection in Care

One of the 'promises' of AI technologies is the potential for automating aspects of care [36]; however, caregivers debated whether a music-based intervention that supported social and emotional care could be automated without removing important elements of connection and autonomy.

Caregivers discussed the importance of choice and control, for both themselves, and the people they cared for. They did not want technology to interfere with their own control over the situation, and equally did not want to use technology to control their loved one. Kate highlighted the importance of her own connection with her partner, and her decision making in daily care:

> 'I just wouldn't want anything to take away our decision making or make us lazy in that regard. So if we're relying on a smart whatever to read our partner's moods and, I wouldn't want to rely on that and take away our own control, our own human connection with the person'

Nina expressed a mixed opinion, noting that automated care could be potentially beneficial for her mother's daily experience, but this would be at the cost of Nina's own autonomy in the caring situation. This highlights the importance of effective human-AI collaboration. Nina had previously experienced benefits from the mobile app trial in the previous study, when using a self-paced training program to learn new care strategies and noted:

> 'Anything that gives me a little bit of sense of power when I'm feeling completely adrift and lost in this new experience is a good thing. So what an AI would do is take that away. It's lovely that it would be all automated and that's great for mum, but it doesn't really give me any power or control. So I'd really like to see, if that existed, that the manual side could also still exist so that I would have that, a little sense of control.'

Family caregivers also acknowledged the importance of their own role in care, expressing the expertise they already have as caregivers. Flora felt that she did not need technology to advise on how her father is feeling.

> 'The idea of being able to track their mood, I don't need it, because I'm with them all the time. I understand the way they're talking, what they're doing.'

Lawrence extended this, and noted concerns around the ethical implications of using the technology to "control" his partner:

> 'I'm always wary of trying to control a person's behaviour using devices and techniques. It's very manipulative and it doesn't feel ethical.'

He further described how an automated music system could interfere with the caring relationship in the moment. If he needs to be his partner's main focus during an interaction, an automated system playing music may disrupt their communication:

> 'there's a lot of times when you want to communicate with your partner and you don't want the music there, you don't want background music, you need that single channel, that single focus because your partner, the person you're looking after doesn't need all that noise in the background.'

This was echoed by other participants, who highlighted that *'music itself [could become] an agitator'*, as sometimes, *'I don't want music. I don't want you to match my mood. I don't want you to do anything. I just need some silence.'* (Flora)

This highlights that potential future technologies, such those in the Magic Speaker or Mood Tracking prompts, should allow for control by both the caregiver and the care recipient. Both user types must be able to maintain autonomy and connection.

4.3 AI Technologies Could Support the Broader Care Network

While caregivers addressed several concerns about the idea of a Magic Speaker or Mood Tracker, they did report several opportunities that an AI-assisted music system could afford. They noted that AI could be used to directly support the care recipient, and to assist others in the care network who might be less familiar with the strategies required in day-to-day care.

Caregivers suggested that such an automated music system could benefit the person they cared for, by initiating musical activities if the care recipient either struggled to initiate activities, or no longer used technology. For example, Flora described how the Magic Speaker concept could help her father:

> 'That disconnected state... where my father just sits there... staring into space... He's not going to initiate playing some music in that state...So that's when it would've been nice to have... music playing without me having to go, oh, okay, let's try music.'

Caregivers also highlighted the benefits an AI-assisted technology could have in providing some autonomy for the person they cared for. Dana noted the possibility *'for someone who's perhaps in a milder stage of dementia...I don't know how easy you could make it for the individual to press and play their own playlist, for example, which is why using other sort of voice control things might be really helpful'*. Such a system would support the care recipient's autonomy.

Nina extended this, suggesting additional kinds of content, such as audiobooks or messages from family members, that could be integrated into an automated speaker setup:

> 'I would also like it to be flexible enough that I could add other content, non-musical content. So for example... her reading is now being impacted. So stories are getting harder and harder to access. She loves them. So if I could flip to an audiobook, we could transition from music straight into one of her stories and she'll settle. So having it be like non-proprietary enough that we can add our own content. Or it might be a message from a family member... her grandson, my nephew, that would be really quite useful.'

As well as directly supporting the care recipient, caregivers discussed opportunities for technologies to support others in the care network. While the prompts and questions we asked focused on the care dyad, caregivers noted the extended network of people involved indirectly with the care of a person living with dementia, some of whom would be less familiar with care recipients' mood changes and needs. For example, Flora said:

> 'But where it may be of benefit is with carers and people like that coming in who don't know them as closely as I do, or even with my other relatives coming in. Not something that tells them what to do, but maybe something that's like a green light, red light, yellow. Just something that can help, because people with dementia can't articulate how they're feeling all the time. And, if you know them where you can pick up on the signs and you get the looks and you get the grunts or whatever, you can understand it, but you need to know that person really well. So I could see a benefit of being able to inform people that don't know this person as well as you do that, "Hey, I'm getting upset now," or "Maybe now is the time for you to let me just have some quiet time," or whatever it may be.'

The other caregivers agreed. They described challenges trying to manage communication between the person they care for and others in their network who are less familiar with the individual's triggers or signs of distress. In particular, they felt they needed to balance providing appropriate advice to others without being perceived as *'taking over'* (Flora).

Caregivers further emphasised that training would be beneficial for new caregivers. An interesting idea suggested by Nina was for a sensor system that could be used to support a new caregiver learning how to identify mood changes and to implement strategies for managing symptoms and distress in the initial phase of caregiving:

> 'What about as a training tool? If you did it for a couple of months while the process is new to you, maybe it has some virtues there as a teaching thing.'

5 DISCUSSION

Our study investigated caregivers' views about using AI to support social and emotional care for people living with dementia. In focus groups with family caregivers of people living with dementia, we presented participants with prompts that included a broad question about their hopes and fears for future technologies in dementia care, and two fictional scenarios. The scenarios aimed to interrogate participants' responses to two core ideas: automated music listening and using wearable sensors for emotion monitoring and regulation. From responses to these prompts, we developed themes encompassing 1) participants' thoughtful reflections on how technology could support care, 2) participants' need for autonomy, human interaction and connection in care, and 3) how AI technologies could support the broader care network. Our findings extend research on technology in dementia care by highlighting family caregivers' concerns and hopes about AI in social and emotional care. We aim to draw on these findings to identify how we might carefully design music-based AI tools to provide social and emotional support in dementia care with these concerns in mind.

5.1 Summary of Key Findings

We found that caregivers had mixed feelings about integrating AI-assisted technologies into their daily care, with caregivers providing thoughtful reflections about both the opportunities and challenges these imagined future technologies could provide. While the scenarios we used in our focus groups were fictional, recent research has begun designing and developing AI-assisted technologies in dementia care, particularly for the purpose of monitoring and safety [20, 33]. For example, environmental sensors detect movement to alert caregivers in case of an event such as a fall [33]. Research has shown that care staff and other stakeholders in long-term care homes tend to share promissory ideas around how AI technologies might support care [36]. These ideas centre on the potential of AI to solve challenges in areas such as falls detection and monitoring, and clinical diagnosis and pain management. Our findings diverge from these ideas and suggest that, when considering the potential role of AI in supporting social and emotional care in family caregiving scenarios, caregivers can have more nuanced ideas about both the promises and threats AI could introduce.

A core concern that our participants raised was around agency or "control". A common fear of AI technologies, particularly in care settings, is that they will remove agency [9]. For example, there has been concern that monitoring technologies are designed to be used "on" a person living with dementia, rather than "by" the person or "with" a caregiver [16, 32, 39]. In line with this prior work, our study found a level of caution and scepticism among caregivers and concern that AI technologies could threaten human connection and autonomy in care.

Conversely, caregivers thought it would be wonderful if AI technologies could directly assist playing music with their loved one or support and inform the broader care network. This extends the promise of AI in dementia care, beyond social connection, monitoring, and clinical care. In line with prior work, there is a clear opportunity for AI technologies to play a role in enhancing creativity, enjoyment, and fun for older adults [40]. Arts- or music-based technologies could be enhanced by AI, and there are opportunities to thoughtfully design music-based technologies to support care. Music-based AI technologies may have potential to support people living with dementia, for example by selecting

appropriate, personalised music in the absence of a caregiver. Further, AI technologies could support caregivers as they learn to manage the needs of the person they care for, and inform those in the broader care network, such as paid carers or other family members, who are less familiar with the care recipient's signs of agitation or distress. Used in this way, AI technologies could reduce the risk that person-centred care could be compromised via technology [38].

5.2   Insights from Caregivers' Perspectives on AI-assisted Technology for Dementia Care

From our findings and previous literature, we identify four insights that can inform the design of future AI-assisted technologies in social and emotional dementia care. Our broader goal is to understand how music-based technologies could be designed to augment dementia care by supporting the needs of caregivers and care recipients. We therefore discuss below how our insights can inform the design of music technologies specifically, as well broader arts-based technologies for use in dementia care.

AI systems can be designed to enhance caregivers' skills. Caregivers discussed where they saw potential benefits for AI to integrate into dementia care. While many caregivers felt that their own experience and knowledge negated the need for guidance from an automated system, they also suggested that an AI tool could be useful to advise them while they were new to the caregiving journey and still learning how to best respond to the diverse symptoms of dementia. This was further extended to supporting the broader care network, such as other carers and family members, who do not have the same knowledge as the primary caregiver. Therefore, AI-assisted tools in dementia care, such as an emotion monitoring system [49], or sensors that measure sleep or agitation [33], could be contextualised as teaching and learning tools, supporting caregivers as they develop their own skills and learn how to use other strategies and techniques to assist their loved one. In this way, AI tools in dementia care would not replace caregivers; rather, such tools could suggest ideas and provide support for new caregivers, or those in the broader care network. For example, an AI-assisted system augmenting music use might suggest a song that caregivers could try, based on inputs from a wearable sensor, with clear reasoning and explanation provided, to help the caregiver learn the most appropriate music for a situation.

Dementia care technologies must cater to the diverse needs of multiple users. Dementia care often involves not only a dyad of a primary caregiver and a care recipient, but frequently involves extended family and other carers. As such, these insights must be considered in terms of the multiple users for such technologies. Any AI-assisted system in dementia care, whether focused on monitoring or supporting social and emotional care, will involve more than one user. As Flora reflected, those in the broader care network have varying degrees of knowledge of care and familiarity with a person living with dementia's specific needs. Therefore, new technologies must be adapted to suit the needs of these multiple user types, for example by considering preferred music of multiple people in the care network [48].

AI technologies must be designed to carefully balance autonomy and support for the care recipient. Consistent with previous work, participants discussed the importance of maintaining their own autonomy over the system [12, 13]. The caregiver and care recipient must be able to easily decide when and how the system operates. Prior research has encouraged empathic design, whereby older adults with cognitive impairment are given support when needed, but not offered more help than they require – empowering, rather than simply helping [23]. As we were unable to gain insights directly from care recipients in the present study, future research and design must additionally consider perspectives from a range of people living with dementia. Including this perspective will assist in ensuring that AI technologies are designed to carefully balance agency for individuals living with dementia [50], with providing meaningful assistance in daily life, such as supporting those who no longer initiate music listening [51]. As suggested in the example by Dana, an automated system could recommend music to a care recipient when the caregiver is not present, via voice control.

Prior research has found health and wellbeing benefits for older adults who used a smart speaker in their daily lives, for playing music and connecting with the outside world [28]. Voice control could therefore be one avenue to ensure that technologies are integrated in a way that enables the care recipient to have agency in the technology use, even when a person living with dementia struggles with loss of initiative [16, 39, 51]. For example, in the absence of a caregiver, an AI-assisted system could ask a care recipient via a smart speaker whether they would like to listen to music, and respond to their request. Further research would be required to test this approach with people living with dementia, particularly for situations where people living with dementia do not have a caregiver [37].

AI technologies must be designed to augment rather than replace relational human care. Caregivers in our study questioned whether technology should be used to make caring 'easier' if it compromises connection with the care recipient. Caregivers did not want to be replaced by an automated system. Rather, they hoped for a system that could support better connection and interaction, both for the dyad and those in the broader care network. For example, an automated system could suggest music for the dyad to reflect on together [22], or advise a caregiver who is still learning how to manage behavioural and psychological symptoms. Carefully designing AI-assisted technologies to augment care—rather than replacing caregivers—is crucial to alleviate the potential risks of such systems for depersonalisation, discrimination, dehumanisation, and disciplining via constant AI-based monitoring and surveillance [38].

6 CONCLUSION

We explored caregivers' perceptions of future AI-assisted technologies for supporting dementia care. In focus groups, we asked caregivers to reflect on prompts around different ideas for hypothetical future sensor technologies, including a 'magic speaker' to support music listening and wearable sensor technologies to detect signs of mood changes. We also asked about caregivers' hopes and fears for new technologies in dementia care. We found three key themes. First, caregivers were uncertain and cautious about how such systems could augment care. Second, caregivers emphasised the importance of maintaining connection and autonomy in the face of AI systems. Finally, caregivers suggested ways that AI-assisted technologies could be a training tool or support the broader care network. While these findings provide valuable insights about caregivers' views on the future use of technology in dementia care, we note that our participants were a relatively small group with little diversity of demographics. Therefore, future research should aim to investigate these issues with a more diverse group of caregivers, to explore how needs might differ across different roles and responsibilities across the larger care network.

Our findings contribute to existing research by suggesting ways that AI technologies can augment social and emotional care, for example by supporting music use. If designed to carefully consider caregivers' concerns about such tools, future technologies could provide sensitive and appropriate support for dementia care.

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