Supporting Creativity in Aged Care: Lessons from Group Singing, Music Therapy, and Immersive Virtual Reality Programs

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Engaging in creative activities can be valuable in later life, especially for those who want to enhance their social connections or who have experienced reduced opportunities to engage in meaningful activities due to health and care needs. As well as being beneficial for older adults, we argue that creativity can be an important component of psychosocial caregiving. This has implications for how we design and use technology to support care in later life. In this paper, we draw on our combined experiences with three programs of research that each focused on psychosocial caregiving in different care settings. Further, each program involved different creative endeavours, including group singing; music therapy in family dementia care; and the creative use of immersive virtual reality for personalised enrichment. Drawing on these examples, we argue that any design and deployment of technology to support psychosocial caregiving needs to allow for and support creativity in care.

CCS Concepts: • **Human-centered computing → Empirical studies in HCI**.

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1 INTRODUCTION

Creative endeavours offer people meaning and fulfilment throughout their lives, but can become especially valuable in later life, when people may encounter reduced social networks, limited mobility, and a decline in cognitive and sensory abilities [9, 30]. As people retire and grow older, creativity can offer important opportunities to stimulate ideas and imagination, generate aesthetic experience, and provide social connection. This can be beneficial both for older adults who live independently and for those who depend on care, including people living in residential aged care homes, where there may be reduced opportunities to engage in meaningful and fulfilling activities [51, 56].

In care settings, creativity is not only important for older adults but can also be a valuable way to enhance psychosocial care [24, 72]. "Creativity in care" can involve incorporating creative activities - such as art and music - into care. Indeed, many therapeutic activities and community programs in aged care - such as music therapy, art therapy, and dance and movement programs - involve creativity for both the care giver and the person being cared for. It can also mean

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adopting a creative approach to care: that is, designing personally meaningful and responsive care activities that cater to the interests, needs, and values of the individuals being cared for [5, 6, 76].

In today's digital world, many creative endeavours are supported and mediated by a range of current and emerging technologies. For example, we use digital devices to create, share, and consume music [28, 41, 44], to create and share digital art [45] and to engage in digital storytelling [10]. This alignment between creative endeavours and the use of technology can also be seen in how technologies are designed and used to foster social connections in later life. In HCI, researchers have examined how digital technologies can enhance older adults' creative endeavours, including activities such as crafting [39], making [48], and photo-sharing [75], all of which can lead to enhanced social connectedness.

While this prior work has made a significant contribution by emphasising that technologies can and are being designed and used to augment older adults' active participation in personally meaningful activities, our focus is on the link between creativity and care. We are particularly interested in psychosocial caregiving, that is, attending to people's social and emotional needs. This form of caregiving can result in opportunities to participate in personally meaningful activities, but such opportunities may need to be mediated by the caregivers' creative practices. That is, the caregiver actively creates opportunities for people to participate in meaningful activities. Furthermore, such activities often involve creative endeavours, which may only be possible with access to appropriate support and resources, including, in some cases, technology-based tools. Drawing on both a review of recent research and our own experiences examining creativity in care, in this paper we ask *what needs to be considered when designing and deploying technology to support creativity in caregiving, particularly to foster connection in later life?*

We draw on our combined experiences with three programs of research that focused on psychosocial caregiving in different care settings: 1) care for older people in the community at risk of experiencing loneliness, 2) family care for people with dementia, and 3) care for people living in residential aged care homes. Each program involved different caregiving activities, with varying uses of technology, ranging from a group singing program which was not conceived to incorporate technology, but adapted over time in response to technological advances and societal changes (program 1), a music therapy program that aims to inform future technology design (program 2), and a social enrichment program that involves using immersive virtual reality in residential aged care (program 3). It is important to note that while we draw on these three programs of research, this is a *conceptual* rather than an empirical paper. That is, rather than presenting findings and data from our studies, we bring together our reflections from each research program, along with considerations from other published research, and consider what lessons we can draw from these combined experiences to inform the future design and use of technology to support creativity in caregiving. We argue that creativity is an important component of caregiving, especially when the care provided aims to address people's psychosocial needs. Therefore, any design and deployment of technology to support psychosocial caregiving needs to allow for and support this creativity.

2 BACKGROUND

2.1 Defining Creativity

Over the past three decades, much of the research within HCI has examined technology-mediated creativity [29]. Researchers have designed tools that either support explicit creative endeavours, such as creating music [36], or help to expand opportunities for embedded everyday creativity [58]. In their review of this work, Frich et al [29] found that much of the HCI research on creativity has focused on supporting collaborative, rather than individual, creativity. In addition, they found that the definition of creativity within HCI research is often vague, leading to questions about

what HCI researchers actually mean by creativity. If research aims to inform the design of technologies that support creativity, this lack of a clear definition is problematic.

If we look to creative arts research for a definition, however, we again find challenges in defining creativity. This is because creativity has been conceived in different ways according to cultural context and historical period [42]. However, it has been consistently associated with the 'betterment of the human condition' ([42], p.1). Some conceptions have focused on process-oriented aspects of creativity exploring how it can occur (for example, it engages divergent thinking processes), whereas others have focused on the outcomes of creative activity which are repeatedly associated with novelty and value [15, 40, 65].

Whatever the field of creative endeavour, creativity is shown to involve anticipatory imagination, problem-solving, problem seeking, and generating of ideas and aesthetic sensibilities [65]. Creative processes are often distributed between people, across the brains and bodies of collaborating participants, and across the objects, technologies, locations, systems, and environments within which they occur [59]. This understanding of creativity draws on the notion of distributed cognition, a widely used framework in HCI [33].

2.2 Creativity in Later Life

As we age, we may experience decline in functional capacity and reduced opportunities to engage in professional, leisure, cultural and social activities [69]. Engagement in creative activity in later life promises several positive impacts. Creative endeavours can activate cognitive reserves and promote cognitive functionality by involving activities such as problem solving, retrieving information, remembering, and learning [79]. Furthermore, creativity can elicit strong aesthetic responses and stir emotions [16, 37].

In HCI research, there has been growing interest in how technologies can be designed to best support older adults' creative endeavours. Some of this work focuses on "making", a term Kalma et al [38] use to refer to activities ranging from "traditional crafts like knitting, crochet, and metalworking to emerging Do it Yourself (DIY) making projects with electronic and interactive technologies like Arduino and Raspberry Pi" ([38], p. 194). A prominent example of the latter kind of making is the "MaKey MaKey" project by Yvonne Rogers and colleagues [64]. In this study, small groups of older adults used the MaKey MaKey Arduino toolkit to engage in playful design activities, creating musical instruments from pieces of fruit. Each group engaged creatively with the toolkit, coming up with new ideas and theorising about what objects would work best for creating the musical sounds they aimed to achieve. Rogers et al [64] argued there was great value in empowering older people to engage in this form of playful creativity, and that there is a need to consider other opportunities for new tools and technologies to "enable more people to be involved in the design and use of creative technologies" (p. 3913).

Drawing on a review of the research literature on activities that involve making and crafting, Kalma et al [38] argued that, for older adults, engaging in these creative endeavours can provide benefits that align with each of the three pillars of positive ageing: health, participation, and security. Of particular interest to our work is the benefit that making – and creativity more broadly – offers to the pillar of participation, which involves building connections between people. As Kalma et al observed, there are many online and offline community groups that centre on making, and these may offer valuable opportunities for social participation for older adults [38].

Other research has examined how older adults create and share content online. Examples include creating and sharing videos on YouTube [31] and TikTok [57], writing and publishing blogs [11], and creating content for community radio [60]. In addition, researchers have examined the use of a purpose-built application for creating and sharing photographs within small groups of older adults [75]. In this example, creative photo-sharing supported self-expression,

which in turn helped to facilitate the forming of new social connections among older adults who were socially isolated. Similar benefits can be seen in other research examining the creation and sharing of personal creative content among older adults (e.g., [12]).

The research reviewed here offers valuable insights into the benefits that creativity can provide in later life, especially for those who may be experiencing loss of connection and reduced opportunities to engage in meaningful activities. This research mostly identifies benefits for individual and independent older adults within communities or networks of peers. The opportunities for creativity, however, can extend beyond these settings. Creativity can also benefit people who are in later stages of old age, or who have more advanced care needs than the participants in the studies described above. In such contexts, we need to consider not only how to provide opportunities for creative endeavours in later life, but also how to embed creativity in care.

2.3 Creativity in Care

"Creativity in care" can mean incorporating creative activities into caregiving - for example, through the use of music and art programs in care settings - and approaching care with creativity - for example, designing activities for personal enrichment in response to individual interests and needs. Drawing on a "care ethics" perspective, we see care as an essential part of everyday life that encompasses a range of activities and settings [71]. For care ethicists, the cornerstone of care is connectedness [8]. Care is central to everyday life because human flourishing requires being cared for and caring for others; that is, making situated judgements about other people's needs and responding accordingly [71]). A care ethics perspective on creativity involves shifting the focus of creative practice from creating meaningful or valuable objects to creating meaningful or valuable relationships [52]. Millner and Coombs [52] argue that creative practice can and does involve care. Similarly, we argue that care involves creativity, especially when the goal of care is to meet a person's psychosocial needs for connectedness and social enrichment.

Although care is embedded in everyday life, it is most recognisable when it involves caring for a person or groups of people who are considered vulnerable and unable to survive without receiving care. For example, a parent caring for a child, or a nurse caring for a patient are readily recalled as examples of caring. In our research, we are interested in aged care, or caring for those who are experiencing frailty, isolation, cognitive decline, and other negative impacts of ageing. This care can be formal – that is, care provided by a person paid to undertake care, often within an institutional setting, such as residential aged care. Alternatively, it can be informal, with care provided by and for family members.

In formal institutional settings, or residential aged care, care needs are often significant and complex [27]. For instance, in Australia, around 50 per cent of residents living in aged care homes have dementia, most of whom will exhibit challenging behaviours at some stage of their stay making care stressful for staff [50]. This combined with low levels of training, high numbers of immigrants with low levels of English literacy, poor job satisfaction, and high levels of burnout, have led to an annual staff attrition rate of 29 per cent [17]. Care homes are short-staffed, which means the available time needed to provide meaningful psychosocial interaction with residents is limited.

With these challenges in mind, creative endeavours – including technology-mediated creativity – can support, enrich, and enable care. For example, HCI researchers have explored how art therapy can provide opportunities for "creative, visual expression of ideas, thoughts, and experiences" for people with complex communication needs, including people with dementia living in residential aged care ([47], p. 351). Cornejo et al. [19] conducted a year-long qualitative inquiry involving observations of art therapy sessions and interviews with art therapists in an investigation of an art therapy program conducted in residential aged care with older adults with dementia. In their analysis, they considered the privacy implications and negotiations that were required when sharing older participants' creative work. Although

their focus was on supporting the "complex and dynamic social sharing practices of vulnerable populations," their detailed inquiry also provides insights into creativity in aged care. They showed that art therapists play an essential role in constructing an accessible environment for creating artwork and in negotiating with older adults about how that artwork should be shared.

Lazar et al. [46] conducted a field study in a similar context, describing how art therapists empowered older adults with dementia to participate in constructive art therapy by using empathy and the "third hand", or functional and practical support in the creative process. Lazar et al found that for older adults with dementia, successful engagement in art therapy depended heavily on the therapists who adapted their practice in response to clients' physical and psychological needs; through this process they were able to promote clients' self-esteem and autonomy [46]). This research informed the development of a prototype interactive art frame, which was then trialled in art therapy sessions. The authors found that while there were some benefits to using technology to capture the creative outputs of art therapy, there were also risks involved in introducing technology into this space of creative care. That is, the new tool could disrupt the connection between the therapist and the person receiving care by shifting focus to the tool being used [46].

Another recognised approach used in aged care to help address clients' psychosocial needs is creating and engaging in music activities. This can involve group singing activities, such as those included in the social program in residential aged care homes (e.g., [25]), one-to-one music therapy (e.g., [62]), and playful improvisation supported by bespoke technologies (e.g., [41]). These programs can provide social benefits for different groups of older people, not just those receiving formal aged care. For instance, Davidson et al [26] conducted an evaluation assessing the impact of a group singing program on the wellbeing of community-dwelling older people (that is, people living independently in their own homes). The older participants they interviewed emphasised the social benefits they derived from the program. In this way, group singing addressed the needs for social engagement through community connection [74].

In HCI research, there has been considerable interest in the design of creative technologies to enable the use of sound and music in aged care, particularly to support people with dementia (e.g., [35]). However, less attention has been given to designing technologies to support the care relationship between therapist and clients. In response to this gap, Baglione et al [3] interviewed music therapists to better understand their practices and needs, particularly in relation to how they used technology. They found that widely available technologies, such as YouTube and Spotify, were valued by therapists because they helped to provide personalised connection with clients. They used streaming services to access any song that a client requested. This freedom of access to music enabled therapists to tailor programs in response to in-the-moment needs. One participant noted that "Music therapists are uniquely situated to engage clients in these dynamic music experiences that are individualized... at the end of the day, it's not about my [therapist's] music. It's about their music. I'm just a facilitator" ([3], p. 13).

Similarly, Carrasco et al [14] examined the work of music therapists as they engaged with people with dementia and their family caregivers. They found that personalisation was a crucial component of the therapist's work. This extended beyond choosing music that was personally meaningful to the person being cared for; it also involved identifying the contexts in which different music choices would be most useful. This finding led the authors to argue that technologies designed to support music therapy in family care should enable and facilitate personalisation. For example, an application could be designed to provide personalised recommendations of music choices in response to the daily changing needs of the person with dementia [14].

This prior work has highlighted the role caregivers and therapists play in supporting creativity in aged care. In this paper, we aim to explore creativity in care by looking at three contrasting examples that each showcase how creativity,

in different forms, has supported diverse kinds of care and connection for people in later life. We introduce our three examples below.

3 CREATIVITY FOR CARE AND CONNECTION: THREE PROGRAMS

In this section, we present our reflections from three social or therapeutic programs that aimed to provide support for older adults who had differing needs for psychosocial care and support. While these three programs seem, at first, to be quite disparate, we see connections in how they each involve creativity for the pursuit of care and connection. By reflecting on these three programs together, we aim to highlight how creativity can play a core role in fostering connections between care givers and care recipients, as well as providing other opportunities for enriching social connections in later life. Drawing on lessons from the three programs, we argue that technologies that aim to support care and connection in later life should be designed and deployed in ways that prioritise creative endeavours, including the creativity of both care givers and care recipients.

The programs discussed below differ in the forms of creativity they highlight, but also in the role that technology plays. In the first example, group singing for social connection, the program ran in-person for many years only including technology as a tool for coordinating communications between group members; but over time shifts in practice and the COVID-19 pandemic precipitated changes that had positive impact on the program leaders and participants. The second example describes how an in-person program using music therapy provides inspiration for the design of a digital application to support caregivers to use music therapy while caring for people with dementia. Here, technology will be designed into the music therapy training program. In the third example, technology is the focus of the activity, with caregivers designing immersive virtual reality experiences to provide tailored enrichment for people living in residential aged care. Here, the creativity is not as central as the technology, but making effective use of immersive VR in this setting involves substantial creativity on the part of the care giver.

In the reflections below we do not provide details about data collection and analysis, although each of the programs described is from a research study we have conducted. The three studies involved different research approaches, including semi-structured interviews with program participants and caregivers [22–24, 26, 73, 76] and a randomised controlled trial evaluating a music therapy training program [5]. Our aim here is not to present and discuss findings, but rather to reflect on the role of creativity in care in each of the programs we have been involved in.

3.1 Program 1: Group Singing and Expanding Possibilities for Creative Connectedness

As noted above, community singing groups can provide valuable social benefits for older adults [26]. Recognising this potential benefit, in 2008 we (the second author) established six community singing groups with the goal of targeting socio-emotional connection and creative expression for older people [22–24, 26]. Of these groups, two continue to be active and the research team remains in contact with them. The reflections below draw on the second author's long-term knowledge of the groups. This knowledge has been facilitated by initial leadership participation in the groups, and one-to-one semi-structured interviews and informal 'catch ups' carried out intermittently to understand the changes, challenges and benefits derived from being part of the program.

Participants joined the groups for very different reasons. For example, two of the older women who participated were invited to join by their daughters who could both see potential social benefits for their mothers. One of these women, who was aged 88 when she joined the group, had a long history of music performance; the singing group offered an opportunity to reconnect with an activity she had previously enjoyed and at which she had excelled. The

other woman, aged 78 when she joined, had recently immigrated to Australia, and needed opportunities to forge new social connections within her local community.

Despite different motivations for joining the groups, there were surprisingly similar benefits for participants. There were perceived cognitive benefits: the program offered cognitive challenges and rewards with participants learning new music, words, and stage behaviours, including the memorisation of music for performance. The program also had a positive impact on participants' emotional state: they felt positive, uplifting emotions of joy, fun and happiness through participation.

The program enabled a range of creative opportunities: contributing to the development of new ideas for songs, lyrics, staging, and additionally, there was strong participation in creating morning tea treats such as scones and cakes. This opportunity for engaging in creative endeavours meant the program enabled participants to feel a sense of personal pride and achievement in their different types of involvement. Some became singers in a group for the very first time, working with their section to create a good sound; while others became featured soloists, working on new repertoire.

Relatedly, the groups offered a sense of expansion of personal musical horizons, and, for many, a performer identity was a new and expanded sense of who they were and what they could potentially achieve. For those who believed their musical performance opportunities were long over, they were able to re-kindle and re-affirm their performance capacities in a new context.

Perhaps most prominent was the social benefit that the program provided. Each singing group offered what was described as 'fellowship through song' which was felt to bring "immediate closeness" and literal as well as metaphorical "harmony between the singers." This connectedness was as important during the singing sessions as outside of them. Participants developed new friendships and a rich network of connections that led to social gatherings and communications outside of the weekly singing sessions.

Over time, participants gave and received new forms of care, both musical and social. Indeed, the groups became sites for powerful forms of socio-emotional support; for example, to support bereavement and loss, or to discuss and share common experience, e.g., carer experiences. While one group specifically targeted community-based carer and cared for dyads (typically spouses or parent and offspring), an increase in familial and friendship participation was noted in both singing groups. Carer involvement and support increased, offering benefits to carers as well as those being cared for. For example, where offspring were regular visitors to aged parents who either lived alone or in retirement complexes, the singing group offered a new and deeper way of connecting. Supporting parents to attend rehearsals or watching the choral performances offered ancillary benefits to family members, as they could see the impact of the cognitive and emotional benefits listed above and could transfer some of these feelings – such as joy and pride - to themselves.

But, emergent and crucial to these important creative and connecting socio-musical experiences, technology became embedded within the sessions in ways not imaginable when the choirs were originally founded. The following illustrations reveal how the use of technology expanded accessibility and engagement, and how confidence with technology grew. These changes generated new possibilities for augmented creativity and connection between participants.

Sound support: Music practice away from the choir was always supported with the provision of CDs/tapes; but as time progressed and more participants became familiar with tablet technology, singalong backing tracks with multi-layering functions were made available to them to further support their music learning. Individuals were encouraged and supported to lay down recordings of their own singing so that multi-track versions of songs could be created, enabling new forms of engagement and participation.

Social support: Car pooling and lifts to and from rehearsals and performances were initially the only way the choirs could operate. Communication around this was undertaken either face-to-face in the rehearsals or via phone. As

people took on more technological knowledge, this connection was augmented with the use of social media pages (e.g., Facebook) and chat groups. This enabled more of the group to stay connected outside of the rehearsals and meant that lifts and car-pooling information could be easily shared. The chat groups became very important forms of bridging and bonding social capital for participants.

Transitioning to online sessions: Transitioning to online sessions - In the early years of the choirs, if someone was unable to attend owing to illness or infirmity, their participation inevitably dwindled and would eventually terminate. With the rapid adoption of platforms like Zoom and Teams during COVID-19 lockdowns, choristers are now able to attend weekly rehearsals whether in person or online, allowing for ongoing connection. While no one would wish to replace the joy of live social communion and singing, technology has enabled the choirs to expand and keep participants connected even across the pandemic.

3.2 Program 2: Music Therapy in Family Dementia Care

Music therapy is a non-pharmaceutical treatment that can assist in responding to the global challenge of caring for people with dementia, a disease which is increasingly prevalent as the population ages [4, 5]. Family caregivers play a vital role in providing care for a person with dementia (PwD). Because of the cost and detrimental effects of residential aged care, it is imperative that people with dementia are supported to live at home for as long as possible, benefiting from being in a familiar environment and supported by personalised care provided by family members. However, this requires significant support for family caregivers, especially if they are required to manage distressing behavioural and psychological symptoms of dementia. Managing such symptoms can lead to negative physical and mental health for caregivers, including fatigue, depression, and burnout. Current estimates are that 75 per cent of family carers experience carer burden [2].

To address this, a large international consortium of researchers has established a program that is supporting caregivers to learn how to use music therapeutically in their care [5]. Caregivers have been provided with three training sessions over six weeks, each delivered by a credentialed music therapist via videoconferencing. The training sessions were individualised according to cultural needs and level of functioning of the person with dementia so that strategies could be tailored to each family context. Caregivers were then asked to integrate music care activities into their daily lives for a period of three months. Caregivers did not require any special music skills to take part in the project. The program is being evaluated through a randomised controlled trial.

This is a large research program, involving 50 researchers and music therapists from five countries, and included 420 family carers and 420 people living with dementia and so the reflections shared here provide just a brief snapshot of the program. The program uses a purposefully developed music intervention, a key component of which is training caregivers to use music so as to attune and connect with their loved ones. In other words, care givers are trained to use music creatively and therapeutically to help form a bond between themselves and the person they are caring for. They have been taught, for example, to adapt their live singing to attune with the internal and external tempo of the person being cared for. An example of this attunement can be seen in matching singing with the walking tempo or breathing rate of the person with dementia, using their preferred music and then adapting the tempo to regulate. Similarly, caregivers have been taught to create improvised songs during daily tasks such as when at meals, in the shower, or when going for walks.

In an extension of this program, researchers are now drawing on lessons from the in-person intervention to design and deploy a mobile application that will empower caregivers to use music to address their in-the-moment caring needs. Given the labour required to provide individual music therapy training sessions for family caregivers, a technology-based

program could extend the reach of this training. Designing and deploying a technology-based program will ensure music therapy support can be provided to a larger number of family caregivers and, beyond this, to support the use of music therapy-informed practices in residential aged care homes. Designing technology to support this therapeutic use of music also provides opportunities to enhance personalised care, which was one of the key design considerations from Carrasco et al's [14] study. For example, artificial intelligence could be used to detect signs of mood or behavioural needs and to recommend appropriate use of music in response. As we note below, however, such an approach needs to consider the role of the caregiver in responding creatively to in-the-moment care needs.

3.3 Program 3: Immersive Virtual Reality for Enrichment in Aged Care

Our final program is a departure from the music-based programs described above, and instead focuses on the creative use of technology to support care. This example comes from a series of interview studies conducted in 2018 to 2020 with aged care staff and volunteers who have been using immersive virtual reality as part of activity programs run in residential aged care homes [73, 76].

Residential aged care homes provide 24-hour care for people with high care needs. Aged care residents are often in their 80s, 90s, or older, and usually have conditions that make it difficult for them to remain living independently at home – for example, dementia, frailty, sensory decline, and mobility impairments [27]. Upon moving to an aged care home, people can experience a loss of independence and reduced opportunities to engage in a range of activities, including creative pursuits. Aged care providers typically try to counter this by scheduling a full program of social activities [68], but these do not meet the needs of all residents [55, 56]. In Australia, aged care has been under scrutiny in recent years, with a recent Royal Commission report highlighting that there is an urgent need for improvements in the psychosocial care provided for people living in aged care homes [18].

To ensure residents have opportunities to engage in more meaningful experiences, some aged care homes have recently begun including immersive virtual reality (VR) as part of their activity programs [73]. In residential care, where people may have limited opportunities to leave the care home environment, immersive VR enables people to experience virtual travel, relaxation, and to virtually engage in activities and adventures that are otherwise inaccessible to them, such as sky diving. Recognising that VR may offer unique opportunities for social enrichment in aged care, there has been a sudden expansion of research on this topic in the last five years, including within HCI (e.g., [1, 7, 13, 32, 66, 67, 77, 80].

While prior research has often involved introducing VR into aged care and then evaluating it in short-term trials (e.g., [7]), in this program of research we were interested in understanding how VR is already being used in aged care, through interviews with people working in aged care who have introduced and facilitated VR as part of the lifestyle or activity programs in aged care homes. From these interviews, we have observed a strong element of creativity involved in choosing and designing VR experiences to meet the needs of individual aged care residents. This is a form of psychosocial caregiving: caregivers identify the social and emotional needs of the people they are caring for and carefully choose VR experiences that might respond to those needs. It also aligns with the notion of attunement, which is a core component of both music and art therapy [3, 46].

A compelling example comes from a volunteer who has been using VR to help people living in aged care reconnect with past interests and experiences. The volunteer, Frank, described how he spends considerable time getting to know individual residents before introducing any technology. He said, *"I've never put a virtual reality headset near anyone until I know a whole lot about that person. A whole lot."* This includes information about where they grew up, so that Frank can choose virtual travel experiences that reconnect them with their childhood, and information about their favourite activities and their hopes and dreams.

For instance, Frank described meeting an aged care resident, almost 100 years old, who was a car fanatic. Frank asked the resident what his greatest dream was, to which he responded: *"I would love to be able to sit in a Formula 1 race car."* Frank set about finding a VR experience that matched this dream and was able to help the resident use a VR headset to virtually race a lap at the Formula 1 racetrack in Germany. Frank described watching the man while he was immersed in the VR experience. He was *"whooping and hollering, having such a ball"* and he continued to talk about the experience with his family for a long time afterwards.

This is one of many examples that Frank and other interviewees shared during this research. It was clear that considerable effort had gone into choosing appropriate VR experiences, monitoring the VR activity, and talking to residents afterwards about their experiences. Tailoring experiences to the individual resident's interests and needs required an open mind on the part of the caregiver. They needed to be attuned to residents' needs and able to respond accordingly. In this way, they were able to select travel experiences for those residents who were bored and in need of adventure, meditative experiences for those who were distressed or agitated, and reminiscence experiences for those who were showing signs of disconnected or homesick. We argue that this careful selection of experiences is a form of creativity. In line with the care ethics definition of care, described above, caregivers are seen to be making "situated judgements" about people's needs and then carefully choosing and facilitating technology-based experiences that meet those needs.

4 DISCUSSION

Having introduced our three programs showcasing different kinds of creativity for care and connection, we now turn to the question posed earlier: *what needs to be considered when designing and deploying technology to support creativity in caregiving, particularly to foster connection in later life?* The lessons we present below are general observations, rather than specific design guidelines. In presenting and discussing these lessons, our goal is to foster discussion about technology in supporting creativity in care. This, we hope, will seed broader discussions about technology in care, particularly aged care, which has become a prominent focus as public discourse increasingly considers how technology can help to address growing care needs associated with an ageing population. We present three lessons, highlighting a) the different forms of creativity that can be involved in psychosocial care, b) the importance of personalised care, and c) the relational nature of care. After presenting these lessons, we discuss their implications for future HCI research on designing and deploying technology for creativity in aged care.

4.1 Lesson 1: Psychosocial Care can Involve Different Forms of Creativity

Perhaps unsurprisingly, given the diverse examples we have shared, our first lesson is that psychosocial care can involve different forms of creativity. We have focused on two examples of music-based creative endeavours: group singing and individual music therapy. However, our review of the literature on creativity in care also highlights art therapy (e.g., [19, 46, 47]), and we acknowledge that there are many other kinds of creative endeavours that have been used effectively in aged care, including poetry [78], photography [43, 54], and digital storytelling [63]. Adding to these more obvious forms of creativity, we have argued that using technology-based experiences in psychosocial care can itself be a form of creativity. In this case, the caregiver needs to be attuned to the care recipient's needs and to creatively design a personalised experience that is tailored to those needs.

What does this mean for designing and deploying technology to support creativity in care? Firstly, as HCI researchers have already noted, there are many opportunities to design bespoke technologies and tools that support specific forms of creativity in care (e.g., [34]). Lazar et al [46], for example, designed a prototype digital art frame that aimed to support

the sharing of clients' creative outputs during art therapy sessions in a way that did not disrupt the "Third Hand" - the practical but invisible support that a therapist provides to ensure the art activity proceeds smoothly. Looking at the programs we have highlighted, we can see opportunities to design tools that cater specifically to the needs of family caregivers of people with dementia, to help them to use music to respond to everyday and emergent care needs.

In contrast, supporting a group singing program may involve adopting existing videoconference tools such as Zoom, thereby enabling people to continue participating when they cannot attend in person, as shown in our first example. The use of videoconferencing tools to support real-time participation in group creative endeavours has been an interesting side-effect of the restrictions introduced to slow the transmission of COVID-19 (e.g., [61]). Previously, leaders of such groups may not have even considered the possibility of using technology to support their practices or expand their reach. However, a recent interview study involving community arts practitioners suggests that technology not only enabled these practitioners to continue their work during lockdowns, but also allowed them to increase connection and engagement with wider networks [20]. It remains to be seen whether this use of technology will continue. If it does, an important concern for HCI research is to ensure that all older adults have opportunities to participate in technology-mediated creative endeavours - not just those who have access to technology and confidence in their digital literacy.

In addition to designing and deploying technology to target specific creative activities, we have shown that there are also opportunities associated with using technology to provide access to a diverse range of content that can support creativity in care. In the immersive VR example, interviewees had access to a range of experiences through the VR programs they used and were able to explore the Internet for other experiences in response to clients' individual interests. Frank, for example, searched for a Formula 1 VR experience in response to his client's dream to drive a formula 1 race car. This is similar to the use of YouTube and Spotify by music therapists in Baglione et al's [3] study. They showed that general-purpose and widely available technologies provided great flexibility for music therapists, enabling them to offer tailored experiences for clients and adapt their practice when required. Similarly, Waycott et al [76] found that technology-based enrichment in aged care often involves adapting and using technologies that are widely available, rather than using technologies that are purpose-built for aged care. However, they cautioned that such technologies need to be carefully chosen to ensure they meet the needs of individual residents.

4.2 Lesson 2: A Personalised Approach is Crucial

Building on the arguments above, our second lesson is that a personalised approach is often crucial when providing psychosocial care through creative practices. This can be seen most clearly in our second and third examples, where the caregiver needed to be responsive to the needs of the person being cared for. In particular, the music therapy program involved training caregivers to use music in attunement with the rhythms and behaviours of the person with dementia, such as singing a song with a tempo that matches their walking pace.

This is a highly personalised and individual approach, which raises questions about how technology can best be designed to support this form of care. As we can see from prior HCI research on art and music therapy, therapists play a central role in ensuring the creative endeavours they are facilitating are appropriate for their clients [47]. Meanwhile, outside of therapeutic activities, creative endeavours that focus on community connectedness often rely on the work of a skilled facilitator who adapts the program in response to the needs of individual participants [49]. Similarly, facilitators can play a key role in ensuring people derive benefit from technology-based enrichment activity, such as using virtual reality and digital games in aged care [53, 73]. Any tools designed to support this form of care, then, should support the therapist, facilitator, or caregiver in performing this central role. This raises the question: can technology provide the

same kind of personalised care? Can AI-enabled tools, for instance, track a person's in-the-moment needs and provide appropriate responses? Or is human intervention required, given the creativity involved in providing this form of care?

We suggest that while technology can be designed and used to support personalised psychosocial care, there is a need to be cautious in this space, especially when that care involves facilitating engagement in creative endeavours. Lazar et al [46] found that technology could sometimes disrupt the personalised approach therapists had developed. They observed:

Over time, the art therapist has developed practices and an understanding of her clients that allow her to fade into the background of the creation and sharing process, thus highlighting the active role of the older adult rather than her own activity. This results in a dynamic, fluid, and invisible Third Hand. However, the therapist described how current technology becomes obtrusive and disrupts the work of the Third Hand when she attempts to share the client's artwork (p. 1055)

In the quote above, Lazar et al [46] are describing an experience in which using existing technology to share the client's artwork involved disrupting the activity: the therapist paused to say "Let me take a picture... I'll email this to your daughter" and the focus of the interaction shifted to the therapist, rather than the client. The digital art frame that Lazar et al [46] trialled provided a more streamlined process for capturing and sharing the artwork, but still involved challenges, given the complexity of the clients' care needs in their trial.

Personalised care was less apparent in our first example – the group singing program. This can be partly explained by the community group setting, where caregiving was implicit rather than explicit. Implicit care has been observed in other community settings [70]. When in the choir setting, the facilitator had to work with the whole group, and certainly prior to the implementation of Zoom technology those with health and travel concerns were prevented from participating. The use of Zoom technology expanded the facilitator's capacity for care for individuals as she became able to broaden concepts of participation and choir attendance to embrace those too ill or immobile to come to the live meetings. Indeed, the facilitator was acutely aware of individual needs within the whole, and demonstrated great care ensuring individuals were supported. For example, she made sure individuals could attend performances and when an individual had a specific interest in a particular creative endeavour, such as writing rhyming lyrics, she ensured they had the opportunity to engage in this activity.

4.3 Lesson 3: Care is Relational

Drawing on the care ethics perspective, we argue that all care is relational [71]. Each example highlighted the relationships involved in care, from group or community connections to more individual connections between family members or between formal caregivers and the people they were caring for. The activities we profiled each involved *expanding* or enriching these relationships. In the case of the group singing activity, new relationships were formed. In contrast, for the family caregiver who learned to use music therapeutically in their care, existing relationships were strengthened: the creative activity provided a new means of connection with their loved one with dementia. The virtual reality program, meanwhile, helped to create a sense of connection between the person living in residential aged care and the world outside the care home, enabling residents to reconnect with past interests and engage in new experiences.

These examples of relational care and connectedness align with the three levels of technology-mediated connectedness outlined by Waycott et al [74]. They argued that technologies can be designed to foster personal relationships, community connections, and societal engagement and provided examples showcasing how technology can be designed to build these different kinds of connections in later life. While their framework focused on the opportunities that technology provide for supporting *communication* at different levels of connectedness, we argue that this can be extended to encompass *creativity*. Waycott et al argued that technologies for societal engagement should be designed to support

meaningful and creative activities, but we show here that creativity embedded in care relationships can also enhance personal and community connectedness.

As well as supporting creativity in care, technology needs to be designed and deployed so that it supports, not undermines, the relationships that are central in care. We consider with caution, for example, suggestions that technology might be designed to replace care or to fulfil a role that human caregivers already undertake. While recent developments suggest many opportunities for AI-enabled technologies, such as companion robots and voice assistants, to support care, there is a risk they might be designed or deployed to be used in a way that *diminishes* the role of the human caregiver. This could have the effect of reducing creativity in care. In contrast, there are ongoing opportunities to design and use technologies to *enhance* creativity in care. In the last ten years, researchers in HCI have designed many new tools that serve this purpose (e.g., [34, 41, 72]) and we expect that as technical capabilities develop further we will see more opportunities for technology-mediated creativity to enhance care and connection.

4.4 Future research: Designing and Deploying Technology for Creativity in Care

Drawing together the above lessons, we argue that future HCI research on technology and ageing could focus explicitly on examining how technologies can be designed and used to foster wellbeing through creativity. This could involve co-design with various stakeholders, including older adults, care providers, family members, and friends. Co-design activities could focus on identifying ways of using technology to foster participation in *specific* creative endeavours, such as music and art practices, and more *general* creativity, such as adopting design thinking to improve care [21].

Various technologies can be utilised to support creativity in care, ranging from new and emerging technologies, such as immersive virtual reality, to more established and commonplace technologies, such as mobile applications and video calling tools. As noted above, there are opportunities to design and deploy bespoke applications and devices to support specific creative practices. These could make use of AI-enabled tools to provide personalised suggestions and support. In addition, bespoke applications could support different kinds of media content creating and sharing. Meanwhile, general entertainment technologies, such as YouTube, can also be used effectively to support creativity in care. Therefore, in addition to co-designing bespoke applications, future research could consider how to best *co-deploy* existing tools for creative care and connection [76].

Understanding the role of technologies in supporting creativity in care requires a multidisciplinary approach to research. Our work in this area involves substantial interdisciplinary collaboration, bringing together HCI research with expertise in creative practice and social gerontology. We also recommend using various methods to evaluate technology-supportive creativity in care. This is an area that can benefit from participatory approaches, including participatory action research, and in-depth qualitative research. An in-depth and participatory approach would enable researchers to gain insights into the varied individual experiences, including benefits and challenges encountered when engaging in technology-supported creativity in aged care. Alongside this approach, methods such as randomised controlled trials and measures of wellbeing outcomes can provide valuable evidence to inform the future implementation of creative programs in aged care.

5 CONCLUSION

In this paper we have discussed three examples of different kinds of creativity used to support care in later life. Drawing on our combined experiences with these three diverse research programs, we consider the role of creativity in care, especially in supporting a form of psychosocial care that aims to build connections and provide opportunities for those being cared for to engage in meaningful and fulfilling activities. We show that creative endeavours, such as group

singing and music and art therapy, can foster meaningful engagement and connection in later life. Extending beyond these explicit examples of creativity in care, we also suggest that creativity is an important component of care that involves using technology to enable people to engage in activities that are personally meaningful to them.

Rather than being empirically-driven, this paper is conceptual, aiming to foster discussion about the role of technology and creativity in aged care. We outline three lessons for considering the role of technology in supporting creativity in care: 1) psychosocial care can involve different forms of creativity, which leads to opportunities for both designing specific tools that address particular forms of creativity, and the use of more general-purpose digital tools that can be used in different ways to support the particular interests and needs of the people being cared for; 2) a personalised approach is crucial, and technology needs to be designed to allow for this personalisation, particularly to support the role of the carer/therapist/facilitator in personalising the activities; 3) care is relational, and we need to be cautious to ensure technologies are designed and used to support and enrich care relationships, rather than replace them.

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