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Bridging gaps in the design and implementation of socially assistive technologies for dementia care: the role of occupational therapy

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ABSTRACT

Dementia is a global health challenge, and people living with dementia (PLWD) are especially susceptible to reduced engagement in meaningful occupations, including social participation. In the past few decades, socially assistive technologies continue to be developed amidst a rapidly evolving technological landscape to support the social health of PLWD and their caregivers. Examples include social robots, virtual reality, smart home technology, and various digital technologies, such as mobile applications for tablets and smartphones. Despite an increasing body of research and interest in this field, several gaps relating to the design and implementation process of socially assistive technologies continue to undermine their relevance for PLWD in daily life. In this paper, some of these gaps are highlighted and the role of occupational therapy in the design and implementation of socially assistive technology is presented. In the design process, occupational therapists are uniquely skilled to advise and advocate for the tailoring and personalisation of technology to address the occupational needs of PLWD. In the implementation of socially assistive technologies, occupational therapists are skilled to educate, train, and conduct ongoing evaluations with PLWD and their caregivers, to incorporate socially assistive technologies into their routine and daily lives. We recommend that occupational therapists should continue to be acquainted with such technologies through continuous professional development and educational curricula. Moreover, we highlight the necessary collaboration between occupational therapists, technology developers, and researchers to enhance the process of designing and implementing socially assistive technology, so that their relevance for PLWD and their caregivers can be maximised.

➤ IMPLICATIONS FOR REHABILITATION

- Developers and designers of socially assistive technology should consider the disease trajectory of different types of dementia, as well as the different needs, abilities, preferences, occupations and routines of people living with dementia (PLWD) and/or their caregivers.
- Collaborations between technology developers, researchers, and occupational therapists should take place iteratively throughout the process of designing and implementing socially assistive technology to maximise their relevance and applicability for people living with dementia and their caregivers.
- To continue enhancing the current role of occupational therapy in socially assistive technology provision, occupational therapists should keep up to date with socially assistive technology that are being developed to support the social health of PLWD.

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Introduction

Dementia is expected to affect 152 million people worldwide by 2050 and has been highlighted as a global health priority by the World Health Organisation [1]. It is characterised by a decline in one or more cognitive domains, which include complex attention, executive functioning, learning, memory, language, perceptual skills, and social cognition [2]. While there are different types of dementia, most are progressive in nature. During the prodromal stage, people living with dementia (PLWD) may continue to live independently with or without support [3]. Cognitive and functional decline, as well as behavioural changes, often become more apparent through the moderate and advanced stages of dementia [4]. Such decline may limit their ability to engage in meaningful occupations, which are defined as the things that people need to, want to, and are expected to do in their everyday lives [5]. PLWD often experience reduced meaningful social engagement, leading to loneliness and social isolation as the disease progresses [6]. However, being engaged in personally meaningful social activities, such as meeting friends and family, is an important determinant of successful adaptation and ageing whilst living with a chronic disease [7,8], including dementia. Furthermore, successful engagement in meaningful social activities can result in reduced responsive behaviours such as

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agitation, shadowing, and repetitive questioning [9,10]; provide a feeling of connectedness with self, others, and the environment; and promote life satisfaction and quality of life for PLWD [6,8].

Technology plays a relevant role in supporting individuals to live well with dementia [11]. Over the last few decades, there has been a growing body of research that focussed on developing and evaluating assistive technology (AT) for PLWD [12–14]. The COVID-19 pandemic has further accelerated the research on and the use of AT, which has been paramount in enhancing the social health of PLWD during periods of social distancing restrictions [15,16]. Assistive technology may be defined as "any item that enables a person with a disability to complete a task that they would otherwise be unable to do" [17,p.525]. AT can range from everyday technology such as alarm clocks and telephones, to information and communication technology [18]. However, we will focus specifically on socially assistive technology. In this paper, we define socially assistive technology as AT that is specifically designed for and/or used to promote social health among PLWD by enhancing their capacities to 1) fulfil their potential and obligations, 2) manage life with some degree of independence, and 3) participate in social activities [7,19].

Recent evidence shows that different types of socially assistive technology have been used to enhance the social health of PLWD [20–22]. Everyday technology, such as mobile phones, has been increasingly leveraged as digital medium for a myriad of applications to benefit the social health of PLWD [20,21,23]. Common examples include *Skype* and *Zoom*, which have been used to enhance social connections [24,25]. With continued digitalisation, robotics, virtual reality (VR) and smart home technology also have emerged as novel technologies to support PLWD to engage in different social activities [26,27]. Despite the growing interest in this field, a recent scoping review has highlighted several factors which hindered the application and adoption of socially assistive technology in daily life [27]. Pertinent issues relate to their design and implementation processes, which can limit their relevance for PLWD and uptake in their daily life. Furthermore, the use of socially assistive technology for PLWD can be a double-edged sword. While it is intended to enhance social connections and productivity, it can also simultaneously isolate or alienate the intended users [11] if used improperly, or designed without considering the (current and changing) functional capacities and needs of PLWD and their caregivers. Therefore, it is important to reflect on the gaps in the design and implementation of socially assistive technologies and suggest considerations for practice that will enhance their adoption.

Occupational therapy

Occupational therapy is a healthcare profession that is uniquely positioned to promote engagement in meaningful occupations, and to enhance the social health of PLWD through 1) supporting the maintenance and remediation of their skills and abilities; and 2) modifying their activities or environment [28]. Occupational therapy is the leading healthcare profession in the prescription and provision of AT, as evidenced by findings of an international survey that involved participants from 52 countries [29]. Occupational therapists work with a wide range of population, including children [30] and adults with disabilities [31], older adults [32], and individuals with chronic health conditions such as dementia [33]. One of the key roles of occupational therapists entails assessing, prescribing, educating, and training individuals and their family members to use AT in their daily lives [33–35]. This has played an important role in equipping users with the relevant skills and confidence to use AT and reducing the likelihood of technology abandonment [36]. For instance, in Ireland, occupational therapists lead Memory Technology Resource Rooms to educate, support and prescribe AT for PLWD and their care partners. Similar services are available in other countries, such as the UK [37] and Australia [38].

The current role of occupational therapy lies mostly in the provision of AT that aims to enhance physical or cognitive health [29]. As such, it is a logical extension for occupational therapists to familiarise with and be more involved in AT to enhance social health, a (relatively) newer field of technology development. This will position occupational therapists in a better stead to introduce such technology to PLWD. In similar regard, information about the knowledge and expertise of occupational therapists should be actively disseminated to technology developers and researchers, to raise awareness of the role of occupational therapy in the design and implementation of socially assistive technology, and to advocate for the inclusion of occupational therapists in these processes.

The primary objective of this paper is to propose practicable considerations for bridging pertinent gaps relating to the design and implementation of socially assistive technology for PLWD and their caregivers from an occupational therapy lens, and to highlight the necessary collaboration between occupational therapists, technology developers and researchers. Firstly, a brief overview of socially assistive technology will be presented. These examples include social robots, digital technologies, virtual reality, and smart home technology. Each technology will be described, along with the current state of evidence on their impacts on social health. Next, current gaps and limitations to their design and implementation will be highlighted. Finally, practical considerations for addressing these gaps will be proposed, based on literature supplemented with the authors' clinical and professional expertise. The authors comprise a panel of experienced and internationally diverse occupational therapy clinicians, researchers, and educators from the 1) Dementia: Intersectoral Strategy for Training and Innovation Network for Current Technology (DISTINCT) consortium, which focuses on conducting research on using technology to support the social health of PLWD; 2) the Science Foundation Ireland (SFI) Centre for Research Training in Digitally Enhanced Reality (D-Real), which focuses on research involving the use of digital technology; and 3) the Division of Occupational Therapy at Karolinska Institutet, Sweden.

Socially assistive technologies and their impacts

Social robots

Social robots are developed to facilitate and maintain social networks between people, reduce social isolation, and provide an array of services for PLWD, such as cognitive training and affective therapy [39]. Social robots may be categorised as socially assistive, telepresence, or pet robots based on their functions [27]. Socially assistive robots have several functions alongside their function to enhance social networks, such as providing medication reminders. Examples of such robots include *Nao* and *Pepper*, which have been used across different dementia care settings [40,41]. Next, telepresence robots incorporate a video conferencing platform to facilitate and maintain social interaction. Examples of telepresence robots include *Giraff* and *Double*, which have been used in countries such as Australia and Finland [42,43]. Finally, pet robots are designed to resemble and behave like pets. They are intended as substitutes for live animals to provide physiological and emotional benefits for people with dementia [44]. Examples include *PARO* (seal), *JustoCat* (cat), *AIBO* (dog robot), and *Pleo* (dinosaur). Several

studies have been conducted to investigate the impact of the aforementioned social robots on PLWD. Synthesised findings suggest that social robots had positive impacts on the psychosocial domains of older adults - including PLWD - such as reducing loneliness, and enhancing social engagement interaction [44–46].

Digital technology and virtual reality

Several phone- and tablet-based interventions continue to be developed, refined, and/or evaluated for PLWD and their caregivers to promote their social health [20,21]. Some examples include *Photoscope*, a digital person-centered artistic photo-activity to enhance the social interaction between PLWD in long-term care facilities and their informal caregivers [47], and *I-CARE*, a tablet-based system to enhance the dyadic relationships between community-dwelling PLWD and their informal caregivers [48]. Other examples of digital technology interventions that leverage more established technology platforms include digital gaming technologies, such as exergames [49] or games using iPads, Nintendo Wii, and Nintendo DS [15]. Findings from recent systematic reviews suggest that such digital technologies show promise in enhancing social participation and social support, and reducing social isolation and loneliness among PLWD [20,21]. They also show potential in enhancing social interaction between PLWD and their (informal) caregivers [15,47–49] and support engagement in meaningful social activities [48,50].

Virtual reality (VR) is a novel technology involving a "computer-simulated real or imagined environment that enables users to experience the sensation of being present in a different physical place" [51,p. 558]. VR provides a unique, novel, and safe virtual world for PLWD to participate in meaningful or reminiscent activities including social activities [52] that may be difficult for PLWD and their caregivers in daily life, due to physical or logistical difficulties. VR may be conducted individually or in a group-based setting to increase opportunities for social interaction, socialisation, and social engagement [53,54]. A qualitative evidence synthesis on PLWD's experiences and perceptions of using VR revealed that it can provide a means of unlocking the PLWD's connections with formal, informal caregivers and peers [26]. Sociability outcomes were reported when using VR with others and resulted in sustained sociability where the PLWD reflected on the experience and anticipated subsequent use with peers [26].

Smart home technology

Smart home technology broadly refers to the connection and automation of appliances and devices within a home environment *via* the internet. This connectivity of devices *via* the internet – known as the Internet of Things [55] - uses sensors to monitor and effect change to enhance individuals' experiences of living at home. In the context of dementia, smart home technology has been designed and used to monitor, support and maximise independent living abilities, and to support social connections [56–58]. Some examples include *Amazon Echo* and *Alexa* which are available off-the-shelf, the *Rosetta* [59], and *Dem@Care* systems [60], which are more recently developed (or being developed) for PLWD and their caregivers. A recent review showed that while only a handful of studies have been conducted to evaluate their effectiveness on PLWD [61], there is some evidence of positive impact on performance in activities of daily living, amongst other health outcomes such as depression and anxiety.

Existing knowledge gaps and considerations for practice

> To be leaders, we (occupational therapists) can bring our expertise and understanding of meaningful human occupation into the discourse, design, and implementation of technologies [62,p. 281].

Designing socially assistive technology

Despite their potential, there are several gaps and challenges to the design of these socially assistive technologies. A recent scoping review outlined several barriers related to the design features of such technologies for older adults and PLWD such as complex user interfaces and unclear or unpredictable actions [27]. Technology developers play a crucial role in designing technologies for PLWD. However, due to a different disciplinary focus, they do not often have experience working with PLWD and use other models than social and humanistic models and frameworks to guide their design process [33]. This could lead to the omission of design features that are integral for supporting PLWD and their caregivers [63]. For instance, in a pilot study by Barrett and colleagues [64], PLWD experienced difficulties using a socially assistive robot, as the user interface required PLWD to raise their arms to access the touchscreen from a seated position. This physical movement proved to be physically challenging, as the older population often experiences frailty [65]. In turn, caregivers had to provide support to overcome such challenges [64]. Given that a key driver behind the development of such technologies is to alleviate care provision, it is ironic that caregivers have to provide additional support to PLWD to account for such design limitations. Moreover, the functions of socially assistive technologies do not always align with the occupational needs of PLWD [26,27,66,67]. For instance, in a study by Orejana *et al* [68], users were provided with a socially assistive robot to support them in different aspects of daily life, such as providing medication reminders and providing entertainment. However, some of these features were not relevant as the users were still capable of self-management. This highlights that personalising and tailoring the functions of socially assistive technologies to the individual abilities, needs, and fluctuating emotions of PWLD, remains a pertinent technology development gap [69].

While strides have been made to include healthcare professionals, such as nurses and medical staff, in the development and research on technology, technology developers appear to be unaware of the role, expertise, and impact of occupational therapists in assistive technology provision for PLWD [70]. Although other healthcare disciplines have parallels in terms of their positionality and philosophy of care, the occupational therapy profession can offer a unique, occupation-focussed perspective. Occupational therapists work closely with PLWD and their caregivers to assess and design interventions, including AT prescription, to support their participation in meaningful (and social) occupations. Assessments are often guided by occupational therapy conceptual models, which serve as frame of references to gain a holistic understanding about an individual [71]. For instance, the Person-Environment-Occupation (PEO) model [72] guides comprehensive considerations about the person with dementia (e.g., personal values, physical, cognitive, and social abilities), their environment (e.g., their physical, institutional and social environments, such the extent of support from caregivers), their occupations (e.g., daily routines), and how each may evolve over the life trajectory. Another example is the Human Activity Assistive Technology (HAAT) model that is often used to guide assessments of the dynamic interactions considering the person,

the activity (i.e., occupations), the context (i.e., environment) and the assistive technology (i.e., environment) [73].

While important, an occupation-focussed perspective is not always taken into account when designing socially assistive technology for PLWD. As dementia progresses, the types of occupations that an individual and their caregivers engage in often change due to diminishing abilities [74]. However, there has been insufficient consideration about this aspect of dementia during the design process, which has led to technology abandonment by PLWD and their caregivers [75]. By the same note, while a familiar and predictable life routine has a profound influence on the function of PLWD [76], considerations about how the technology can be designed to align with the daily routines of PLWD and their caregivers are often precluded from the design process [77]. Rather, they are expected to "fit" the AT in their lives [13]. The findings from an ethnographic study describing the use of smart home technology with PLWD and their caregivers exemplify the abovementioned points [78]. In the study, an individual with dementia had to don a wearable device which was unfamiliar to her and her routine, which led to infrequent use. Using the technology also required the individual to activate a device, a task that warrants several cognitive functions such as attention and working memory – which decline as part of the disease trajectory. In turn, her caregiver had to request an alternative wearable device, and "remind" her to use it. These omissions highlight the importance of integrating occupational therapy expertise to address pertinent gaps in the design of socially assistive technologies. Activity analysis is a core occupational therapy skillset involving thorough analysis of the demands of an activity and identifying the necessary skills for activity engagement [79]. In the context of socially assistive technologies, activity analysis may address important design features, such as user interfaces, that cater to the abilities and daily needs of PLWD.

Implementing socially assistive technology

Implementing a technology refers to putting it to use in practice in daily lives. Even though technology may prove to be effective for people with dementia in a research study, successful implementation in daily life goes beyond research evidence that demonstrates their effectiveness [27]. Similar to the gaps highlighted in the technology design process, the mismatch between the socially assistive technology and the dynamic needs (i.e., existing and changing needs) of PLWD and their caregivers have challenged their uptake. Previous studies have highlighted this as an important predictor of AT abandonment [80–82]. Insufficient facilitation, knowledge, and training to support PLWD and their caregivers to integrate AT into their daily routines have also challenged implementation efforts [12]. For instance, Gibson *et al.* [18] found that family members were unclear about when technology should be introduced to PLWD. In another study, Chang and colleagues [83] found that users had poor engagement with a social robot in a group setting without facilitation by a therapist.

Deliberate efforts must be made to bridge these gaps to enhance their implementation. Like the role of occupational therapy in the provision of other ATs, occupational therapists should be consulted to identify and match the "right" socially assistive technology to the "right" individuals (i.e., PLWD and/or their caregivers). This will involve discussions to identify activities that are meaningful to PLWD and/or their caregivers, assessing the functional capacities of PLWD, and assess the ability of the AT to address their dynamic social needs and wants [9,10,84–86]. These considerations may inform the prescription of socially assistive technology and supporting interventions, to empower PLWD and their caregivers to engage meaningfully with the technology. In consideration of the progressive nature of dementia, it is also necessary to factor in regular re-assessments of the needs and abilities of PLWD and their caregivers [87]. While these constitute key elements of current occupational therapy practice – given a rapidly evolving technological landscape – occupational therapists should actively acquaint themselves with evolving and emerging socially assistive technology to ensure that they are well-informed to advise on suitable and desirable AT for PLWD and their caregivers.

Thereafter, formal and/or informal caregivers should be coached to support PLWD through problem-solving, identifying, and simplifying steps required to use and embed the socially assistive technology in their daily lives [88,89]. These are important strategies to enhance PLWD's abilities to participate in activities [88]. Such interventions may encompass the use of strengths-based approaches [90], caregiver training, activity gradation and modifications [88], and other cognitive strategies such as a combination of errorless learning and spaced retrieval [91,92].

When implementing socially assistive technology in a group-based setting, for example in a day-care or residential setting, it is also necessary to carefully consider group dynamics [93], such as the attributes of PLWD who are participating, group size, and the similarities or differences in their values or abilities. Correspondingly, skilled facilitation is necessary to enhance group processes [93,94], to ensure that PLWD can engage meaningfully with the socially assistive technology in the group setting. In one study, group facilitation techniques supported older adults' engagement with a social robot [83]. These group facilitation techniques included carefully tailoring the social and physical environment to the older adults' abilities. Occupational therapy clinicians and trained occupational therapy assistants can contribute to this gap by tailoring and facilitating group-based use of socially assistive technology, or by training other healthcare professionals to facilitate group-based use of socially assistive technology.

Discussion

We provided an overview of socially assistive technologies that have been (and are being) developed to benefit the social health of PLWD, such as social robots, digital technologies, virtual reality, and smart home technology. Although more controlled studies with larger sample sizes and more rigorous designs are needed, several studies highlight their promise [20,21,26]. We also identified several gaps in their design and implementation and discussed ways in which the unique skills of occupational therapists, and their focus on PLWD and their caregivers' daily lives and occupational engagement, could be used to bridge these gaps.

Given that engagement with AT by PLWD is potentially a transformative, health-promoting occupation in itself, as well as the means by which PLWD may influence their own health, it is incumbent on the profession of occupational therapy to contribute its theoretical and practice expertise to this emerging aspect of health and social care. Occupational therapy "enablement skills" of adapting, advocating, coaching, collaborating, consulting, coordinating, designing/building, educating, engaging, and specialising [95] would all be called upon in various ways at various stages along the design to implementation pathway. At the design phase, collaboration and consultation with interdisciplinary teams, including occupational therapists, can improve the design of adaptive interfaces and functionality to meet the (changing) needs of PLWD and their caregivers. This approach could further support the development of participatory and co-design methodologies. At the implementation phase, occupational therapists' skills in educating and coaching

Table 1. Recommendations to enhance the design and implementation of socially assistive technologies.

A) Designing socially assistive technology	
Gaps	*Considerations for bridging the gaps*
1. **Not considering (and anticipating) the current and evolving needs, preferences, abilities, and occupational preferences of PLWD and their caregivers** Dementia is progressive; this means that the abilities of PLWD to engage in their day-to-day routines can change over time. Correspondingly, their needs and ability of PLWD and their caregivers to interact with and use the technology can also evolve rapidly.	• Technology developers and occupational therapists (researchers, educators, and/or clinicians) could reach out to each other to collaborate in the (iterative) process of designing technology. The outreach may be done through clinical services or national representative organisations for the occupational therapy profession. • Technology developers and researchers could consider the disease trajectory of different dementias, and understand the implications on the functional abilities and needs of PLWD and their caregivers.
2. **Not aligning the function of socially assistive technology with the occupational needs of PLWD and their caregivers** Each individual and their caregiver may have different needs and preferences. Therefore, a tailored approach to technology development is needed.	• Technology developers and researchers could consult with occupational therapists who have knowledge of holistic and occupation-based models to enhance the comprehensiveness of considerations for technology design in relation to PLWD and their occupations. Examples include the Person-Environment-Occupation (PEO) model and the Human Activity Assistive Technology (HAAT) model.
3. **Not aligning socially assistive technology with the daily (and familiar) routines of PLWD and their caregivers** Familiar routines are important for PLWD (and their caregivers), as such considerations about how technology can be designed to align with the routine of PLWD and their caregivers have to be made explicit.	• Occupational therapists could engage in professional development and further education to keep up to date with emerging technology and advocate for active occupational therapy involvement. • Educators could consider educating about socially assistive technology within the occupational therapy educational and professional development curriculum.
B) Implementing socially assistive technology	
Gaps	*Considerations for bridging the gaps*
1. **Not facilitating PLWD and their caregivers to choose the "right" socially assistive technology** Different socially assistive technology may suit different PLWD and their caregivers, depending on their unique preferences and needs. For example, a socially assistive technology with medication reminder functions may not as relevant or appropriate for PLWD in residential facilities, or for caregivers who are keen to support PLWD in medications without technology.	• Technology developers and researchers could consider establishing a relationship with national assistive technology clinics and services to inform clinicians about emerging technologies, to support the uptake of these technologies by PLWD and their caregivers. • Occupational therapists could consider: (i) collaborating with technology developers and researchers to design comprehensive assessments to match and to tailor the socially assistive technology to PLWD and their caregivers, and (ii) developing a clear intervention plan to train and equip them with the skills and confidence to use the technology in their daily lives.
2. **Not facilitating and training to support PLWD and their caregivers to integrate socially assistive technology into their daily routines** Routines are important for PLWD. There is an insufficient focus on how the technology can be integrated into the daily lives of PLWD and their caregivers.	• Occupational therapists and service providers (e.g., assistive technology clinics and providers) could factor in regular re-assessments of the changing needs and diminishing abilities of PLWD and their caregivers to determine the suitability of the socially assistive technology over time.
3. **Not facilitating the use of socially assistive technology in dementia care facilities** In dementia care facilities, the use of technology may occur in a group setting.	• Service providers (e.g., healthcare providers, dementia care facilities) could work with occupational therapists to design and facilitate the use of socially assistive technology in shared/group-based settings. An example includes group-facilitation techniques.

users, designing and coordinating programmes, consulting with health systems, and advocating at the policy level could improve the adoption, engagement, and spread of socially assistive technologies in the everyday life of PLWD and their caregivers [96]. Examples of such initiatives may include the development of targeted educational and training materials that are tailored to PLWD and their caregivers, care providers, and health systems.

Despite the rapid technological advancements in socially assistive technology intended to enhance the social health of PLWD and their caregivers, such technologies have ironically not become a part of mainstream dementia care. They have not been widely adopted by healthcare professionals, including occupational therapists. Despite having a well-established role in traditional AT provision, occupational therapists seem to be less informed of socially assistive technologies that continue to be developed, and their potential to influence the social health of PWLD [33,69]. Therefore, alongside efforts that should be made to involve occupational therapists in the design and implementation of socially assistive technology, efforts should also be made to move socially assistive technology into clinical practice and the education curriculum for the next generation of healthcare professionals, including occupational therapy clinicians. Subsequently, strategies at the education and post-qualification level should be developed to sustain this movement. Including contextualised learning in education curricula for healthcare professionals, such as the use of simulation [97], could be one strategy to ensure readiness for using socially assistive technologies in practice.

We also echo calls from the Human-Computer Interaction (HCI) research community to embrace interdisciplinarity for the benefit of end-users. Occupational therapists, like HCI researchers and other healthcare professionals, share an obligation to aim for the highest ethical standards in research and practice. These collaborative actions we propose here could have far-reaching implications in terms of improving digital equity and occupational justice; PLWD should have the rights and opportunities to leverage on socially assistive technology to support their engagement in meaningful occupations [98]. Therefore, we encourage both occupational therapy and HCI practitioners to reach out to each other to avoid this blind spot and to work together collaboratively in this mutual endeavour. Occupational therapists specialising in roles as dementia researchers themselves could be most effective in bridging the gap between the two communities of HCI researchers and behavioural scientists with an occupational

therapy background. Furthermore, we recognise the need to include people with dementia and their caregivers in the development of technology for PLWD and related research as experts by experience. In recent studies, people with dementia expressed the wish to participate in research regarding interventions and technologies addressing their social health [69,99]. Moreover, involving PLWD in the development of supportive technology has been shown to facilitate the personalisation of functions to end-users [100,101].

Recommendations

We have highlighted several gaps in the current design and implementation of socially assistive technologies for PLWD, and have suggested considerations for practice based on our expertise as occupational therapists and researchers in the field of using technology to improve the social health of PLWD supported by the literature. A summary of the considerations that are relevant for technology developers, HCI practitioners, occupational therapists, and other professions included in the design and implementation of socially assistive technologies for PLWD, can be found in Table 1. These occupations-based considerations are important steps that could bridge pertinent gaps in existing design and implementation processes, and maximise the relevance of socially assistive technology for PLWD and their caregivers.

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