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S. Martin & C.H. Jones

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REVIEW

A scoping review of how people living with dementia perceive and use assistive technology to support everyday activities in their homes

S. Martin [ID][a] and C.H. Jones [ID][b]

[a]Denbighshire Older People's Mental Health Team, Betsi Cadwaladr University Health Board, Rhyl, Wales; [b]Association of Dementia Studies, University of Worcester, Worcester, England

ABSTRACT

There is an increasing need to support people living with dementia to increase participation in activities of daily living (ADLs). Research on the uptake and acceptability of Assistive technology (AT) includes the views of carers and results from living lab or prototypes rather than people living with dementia using AT in 'real world' settings. This review explored the perceptions of people living with dementia using AT to carry out everyday activities at home to identify barriers and facilitators to using AT. Twelve peer reviewed studies and one focus group report published between 2013 and 2022 were selected and thematic analysis completed. AT was accepted for meaningful activities which have value and purpose. Support and individualised strategies to adapt AT into their daily life is required and successful use of AT can support maintenance of identity. Barriers to AT use were perception of AT and self-perception in relation to learning to use AT, cost, functionality, insufficient information and support. AT can cause unintended negative outcomes. Supporting people living with dementia to use AT for meaningful activities can maintain identity and personhood.

KEY FINDINGS

People living with dementia adopt and use AT to support meaningful activity
OTs should offer person-centred individualised strategies to support AT use
OTs should consider potential negative consequences of AT provision
What has review added?
People living with dementia accept AT for meaningful activity supported by individualised strategies and ongoing successful AT use can support maintenance of identity.

CONTACT C.H. Jones ✉ catrin.jones@worc.ac.uk 🖂 Association of Dementia Studies, University of Worcester, The Jenny Lind Building, Worcester WR1 3BZ, England

Introduction

Dementia is an umbrella term for a group of syndromes which affects the brain causing cognitive decline (Livingston et al., 2020). Declining functional ability impacts on people living with dementia performing occupations or activities of daily living (ADLs) to their previous ability which can impact on occupational identity and wellbeing (Kielhofner, 2008). Kitwood (1997) suggested that enabling people living with dementia to maintain engagement in meaningful activity can promote identity and personhood. This seminal work has informed this review. Occupational therapists (OTs) are recognised for assessing a person within the context of their environment and their occupations to anticipate and adapt to functional changes with everyday activities and improve functional ability (Kielhofner, 2008). Early interventions within occupational therapy and cognitive rehabilitation show promise in delaying the progression of functional decline (Clare et al., 2019), which is further strengthened by increasing calls for reablement as routine dementia care provision (Poulos et al., 2017).

Adopting a reablement approach for people living with dementia can include compensatory strategies as well as assistive technologies (AT) to maintain functioning (Clare et al., 2019; Poulos et al., 2017). According to the World Health Organisation (WHO), AT covers a 'broad field' and is 'fundamental to persons with permanent or temporary functional difficulties as it improves their functional ability and enables and enhances their participation and inclusion in all domains of life' (World Health Organisation [WHO], 2022, p. 5). However, this broad definition means that items like wheelchairs and grab rails can be termed as AT as well as digital technologies like apps (WHO, 2022). Therefore, for the purposes of this research, the definition of AT is more specifically defined to devices most commonly used by people living with dementia, for example devices like telecare and monitoring systems, electronic pill dispensers, day clocks with reminders, global positioning systems (GPS) as well as smart and digital technology (Astell et al., 2019; Holthe et al., 2022). AT can incorporate off the shelf mainstream products or products developed to meet the needs of specific functional issues or health conditions (Astell et al., 2019). Both the Royal College of Occupational Therapists (RCOT) and World Federation of Occupational therapists (WFOT) cite that AT has a role in enabling people to participate in daily occupations they need and want to do, to increase independence and quality of life (Royal College of Occupational Therapists [RCOT], 2020; World Federation of Occupational Therapists [WFOT], 2019). However, OTs cite a lack of practitioner knowledge of AT products, insufficient time and training about AT (McGrath et al., 2017). Furthermore, there is a mixed approach across health and social care services in the United Kingdom (UK) of which products are funded and which would require private purchase (Gibson et al., 2016), with mainstream AT products

often not meeting the health criteria for funding (Astell et al., 2019). Therefore, this creates complexity for OTs to encourage people living with dementia and their carers to accept AT if they are having to meet the costs themselves (Nordgren, 2018). In a scoping review by Gibson et al. (2016) which aimed to find out what AT products were available in the UK and how much information was accessible for people living with dementia. They found that provision of AT has not focused on how it can support everyday tasks or contribute to quality of life. Furthermore, they highlight the need to consider if AT is being used 'by' people living with dementia; for example, a day clock to support orientation or if AT is used 'on' people living with dementia, for example carers using covert remote monitoring. Koo and Vizer (2019) also reflect this distinction by examining AT use for people living with dementia through the lens of personhood and human needs. They discuss that AT can meet the needs for carers, for example a GPS device giving peace of mind, however they raise the ethical issue that this does not meet the needs of people living with dementia if they are unable to use the device for wayfinding. Their systematic review of 24 studies which mapped the types of AT to human need found the majority of AT being used addressed only basic safety needs rather than addressing higher level psychological needs for people living with dementia. Higher level needs such as empowerment were also the focus of scoping review by Löbe and AboJabel (2022) which examined how intelligent assistive technology can empower people living with dementia. They identify that although the concept of empowerment is not always termed and measured in a consistent way, making it difficult to determine the specific role of technology, they found evidence that the majority of the 28 studies reviewed demonstrated technology can empower people living with dementia by living independently for longer.

Key developments and future directions for dementia and technology have been summarised by the United States Alzheimer's Association Technology Professional Interest Area Executive Committee, who identified that the issue of acceptance of AT by people living with dementia has been low, in part due to high costs and the fast-paced changes seen in technology development over recent years (Astell et al., 2019). Furthermore, a review by Holthe et al. (2022) found the issue of acceptance of AT by people living with dementia is often not explicitly addressed in AT research trials with AT research being more focused on device performance. Only one study out of the 14 reviewed exclicitly considered the effect of AT on performance of daily tasks (Holthe et al., 2022) explicitly considered how AT affected use of AT in daily life. Systematic reviews that focus on use and acceptance of AT for people living with dementia by Boyle et al. (2022), Holthe et al. (2022) and Thordardottir et al. (2019) identified functionality issues of devices, lack of AT knowledge or digital skills as barriers and the need to have individualised support to promote acceptance of AT for people living with dementia.

However, these reviews included studies using prototype AT devices, research in living lab environments and some which only included the views of formal and informal carers on AT use for people living with dementia. Therefore, it should be considered whether the overall findings also reflect how people living with dementia use AT in everyday life. Jakobsson et al. (2021) identified through their research the importance of consulting people living with dementia in the first instance, rather than referring exclusively to carers because people living with dementia were able to express opinions on their use of AT. This review will aim to increase our knowledge from the perspective of people living with dementia using AT in daily life to understand the reasons why they may accept and use AT to carry out everyday activities and importantly what are the barriers to the use of AT.

This is emerging area of research and therefore a scoping review (Arksey & O'Malley, 2005; Daudt et al., 2013; Peters et al., 2021) was selected to identify themes and gaps in AT use with people living with dementia following the PRISMA checklist (Tricco et al., 2018). AT is a current topic seen in healthcare with various policy documents and consultations including people living with dementia, therefore it was reasoned that searching peer reviewed and grey literature for data collected directly from people living with dementia could provide valuable insights using a scoping review. This methodology did not include an assessment of the quality of the study design with the aim to gain knowledge from a range of literature within this emerging area of research.

The mnemonic of population, concept, and context (PCC) framework (Peters et al., 2021) was used to refine the research question. People diagnosed with any type of dementia or Mild cognitive impairment (MCI) were included as the Population of interest, the Concept included their perceptions and experiences of using assistive technology to increase independence with everyday activities with an additional focus on the reported barriers and enablers to uptake and adherence of accepting AT. The Context was focused on living at home with or without carer/family support. This process informed the final research question: A scoping review of how people living with dementia in their own homes perceive and use assistive technology to support everyday activities. The eligibility criteria for the review are listed in Table 1. The authors included both peer reviewed and grey literature published in 2013 and 2023 inclusive. They were available in English with a focus on the experiences of the people living with dementia. The views of carers and health care professionals; research within residential or nursing homes or conducted within living lab or tests of prototypes were not included. Research which included carers as participants alongside people living with dementia which clearly identified the lived experience of people living with dementia in the findings was selected if relevant information from the people living with dementia was clearly identifiable in the work. Reviews were not included in the selection process and research that focused on use of AT by

Table 1. Pre-determined inclusion and exclusion criteria.

Inclusion	Exclusion
Research gathering the views of people living with dementia using AT in everyday life tasks that captures information related to barriers and/enablers to using AT	Research that only gathers the views of people living with dementia on their potential to use a AT device rather that lived experience
People living with dementia of any type at home either alone or with family/carer	Research conducted within a care home setting
Research with people living with dementia and carers only if the experiences of people living with dementia was identifiable.	Research that only includes the perspectives of family/carers/health care professionals on people living with dementia using AT
Articles published 2013–2023	Abstract only, no access to full text
Published in English	Non- English articles
	AT research focussed only on the efficacy, design or cost of AT
	Research that only focusses on technology prototypes or research conducted in a living lab environment

people that primarily had physical or other neurological impairment which was not identified as dementia or Alzheimer's disease were not included.

Electronic searches were completed in March 2023 with the following databases: CINHAL, Medline, ASSIA, Psych INFO, Pub Med. The following search terms were used: Dementia OR Living with Dementia OR Alzheimer's OR Mild Cognitive Impairment AND 'Assistive technology' OR 'Assistive Technologies' OR 'Adaptive technology' OR 'Electronic Assistive technology' OR 'Everyday technology' AND perspective* OR view* OR perception* OR feelings OR attitude* OR confidence* OR satisfaction OR barrier* OR resist* OR facilitate* OR improve* OR engage* OR engaging OR accept* OR Adhere* OR Adopt* OR Uptake OR Abandon* OR Compliance. Articles were chosen or excluded according to the predetermined criteria.

The database search resulted in 499 potential articles and one grey literature (Figure 1). After removal of the duplicates 334 article abstracts were screened to identify if they met the predetermined criteria. Following this, 33 articles were identified for full text screening, resulting in 21 articles being excluded as they discussed perceptions of the potential to use AT rather than lived experience of using AT, reported studies which used a prototype in the trial, one study included people with stroke as well as people living with dementia and one study which only consulted carers and health professionals' views. This resulted in 11 peer reviewed articles and one grey literature (Yellowlees, 2020). Gibson et al. (2015, 2019) were from the same study but reported a different focus for the data analysis. As recommended by Daudt et al. (2013) the reference lists of the final articles for the scoping review were checked to ensure any articles which may have been missed in the searches are captured. This resulted in one additional article (Riikonen et al., 2013), being included in the 13 articles which met the scoping review criteria.
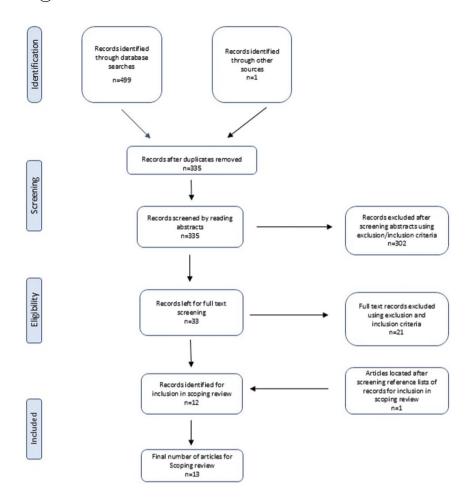
Figure 1. PRISMA flow diagram (Moher et al., 2009).

Following the selection process, a chart of the selected articles was developed. The following categories were selected for the chart: Date and country the research was conducted, research aims, key themes and outcomes; study design; participants; AT devices used and referred to in the study, authors names and year of publication (Table 2).

A reflexive diary was also used throughout the course of the 6-step scoping review process to limit potential bias of how articles were selected and charted (Denscombe, 2019). A deductive approach was taken with data coded according to the aims of the study so specific aspects of the data could be analysed (Braun & Clarke, 2022). Therefore, data was coded according to types of AT used and for which activity, barriers and enablers to AT use and acceptance and adherence were coded. For data that did not fall definitively into these subjects, for example *unintended negative outcome for PLWD*, this

Table 2. Articles used for the review.

Title	Authors *See references for full details	Year of publication and country of research	Types of AT used and reported on in the study	Study design	Participants PLWD- persons living with a dementia	Key findings
Home-dwelling persons with dementia's perception on care support: Qualitative Study	Faeo et al	2020 Finland	Safety monitoring (stove guard)	Semi-structured interviews	12 PLWD at home	Study explores perception of PLWD of various aspects of homecare including AT. PLWD reported limited knowledge about AT. Participants were using AT for safety, but some found it intrusive due to loud alerts or flashing lights.
Learning and Knowing technology as lived experience in people with Alzheimer's Disease: a phenomenological study	Rosenberg et al	2017 Sweden	Everyday technology including computers, mobile phones	In depth interviews combined with participatory observations when relevant	7 people diagnosed with Alzheimer's Disease either living alone or with partner in the community	Participant positioned themselves as either receptive to learning or deciding learning new technology is not for them. Study explores the way previous learning and current strategies informs adoption of AT. Motivation to learn affected adoption more than previous technology experience.

(*Continued*)

Table 2. (Continued).

Title	Authors *See references for full details	Year of publication and country of research	Types of AT used and reported on in the study	Study design	Participants PLWD- persons living with a dementia	Key findings
Usability evaluation of assistive technologies through qualitative research focusing on people with mild dementia	Asghar et al	2018 Pakistan	Communication (smart phone, apps), wayfinding (GPS/ smartwatch and smart walker) and reminders for tasks like medication and activities	Semi-structured interviews	20 PLWD (18 in own home 3 in care home). Majority of views appeared from PLWD at home.	PLWD were 'happy' and 'non-happy' users of AT. AT adopted and used for wayfinding, communication and reminders. Barriers included issues with usability and efficacy of AT, AT not meeting specific needs, privacy issues and dependence of others to use AT. Some negative outcomes from AT use bringing in concern of balance of AT with human care.
Personal and complex: The needs and experiences related to technology use for people living with dementia	Liddle et al	2022 Australia	Orientation (day clock), wayfinding (apps, GPS) communication (smart phone, iPad, videoconferencing), ADL reminders, leisure (games on iPad and online)	Semi-structured interviews with flexible communication approaches	13 PLWD and 21 care partners living in community either alone or with family	AT is complex with cycle of use and non-use. AT use dependent on interaction of user, technology identity, support affecting AT use and the changing AT landscape being continuously updated. Carers use of AT for safety whereas PLWD using for activity participation and maintain roles.

(Continued)

Table 2. (Continued).

Title	Authors *See references for full details	Year of publication and country of research	Types of AT used and reported on in the study	Study design	Participants PLWD- persons living with a dementia	Key findings
Personalisation, customisation and bricolage: how people with dementia and their families make assistive technology work for them	Gibson et al	2019 UK	Safety, orientation and monitoring (motion sensors, CCTV), locating AT (GPS) 'homemade' Telecare alarm	Qualitative semi structured interviews	13 PLWD, living at home, with and without family and 26 family carers	Carers adapted mainstream technology to meet needs for PLWD to fit with routines and roles. PLWD and carers report lack of statutory support. Highlights need for support with personalisation of AT.
The everyday use of assistive technology by people with dementia and their family	Gibson et al	2015 UK	Privately purchased for monitoring (passive sensors) and GPS for locating, orientation clock	Semi structured interviews	13 PLWD and 26 carers	AT accessed via health and social care, purchased privately or people found their own bespoke solutions. PLWD reliant on carer and AT is driven by carers; therefore, could benefit the carer the most. Barriers highlighted were perceptions of AT, cost, lack of information of how to access AT

(*Continued*)

Table 2. (Continued).

Title	Authors *See references for full details	Year of publication and country of research	Types of AT used and reported on in the study	Study design	Participants PLWD- persons living with a dementia	Key findings
The use of technology among persons with memory concerns and their caregivers in the United States during the COVID-19 Pandemic: Qualitative study	Albers et al	2022 USA	Online platforms for cognitive stimulation and communication (blogging, vlogging), GPS for location tracking	Qualitative interviews completed on an online digital platform	20 PLWD and 20 carers. 80% of PLWD lived with a family carer	Technology use became part of managing everyday tasks. Covid pandemic encouraged more use of technology however barriers cited as digital literacy, limits of technology and reliance of caregiver support to use technology.
Tracing the successful incorporation of assistive technology into everyday life for younger people with dementia and family carers	Arntzen et al	2016 Norway	Simplified TV remote, electronic item locator, passive stove alarm, day clock, digital calendar, GPS	Qualitative longitudinal study. In depth interviews and observations completed at start of study and repeated every 3 months for 12-month period. OT identified AT suitable with PLWD and carer to meet their identified needs and responsible for the implementation of AT	12 PLWD (under the age of 65) and 14 family carers	Study focuses on how AT incorporated over time and what strategies led to adoption and use of AT. Found that successful adoption involved; AT fitting within a routine, practical and emotional value of AT, user friendliness, feel positive when using AT, interest to carer. Concluded family carers had significant role in AT adoption for PLWD.

(Continued)

Table 2. (Continued).

Title	Authors *See references for full details	Year of publication and country of research	Types of AT used and reported on in the study	Study design	Participants PLWD- persons living with a dementia	Key findings
The use of digital technologies by people with mild to moderate dementia during the COVID-19 Pandemic: A positive technology perspective	Talbot and Briggs	2022 UK	Online platforms for cognitive stimulation (groups, reminiscence activities). Online videos for self- development. Online platforms and social media for communication and engagement in roles. GPS and apps for wayfinding	Online semi structured interviews	19 PLWD	PLWD using digital technology —to help everyday tasks, engaging in meaningful activity and communication, which helped reduce stresses of the pandemic for PLWD and promote sense of identity and wellbeing. barriers to using technology included usability and cognitive fatigue.
Factors supporting the use of technology in daily life of home-living people with dementia	Riikonen et al	2013 Finland	remote monitoring (door camera), reminders (household panel), medication (pill dispenser), communication (photo phone)	Ethnographic study: open interviews with PLWD and structured questionnaire with family carers. AT issued as part of the research; AT identified by researcher and 'technology expert' with PLWD and carer to meet individual needs.	25 PLWD and 21 carers	AT used to meet specific ADL needs with PLWD with five home visits. Early provision of AT and perceptions of PLWD of AT affects adoption. External guidance can enable adoption of AT. Social support is required for successful implementation of AT.

(*Continued*)

Table 2. (Continued).

Title	Authors *See references for full details	Year of publication and country of research	Types of AT used and reported on in the study	Study design	Participants PLWD- persons living with a dementia	Key findings
Dementia and Technology: A literature review and qualitative study	Yellowlees	2020 UK	monitoring (telecare, door sensors, falls detector), wayfinding and location tracking (GPS apps). orientation (Day clock), communication (simplified phone)	6 Semi structured focus groups	13 PLWD (over age 65) living at home with or without family and 14 carers	Views and feelings about AT showed AT being helpful, reducing distress and increasing confidence. Factors important for adoption were ease of use, better than low tech solutions, needing information and education about AT and support to use AT. Barriers to engagement: lack of information, cost, lack of functionality, needing support to use.

Table 2. (Continued).

Title	Authors *See references for full details	Year of publication and country of research	Types of AT used and reported on in the study	Study design	Participants PLWD- persons living with a dementia	Key findings
Significant junctures on the way towards becoming a user of assistive technology in Alzheimer's disease	Lindqvist et al	2013 Sweden	Reminder panel, item locator, orientation day clock and planner, Alarm watch, GPS on mobile phone for wayfinding	Longitudinal grounded theory design, semi structured interviews completed over 6-month period. OT input to identify AT with PLWD and carer to meet individual needs. OT input following study to provide support ongoing with AT.	10 PLWD living at home alone or with family. PLWD also chose one significant other to support with AT choices and were also interviewed	PLWD were allocated AT devices according to their needs and used this in daily life for a six-month period. Adoption relies on how AT is introduced, how it's incorporated into a routine, trusting AT, feeling a sense of capacity for PLWD when using AT. If PLWD able to identify needs and difficulties and motivated to adapt to change then AT can be positive experience.
Placing assistive technology and telecare in everyday practices of people with dementia and their caregivers: findings from an embedded ethnography of a national dementia trial	Lariviere et al	2021 UK	safety Including remote monitoring (falls detector, stove timer) locating devices (GPS)	Ethnographic case studies. Observational data collected over 6 months with monthly visits	10 PLWD and 10 carers	Research carried out in real time of PLWD using AT rather than relying on retrospective recall. Themes related to how AT fitted into routine and habits, replacing care with AT and AT displacing care.

data was coded under another section to ensure it was captured (Braun & Clarke, 2022).

All the codes found in the data were transferred to separate pieces of paper so the process of sorting codes could evolve and consider how they may combine to an overall theme (Braun & Clarke, 2022). An initial thematic map was produced in the form of a mind map to establish how these themes formed a pattern and consider their relationship to each other (Braun & Clarke, 2022). The initial themes were reviewed by the authors to make further refinements by collapsing some themes into each other to produce fewer but more coherent themes (Braun & Clarke, 2022). Once the themes were refined the entire dataset was reread to ensure the themes are accurate and this also enabled three codes to be captured that were missed in the initial coding stages which is reflective of the ongoing organic nature of coding (Braun & Clarke, 2022).

The analysis resulted in three overall themes and eight subthemes (Figure 2).

A consultation exercise is suggested as a final optional (Arksey & O'Malley, 2005) or essential (Levac et al., 2010) stage within a scoping review process. Daudt et al. (2013) extends this by stating that if stakeholders are not part of the research team, they should be part of a consultation process. This is also strengthened by the increasing argument that people living with dementia should not only participate in research but be actively involved in every aspect of the research process (Gove et al., 2018). Three people living with dementia agreed to participate in the consultation exercise and prompts relating to the themes found within the scoping review were presented to the participants to gain their perspectives of the findings. It was important to consider how perspectives may contrast with the findings as well as verifying findings, as a recent critical review of the consultation exercise in scoping reviews recommends there should be participation rather than just consultation so new perspectives can be considered on the findings to further inform the research (Buus et al., 2022).
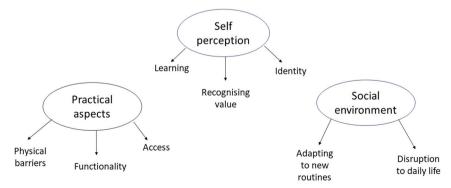

Figure 2. Final themes.

The consultation was conducted on Microsoft TEAMS and by telephone according to preferences for communication mediums. Verbal agreement to take part was recorded at the start of the consultation and the meetings lasted sixty minutes where the authors made notes.

Findings

The research included in this review resulted in the views of 168 people living with dementia and 136 carers. Only five articles were exclusively with people living with dementia (Arntzen et al., 2016; Ashgar et al., 2018; Fæø et al., 2020; Rosenberg & Nygård, 2017; Talbot & Briggs, 2022). The other articles included both people living with dementia and carers as the participants but the views of people living with dementia could be distinguished in the data and used for this review. All the research adopted a qualitative approach with the majority (eight) using interviews, one focus group (Yellowlees, 2020), and observation (Lariviere et al., 2021) and a combination of interviews and observations in two of the papers (Arntzen et al., 2016; Rosenberg & Nygård, 2017).

The following sections provide further descriptions of the barriers and facilitators to adopting AT reported by people living with dementia. The main barriers to accepting AT were stigma, approaches to learning, access and support, cost and functionality.

The facilitators to adopting AT use were found to also be linked to the attitude of the individual to technology. Accepting AT for meaningful activity, being supported by carers to implement strategies to adopt the AT into their lives, a recognition of the value of adopting AT and its impact on the persons perceived identity.

Barriers

Stigma can be a factor for accepting and using AT for people living with dementia; one person stated that AT sounded 'despairing' (Fæø et al., 2020, p.995) and another did not activate their careline because they did not want to be a burden to others (Lariviere et al., 2021). Some raised concern about monitoring devices (Asghar et al., 2018; Gibson et al., 2015; Liddle et al., 2022) with one person stating, 'I don't like being labelled' (Liddle et al., 2022, p.11).

Although some felt a lack of experience with technology to be a barrier to learning, there was also evidence how some perceive themselves and their ability to learn to use AT can be a barrier to AT acceptance (Albers et al., 2022; Arntzen et al., 2016; Asghar et al., 2018; Fæø et al., 2020; Liddle et al., 2022; Lindqvist et al., 2013; Riikonen et al., 2013; Rosenberg & Nygård, 2017). Some positioned themselves as being too old' or 'lazy' to learn about AT (Rosenberg & Nygård, 2017, p.1276), reporting AT was for younger people (Asghar et al.,

2018) defining themselves as 'computer illiterate' (Albers et al., 2022, p.7) or having to rely on others to use AT but wanting to be independent using AT (Liddle et al., 2022; Talbot & Briggs, 2022). The consultees also stated that they experienced concerns about learning anything new. Receiving a diagnosis of dementia and existing difficulties with using technology could be perceived as another barrier to learning. Not growing up with computers along with reported frustrations with learning how to use AT were also cited as barriers by the consultees.

Some did not see the relevance of technology once their work role finished (Liddle et al., 2022; Rosenberg & Nygård, 2017). Their historic use of technology prior to the onset of dementia was found to be a factor in people engaging and using AT (Liddle et al., 2022; Rosenberg & Nygård, 2017; Talbot & Briggs, 2022). Attitudes and interest in learning to use AT can affect people living with dementia engaging with and adopting AT, for example a negative experience of learning from school (Rosenberg & Nygård, 2017) or lack of confidence and uncertainty of being able to learn and use AT (Arntzen et al., 2016; Asghar et al., 2018; Fæø et al., 2020; Liddle et al., 2022; Lindqvist et al., 2013; Rosenberg & Nygård, 2017) and awareness of families concern with their ability to use AT (Liddle et al., 2022)

A lack of awareness and knowledge about AT was reported (Fæø et al., 2020; Gibson et al., 2015, 2019; Liddle et al., 2022; Lindqvist et al., 2013; Yellowlees, 2020). These findings were also the experiences of the consultees when they reported agreed there was a lack of information about AT and felt AT information should be available at the start of the diagnosis to raise awareness of what is available and what could help in the future.

Lack of knowledge of what AT is funded and concerns of the cost of AT was cited a barrier (Gibson et al., 2015; Liddle et al., 2022; Yellowlees, 2020). People living with dementia wanted to trial AT devices before purchase rather than just seeing an image (Gibson et al., 2015; Yellowlees, 2020) and they wanted advice and education about AT (Arntzen et al., 2016; Asghar et al., 2018; Liddle et al., 2022; Riikonen et al., 2013; Rosenberg & Nygård, 2017; Yellowlees, 2020).

The stage of dementia and level of cognitive impairment can affect use of AT, for example people living with dementia cited sensory needs affecting processing information and ongoing use of technology and digital platforms (Albers et al., 2022; Liddle et al., 2022; Talbot & Briggs, 2022). Cognitive fatigue from using screens was cited as a barrier to continued use (Talbot & Briggs, 2022).

The overall design of AT can be too complex or difficult to operate and this was reported as a barrier to being able to use AT effectively (Arntzen et al., 2016; Asghar et al., 2018; Liddle et al., 2022; Rosenberg & Nygård, 2017; Talbot & Briggs, 2022). AT needs to have a simple design, so it is easy to use (Albers et al., 2022; Asghar et al., 2018; Gibson et al., 2015; Liddle et al., 2022;

Rosenberg & Nygård, 2017; Yellowlees, 2020). Mainstream technology would be adopted if it were easy to use or if it were the same version of existing technology (Liddle et al., 2022; Rosenberg & Nygård, 2017). Technical issues such as connectivity or lost settings with AT can also cause barriers (Albers et al., 2022; Liddle et al., 2022; Lindqvist et al., 2013) being able to manage updates (Albers et al., 2022; Liddle et al., 2022; Talbot & Briggs, 2022), difficulty navigating touchscreens and accidental activation of devices (Albers et al., 2022; Arntzen et al., 2016; Liddle et al., 2022; Yellowlees, 2020) and false alarms and notifications from AT devices (Arntzen et al., 2016; Asghar et al., 2018; Fæø et al., 2020; Gibson et al., 2015, 2019; Lariviere et al., 2021).

Facilitators

Positive attitudes towards technology were described as a facilitator to learning and engaging with AT (Riikonen et al., 2013; Rosenberg & Nygård, 2017). People living with dementia positioned themselves as learners or non-learners and this was influenced more by their attitude to learning rather than their ability with technology (Rosenburg & Nygard, 2017). People living with dementia expressed the need for training to learn use AT (Asghar et al., 2018; Fæø et al., 2020; Rosenberg & Nygård, 2017; Talbot & Briggs, 2022; Yellowlees, 2020). However, some reported it was hard to ask for help when they were previously able to cope with technology (Liddle et al., 2022; Talbot & Briggs, 2022). People living with dementia reported they wanted AT they could use independently (Liddle et al., 2022; Rosenberg & Nygård, 2017; Talbot & Briggs, 2022).

The findings showed that for AT to be adopted it had to work better that low tech adaptations already in place for example paper diary or sticky notes (Arntzen et al., 2016; Gibson et al., 2015, 2019; Lariviere et al., 2021; Liddle et al., 2022; Yellowlees, 2020). AT that was successfully incorporated into daily routines and being used by people living with dementia was reported in all the studies. However, strategies were often needed to enable this adaptation to take place. In three studies, these were implemented by the researcher team (Arntzen et al., 2016; Lindqvist et al., 2013; Riikonen et al., 2013) but often carers implemented and supported these, for example leaving devices in the same location to act as a cue to wear or use the device (Gibson et al., 2015, 2019; Liddle et al., 2022), visual cues in the form of instructions or additional visual reminders to support learning to use AT (Albers et al., 2022; Arntzen et al., 2016; Gibson et al., 2015, 2019; Liddle et al., 2022; Riikonen et al., 2013; Talbot & Briggs, 2022). Repetition and practice to implement and use AT successfully was also reported (Albers et al., 2022; Gibson et al., 2015, 2019; Lariviere et al., 2021; Riikonen et al., 2013; Rosenberg & Nygård, 2017; Talbot & Briggs, 2022). A graded approach to learning with information given in small steps to allow the people living with dementia to take on board new information in manageable amounts (Liddle et al., 2022; Riikonen et al., 2013;

Rosenberg & Nygård, 2017). Supporting the transition to using AT was described as using an overlap of an existing routine with the new routine with AT to build confidence and adapt to using AT in the longer term (Arntzen et al., 2016; Lindqvist et al., 2013; Riikonen et al., 2013). The consultees all agreed they had used additional strategies to help learn to use AT, including purchasing the same brand when replacing devices, putting a device in the same location, using visual reminders or instructions and repetition and practice. A lack of family or statutory support with implementing and managing AT was referred to as a barrier (Gibson et al., 2015, 2019; Liddle et al., 2022; Riikonen et al., 2013). The consultees also agreed that practical support is needed from friends and family members to support with setting up AT and ongoing monitoring and felt AT would not work for them without support from family members. Help and support was cited to encourage self determination to continue trying to learn.

The majority of the studies showed that people living with dementia are more likely to incorporate AT into daily life if it enabled them to carry out meaningful activities which are highly valued and have a purpose to the individual (Albers et al., 2022; Arntzen et al., 2016; Asghar et al., 2018; Fæø et al., 2020; Liddle et al., 2022; Lindqvist et al., 2013; Riikonen et al., 2013; Rosenberg & Nygård, 2017; Talbot & Briggs, 2022; Yellowlees, 2020). AT was accepted and used to compensate for cognitive changes impacting on functioning, for example using a day clock to help with difficulties with orientation to time (Arntzen et al., 2016; Asghar et al., 2018; Liddle et al., 2022; Lindqvist et al., 2013; Yellowlees, 2020), issues with short term memory requiring AT to help locate lost items (Arntzen et al., 2016; Lindqvist et al., 2013) and reminders for daily activities (Asghar et al., 2018; Lariviere et al., 2021; Lindqvist et al., 2013).

Communication was found to be another key area why people living with dementia were using AT; this could be using simplified mobile phones (Arntzen et al., 2016; Liddle et al., 2022; Riikonen et al., 2013) or communicating online through social media apps or online video conferencing (Albers et al., 2022; Asghar et al., 2018; Liddle et al., 2022; Talbot & Briggs, 2022). Using this type of technology also enabled them to maintain social connections (Albers et al., 2022; Asghar et al., 2018; Talbot & Briggs, 2022); keep in touch with health professionals (Asghar et al., 2018) and to continue personally meaningful roles such as volunteering and advocacy that promoted a sense of purpose (Talbot & Briggs, 2022).

People living with dementia also reported the AT provided a perceived sense of safety, reassurance and reduced distress (Asghar et al., 2018; Fæø et al., 2020; Lindqvist et al., 2013; Riikonen et al., 2013; Yellowlees, 2020). Some reported they accepted AT in response to their carers concerns about safety even if they did not have this concern for themselves (Gibson et al., 2015; Lindqvist et al., 2013). Some reported they were likely to accept AT to support daily tasks if this enabled them to remain independent and avoid carer support in the home (Fæø et al.,

2020; Rosenberg & Nygård, 2017; Talbot & Briggs, 2022) and they recognised the value of being able to use AT independently (Asghar et al., 2018). Being independent outside of the home was also of importance as many of the studies discussed people living with dementia using GPS technology to help with orientation and wayfinding (Asghar et al., 2018; Liddle et al., 2022; Lindqvist et al., 2013; Talbot & Briggs, 2022; Yellowlees, 2020). This maintained the ability for them to shop and meet friends (Asghar et al., 2018) and maintain an active life outside the home (Lindqvist et al., 2013).

Continued participation in leisure activities was also highlighted as a valuable occupation where people use AT by using a modified TV remote (Arntzen et al., 2016), use an iPad which allows cognitive stimulation and entertainment to access online groups (Albers et al., 2022; Talbot & Briggs, 2022). The consultees also discussed the value of AT for continued participation in everyday activities and roles, communication and using AT to maintain safety and independence in the community. A sense of capacity to use AT successfully was an important factor in ongoing AT use (Arntzen et al., 2016; Asghar et al., 2018; Lindqvist et al., 2013; Rosenberg & Nygård, 2017; Talbot & Briggs, 2022; Yellowlees, 2020). A positive effect on perceived identity for people living with dementia AT effectively was reported when continued participation in meaningful activities resulted in reported feelings of increased confidence and mastery (Arntzen et al., 2016; Asghar et al., 2018; Lindqvist et al., 2013; Yellowlees, 2020). AT that enabled continued participation resulted in a sense of self-worth, achievement and dignity (Lindqvist et al., 2013; Rosenberg & Nygård, 2017; Talbot & Briggs, 2022). Another positive impact on identity from engaging with AT was how they were perceived by others (Lindqvist et al., 2013; Rosenberg & Nygård, 2017; Yellowlees, 2020). Using new technology was seen as important to be able to keep up with everyone else (Rosenberg & Nygård, 2017), being seen as independent and 'doing stuff yourself' (Talbot & Briggs, 2022, p.1370) and the positive affect for people living with dementia in perceiving that family can see the benefit of them using AT (Lindqvist et al., 2013; Rosenberg & Nygård, 2017; Yellowlees, 2020).

The literature also raised issues of AT use resulting in negative effects on daily life of the people living with dementia. Unintended outcomes from using AT included false notifications causing irritations (Arntzen et al., 2016; Asghar et al., 2018; Yellowlees, 2020) or sounds from AT causing distress (Arntzen et al., 2016; Gibson et al., 2015, 2019; Riikonen et al., 2013). People living with dementia expressed fear of accidental activation of AT (Gibson et al., 2015) or concerns of being monitored by AT devices (Asghar et al., 2018; Gibson et al., 2015; Liddle et al., 2022).

Introduction of AT was also shown to have negative consequences (Asghar et al., 2018; Fæø et al., 2020; Gibson et al., 2019; Lariviere et al., 2021) with a person living with dementia reporting that family visits had reduced

because they perceived their family thought they were now safer at home (Asghar et al., 2018) and another two studies identified that having a stove guard in place had resulted in stopping the person living with dementia from cooking (Fæø et al., 2020; Lariviere et al., 2021). In two of the studies, GPS location devices were used by people living with dementia and this resulted in changed or restricted freedoms when walking because the device had shown to their carers that they were travelling further or to different locations than the carers were aware of (Gibson et al., 2019; Lariviere et al., 2021). Although some reported benefits in using GPS technology there were some studies where only the benefits for the carers of using GPS or monitoring technology were reported rather than the views of people living with dementia (Albers et al., 2022; Gibson et al., 2015, 2019; Lariviere et al., 2021). The consultees agreed that alarms and notifications could be irritating but felt their purpose outweighed any disruption. There was a difference of opinion of whether AT could infringe on freedoms in the group, some did not feel they had experienced this but felt it may be an issue in the future for them and one participant reported feeling some sense of restriction from using location devices.

Discussion

The findings reflect that functionality of devices, lack of AT knowledge and experience, level of cognitive impairment affects usability of AT which can be a barrier to AT use. This concurs with the reviews by Boyle et al. (2022); Holthe et al. (2022); Thordardottir et al. (2019). A lack of AT information continues to be a barrier for people living with dementia, demonstrating the need for OTs to ensure they can provide this information; however, it may continue to be challenging for OTs to find the time and resources to keep up to date with AT developments (McGrath et al., 2017). Furthermore, the cost of unfunded AT is highlighted as a barrier (Gibson et al., 2015; Liddle et al., 2022; Yellowlees, 2020) which demonstrates the continued complexity for OTs when wanting to prescribe AT for people living with dementia which may not meet health criteria for funding (Astell et al., 2019).

Some of the studies raised unintended outcomes from AT such as reduced human contact (Asghar et al., 2018) and limited freedoms for some (Gibson et al., 2019; Lariviere et al., 2021) which may indicate that AT provision resulted in more unmet needs (Koo & Vizer, 2019). Therefore, this reflects the importance of including people living with dementia in research to help inform issues around AT and for OTs to review following AT provision to ensure needs are being met and there are no unintended outcomes. Koo and Vizer (2019) argue that AT device development should consider how it can support rather than diminish personhood for people living with dementia. The findings of this review identified that some can be affected by their own

perceptions of their ability to learn to use AT (Albers et al., 2022; Arntzen et al., 2016; Fæø et al., 2020; Liddle et al., 2022; Lindqvist et al., 2013; Riikonen et al., 2013; Rosenberg & Nygård, 2017), but stigma from AT devices was also reported in terms of being monitored (Asghar et al., 2018; Liddle et al., 2022) or perceiving AT as 'despairing' (Fæø et al., 2020, p.995). Desmond et al. (2018) argues that AT is often marketed to address deficits, for example becoming lost or falling and this can perpetuate sigma, rather than AT being marketed towards enabling participation in a valued activity like walking. Some of the articles only captured views of carers rather than people living with dementia for some monitoring AT (Albers et al., 2022; Gibson et al., 2015, 2019; Lariviere et al., 2021) but if AT can be shown to have limited or restricted freedoms this demonstrates the importance of gathering views and experiences of people living with dementia on AT. Furthermore, this raises the challenge to OTs when recommending AT to consider whose needs they are meeting by reflecting whether AT is being used 'by' or 'on' people living with dementia (Gibson et al., 2016). The consultation group discussed that AT could infringe on freedoms if cognitive capacity is affected in the future. This suggests the need for more research with people living with dementia using AT in everyday life (Holthe et al., 2022) and at various stages of dementia.

Previous reviews on acceptance show that people living with dementia need support to implement AT (Boyle et al., 2022; Holthe et al., 2022; Thordardottir et al., 2019) and this scoping review identified successful AT use required adaptation into daily routines, with individualised strategies supported by carers and incorporated according to their individual needs; this finding was verified by people living with dementia in the consultation group. Furthermore, some of the studies in this review argue their research demonstrates the need for a person-centred approach to AT, with consideration of the needs and perceptions of people living with dementia, along with support and strategies to implement and continue to use AT in practice (Arntzen et al., 2016; Gibson et al., 2015, 2019; Liddle et al., 2022; Lindqvist et al., 2013; Riikonen et al., 2013). This indicates that people living with dementia and carers could benefit from OTs delivering specific interventions like cognitive rehabilitation to help implement AT interventions (Clare et al., 2019; Poulos et al., 2017). This requires OTs to move away from AT devices that focus on risk management to one that includes AT for personally meaningful goals related to activities that have value and purpose and focus on personhood, empowerment and quality of life for people living with dementia (Kitwood, 1997; Koo & Vizer, 2019; Löbe & AboJabel, 2022). Therefore, OTs need to view AT provision from a human rights-based approach, with AT used as an enabling and positive way to promote independence and autonomy (Desmond et al., 2018; Poulos et al., 2017). However, OTs will need to have resources to dedicate time to deliver these types of interventions and

consider ways to overcome accessibility issues relating to cost and funding for AT on a local level (WFOT, 2019).

This review has not only shown that people living with dementia accept AT to carry out meaningful activities which have value or purpose to the individual but by focusing on the views of people living with dementia using AT in daily life, this review has demonstrated that identity can be supported through AT use for meaningful activities because increased feelings of confidence and mastery were reported (Arntzen et al., 2016; Asghar et al., 2018; Lindqvist et al., 2013; Yellowlees, 2020), a sense of self-worth, achievement and dignity from ongoing AT use (Lindqvist et al., 2013; Rosenberg & Nygård, 2017; Talbot & Briggs, 2022). People living with dementia also recognised the positive impact of their AT use was perceived as beneficial by those around them (Lindqvist et al., 2013; Rosenberg & Nygård, 2017; Yellowlees, 2020). Furthermore, this sense of capacity to use AT also supported ongoing AT use (Arntzen et al., 2016; Asghar et al., 2018; Lindqvist et al., 2013; Rosenberg & Nygård, 2017; Talbot & Briggs, 2022; Yellowlees, 2020). Therefore, people living with dementia had occupational competence because they were able to participate in meaningful activities that provided a sense of ability, control, fulfilment and satisfaction by pursuing their values and fulfilling expectations of their roles which contributed to maintaining autonomy and identity (Kielhofner, 2008). This finding indicates the value of focusing on the views of people living with dementia to consider how AT can promote identity and personhood and indicates that further research should focus on the lived experience of AT use for people living with dementia in real world settings.

Conclusion

For people living with dementia, acceptance of AT and ongoing use is affected by the practical aspects of the AT device, personal factors, which are influenced by the wider social cultural environment. AT must be for a personally meaningful activity that has value to the person, whether this is compensating for cognitive changes in daily tasks or enabling continued participation associated with maintaining roles to enable it to be accepted. People living with dementia benefit from having individualised support to adapt and learn to implement AT into routines. Using AT successfully can support carrying out meaningful roles, which can contribute to a positive sense of identity. The sense of capacity using AT also contributes to ongoing use.

There is complexity in AT provision because of funding issues, access to timely information about AT, the need for bespoke support, along with consideration of the ethical aspects for people living with dementia if they are unable to weigh up the risks from the potential unintended consequences of AT. Further primary research gathering the lived

experience of people living with dementia using AT in real world settings is required.

The following presents recommendations for practice and research:

• People living with dementia want and need information about AT and how it can be used to increase participation and maintain independence.

• Evidence indicates people living with dementia accept AT that supports activities which are valued, which in turn can contribute to maintenance of identity.

• To implement AT successfully people living with dementia should be offered a person centred assessment and bespoke strategies to support adoption into daily routines.

• OTs should consider potential negative consequences of AT and consider whose needs are being met when prescribing AT devices.

Limitations

This review has not focused on AT use with people living with dementia living in care environments so findings may not be generalised within different settings. Two articles were from the same research so could have influenced findings. The literature within this review reported findings from research conducted in Scandinavia, UK, Australia and Pakistan and the USA demonstrating a range of health systems but further work is required to represent the experiences of at all stages of dementia. The exclusion of non-English articles may also have excluded useful information for this review.

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Disclosure statement

ORCID

S. Martin http://orcid.org/0009-0004-2686-0188
C.H. Jones http://orcid.org/0000-0001-9753-0777

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