The use of everyday technologies to enhance wellbeing and enjoyment for people living with dementia: A systematic literature review and narrative synthesis

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Introduction

Wellbeing is a fundamental aspect of being human and can be conceptualised in terms of positive emotions, engagement in meaningful activities, positive relationships, meaning, and sense of achievement (Seligman, 2012). Since living with dementia increases the risk of experiencing depression and anxiety (Kraus et al., 2008), it is important to focus on how wellbeing can be maximised to help enable people with dementia to 'live well' (i.e. reach an optimal state of health and wellbeing despite health-related adversity; Harris & Wallace, 2012). Evidence indicates that psychological health, social engagement, functional ability and positive relationships are associated with living well with dementia (e.g. Clare et al., 2019). Finding ways to facilitate these factors for people with dementia remains a clinical and research priority.

We are living in a digital world and technological solutions that support people with dementia are increasingly popular. The use of Assistive Technology (AT), devices that either allow an individual to perform tasks that they would otherwise be unable to do (e.g. automated prompting) or which increase the ease and safety with which tasks can be performed (e.g. locator devices. See Cowan & Turner-Smith, 1999), can promote independence and quality of life in dementia (see Cahill, Macijauskiene, Nygård, Faulkner, & Hagen, 2007; Mulvenna et al. 2010). However, focusing solely on dementia-specific AT and assuming that this is the only technology suitable for promoting wellbeing in people with dementia can also perpetuate stigmatisation around using technology (see Astell, 2013).

In contrast to AT, everyday technologies (ETs) – electronic / digital devices such as app-enabled computers, tablets and smartphones - already exist in people's lives at

home (Beasley & Conway, 2012) and are more readily accessible. Research into the use of ETs by people with dementia is growing; such "off-the-shelf" technology can have social benefits for people with dementia by increasing conversations around shared interests (Capstick, 2011) and increasing independent engagement with pleasurable activities (e.g. Lim, Wallace, Luszcz & Reynolds, 2013). Furthermore, ETs are often cheaper to acquire than dementia-specific technologies (Bowes, Dawson & Greasley-Adams, 2013), suggesting they are more likely to be used.

Screen-based everyday technologies, such as iPads, have become a particular focus of research in this area as touchscreens and applications can be personalised to an individual or group (Astell, Smith & Joddrell, 2019) and they reduce the demand of hand-eye coordination (Wandke, Sengpiel & Sönksen, 2012). Furthermore, the use of motion-based everyday technology (e.g. gaming consoles) in dementia has been gaining attention (Astell et al., 2019). Because screen-based technologies hold potential for facilitating leisure activities in dementia care, and therefore enhancing wellbeing, it is important to understand the views and experiences of individuals living with dementia with regard to using such technologies for these purposes.

ETs are likely to facilitate positive emotions, such as enjoyment and pleasure (Lin & Yu, 2011), supporting wellbeing in turn. In dementia, ETs could foster wellbeing by promoting 'positive person work', such as maintaining personhood through play, creation, validation, participation and collaboration (Kitwood, 1997) as everyday technology allows individuals to play a variety of games independently and with others (Pedell, Beh, Mozuna & Duong, 2013). To date, however, research that has investigated these links has not been systematically reviewed.

A review conducted by Pinto-Bruno et al. (2017) found that people with dementia can benefit from ICT interventions in relation to creating and maintaining social engagement and participation. Social participation relates to a person's involvement in activities that provide interaction with others in the community (Levasseur, Richard, Gauvin & Raymond, 2010). Effective social participation is linked with wellbeing in later life (Wanchai & Phrompayak, 2019) and can be categorised as collective participation, activities in collaboration with others (e.g. game playing) and productive participation, activities that benefit others (e.g. reading books to children). Pinto-Bruno and colleagues (2017) noted that the most "promising" evidence (p.16) that technology use supports social participation in dementia came from qualitative studies. Reviewing the qualitative evidence in this area could therefore increase our understanding of peoples' experiences of using technology for enjoyment and pleasure as well as social engagement. Looking at experiences of using technology from the perspective of people with dementia is important as the views of these individuals can often be unheard (Span et al., 2013). As such, this review would aim to ground analysis in raw, rich data to ensure the voices of those with dementia are captured around this important area. Furthermore, the perspectives of caregivers are important to explore in order to fully understand how the social environment around the person might impact on experiences of using technology with respect to enjoyment, social participation and engagement.

A distinction can be drawn between engagement and 'effective engagement' in technology, which can be defined as a level of engagement to achieve intended and meaningful outcomes for a person that can only be established in the context of a specific intervention used (Yardley et al., 2016). It is important to understand what

experiences of using technology facilitate or hinder effective engagement in ETs from the perspective of people with dementia, as this would clarify the contextual factors that facilitate the benefits people derive from technology use. For example, the usability of ET may influence effective engagement in dementia but this may vary (Lim et al., 2013). Yardley and colleagues contend that qualitative research is needed to understand how technological interventions can meet the specific needs of technology users.

In view of this, a qualitative systematic literature review incorporating the views of people living with dementia and their care partners would provide a unique and deeper understanding of experiences of using screen-based everyday technology in relation to the social environment. In turn, this will help clarify how technological interventions can help influence enjoyment, pleasure, effective social participation and engagement.

As such, the current review aimed to answer the following questions:

1. *How do people with dementia and their care partners experience using screen-based everyday technologies to enhance their wellbeing through social engagement, participation and leisure?*

2. *What are the views of people with dementia and their care partners about using screen-based everyday technology to enhance wellbeing?*

3. *What experiences and views do people with dementia and their care partners have in relation to the usability of screen-based everyday technology in dementia?*

4. *What is the methodological quality of studies in this area?*

Method

Search Protocol

The lead researcher (LS) conducted a systematic literature search in December 2018 across three electronic databases: PsycINFO, CINAHL and PsycArticles. To extend the inclusivity of this review, further searches were run using the EThOS database to explore grey literature. Furthermore, the reference and citation lists of included papers were scanned for relevant papers. Relevant articles were also sought through contact with relevant researchers considered to be influential in this area.

The search strategy was guided initially by scoping previous empirical studies and literature reviews relating to dementia, wellbeing and assistive technology generally. The final search strategy focused on screen-based technology use for leisure, social participation and engagement, based on emerging literature emphasising that this technology can offer enjoyable activities for people living with dementia (Hitch, Swan, Pattison & Stefaniak, 2017; Joddrell & Astell, 2016) as well as literature suggesting that traditional assistive technology, which focuses on using devices 'on' people, can be

stigmatising (Greenhalgh et al., 2013). Search terms were also generated using conceptual literature around positive psychology and wellbeing (Seligman, 2012; Diener, 1984; Cohen-Mansfield, Dakheel-Ali & Marx, 2009) as well as previous research emphasising the need to explore social engagement further in everyday technology (Astell, 2013).

A broad category of search terms relating to technology was utilised to capture the different types of screen-based technology that may be used in this context. Further search terms were added based on the key words from retrieved papers. The key search terms were as follows:

Terms relating to dementia - *dementia or Alzheimer* or mild cognitive impairment*

AND

Terms relating to everyday technology - *technolog* or digital* or electronic* or device* or computer* or tablet* or "mobile phone*" or smartphone* or internet or iPAD**

AND

Terms relating to the purpose of the use of technology (with respect to wellbeing) - *Social or engagement or inclusion or involvement or participation or leisure or pleasure or enjoy**

In addition, the search terms *dementia* AND *technology* were used on the EThOS database to retrieve doctoral theses in this area. Search terms were applied to the titles and then the abstracts of identified articles.

Inclusion and Exclusion Criteria

Tables 1 and 2 show the inclusion and exclusion criteria for papers alongside the rationale for each criterion. Limiters were applied to retrieve papers written in English only.

Table 1. Inclusion criteria and rationale

Inclusion Criteria	**Rationale**
The study aimed to explore views and experiences of using ET in the form of computers, tablets, screen or motion-based devices or phones to support wellbeing via social engagement, participation, enjoyment, pleasure and leisure in dementia.	To find papers which explored the lived experience, views and opinions, or to find papers that reflected on this in their results section.
The study had at least one discrete, overarching theme within the findings relating to views/experiences of using everyday technologies to support wellbeing via social engagement, participation, enjoyment, pleasure and leisure in dementia.	To identify and include studies that may not have directly investigated links between ETs and wellbeing but did have important incidental findings relevant to the aims of this review.
Participants had to be people with dementia or mild cognitive impairment (MCI) or an informal/formal carer to those living with dementia or MCI	To find papers relevant to the clinical population and to incorporate multiple perspectives from key people in the social environment of individuals living with dementia. MCI was included as often research samples are mixed and to include people who are early in the dementia journey as MCI can be a precursor to dementia (Janoutová et al., 2015).
The study employed a qualitative or mixed-methods methodology.	To ensure subjective views and lived experiences were captured.
The study included original quotes in the write up	For rich data to capture depth of experiences and views.
Written in English	To find papers which were written in the known language of the researcher, as there was no access to translation.

Table 2. Exclusion criteria and rationale

Exclusion	Rationale
Studies that do not capture experiences or views. For example, studies that only present quantitative data.	To ensure that the data analysed directly answered the research questions which aim to explore views and experiences.
Studies that explore assistive technology use in relation to activities of daily living (ADLs) or safety (e.g. technology to track individuals, to assist with practical difficulties and/or to rehabilitate memory) only	It is argued that there is a distinct difference between technologies that support safety and ADLs and those that facilitate positive emotions, leisure, participation and engagement (Alzheimer's Society, 2015). Whilst technology used and designed to support ADLs may result in enhanced wellbeing as a consequence of use, often wellbeing is not the predominant or primary aim of this and the person with dementia is not the intended user of assistive technology (Joddrell, Hernandez & Astell, 2016; Astell, Smith & Joddrell, 2019).
Studies focusing on technology use for leisure, social participation and engagement in a population other than individuals living with dementia or mild cognitive impairment and respective caregiver views (e.g. Parkinson's).	To ensure that data being examined related solely to the experiences, views and opinions of people who are living with dementia and their caregivers.
Reviews, reflective or discussion papers and conference presentation summaries	To ensure studies that are included in the review capture lived experiences, opinions and views.
Studies before 1980	The first motion-based technology was created in 1981 (Astell et al., 2019), with touchscreen first being invented 1983 (Bellis, 2018).

Quality Assessment

Methodological quality was assessed using the checklist for qualitative studies created by the UK National Institute for Health and Care Excellence (NICE, 2012). A subset of papers was rated by a peer researcher to increase the transparency of the quality appraisal process. Three papers were randomly selected and were checked by a peer researcher to ensure reliability in quality rating; no disagreement in ratings emerged.

The checklist was used to critique the quality of each research study with regards to design, method, reflexivity and trustworthiness. In studies where a mixed methodology was used, only the qualitative aspects of the study were evaluated using the quality checklist. Methodological quality was not assessed as part of the inclusion criteria, but rather to help contextualise the findings of the synthesis. The quality scoring checklist can be found in Table 3.

Table 3. The NICE (2012) methodological quality checklist scoring criteria

Description	Score
All or most of the checklist criteria have been fulfilled, where they have not been fulfilled the conclusions are very unlikely to alter.	++
Some of the checklist criteria have been fulfilled, where they have not been fulfilled, or not adequately described, the conclusions are unlikely to alter.	+
Few or no checklist criteria have been fulfilled and the conclusions are likely or very likely to alter.	-

Data Synthesis

Studies included in the review were qualitative in focus and varied in their design and the type of ET used / evaluated. Inductive narrative synthesis was therefore employed to analyse and synthesise research findings relating to the aims of the review whilst

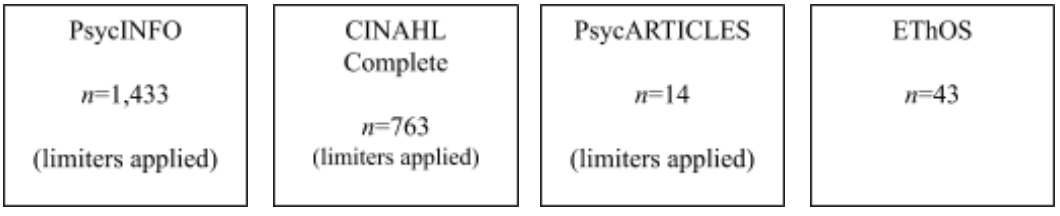
grounding the analysis in participants' experiences in order to provide a richer overview. Narrative synthesis aims to understand and synthesise ideas and theories around how and why an intervention (e.g. everyday screen technology) may be beneficial for a population (Tong, Flemming, McInnes, Oliver & Craig, 2012) as well as telling a story about the findings (Popay et al., 2006). This is an inductive approach that allows for an understanding of beneficial experiences to be developed based on integrating data rather than potentially being constrained by applying any pre-existing theory or framework.

In line with the procedure outlined by Popay et al. (2006), relevant information (key themes from each included study along with corresponding representative quotes) was extracted using a data extraction form, and a preliminary synthesis was created through grouping studies by modality of technology use (individual, one-to-one and group-based) and tabulating findings according to the review questions before synthesising initial themes. Relationships within and between studies were then explored. Finally, an integrated narrative synthesis of the data was developed and refined in relation to emergent themes and sub-themes.

Results

Identification and Characteristics of Relevant Studies

10 papers from electronic searches met the inclusion criteria for the review. The process article selection is outlined in Figure 1.



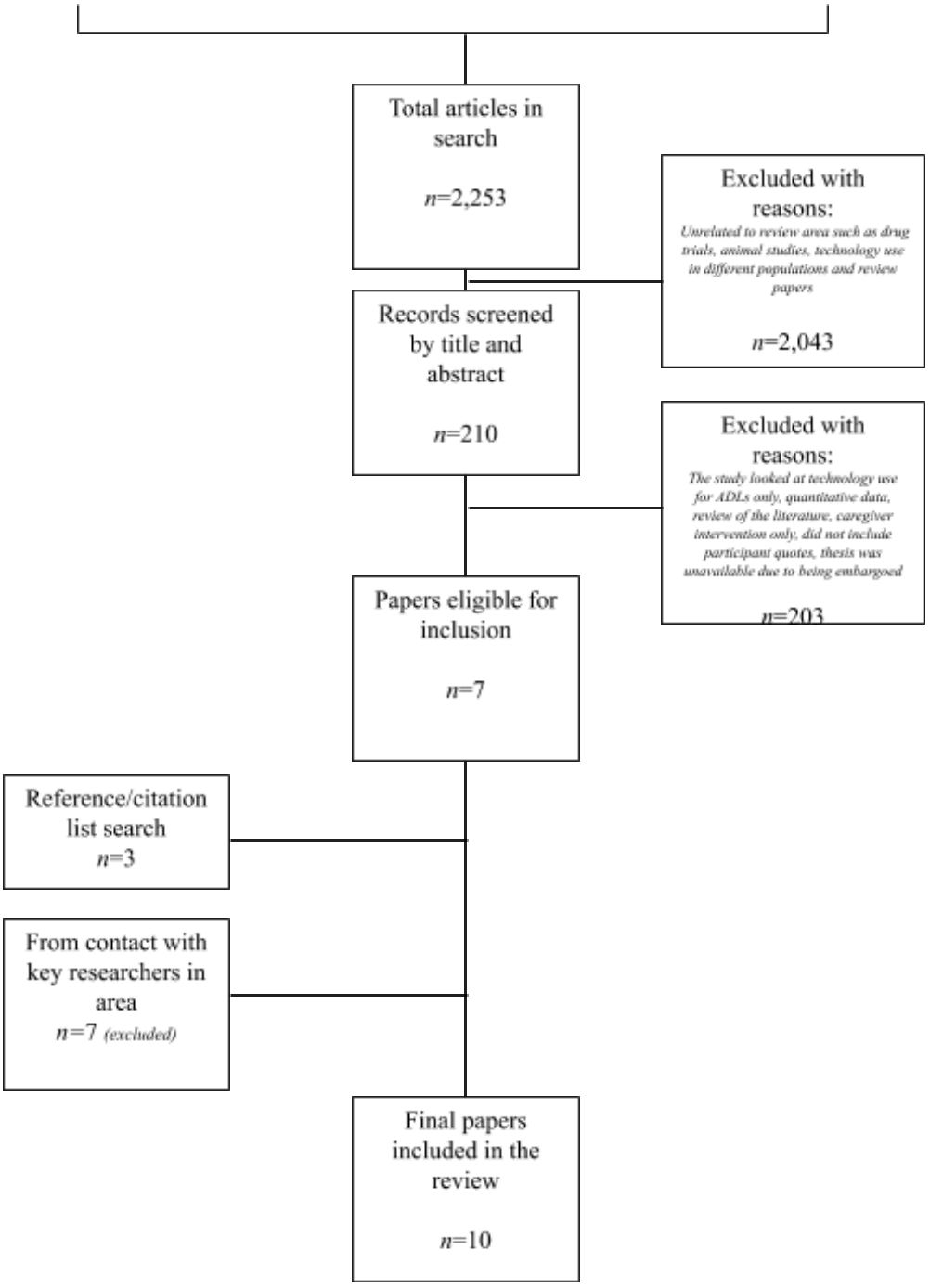


Figure 1. Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) diagram detailing selection of papers

One of the published papers from the database search (Cutler, Hicks & Innes, 2016) matched a doctoral thesis paper generated from EThOS. Both were scrutinised and the

published, peer-reviewed version was included. A published paper identified by a key researcher matched a doctoral paper from EThOS (Smith, 2015). The doctoral thesis was included as it had richer qualitative data.

Table 4 details the characteristics of the included studies along with the relevant findings extracted for analysis. Five studies employed a mixed methodology and five used only qualitative methods. Overall, 3 studies included the perspectives of people with dementia only, 1 study focused on the perspectives of caregivers either formally (e.g. staff) or informally only (e.g. family, volunteers) and 6 studies included perspectives from both individuals with dementia and those in a caring role.

Technology use was predominantly framed as an intervention in a group or/and one-to-one (*n*=9). All studies included touchscreen technology (e.g. smartphones and tablets), some specially adapted for older people (*n*=2; see Lazar et al., 2016 and Alm et al., 2009). Two studies evaluated gaming consoles alongside touchscreen technology (Hicks, 2016; Cutler, Hicks & Innes, 2016). One study did not employ a specific intervention and instead explored naturalistic use of everyday technology (Hedman, Lindqvist & Nygård, 2016). Studies were conducted in community settings (*n*=6) and residential care facilities and inpatient units (*n*=4). All studies were reported in English.

Quality of Included Studies

Quality ratings can be found in Table 4. Most studies lacked evidence of researcher reflexivity, with little or no attention paid to the relationship between the researcher and participant or consideration of the impact of the researchers' own biases and values on the research. Poor researcher reflexivity is often cited as a limitation of qualitative research (Newton, Rothlingova, Gutteridge, LeMarchand & Raphael, 2012). Only four

papers discussed issues of reflexivity explicitly (Astell et al., 2014; Hicks, 2016; Smith, 2015; Swan et al., 2018). This may be a result of limitations on word-counts in peer-reviewed papers.

Across studies, chosen qualitative methods appeared appropriate in relation to the aims of the studies but not all studies provided a clear rationale for including qualitative methods or clearly explain how data analysis occurred.

Table 4. Summary of characteristics of studies included in the literature review

	Author and Year	Technology used	Aims	Qualitative Methods utilised	Participants	Modality	Setting
1.	Alm et al. (2009) *UK*	Multimedia technology on touchscreen	Investigated ways in which an interactive entertainment system for people with dementia could engage and support them	*Mixed methods:* Qualitative methods - questionnaire (staff) and interviews (people with dementia)	13 professionals and 5 individuals with dementia	One-to-one	Care facility
2.	Astell, Malone, Williams (2014) *UK*	Laptop and iPhone™	To present the self-described journey of a person with dementia in his re-learning of old technologies and learning of new ones and the impact this had on his life	*Qualitative:* Case study using thematic analysis from online blog and diary entries.	1 individual with dementia	One-to-one	Community setting
3.	Cutler, Hicks, Innes (2016) *UK*	Apple iPad™, Nintendo Wii™, Nintendo DS™	To capture experiences and views of using digital gaming from people with dementia.	*Mixed methods:* ethnographic field notes, self-completed questionnaire, focus group discussions. Qualitative data was analysed thematically.	29 individuals with dementia	Group led by facilitators "Tech Clubs" delivered by a local council at 4 accessible venues. The sessions were 2 hours and ran for 6-8 weeks.	Community dwelling
4.	Groenewoud et al. (2017) *Netherlands*	Apple iPad™	To explore experiences and views of independent tablet games	*Mixed methods:* Qualitative from post-game interviews and in researcher field notes.	54 people with dementia (24 men, 30 women).	Group	5 small-scale living facilities for people with dementia
5.	Hedman, Lindqvist & Nygård (2016) *Sweden*	Everyday technologies (including tablet and smartphones)	This study explored how persons with MCI experience both technology in the present and their views of using technology in the future.	*Qualitative:* grounded theory analysis was used to analyse semi-structured interviews	6 people with MCI	Individual	Community dwelling
6.	Hicks (2016) *UK*	Apple iPad™, Microsoft Kinect™, Nintendo Wii™, Nintendo Balance Board™	To explore ways to support older men living with dementia and to examine the impact of technology on older men with dementia in rural areas, particularly with regards to social inclusion.	*Qualitative:* Thematic analysis of interviews, focus groups and reflexive field notes.	22 men with dementia alongside 15 care partners and 5 community volunteers.	Group	Community dwelling in rural areas
7.	Lazar, Demiris, Thompson (2016) *USA*	A commercially available computer system designed for older adults in community settings	To evaluate a commercially available system designed to encourage the engagement of people with dementia in activities and social interactions	*Mixed methods:* semi-structured interviews with family members and staff analysed thematically.	5 individuals with dementia, 4 family members and 7 staff members	One-to-one	Memory Care Unit
8.	Smith (2015) *UK*	Touchscreen technology	*Study 1* – To explore how technology is received by members of a day care centre, explore if technology enables interaction through enjoyment and if familiarity with technology increases over time. *Study 2* – To focus on enjoyable activities and what factors shape engagement and interaction with technology, if the devices present observable challenges/gains and what they are, and whether technology use involves new knowledge and retained learning.	*Qualitative:* Used visual ethnography to analyse qualitative data and illustrated the findings thematically.	In Study 1, there were 9 women and 3 men living with dementia. 9 participants in a supporting role (including the researcher, paid staff, students, and volunteers) also consented to take part. In Study 2, 16 participants took part where 10 were living with dementia and 6 were in a supporting role.	Groups and one-to-one setting	Study 1 was based in a well-established charity organisation offering community groups for people with dementia. In Study 2, the focus was exploring touch-screen computers on a one-to-one basis with participants in their own homes.
9.	Swan et al. (2018) *Australia*	Apple iPad™	Explore the experience of staff and residents, using iPads as a medium to engage meaningful occupation.	*Mixed methods:* Combining descriptive quantitative and thematic analysis through interviews, focus groups and surveys	7 residents and 8 staff members participated in the qualitative component	One-to-one	Mental health service that included three acute in-patient units (Australia).

10.	Upton et al. (2011) *UK*	Touchscreen technology (iPad™)	To provide insight into the experience of the person with dementia with regard to using touchscreen technology and the impact that it has on individual staff working with the person they care for and to develop a better understanding of the perceptions of people engaged in dementia care as to the potential for the use of touch screen technology.	*Qualitative:* Used thematic analysis to analyse interviews and focus groups.	In the interviews, 10 participants with dementia and one member of staff were included. In the focus groups, 10 care home staff and managers participated in the study.	Group and one-to-one setting	The study was carried out in 11 care homes

Synthesis of Findings

The narrative synthesis generated 4 themes and 10 subthemes, as displayed in Table 5.

Participant quotes used in the narrative synthesis to develop the final themes and subthemes are displayed in Table 6.

Table 5. Themes and subthemes derived from the synthesis of findings

Themes	Subthemes	Papers*
Technology use maintaining a sense of identity	*Learning and achievement*	Astell et al., 2014; Cutler et al., 2016; Groenewoud et al., 2017; Hicks, 2016; Swan et al., 2018; Alm et al., 2009; Upton et al., 2011; Lazar et al., 2016
	Past and future interests	Swan et al., 2018; Groenewoud et al., 2017; Hedman et al., 2016;Lazar et al., 2016; Hicks, 2016
	Reminiscence	Swan et al., 2018; Upton et al., 2011;Lazar et al., 2016; Hicks, 2016
Assumptions held by the self and others	*Positively challenging assumptions about the self and others*	Hicks, 2016; Cutler et al., 2016; Groenewoud et al., 2017; Astell et al., 2014, Alm et al., 2009; Upton et al., 2011
	Feeling negative assumptions of the self were actualised	Swan et al., 2018; Groenewoud et al., 2017; Hedman et al., 2016; Lazar et al., 2016
The importance of others	*Others' role in scaffolding technology use*	Swan et al., 2018; Groenewoud et al., 2017; Astell et al., 2014; Smith, 2015; Cutler et al., 2016; Lazar et al., 2016
	Technology as a shared experience	Cutler et al., 2016; Hicks, 2016; Groenewoud et al., 2017; Upton et al., 2011; Smith, 2015
	Enhancing relationships	Upton et al., 2011; Swan et al., 2018; Lazar et al. 2016
The usability of technology influencing effective engagement	*Problems encountered*	Groenewoud et al., 2017; Hedman et al., 2016; Lazar et al., 2016; Upton et al., 2011
	Solutions found	Upton et al., 2011; Lazar et al., 2016

*Representative studies corresponding to each sub-theme. Findings from included studies could relate to more than one theme (e.g. Astell et al. 2014).

Table 6. A sample of participant quotes used to develop themes and subthemes

Themes	Subthemes	Participant Quotes
Technology use maintaining a sense of identity	*Learning and achievement*	*"I'm hoping to learn more next week about the iPad" – person living with dementia (PLwD) – From the theme of "Promoting life-long learning" - Cutler et al. (2016) – page. 111* *"It is nice to have something to do. And it is intelligent. It is a nice therapy" – PLwD– From the theme "Having something to do" – Groenewoud et al. (2017) – page. 42* *"Able to kind of learn more and sort of build on their knowledge – a sense of accomplishment and confidence in themselves" – Staff – From the theme of "Belonging" - Swan et al. (2018) – page. 5*
	Past and future interests	*"I loved the golf game... I can't play it in reality…I can't go out and play on a course anymore. I don't have the money or equipment and… I'm not physically able to now but I love it" – PLwD - From the theme "Meaningful activity" – Hicks (2016) – page. 148* *"I think there is nothing in it. I cannot do anything with it and it doesn't work like I want it to" – PLwD – From the theme "Sense of insecurity" – Groenewoud et al. (2017) – page. 43* *"Yes he really enjoys it. He used to play golf and fly fishing. He misses his golf and was in his element the other day when you played golf"- Carer –From the*

		theme "Meaningful activity" – Hicks (2016) – page. 149
	Reminiscence	*"…it was discovered that both participants were artistic…Following from this it was decided that the iPads would be used . . . to be creative . . ." – Carer – From the theme "Mental stimulation" - Cutler et al. (2016) – page. 114*
		"I think they [iPads] appeal to a lot of people here. They bring back memories from our younger days. It was most enjoyable" – PLwD – From the theme "Reminiscence and recall" - Upton et al. (2011) – page. 11
		"We did have a bit of a project where they'd put together a bit of story of something they enjoyed in their past and shared that with others, so yes promoting a shared experience" – PLwD – From the theme "Belonging" - Swan et al. (2018) – page. 6
		"[she] absolutely loves the casino one, and that's because she used to meet her favourite sister in Las Vegas." – family member – From the theme "Reminiscence" - Lazar et al. (2016) – page. 379
Assumptions held by the self and others	*Positively challenging assumptions about the self and others*	*"It was great to see I could do it" – PLwD - From the theme "Optimising mental, physical and social stimulation" – Cutler et al. (2016) – page. 119*
		"I only have to think back six months and recall that I could barely use a Television Remote Control. The changes in me are incredible" – PLwD - From the theme "Identity" – Astell et al. (2014) – page. 10
		"I wasn't sure who was the volunteer and who was the person with dementia…" –Volunteer – From the theme "Challenging

		others' assumptions" – Hicks (2016) – page. 160
	Feeling negative assumptions of the self were actualised	*"I'm too old for that"- PLwD - From the theme of "Doing" – Swan et al. (2018) – page. 5*
		"I did not like the effort. I used to be able to do this" – PLwD - From the theme "Failure, low self-esteem" – Groenewoud et al. (2017) – page. 42
		"And like then you have to adapt these things, I'll never manage this, with Spotify and all that. If…if I get a little more scatter-brained, eh? That won't work." – Person with MCI – From the theme "Downsizing" – Hedman et al. (2016) – page. 6
		"If we're having a hard time using it, it's definitely gonna be hard for [residents]" – Staff– from the theme "Challenges" – Lazar et al. (2016) – page. 381
The importance of others	*Others' role in scaffolding technology use*	*"Taught how to put it in, and then we are left to our own" – PLwD – From the theme "Doing" – Swan et al. (2018) – page. 5*
		"I didn't fully understand it. I would if someone told me to do such and such" - PLwD - From the theme "Sense of insecurity" – Groenewoud et al. (2017) – page. 43
		"One time when I was using [the system], and [she] was playing blackjack, I had to leave, and I said 'You know you can still keep playing' and she's like 'No, I don't want to'" – Family member – From the theme "Influencers" – Lazar et al. (2016) – page. 379
		"You have to have someone that's knowledgeable" – Staff member – From the theme "Influencers" - Lazar et al. (2016) – page. 382

	Technology as a shared experience	*"Well it helped to sort of meet other people. I don't socialise that much." – PLwD – From the theme "Social Participation" – Hicks (2016) – page. 147*
		"I think the social benefits were brilliant" - Family member – From the theme "Life-long Learning" – Hicks (2016) – page. 155
	Enhancing relationships	*"I think it influences as well the relationship between staff and the residents, a closer relationship" – Staff member – From the theme "Quality of Life" – Upton et al. (2011) – page. 16*
The usability of technology influencing effective engagement	*Problems encountered*	*"It did not run smoothly" – PLwD – From the theme "Annoyance" – Groenewoud et al. (2017) – page. 43*
	Solutions found	*"People have said oh it's quite heavy…so I tend to think oh I can put it [the device] on a cushion or a pillow"– Staff – From the theme "Technology as a challenge" – Upton et al. (2011) – page. 17*

Technology use maintaining a sense of identity

Findings from several studies suggested that using everyday technology helped maintain a sense of identity through a sense of achievement. In turn, this was linked to experiences of learning something new, using technology relating to past interests and growing interests and reminiscing about one's life.

Learning and achievement

The majority of studies demonstrated that learning how to use different everyday technologies influenced a sense of mastery and achievement, which increased feelings of enjoyment. Varied findings demonstrated how learning about using ET helped people with dementia to foster hope around future learning (Astell et al., 2014; Cutler et al., 2016), as well as a sense of mastery, achievement and progress over learning something new (Cutler et al., 2016; Groenewoud et al., 2017; Hick, 2016). One study found that engaging in ETs helped people to relearn (Astell et al., 2014) how to use aspects of technology they found difficult previously. The finding that technology was linked to a sense of learning and achievement was evident across studies of varying methodological quality.

A sense of achievement was evident when the technology involved the use of 'scoring games' which provided a form of tangible achievement (Groenewoud et al., 2017). Further to this, a sense of achievement was enhanced through using technology in groups as it offered opportunities for others to comment on their successes at using technology (Groenewoud et al., 2017) but to also encourage learning through positive feedback (Cutler et al., 2016).

A sense of learning something new was an important aspect of this theme. Participants in different studies felt as though the learning was stimulating (Cutler et al., 2016; Hicks, 2016) and compared using the technology to less stimulating activities (Groenewoud et al., 2017). Learning about the technology offered individuals something to do which increased feelings of enjoyment (Hicks, 2016; Cutler et al., 2016; Groenewoud et al., 2017).

Caregivers also had key experiences of how technology helped individuals with dementia to learn more, build on their knowledge and generate a sense of accomplishment and confidence (Swan et al., 2018; Alm et al., 2009; Upton et al., 2011). An increase in observed confidence

was something only spoken about from the perspective of carers. Care staff commented on how using technology was a 'learning curve' (Lazar et al., 2016).

Past and future interests

Positive experiences of ETs offered a means to engage in past interests and hobbies that shape individuals' lives and sense of identity. These experiences also offered individuals a way of pursuing and broadening their interests. This finding was consistently evident across studies of varying methodological quality (Swan et al., 2018; Groenewoud et al., 2017; Hedman et al., 2016; Lazar et al., 2016; Hicks, 2016).

Studies found that individuals with dementia enjoyed the technology if it was linked to their own interests (Groenewoud et al., 2017; Hicks, 2016; Smith, 2015). Technology offered a way to continue to engage in physical interests, such as sport, which helped to maintain a sense of identity despite physical limitations (Hicks, 2016). Further to this, experiences of disengagement and indifference occurred if the technology did not match individuals' interests (Smith, 2016; Groenewoud et al., 2017).

This was also evident from the perspective of caregivers. Using ET was a way of keeping up with interests people with dementia may not otherwise be able to easily engage with. Positive affect and enjoyment was observed by family members when individuals based their technology use on their past interests (Hicks, 2016).

For caregivers, discovering the interests of the individuals with dementia appeared to be facilitated through the use of technology, which increased subsequent engagement (Cutler et al., 2016).

Reminiscence

Technology was an effective way of engaging in reminiscence and story-telling and was an opportunity for an individual to share aspects of their past with others (Swan et al., 2018). This was particularly pertinent to those who had used technology in a group setting.

Individuals living with dementia reflected on how they reminisced about their past through using technology (Swan et al., 2018) and how this increased enjoyment (Upton et al., 2011). The use of specific ET, such as the iPad, offered a way to capture life stories more easily than on paper (Upton et al., 2011).

Carers' experiences of reminiscence seemed to outweigh those of people with dementia and tended to focus on a "shared" process. However, it was unclear if this is because carers have been asked more about this topic than individuals with dementia (see Swan et al. 2018). Different studies reported that caregivers were able to promote engagement in reminiscence through the apps everyday technologies offer, such as YouTube (Swan et al., 2018; Lazar et al., 2016; Hicks, 2016). Dementia care staff in one study described a group life story project on iPads that centred on creating a shared experience.

Family members from another study spoke about how happy memories were recalled through the use of games using ETs (Lazar et al., 2016).

Assumptions held by the self and others

Positively challenging assumptions about the self and others

Across several studies, experiences of using technology challenged negative assumptions that individuals with dementia held about themselves in relation to technology use. This may have

related to beliefs linked to dementia and / or longstanding beliefs that existed prior to living with dementia. Whilst the assumptions of individuals with dementia and those who care for them were discussed in the studies reviewed, only three of the studies (Astell et al., 2014; Hicks, 2016; Smith, 2015) discussed researchers' own assumptions about dementia, potentially affecting the trustworthiness of findings within this theme, as little attention was paid to researcher reflexivity (Finlay, 2002).

Individuals with dementia experienced surprise at how much they enjoyed using everyday technology (Hicks, 2016) and the positive feeling arising from realising that they could use and interact with the technology (Cutler et al., 2016; Groenewoud et al., 2017; Astell et al., 2014, Alm et al., 2009).

Further to this, gratitude was expressed towards a new ability to use technology, as it differed from previous negative experiences and this supported a positive sense of identity (Astell et al., 2014).

One individual with dementia perceived that others would believe that "a diagnosis of dementia would leave me without these skills forever" and were therefore "shocked" to see when he was able to successfully use ET for enjoyment (Astell et al., 2014; page 16).

Similarly, caregivers experienced surprise (Upton et al., 2011; Cutler et al., 2016) when individuals with dementia successfully navigated ETs. For example, a volunteer described how in their technology group they could not discriminate between who was facilitating the group and who was the person living with dementia (Hicks, 2016). As a result, the volunteer felt they learnt more about dementia.

Feeling negative assumptions of the self were actualised

In contrast, some studies reported that experiences of technology may have strengthened negative assumptions individuals with dementia held about themselves. One study found that individuals with dementia felt as though they were not able to use technology because of their age rather than their dementia (Swan et al., 2018).

Another study reported that a sense of failure can emerge from difficulty using ETs, as people compared themselves to previous successful experiences of using technology.

A fear of not being able to engage as well in technology as memory difficulties progressed was found in one study (Hedman et al., 2016). For some, current technology use can be a negative experience that activates future negative assumptions of the self. It was evident that a 'basic-Spotify variation just by pushing two buttons' (p.6) would be favoured as it would enable people to continue to feel independent if memory difficulties progressed.

Furthermore, negative assumptions about using technology in dementia were found in a study focusing on staff views. Because staff had difficult experiences of using the technology themselves they believed that it would be more problematic for individuals with dementia (Lazar et al., 2016).

The importance of others

All but one of the studies (Hedman et al., 2016) focused on experiences of using everyday technology in either a group or one-to-one setting. This finding was reported in studies of varying quality but those with a higher quality rating (Swan et al., 2012; Astell et al., 2014; Groenewoud et al., 2017; Hicks, 2016; Smith, 2015) gave further insight into direct experiences of shared ET use as more detailed quotes were provided. It was less clear in

lower quality studies what role other people played in ET use and its relationship with wellbeing (e.g. Alm et al., 2009).

The importance of having a caregiver helping to scaffold ET use appeared linked to increased engagement with technology. Shared experiences of ETs with other people with dementia, particularly in a 'club' setting, helped increase laughter, conversation and enjoyment. ET use also helped increase social interactions and enhanced relationships between individuals with dementia and carers.

Others' role in scaffolding technology use

From the perspective of people with dementia, having other people involved was important to help learn to use ETs. An important aspect of this was ensuring the right support, such as explaining how to use apps on a device, was matched to individuals' existing abilities to use the device (Swan et al., 2018; Groenewoud et al., 2017; Astell et al., 2014; Smith, 2015; Cutler et al., 2016).

When scaffolding was inappropriately matched to the person living with dementia, then disengagement from the technology could be experienced (Smith, 2015; Groenewoud et al., 2017).

Conversely, the importance of others scaffolding learning around technology was only described by caregivers in one study (Lazar et al., 2016). These researchers reported that engagement in technology, and how enjoyment was enhanced, was affected by the presence of another person.

A professional carer reflected that it was important for the staff member helping others to learn about technology to have enthusiasm and knowledge around using the technology or else the process of learning would be seen as difficult.

Technology as a shared experience

The importance of using technology with other people with dementia was described as a shared, positive experience across several studies. Technology use helped to influence social interaction and participation. Some of the studies explored experiences of using technology in a 'club' setting (Cutler et al., 2016; Hicks, 2016; Groenewoud et al., 2017) and found that being in a group and learning how to use technology with others increased enjoyment, laughter, conversations and subsequently overall wellbeing as it was a shared and inclusive experience (Hicks, 2016; Upton et al., 2011). The variety of different activities provided through touchscreen interfaces (e.g. apps) meant that individuals felt everyone could join in and learn about each other's interests by showing each other what they were looking at on the iPads (Upton et al., 2011). Shared experiences of ET in a group helped others to encourage and be encouraged when using technology (Cutler et al., 2016), which appeared to foster a sense of motivation around technology use. Participants in one study described how the social interaction involved in using technology in a group positively influenced self-esteem (Groenewoud et al., 2017), as others were able to comment on successes in ET use. Specifically, one study demonstrated that having technology groups in rural environments was connected with enhanced social interaction and confidence, as people with dementia reflected on how there are little opportunities for meeting people and the technology groups provided the means for socialising whilst engaging in the everyday technologies (Hicks, 2016).

Caregivers held similar views. The novelty of using technology stimulated conversation and laughter as shared experiences (Cutler et al., 2016; Smith, 2015). Family members perceived the social element of technology clubs to be most important, both in terms of addressing isolation and increasing enjoyment (Hicks, 2016).

Enhancing relationships

Across studies, relationships between carers and individuals living with dementia appeared enhanced through the shared use of technology. In particular, care staff learned more about people through the use of technology (Upton et al., 2011) and technology provided a topic of conversation between staff and individuals with dementia (Swan et al., 2018). Staff also spoke about how building rapport through technology felt "less creepy than coming and going "We're going to chat for a few minutes"" and more comfortable than trying to build conversations around topics without a tangible aid (Swan et al., 2018). Having a task to think about allowed care staff to feel more comfortable integrating technology use into their care practices. In one study (Lazar et al., 2016) staff members reflected on how using technology helped bridge generational differences to foster closer relationships.

The social interactions created by technology use transcended relationships in the here-and-now, allowing individuals living with dementia an opportunity to talk about their new experiences and share them with loved ones who live abroad, building upon existing relationships (Upton et al., 2011).

The usability of technology influencing effective engagement

Problems encountered

Some included studies report problems for people using ETs, which hindered effective engagement. This finding was most evident in studies deemed to have a higher methodological quality; the study receiving the lowest quality rating (Alm et al., 2009) was unclear in the reporting of views and experiences relating to the overall usability of technology.

Individuals with dementia experienced annoyance and frustration when technology did not work properly and when available applications did not meet expectations of what would be enjoyable (Groenewoud et al., 2017).

Furthermore, individuals reflected on the sophistication of some of the technologies, and would have preferred variations of popular apps, such as Spotify, that were simpler to navigate (Hedman et al., 2016). The cost of technology was also a concern: people with dementia explained that whilst they enjoyed using the technology, they felt reluctant to use it further due to its costs (Groenewoud et al., 2017).

Carers also related experiences of technology failing, causing frustration and disengagement, as well as devices being physically unattractive and bulky (Lazar et al., 2016; Upton et al., 2011).

Solutions found

Solutions to problems were discussed in two studies where staff adapted technology to help individuals use it more easily (Upton et al., 2011; Lazar et al., 2016). Tablets were seen as favourable as they helped individuals with hand-eye coordination (e.g. using fingers instead of a mouse; Upton et al., 2011). Furthermore, using technologies in a group setting seemed to buffer against difficulties encountered and made devices feel easier to use (Upton et al.,

2011). This was suggested to be a result of scaffolded learning being perceived as being the norm where difficulties encountered were not viewed as abnormal or unexpected.

Discussion

Overview of findings and implications

To our knowledge, this review is the first to collate and synthesise the experiences and views of people with dementia and caregivers in relation to using everyday technology to enhance wellbeing and enjoyment through social engagement, participation and leisure, whilst also highlighting the usability of ETs in dementia. Whilst synthesised themes were represented across the higher and lower rated studies, better quality studies that explicitly acknowledged researcher reflexivity and provided a rich account of data made a stronger contribution to the synthesis. Further information about interview schedules would help understand if/how the questions were different for carers and people with dementia and increase transparency over the process.

The findings of the review are similar to other reviews in the area in emphasising the role of technology to help social participation and enjoyment (Pinto-Bruno et al., 2017; Hitch et al., 2017) but also the importance of others both in terms of sharing the experience and providing scaffolding support (Joddrell & Astell, 2016). However, other reviews have included assistive technologies alongside everyday technologies and have not specifically explored the lived experiences of people with dementia and carers in tandem. This review extends our understanding of ETs in dementia by highlighting the particular experiences people with dementia and carers can have in using them, how these relate and what factors might facilitate as well as hinder positive, effective engagement.

The review highlights that using everyday technology helped to challenge negative assumptions that individuals with dementia may hold about themselves, particularly internalised stigma (Corrigan et al., 2010) around being unable to learn new ideas when living with dementia. This emphasises the potential that ET use may have to increase self-efficacy and mitigate feelings of low mood in the context of dementia. Existing evidence indicates that supporting self-efficacy in dementia can facilitate wellbeing (e.g. Quinn et al. 2016).

The review findings draw particular attention to the importance of social scaffolding in ET use in dementia; learning about technology needs to be matched to the individual's needs and abilities to buffer against a sense of failure and lowered self-efficacy. Not only should scaffolding be a part of matching technology to the individual, but it is important that scaffolding is normalised and seen as part of the process of learning something new to help when problems are encountered in using technology so that individuals are not left feeling anxious about using the devices "properly" (Swan et al., 2018) and more likely to gain psychosocial benefits from the use of technology (e.g. enjoyment, enhanced relationships). 'Effective engagement' (Yardley et al. 2016) in ETs in dementia might therefore be increased when other people are involved in scaffolding and when scaffolding is normalised as a part of using technology; the review findings suggest that presence of scaffolding is connected with experiences of positive emotions in response to technology use (e.g. enjoyment) whereas the absence of scaffolding hinders engagement.

ETs offered a way to feel included and accepted by others, maintain a sense of continuity with the past and keep up with personal interests. This links to Kitwood's (1997) description of engaging in meaningful activity as way to meet psychological needs for occupation and

inclusion as key aspects of wellbeing in dementia. In turn, this relates to the 'global sentient states' of personal worth, and social confidence that Kitwood and Bredin (1992) describe as fundamental foundations for wellbeing in dementia. The findings suggest that when there is a goodness of fit between preference, abilities and activities in using ETs, these psychological needs are met and this fosters positive engagement in a task that leads to a sense of satisfaction (i.e. flow; Czikszentmihalyi, 1990). Experiencing flow motivates people to further engage with activities as they are rewarding for a sense of achievement and development or maintenance of skill, factors highly pertinent to wellbeing in dementia (see Clarke & Wolverson, 2016).

This review highlights that ET can support multi-sensory reminiscence with videos and music, helping people maintain their sense of identity through life story work. The use of ETs, when used in a group, facilitated enjoyment and self-expression through play and creation, which are key aspects of positive person work in dementia (Kitwood, 1997). Overall, it is plausible that using ETs can help maintain personhood through multiple avenues, and this can enhance wellbeing in dementia. Future research that investigates the specific uses of ET, such as exploring past interests and shared reminiscence, would help illuminate further what specifically is enjoyable about using ETs, and the implications this has on sense of identity.

The review highlights the potential for everyday technology to promote interaction between caregivers and people living with dementia; including having fun together and feeling connected. This highlights how wellbeing in dementia needs to be considered in relation to aspects of social wellbeing, such as social acceptance and integration (Keyes, 1998). It is therefore important for research to investigate how technologies that aim to enhance

wellbeing in dementia can be designed to have an element of 'co-use', which could promote social wellbeing The extent to which shared use of ETs can help improve relationships between caregivers and those living with dementia, thus influencing relationship-centred care (Woods, Keady & Seddon, 2008) and wellbeing for both the individual living with dementia and their caregivers, is another avenue for future research.

This review highlights how technology use can help challenge negative assumptions held by carers, allowing them to see the person beyond a disease (Burstow, 2006). However, the negative assumption that technology is difficult for people with dementia, or simply not 'dementia friendly', may have the potential to prevent individuals with dementia from using and benefitting from technology, as many caregivers are often 'gatekeepers' of what is available. Shared technology use may have the potential to enhance person-centred care, reducing the risk of 'othering' people with dementia (Green, Davis, Karshmer, Marsh, & Straight, 2005) whilst also supporting selfhood (Sabat, 2001).

The review findings highlight why some devices are more easily used than others. Practical considerations were prominent and included access to lighter devices (e.g. tablets over computers), using tablets to help with hand-eye coordination (e.g. being able to use fingers over the mouse) and the use of internet to access a wide range of photos/videos. Peer support when using the technology and ensuring devices and apps also seemed linked with usability. Interestingly, the findings highlight the need for popular applications (e.g. Spotify) to be simplified rather relying on individuals living with dementia to use 'dementia-specific' apps only. This is potentially linked to the need for people with dementia to not be exposed as 'different' (Astell et al., 2019). Whilst it was suggested that including 'two buttons', alluding to the importance of quick access to music, and 'customisation' would help access Spotify

(Hedman et al., 2016, p.46), it was unclear what other changes would be required for individuals living with dementia to find existing apps more accessible, and thus more enjoyable. This suggests a need for further research, including from app developers, to understand how existing technology can be further developed to maintain enjoyment and retain a sense of independence when living with dementia.

Technical problems and the high perceived cost of technology were identified as additional factors linked with usability. This contrasts to previous ideas put forward by Bowes et al. (2013) that ETs are a cheaper alternative to assistive technology. Existing literature has established that money is a barrier to accessing leisure activities generally in dementia (Innes, Page & Cutler, 2016), and that the cost of technology may inherently be a barrier to accessing enjoyable leisure activities. Future research could investigate the relative benefits of affordable access to everyday technologies.

Limitations

A particular challenge for any qualitative review lies in navigating a triple hermeneutic (Suri, 2014), where the reviewer is interpreting the work of other researchers, who have interpreted the experiences of participants who have made sense of their own experiences. As such, the transparency and rigour of included studies become key issues (Krefting, 1991). Some studies included in this review did not explicitly report evidence of reflexivity. Furthermore, some did not report steps taken to enhance trustworthiness. Because of this, it is difficult to interpret the findings of some of the studies included in this review as trustworthy (Lincoln & Guba, 1985), impacting on the trustworthiness of the synthesis overall.

A further limitation is that leisure, enjoyment and pleasure are all subjectively defined within differing contexts. For example, what may be seen as enjoyable for one person may not be for

another. Furthermore, the impact of culture will influence the way these constructs are also experienced (Diener & Suh, 2003). Whilst we attempted to operationalise the constructs by grounding definitions in theory (e.g. Seligman, 2012) and to conduct the narrative synthesis inductively and reflexively, it is possible that our own interpretations of these definitions influenced this process.

Included studies involved heterogeneous samples (e.g. differing diagnoses), intervention-based versus naturalistic use of ETs, and different settings in which technology was used. Factors such as previous experiences of using technology, gender, socio-cultural identity, current social support and age may all influence the degree to which individuals used and accessed technology. Available demographic information varied, making it difficult to interpret if any of the above factors influenced the experiences of ET use.

Conclusion

The findings of this review indicate that using everyday technology can be a helpful means to maintaining a sense of identity and wellbeing in dementia through engagement with meaningful and enjoyable activities in social contexts. The findings remind us that we should not assume that individuals with dementia cannot learn something new and are unable to use technology; enhancing the usability of ETs and normalising social scaffolding around their use are likely to be key facilitators. We should ensure opportunities to effectively engage in everyday technologies are there for those who wish to engage with them.

Declaration of Conflicting Interests

The author(s) declared no potential conflicts of interest with respect to the research, authorship, and/or publication of this article.

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