Praxis Care

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Technology for assisting daily living in social care: a scoping review

Claire McCartan, Gavin Davidson, Paul Best and Paul Webb

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1 Background

Social care includes public, not for profit and private sector services, paid carers and unpaid carers, and has been described as multidimensional: (1) as care-providing labour; (2) as a relationship of obligation and responsibility, and; (3) an activity that has both financial and emotional costs that merge public and private boundaries (Daly & Lewis, 2000).
Social care in the UK is under significant pressure given the current funding shortfall (Maynard, 2017) as a result of a commissioning model designed primarily around cost and not quality (Dromey & Hochlaf, 2018). In contrast to healthcare delivery within the public sector, technology and digital advances in social care are less likely to be developed and delivered in routine services for a number of different reasons. These include: a relative lack of policy level strategy, drivers and support; the largely devolved responsibility of implementing technology; the challenges of translating small pilot schemes into routine services; and the shorter lifespan of general consumer products that aren't subject to the same rigorous testing and research in comparison with those used within healthcare settings (Wright, 2020).

One of the challenges for community and voluntary sector organisations delivering social care is assessing the acceptability and cost-effectiveness of adopting innovation, and balancing the required investment in staff and service users to implement change. Low pay and heavy workloads mean that staff turnover can be a significant challenge in social care settings. Technology alone cannot effectively address all these issues but it does offer huge potential for efficient solutions to support and extend independent living, promote social connections, learn new skills, improve working conditions and reduce the need for some labour intensive activities such as home visits. Data monitoring and artificial intelligence can help track people's health and wellbeing, help manage risks, promote self-care and self-management and ultimately improve people's quality of life.

Assisted living is one element of social care which can help promote less institutional and more social models of short and long term care, providing access to a wide range of health and social care supports, which better respect autonomy, privacy, dignity and choice (Roth & Eckert, 2011; Valkila & Saari, 2011; Yamasaki & Sharf, 2011). Research has shown that people with severe mental illness (SMI) are receptive to using technology (Ben-Zeev et al., 2013;

Borzekowski et al., 2009; Robotham et al., 2016) and there is evidence too of high rates of retention and adherence using technology although sample sizes are small (Firth & Torous, 2015). This scoping review seeks to establish the range of technologies available to support assisted daily living for children, young people and adults with mental health problems, intellectual/learning disability, Autism Spectrum Disorder (ASD) and dementia.

2 Methods

The aims of this study are to explore evidence from systematic reviews to establish:
(a) what technology is available?
(b) what are the most effective uses of technology?
(c) what are the facilitators and barriers to the implementation of this technology?
(d) are there any ethical issues about the use of this technology?
(e) what further research is needed in this area?

This review is one of three examining the role of digital technology in social care. This article focuses on assisting daily living, and the two other reviews report on: digital therapeutic or psychological interventions and; the use of technology for staff training and development. Searches were conducted to cover all three of these related topic areas. Recommended scoping review methods (Arksey & O'Malley, 2005; Levac et al., 2010) were used and results were reported using the PRISMA extension for scoping reviews guidelines (PRISMA_ScR; Tricco et al., 2018). Studies were eligible for inclusion if they were published in the English language and focused on digital technology for (a) assisting daily living, (b) health or skills training interventions, or staff training and development in social care services (including community, hospital or secure settings), (b) supported service users with mental health problems, Autism Spectrum Disorder (ASD), intellectual/learning disability, or dementia. As this is a fast-changing environment, results were limited to systematic reviews, narrative reviews, and qualitative evidence syntheses published between 1 January 2015 and 28 February 2023. Reviews that were published outside these dates or in a language other than English were excluded.

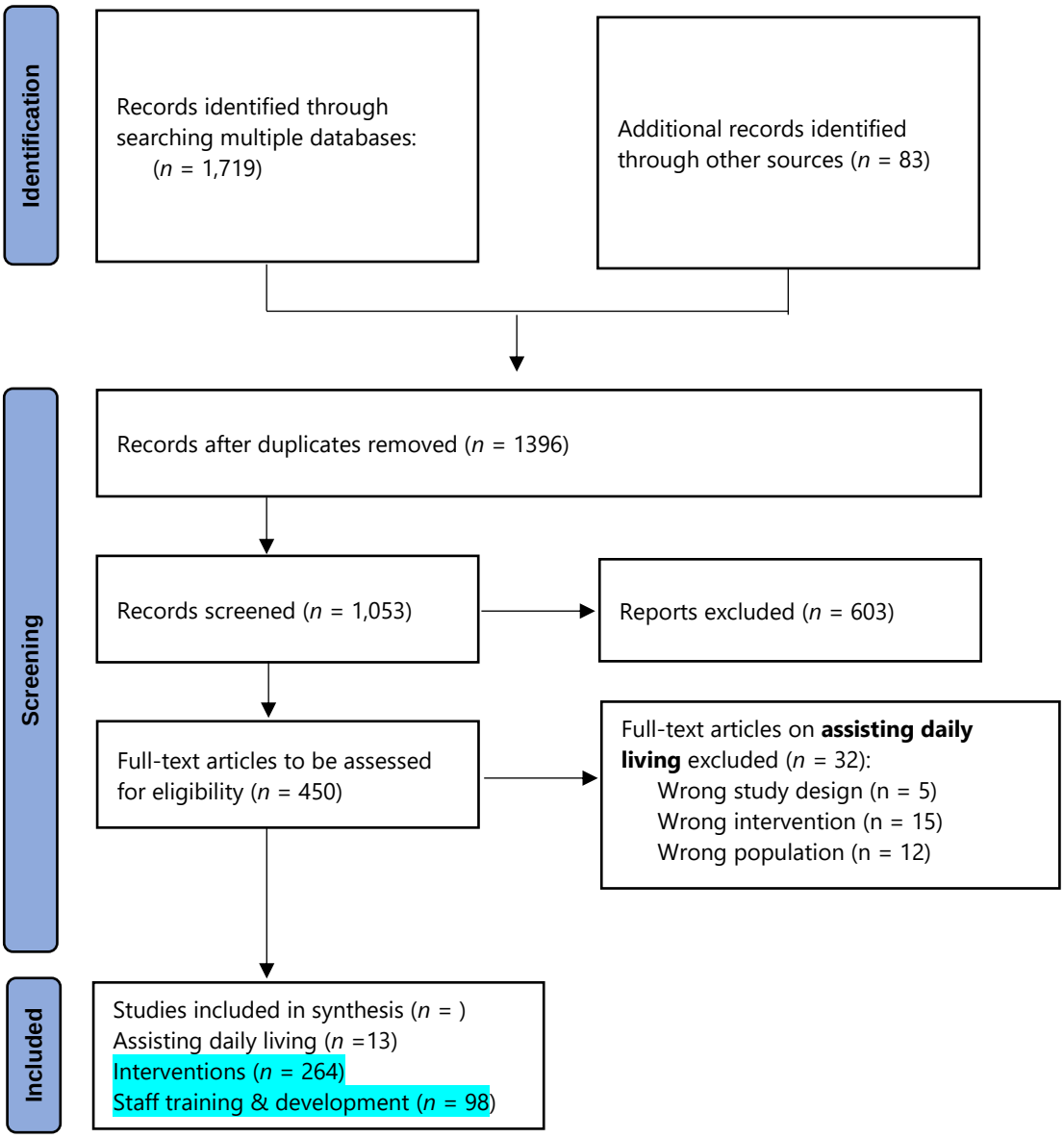
Searches were conducted in MEDLINE, PsycINFO, Social Sciences Citation Index (SSCI) and Social Care Online. Searches were derived from key terms and tailored for each database.

Search results were exported to EndNote and titles and abstracts of the results were screened to be considered for full text review. Ten per cent of the search results were double screened. Disagreements on inclusion at full text review were resolved through team discussion. Data were extracted from included studies including: author information; study design; sample characteristics; the type and range of technology used; its effectiveness and acceptability; facilitators and barriers; ethical considerations; and recommendations for future research. Results were summarised and reported using a narrative synthesis approach. Key findings from studies were then compared, contrasted and synthesised to illuminate important themes.

3 Results

The searches retrieved 1,802 studies, 406 duplicates were removed. 1,053 titles and abstracts were screened and 603 were excluded at this stage. 450 were considered for full text review and 75 were excluded because the focus was not relevant to social care, did not include the population of interest, did not meet the aims of the review or did not meet the methodological inclusion criteria. The PRISMA diagram format for scoping reviews (ScR) is provided in Figure 1. Details of the 13 studies included in the review are provided in Table 1. A narrative synthesis of review results is detailed below.

Figure 1. PRISMA-ScR Diagram



Narrative analysis identified the following themes: improving functioning; monitoring and managing symptoms; promoting independent living; reducing social isolation and loneliness; telemedicine; caregiver support; barriers and facilitators; and recommendations for future work.

Improving functioning

Assistive technology is an umbrella term to describe devices or systems that 'increase, maintain or improve capabilities of individuals with cognitive, physical or communication disabilities' (Marshall, 2000). A recent systematic review of Intelligent Assistive Technologies

(IAT) (Ienca et al., 2017) demonstrated how quickly developments in this field of health and social care are moving, identifying over 530 'distributed' systems (providing intelligent environments that aim to compensate for predominantly age-related deficits), robots, mobility and rehabilitation aids, the majority designed to support users to complete ADLs. Many include specific programming capacity to address certain deficits including motor function, impaired cognition, mood and emotional disturbances.

Monitoring and managing symptoms

Real-time longitudinal data can help diagnose and inform treatment decisions or target early intervention to help avoid a crisis from developing (Batra et al., 2017). Monitoring can also help people better understand their illness and track symptoms and promote positive behaviour. Disruption to regular routines can flag early changes in disease progression and multi-sensor systems can monitor individuals 24 hours a day recognising and quantifying any changes (Facchinetti et al., 2023). Findings for the use of robot pets in dementia to help behavioural and psychological needs are mixed (Chan et al., 2022). A review of interventions (Steinkamp et al., 2019) identified a range of different technologies that relied on patient self-report, observation based on retrospective reports by a service user's care network (e.g. friends/family and other sources of social support), direct visualisation, observation of medication ingestion via mobile videoconferencing or static photographs or measuring biomarkers/metabolites. Smart pill containers, smart/digital pills monitored via gastric activation, and low cost options that involve single-time counting of pills.

Promoting independent living

The Internet of Things (IoT), which refers to objects that link systems within homes and/or with the internet, and ambient assisted living, which refers broadly to the use of technology to manage people's home environment, have demonstrated their potential to help people live as independently as possible. Smart home technology incorporates internet-enabled devices with sensors and machine learning that can help understand the physical environment and those living there to improve quality of life (Dahmen et al., 2018; Kim et al., 2017). Much of the literature focuses on 'ageing in place' and many of these interventions have relevance for people with additional needs and how smart home technologies can promote independent living. Technologies that monitor movement, light, heat and contact

can be an unobtrusive and an effective way of helping individuals to stay in their own homes for longer. Sensors can monitor the amount of time spent in each room, the frequency of toilet use, food-related routines and sleep and trigger alarms if doors for example are left open or unlocked. One example is the Dreampad™ sleeping device which aims to improve sleep, reduce wandering and agitated behaviour using music and vibration but improvements were not statistically significant in a sample of only 4 participants (Chan et al., 2022). The evidence suggests that smart home technologies can be effective in monitoring activities of daily living, cognitive decline and mental health, and heart conditions in older adults with complex needs; but there is little research to demonstrate if they help address disability-related prediction and health-related quality of life, or fall prevention; and conflicting evidence that they can help address Chronic Obstructive Pulmonary Disease (COPD) (Liu et al., 2016).

Technology also includes ambient monitoring systems, household robots, automatic fall detection, doorbell systems, bath support aids, interactive reminiscence conversation aids, cognitive training and wearable devices that can be used as orientation and wayfinding aids or to monitor physical health metrics (Liu et al., 2016). In Liu et al.'s review, cost savings were demonstrated in the monitoring of activities of daily living and reported considerable benefits for individuals and caregivers. Treatment groups maintained physical and cognitive status and the control group declined significantly. Lower emergency department use was observed as well as improved health outcomes for older people with depression who were living and receiving care at home. The review identified structural limitations impeding successful implementation including a partial lack of clinical validity and an insufficient focus on patients' needs.

Walking outdoors can have a significant number of benefits for people with dementia, not least improving their quality of life (Cooper et al., 2021). However, the risk of becoming lost or falling often precludes people from accessing the outdoors when they want, particularly when caregivers experience significant anxiety about the safety concerns. Global positioning systems (GPS) with or without geo-fencing technology, which can provide an alert when someone leaves a specified area (Ehn et al., 2021), can offer people with dementia the potential to explore the outdoors independently, improve quality of life and has

demonstrated improvements in self-confidence, independence and autonomy. However systems need to be individually tailored to work effectively (Cooper et al., 2021). Over the last decade, the narrative around using GPS has moved away from 'managed wandering' to empowering the individual with dementia (Cooper et al., 2021). Successful implementation of GPS often relied on a number of different factors: the person with dementia accepting their diagnosis; recognition that they needed support; as well as understanding that their carer required reassurance relying on the technology (Cooper et al., 2021). Ehn et al. (2021) examined the evidence for the use of mobile safety alarms based on GPS technology in social care for older adults. Also designed to support independence, the authors concluded that while these systems had been successfully piloted and/or implemented within health systems, and users were largely satisfied with their use, the evidence was insufficient. The only RCT included in their review reported no effect on frequency of going out, feeling unsafe or fear of falling. Uses of low tech solutions (such as alarms that monitor behaviour and activity) have been used successfully to support people with intellectual disabilities and cognitive decline for many years (Sheehan & Hassiotis, 2017).

In other related technology, wayfinding guidance using Bluetooth technology have been tested with individuals with cognitive impairment, concluding that video prompts rather than picture or oral prompts were more effective (Chivilgina et al., 2020). In the Oudshoorn et al. (2020) review a number of studies had explored the use of wayfinding technology to facilitate independent public transport travel as well as using smartphones and remote guidance using an earphone.

Falls with injuries are the main cause of accidental death in the older population. Position-sensor technologies have been used to prevent falls in dementia patients but sample sizes were too small to draw definitive conclusions (Chan et al., 2022). Liu et al. (2016) found evidence for improved fall prevention by remote monitoring of balance and fall risk.

External memory aids such as digital-memory notebooks can help individuals manage daily tasks, by providing prompts and reminders for those that have been completed and those still to be done (Facchinetti et al., 2023; Oudshoorn et al., 2020).

Smartphone and tablet apps have been used to encourage people to take part in everyday activities such as cooking and vocational training. Money management skills have been targeted in 'serious gaming' programmes that offer educational as well as entertainment fun for young adults with intellectual disability (Sheehan & Hassiotis, 2017). Practical skill teaching using technology to promote independence were some of the interventions included in the Oudshoorn et al. (2020) review. These ranged from Virtual Reality games to teach fire safety, to a range of different iPad/computer/video tools to teach among other things cooking, laundry, shopping, setting the table and putting groceries away. One study used a 'bug in ear' to practise paying a bill and using public transport.

Reducing social isolation and loneliness

Person-centred care for dementia is extremely important (Kitwood & Bredin, 1992) but tackling loneliness and social isolation can be complex for a range of reasons including the varied progression of the illness (Rai et al., 2022). The rate of change can vary substantially, from slow, gradual onset to very rapid decline, and family members and carers may not know what level of support to provide and when (Rai et al., 2022). Rai's review identified four different types of technology: humanoid/animal robots, multi-sensory touch-screen, assistive technology systems and virtual reality that offer companionship and/or reminiscence, improve communication between family members or other residents, improve engagement in physical activity, remote monitoring or provide support with assistive functions. All of the technologies included in the review demonstrated some level of improvement on quality of life but also impacted positively on other outcomes relating to social inclusion, social isolation and loneliness. Rai et al. (2022) acknowledge limitations with the studies' design and small sample sizes, so they advise caution in interpreting the findings on effectiveness. Longer-term follow-up and larger sample sizes in robust research would further inform the evidence base for using these technologies to reduce loneliness and isolation for people with dementia and other groups. Robot animals have been used in therapeutic settings drawing on some of the evidence from traditional pet therapy without the practical complications of caring for a real animal (Libin & Cohen-Mansfield, 2004). Chan et al.'s (2022) review of technology for dementia identified a number of studies that assessed the benefits of robotic animals (mostly cats or dogs) designed to improve quality of life by increasing pleasure and

interest and decreasing anger, anxiety and depression, yet again sample sizes were small and further research is required.

In Chivilgina et al.'s (2020) review, one study tested the App4Independence to prompt and schedule activities for social and peer-to-peer engagement for people with schizophrenia. Significant improvements were observed across a range of mental health domains including psychoticism, depression, anxiety, paranoid ideation and interpersonal sensitivity however the sample size (n=38) was relatively small.

Online monitoring and telemedicine

Smartphone apps are perhaps the most widely available form of technology (Batra et al., 2017), and have been used for monitoring patients with severe and enduring mental health problems. Batra et al's review demonstrated high feasibility and acceptability of smartphones and highlights their potential for symptom monitoring to help people gain greater insight into understanding their mental health. Testing the usability of Digital Health Technologies (DHTs) for users with mental health problems is important as they may differ from the general population however co-production does not appear to be widely used in the development of technology (Batra et al., 2017). Mobile apps can offer real-time monitoring of physical and mental health and can provide remote access to service users and providers (Batra et al., 2017).

Medication adherence can be a critical element of care with non-adherence associated with hospitalisation, slower recovery, suicide risk, violent behaviour and mortality in a range of mental health problems (Gonzalez-Pinto et al., 2006; Meyers et al., 2002; Witt et al., 2013). Mobile phones have been successfully used to monitor medication adherence in adults with mental health and substance use problems, using real-time video recording, providing static photos (Steinkamp et al., 2019) or completing assessments through the day and demonstrated a reduction in symptoms and enhanced mood awareness (Batra et al., 2017). Digital health feedback systems that electronically confirm whether oral medication is ingested were positively rated, with most participants finding them easy to use although a small number of adverse events relating to the device led to the study termination (Batra et al., 2017). A trial of electronic pill containers demonstrated good adherence and better than

treatment as usual, no significant differences were observed in symptoms, functioning or health care use (Batra et al., 2017). Similar technology prompted older adults to maintain their medicine routine by activating sensors on a medicine box (Facchinetti et al., 2023). Supporting smoking cessation using ecological momentary assessment (EMA), which repeatedly collects brief data from people about their thoughts, feelings and behaviours, did not seem to be effective (Chivilgina et al., 2020).

Apps used for clinical assessment did demonstrate some effectiveness as reported in Batra et al.'s systematic review, however some patients with schizophrenia found the device difficult to operate, highlighting the need for an individualised approach when deciding which technology to use.

Passive and active data collection has been used to monitor people with schizophrenia and related disorders using wearable technology and smartphone apps but the effectiveness of these remains unclear (Chivilgina et al., 2020).

Apps and smartphones have also been used to provide opportunities for active learning and delivering telemedicine, also enabling ongoing monitoring, providing continuity of care and increasing patient safety (Facchinetti et al., 2023). In recent years, digital technology has been used to help people understand and access their health records (My Health Guide) and has included the development of online tools to support communication using Makaton such as 'MyChoicePad' and pictograms/graphic images to help people with intellectual disabilities communicate pain (Sheehan & Hassiotis, 2017). Visual analogue scales have been developed for reporting hallucinations in schizophrenia and while reductions were observed in the Beliefs about Voices Questionnaire-Revised scale (BAVQ-R; Chadwick et al., 2000), the study had only 3 participants. Apps are also used to access, store and securely share patient data (Chivilgina et al., 2020).

Innovation has also included using virtual reality (VR) as way of navigating healthcare environments. Krysta et al.'s (2021) review of telemedicine for intellectual disability identified a range of benefits and although delivering care may take longer they were acceptable, and

research demonstrated increases in independence and other positive outcome measures such as physical activity.

Caregiver support

The impact of providing care for dementia patients can be considerable for family members. Support for activities of daily living such as cooking, shopping and other household tasks can be time-consuming and the behavioural changes often observed in people with dementia can be challenging and lead to stigma, guilt and poor mental and physical health (Martinez-Alcala et al., 2016). Technology that increases understanding of the progress of the illness, and facilitates remote monitoring and assistance could improve the caregiver role, increase access to social environments and in so doing increase autonomy, improve quality of life and social inclusion for both patient and carer (Landau et al., 2010; Nijland et al., 2008).

Barriers and facilitators

Potential barriers to the effective use of technology in this population can include cognitive and/or physical or sensory impairments, lack of training/ongoing support and organisational barriers, keeping up with frequent interface changes, economic barriers, self-exclusion and tackling attitudes that may be paternalistic and risk-averse (Sheehan & Hassiotis, 2017). Early adoption of technology before someone deteriorates can be beneficial, e.g. using GPS to support independent outdoor walking in dementia (Cooper et al., 2021). It may be more difficult to retrofit older homes with smart home technology and associated installation costs may be unaffordable. Many remain at the pilot stage of their development (Liu et al., 2016).

The Expert Consensus Survey on Digital Health Tools for Patients with Serious Mental Illness identified how essential it is to identify who is most likely to adopt technology (Hatch et al., 2018). The necessary factors the survey identified included service user interest in using technology, access to the resources (e.g. Wi-fi and hardware), positive expectations, current ownership of a smartphone/computer/tablet and receiving positive social support. Good occupational functioning was considered important but those with a high level of chaos or disorganisation, low literacy levels and low motivation were less likely to be technology candidates. Specific diagnoses were not considered as important as certain symptoms that

may make it more difficult for someone to engage with a digital tool – these included "more severe positive, negative, disorganised, and neurocognitive symptoms; acute substance abuse; agitation or aggression; and low energy or frustration or tolerance." (Hatch et al., 2018, p. 4).

The Consensus Survey also highlighted the influence that health care professionals have in enabling the adoption of technology and showing enthusiasm and willing to provide support to the service user, provide the necessary equipment to encourage regular use. Ensuring that services are aware of the range of technology available needs some thought as well as the ethical considerations for their use (Cooper et al., 2021).

Other barriers in the literature include potential gender differences in how people engage with technology (Batra et al., 2017), education level (Batra et al., 2017), and the progression of the disease e.g. in dementia (Ehn et al., 2021). Many of the follow-up studies have been undertaken over a short period of time or for a pilot, so more robust research is required (Batra et al., 2017).

There doesn't seem to be a systematic approach to determine the needs of participants before beginning an eHealth intervention (Oudshoorn et al., 2020) and little discussion about individual preferences for the type of technology or assessment of existing digital skills. The Matching the Person to the Technology (MPT model) is discussed in the literature (Scherer & Craddock, 2002; Scherer & Federici, 2015) and distinguishes three areas for assessment: (1) the characteristics of the service user; (2) environmental factors, and (3) functions and features of the application. This helps researchers and healthcare professionals to think about the context of people's lives (Oudshoorn et al., 2020) and how best to introduce technology into their routines. Oudshoorn et al. highlight the importance of providing device training before the intervention and how best this can be is achieved (Oudshoorn et al., 2020).

Ethical considerations

Choice

Not everyone is enthusiastic about the use of technology in the delivery of their healthcare and better evidence is required to establish their safety and effectiveness (Chan et al., 2022)

Data

Access to online data needs to be carefully and securely managed, particularly when dealing with SMI (Chivilgina et al., 2020). Ethical issues surrounding the use of GPS were discussed in literature reviewed by Cooper et al. (2021) and the considerations for sacrificing privacy in exchange for keeping safe, but service users with dementia wished to retain autonomy around decision-making whether to use GPS or not.

Discussion

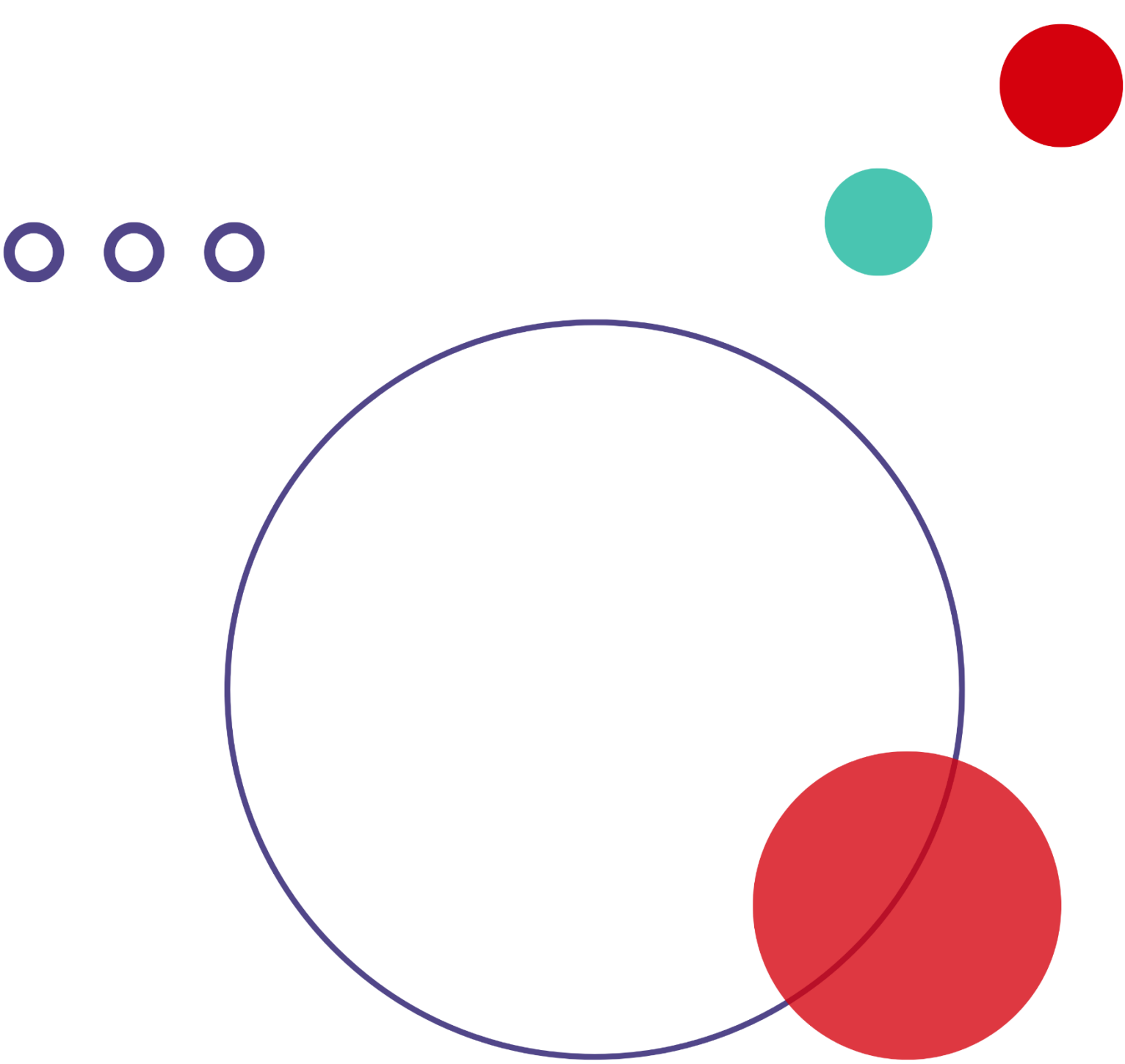
- There is a wide and ever growing variety of digital technology to support users – keeping up to date with developments may be difficult for many community/voluntary sector organisations, how evidence is shared effectively is a challenge
- It is difficult to find robust research evidence to support their use, but this should not necessarily stop implementation
- Specifically, further research is required in intellectual disability, ASD, and children and young people
- The cost-effectiveness of data is lacking
- Co-production is required to help meet users' needs
- Organisations need to assess individual needs prior to selection of digital tools, ensure training and support is available to service users, staff and families/carers
- Service users should be given autonomy to make informed decisions about the use of technology to assist their daily living

First author (year)	Design	Aim	Population	Content relating to assisting daily living & monitoring
Batra (2017)	Systematic Review	Currently available health technologies & intended use for SMI population.	SMI (schizophrenia/ schizoaffective disorder, bipolar disorder & major depressive disorder) N = 1,000 *k* = 18	Smartphone apps (daily mood & symptom monitoring; Ecological Momentary Assessments (EMAs)). Digital medicine systems including: wearable ingestible monitor; physiological metric data sharing; and electronic pill containers demonstrate high levels of acceptability & may provide greater insight into conditions. Growing use, with potential for treatment but better research required.
Chan (2022)	Systematic Review	Digital technology for fall prevention & management of behavioural & psychological symptoms of dementia (BSPD)	Dementia Long term care N = 1,245 *k* = 17	Position-sensor technology for fall prevention – larger sample sizes required. Mixed evidence for use of pet robots for BSPD.
Chivilgina (2020)	Systematic Review	mHealth for Schizophrenia spectrum disorders	Schizophrenia spectrum disorders N = 63 mobile technologies *k* = 111	There is a wide range of digital technology to support people with schizophrenia and they show some promise. Decision-making around the use of mobile technology needs to improve. Ethical issues needs careful consideration as does their clinical utility. Better evidence is required.
Cooper (2021)	Qualitative Systematic Review	GPS to promote safer outdoor walking	People with dementia, dementia family carers, formal carers, care managers, & cognitively intact older people	Positive perceptions of people living with dementia, family carers, professionals & other stakeholders of use of GPS for safer walking but systems should be individually tailored to meet need. Potential to be both empowering & improve quality of life.

			N = 271 *k* = 14	
Ehn (2021)	Systematic Review	Mobile safety alarms based on GPS compared to non-GPS standard care	People with dementia, dementia care givers & care professionals, older adult controls N = 940 *k* = 16	Evidence of the benefits of GPS alarms within adult social care remains insufficient.
Facchinetti (2023)	Systematic Review	Smart home technologies	Older adults with chronic disease including cognitive impairment N = 1,404 *k* = 19	Smart home: environmental sensors that detect motion, contact, light, temperature/humidity. External memory aids: mobile/smartphone apps that promote home-based activity learning. Hybrid technology: telemedicine. Smart homes show great potential to manage conditions, increase safety, & continuity of care.
Ienca (2017)	Systematic Review	Intelligent Assistive Technology	Dementia N = *k* = 571	The development of IAT is rapidly expanding, offering a wide range of tools & devices to support dementia care but structural limitations impact their successful implementation including partial lack of clinical validation and insufficient focus on patients' needs.
Liu (2016)	Systematic Review	Smart homes & home health monitoring technologies	Older adults N = 11,282 *k* = 48	Technology readiness for smart homes and home health monitoring technologies is low; they are used to monitor activities of daily living, cognitive decline and mental health, and heart conditions in older adults with complex needs; but there is no evidence that they help address disability prediction and health-

				related quality of life, or fall prevention; and conflicting evidence that they can help address COPD. Cost savings & benefits to individuals & caregivers were observed in monitoring activities of daily living, maintenance of physical & cognitive status compared to decline in control groups. Lower emergency admissions, & fall prevention monitoring.
Martinez-Alcala (2016)	Systematic Review	ICT applications developed to assist patients.	Alzheimer's Disease patients & caregivers N = not reported *k* = 26	ICT tools are strongly recommended to support quality of life in older adults & their caregivers. It can be beneficial in supporting caregivers understand the disease process & manage situations more effectively.
Oudshoorn (2020)	Systematic Review	eHealth to support people with mild intellectual disability	Mild intellectual disability including ASD, children & adults N = 346 *k* = 46	MPT model is valuable framework, large amount of technology available flexible to meet a wide variety of needs and wants. More needs to be done to assess individual needs to find the most appropriate tools, a needs assessment for training will also be required. Involving people's networks in the selection of tools is also important but the technology is promising. A coproduction approach would be beneficial.
Rai (2022)	Systematic Review	Digital technologies to prevent social isolation & loneliness	Dementia N = 280 *k* = 10	Limited but growing evidence that digital technologies have potential to improve quality of life and reduce isolation/loneliness in dementia. Larger scale research studies are required.
Sheehan (2017)	Narrative Review	Digital mental health & intellectual disabilities	Intellectual disability N = not reported	Range of uses identified including: online & mobile phone apps for practical & organisational tasks (booking appointments online, web-based personal health records, appointment reminders); telecare; smartphone/tablet apps to track symptoms, passive data collection; online psychoeducation; social media/social networks for peer networking, support groups, online chat; traditional

				psychosocial therapies delivered electronically; novel therapies using tech e.g. avatar therapy, VR & serious games)
Steinkamp (2019)	Systematic Review	Technological interventions for medication adherence	Adult mental health & substance use disorders N ≈ 63,848 *k* = 127	Interventions included reminders, support messages, social support engagement, care team contact, data feedback, psychoeducation, psychotherapy, remote care delivery, secure medication storage & contingency management.



For further information, please contact

research-info@praxiscare.org.uk

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