Journal of Health Service Psychology (2024) 50:37–46
https://doi.org/10.1007/s42843-024-00101-7

Technology Assistance in Dementia (Tech-AiD): A Framework for Care in the Digital Age

Alyssa N. Kaser · Cynthia M. Mikula · Andrew M. Kiselica

Published online: 24 April 2024

Abstract
Recent advances in digital technologies hold promise for supporting aging adults and their care partners as they navigate changes in cognitive and daily functioning associated with Alzheimer's disease and related dementias (ADRD). Commonly owned digital technologies, like smartphones, include features that could help maintain independence and reduce caregiver burden. However, we lack models for successful integration of technologies into treatment of persons with ADRD. We propose the Technology Assistance in Dementia (Tech-AiD) framework for aiding persons with ADRD and their care partners with using digital technologies to reach individualized goals. We discuss how technology use is impacted by a multitude of factors, including severity of cognitive impairment, technology proficiency, and barriers to adequate and equitable care, all of which are further complicated by health disparities. Further, we explore the potential benefits of technology use among patients with ADRD and their care partners, highlighting pertinent clinical and ethical challenges and drawing from evidence-based strategies to promote practical recommendations.

Keywords Technology · Aging · Alzheimer's disease · Dementia · Cognitive decline · Dementia care · Caregiving

Clinical Vignette

Ms. Miller is a 72-year-old, Black, cisgender female who lives in a small, rural town outside of Shreveport, Louisiana. Upon graduating from high school, Ms. Miller married her high school sweetheart and was a full-time homemaker before eventually joining the work force as a mail carrier when her family's financial needs grew. Ms. Miller was a dedicated employee, working six to seven days per week, but stopped working at age 66 when the physical demands of her job became too challenging to manage. Additionally, the passing of her husband five years ago left a noticeable gap in her life. Despite this loss, she remained resilient and was determined to maintain her independence. She has subsequently lived alone, keeping up an independent lifestyle, attending her medical appointments, driving to her weekly book club, and completing day-to-day tasks around her home without any difficulty. Ms. Miller has osteoarthritis, Type 2 Diabetes, and high blood pressure, which she manages with medication and regular check-ups with her primary care physician.

Her level of independence is a relief to her four adult children, who stay busy with jobs and families of their own. However, during a recent visit with her children, Ms. Miller's son, Jalen, noticed that she seemed to be having difficulty staying on topic, and had asked him the same question a few different times. Jalen discussed what he observed with his siblings, and Ms. Miller's other children report noticing similar symptoms. They wondered if these changes could be signs of something like Alzheimer's disease. Ms. Miller assured her children that she was fine.

During a primary care visit, Jalen arranged to call into the visit to describe some of the symptoms Ms. Miller's children had noticed. Ms. Miller explained that while her memory wasn't like it used to be, she did not want to burden her family with a health-related issue. Ms. Miller's doctor validated her concern and encouraged her to at least let the healthcare team further evaluate the cognitive symptoms. Ms. Miller was willing to undergo some additional testing, and her provider orders labs and an MRI of the brain in addition to following up with a cognitive screening test in three months.

At the next visit, the primary care doctor informed Ms. Miller that her lab values were mostly within normal limits, except for elevated cholesterol, but her MRI of the brain showed "substantial, confluent white matter hyperintensities, likely consistent with moderate severity microvascular ischemic change." Further, she scored a 20/30 on the Montreal Cognitive Assessment. The doctor explained to Ms.

Miller that she most likely had mild cognitive impairment, and she suspected that the symptoms Ms. Miller was experiencing are vascular in etiology. The physician would like to be sure about this diagnosis, so she referred Ms. Miller to the closest memory disorders clinic, but informed her and her family that the waitlist is approximately a year long. The doctor encouraged them to develop some plans to help keep Ms. Miller independent and safe in the meantime.

Ms. Miller's children were very concerned about her; at the same time, she had been getting by on her own managing her medications, shopping, and doing other daily activities. Plus, she was insistent that her children have their own busy lives, and she did not want them dropping commitments to come help her. Jalen suggested that they might be able to keep in better contact with Ms. Miller and help her from a distance if she had a smartphone. He helped her upgrade her standard cell phone to a smartphone and showed her a few features from which she might benefit.

Jalen's instinct to use a smartphone to help his mother fit with a growing body of research on the application of digital technologies to support persons with ADRD and their care partners. This area of scholarship is still relatively new, and it is important to acknowledge that there are not yet gold standard approaches regarding how best to incorporate digital technology into ADRD care. Rather, this area is ripe for exploration and refinement. The current paper is guided by our ongoing work in developing a novel technology-focused behavioral intervention for persons with ADRD called Technology Assistance in Dementia (Tech-AiD). We utilize the presented framework to enhance comprehension of current research and facilitate its application by health service psychologists involved in direct clinical care. In this article, we outline theoretical underpinnings and empirical evidence for the use of technology in ADRD care, highlight associated clinical and ethical challenges, and draw from the literature to provide evidence-based assessment and practice considerations.

Key Background

Technological Reserve Hypothesis

The concept of cognitive reserve in aging and neurodegenerative disease is now widely accepted (Stern, 2012). It suggests that older adults who have received higher levels of education and cultivated a wide range of skills and knowledge during their early adult years may be able to better compensate for declines in cognitive abilities later in life by substituting retained skills for impaired abilities. The technological reserve hypothesis, developed by Benge and Scullin (2020), builds from this concept, focusing on how technology use can counteract cognitive deficits and reduce disease burden: "Technological reserve refers to the development of a culture and environment of technology use in older adults that can buffer against the impact of cognitive decline on day-to-day activities" (p. 1).

Further developing the technological reserve concept, Wolff et al. (2021) outlined three primary ways that technology may contribute to reduced risk for cognitive and functional decline. First, technology introduces cognitive complexity, which may contribute to cognitive reserve. That is, technologies improve access to information (e.g., online news articles), facilitate mentally stimulating activities (e.g., word games), and require learning and adaptation as technology changes. Second, technology can facilitate connection and social engagement, known protective factors (Penninkilampi et al., 2018), via features like social media, video and phone calls, and text messages. These features may mitigate loneliness, maximize access to supportive resources, and facilitate accessible communication with healthcare providers via telehealth. Finally, technologies can serve as cognitive prosthetics, allowing for individuals to directly compensate for lost cognitive abilities, particularly those involved in completing activities of daily living. For example, creating an automated smartphone reminder could help a person with dementia remember upcoming appointments on their own, even in the presence of memory problems (Scullin et al., 2022). In this way, technology may be used as a form of scaffolding to support independence and safety while aging in place.

There is growing evidence to support the technological reserve hypothesis. First, cross-sectional studies have demonstrated a negative association between increased technology use and reduced cognitive symptoms (e.g., Stojanovic et al., 2023). Second, large longitudinal studies that closely represent the U.S. population have found an approximate halving of the risk of developing dementia among high technology users (relative to low users), controlling for demographic, socioeconomic, and cohort factors (Cho et al., 2023). Finally, there have been randomized controlled trials that have shown that providing training in technology use can improve cognitive and functional outcomes (e.g., Dowell-Esquivel et al., 2023).

Technologies in the Care of Persons with Alzheimer's Disease and Related Dementias (ADRD)

Kiselica et al. (under review) have extended the concepts of the technological reserve hypothesis to the realm of care for persons with ADRD. Specifically, they argue that technological supports can improve both patient and care partner outcomes. The authors summarized the pathways by which technology might influence these outcomes with the acronym CARES: **C**ognitive offloading, **A**utomation, **R**emote monitoring, **E**motional/social support, and **S**ymptom treatment. First, **C**ognitive offloading refers to

placing the burdens for remembering onto digital devices, such as setting a smartphone reminder to take medications at a certain time. Second, **A**utomation is the ability of technologies to take over task performance, such as placing bills on autopay. Third, **R**emote monitoring refers to use of technologies to assess for health and safety even when not physically present in the environment with the persons with ADRD. For example, a wearable device can monitor for falls and provide alerts to emergency personnel. Fourth, **E**motional/social support can be more easily accessed via technologies, with the internet providing connections to information (e.g., Alzheimer's Association website) and care resources (e.g., online support groups). Finally, technologies may improve **S**ymptom treatment, such as the use of audiobooks and music streaming to address feelings of boredom and social isolation that may contribute to neurobehavioral symptoms.

While support for the use of technologies in the care of persons with ADRD is growing (Fabricatore et al., 2020), important questions have been raised about the implementation of such approaches. First, do older adults with ADRD and their care partners even own digital technologies? In general, ownership of digital technologies is on the rise among older adults. According to a 2023 Pew Research Center (2024) survey, 94% of adults over the age of 65 own cell phones, with 76% owning a smartphone. Even among memory clinic patients with or at risk for ADRD, smartphone ownership rates are high, with 90.6% of patients owning a cell phone and 75.4% owning a smartphone (Benge et al., 2020). Thus, digital device ownership appears to be growing among those with ADRD and their care partners, even if ownership rates remain lower when compared to healthy older adults (Jacobs et al., 2021).

A second question is whether persons with ADRD can use technologies in a way that can support independence and reduce care strain. Indeed, research suggests that this patient group is less likely to use device features that can support daily task performance (Benge et al., 2020). Further, individuals with ADRD exhibit greater struggles with navigating digital tools, like the internet (Woods et al., 2019). Despite these challenges, evidence suggests that persons with ADRD can learn to use new technologies effectively given appropriate support. Systematic reviews suggest that various smartphone, internet, and tablet training interventions could assist older adults with and without cognitive impairment to use these technologies, often retaining their knowledge and abilities at 6 and 12-month follow-ups (e.g., Kwan et al., 2020).

In turn, more frequent device usage has been suggested to support cognitive abilities and independence. For example, Scullin et al. (2022) reported improvements in prospective memory functioning and independence following training in smartphone-based memory strategies. Similarly, Harvey et al. (2022) reported improvements across several cognitive and functional domains among persons with mild cognitive impairment following training with the Functional Assessment Skills Assessment & Training Application, an online software that teaches skills to complete technology-based activities of daily living (e.g., online banking).

In summary, there are many ways in which technology may be useful to assist persons with ADRD and their care partners in buffering against the impacts of cognitive and functional decline. Such applications are underutilized in psychosocial interventions, likely due to a lack of evidence-based guidance. Thus, we now turn to some key clinical and ethical challenges in the application of digital technologies when treating persons with ADRD.

Clinical and Ethical Challenges

The Role of Intersectionality in Technology-Based Treatment of People With ADRD

Adopting a culturally sensitive approach to clinical care in aging requires recognition of the intricate intersections of identities, values, and beliefs that shape how patients receive and approach treatment. Moreover, it acknowledges how belonging to multiple social groups affected by systems of oppression—including people of color, those with low socioeconomic status, individuals with sexual and gender minority identities, and those with disabilities—amplifies adverse impacts on health outcomes and limits access to resources. The interaction of these factors with processes involved in aging and ADRD have been reviewed in detail by other authors (e.g., Misiura et al., 2023), and this literature documents a higher likelihood of misdiagnosis, inadequate care, and poorer outcomes among individuals from underserved communities.

A similar theme is emerging regarding the interplay among identity, aging, ADRD, and technology ownership and use. Specifically, there are health disparities in what we term digital disadvantage, which consists of reduced access to and comfort with digital technologies. Older adults and care partners face several barriers to technology use, including limited availability of technologies, high financial costs, usability issues, and concerns about privacy and security (Mikula et al., 2022). This digital divide for older adults is perpetuated by ageist beliefs and practices in modern healthcare (Mace et al., 2022), wherein providers may be quick to dismiss technology use by older adults due to preconceived beliefs about their disinterest or inability to adapt to evolving technology. Psychosocial barriers to technology use among older adults interact with sociocultural identities, wherein individuals from low socioeconomic backgrounds or minoritized racial/ethnic

groups experience the lowest rates of access to and use of technologies (Yoon et al., 2020; Li et al., 2023). This digital divide bidirectionally reinforces sociocultural disparities, with limited exposure to technology further exacerbating inequalities in educational attainment, employment opportunities, socioeconomic status, and healthcare use. In summary, digital disadvantage among older adults occurs along historic racial/ethnic and socioeconomic fault lines and is also a contributor to the widening of these fault lines.

Health service psychologists can play an important role in helping patients overcome digital disadvantage. One easy step is to reinforce the use of technology-based adaptations among older patients, particularly those from digitally disadvantaged groups, eschewing harmful stereotypes. In addition, health service psychologists can help patients access resources to support technology ownership and implementation. For example, in Missouri, public funds are available to assist older adults with aging in place using "home technology and automation" (Missouri Department of Health & Senior Services, 2024, p. 5), and similar programs exist in other states. Technology support for older adults is also often provided by non-profit organizations. For instance, the Association for the Advancement of Retired Persons developed the Older Adults Technology Services (OATS) program, which teaches low-income older adults to use tablets in ways that promote social connectedness and civic participation.

Considerations for Technology Selection

Health service psychologists can also guide patients in selecting technology-based solutions to meet their needs. Here, one important factor to consider is the patient's severity of cognitive decline, which directly influences the ability to effectively engage with and benefit from the treatment (Thordardottir et al., 2019). A cognitively healthy older adult may be able to navigate technology with minimal assistance, though front-end support may be necessary if they have limited experience with a device or application. Likewise, those living with mild cognitive impairment or the initial stages of dementia may be able to independently engage with technologies, though more support and greater involvement of their care network is likely necessary. Finally, in the later stages of dementia, technology will likely be implemented in large part by care partners. Of course, it is important to note that as the severity of cognitive decline progresses, susceptibility to internet scams and financial fraud rises, requiring additional technology safeguards to counteract this risk. Thus, health service psychologists can inform technology selection and adaptation by disease stage.

Selection of suitable assistive technologies is also dependent on the context and goals of the patient and care partner. A systematic review reported at least 17 different types of technologies available for care of persons with ADRD (Lee-Cheong et al., 2022), with potentially hundreds of available applications or devices per category. As such, choosing the right technology for the right situation can be a daunting task. Health service psychologists often have experience with helping patients identify specific goals, brainstorm possible solutions, and track progress. They can apply these skills to guide patients with ADRD in implementing technologies in care. Next, we give some practical clinical guidance on assessment and treatment considerations for such a technology-based approach to working with patients with ADRD.

Evidence-Based Assessment and Practice Considerations

As noted previously, literature on the application of technologies in the treatment of persons with ADRD is still emerging. Here we provide a framework under which to better understand this research and apply it in clinical practice, using principles from our Technology Assistance in Dementia (Tech-AiD) intervention. The Tech-AiD framework has six components: 1) assess disease severity, 2) evaluate the technological environment, 3) provide psychoeducation on potential benefits of technology, 4) identify goals that can be addressed via technology, 5) utilize evidence-based problem-solving approaches to guide technology selection and implementation, and 6) develop a maintenance plan. This framework is summarized in Figure 1.

Stage Disease Severity

Before integrating technology into clinical care, it is critical to properly assess and stage an individual's level of cognitive impairment. This goal is often accomplished by way of comprehensive neuropsychological evaluation. However, in many cases, such specialized assessment services may be unavailable to patients, as was the case for Ms. Miller due to a lengthy waitlist. Thus, a health service psychologist may benefit from implementing briefer screening tools to assess disease severity, such as the Quick Dementia Rating System (QDRS; Galvin, 2015). Such measures can provide the clinician with an idea of the patient's likelihood of being able to successfully implement technology-based solutions on their own and the relative level of involvement they should expect to require from care partners. As discussed previously, patients without cognitive disorders and those in the mild cognitive impairment and mild dementia stages have been shown to benefit from technology-based training, with interventions in the moderate-severe stages of dementia likely to be directed more at care partners.

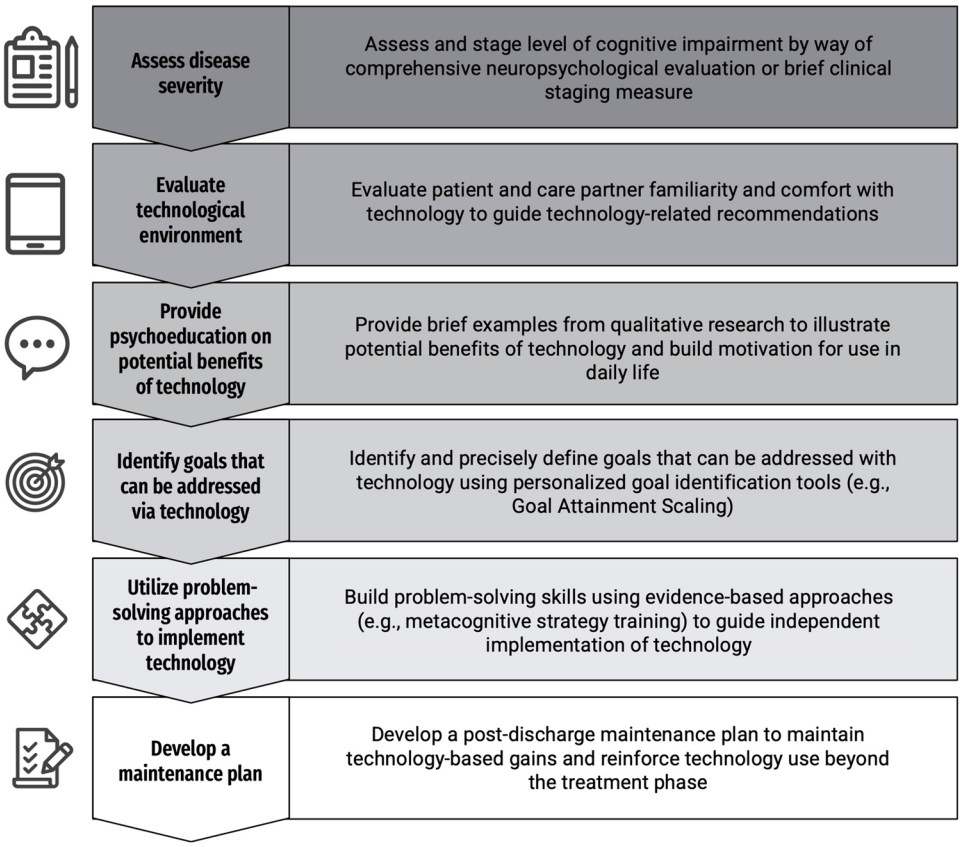

Fig. 1 The Tech-AiD framework has six components: 1) assess disease severity, 2) evaluate the technological environment, 3) provide psychoeducation on potential benefits of technology, 4) identify goals that can be addressed via technology, 5) utilize evidence-based problem-solving approaches to guide technology selection and implementation, and 6) develop a maintenance plan

Evaluate the Technological Environment

Once the cognitive disorder has been properly staged, assessing the individual's familiarity with and ability to use technology is needed to inform technology-related recommendations. An element of this process can include assessing what technologies are available in the person's environment and the degree to which they are being used to support performance in daily tasks. One measure to consider is the Digital and Analog Daily Activities Survey (DADAS; Benge et al., 2023). Additionally, a health service psychologist can assess technology familiarity and comfort. Researchers from the Center for Research and Education on Aging and Technology Enhancement have developed and validated several measures for this purpose, including the Mobile Device Proficiency Questionnaire (MDPQ; Roque & Boot, 2018), the Computer Proficiency Questionnaire (CPQ; Boot et al., 2015), and the Technology Experience Profile (TEP; Barg-Walkow et al., 2014). Further, if the clinician is able to involve a care partner in the intervention process, a potentially useful measure of how they use technology-based strategies in care is the Technology in Caring Questionnaire (TCQ; Kiselica et al., 2024).

Combined, these measures guide decisions about whether and how individuals need to be supported in acquiring and learning to use technologies to support independence and minimize care strain. More specifically, individuals who own and use fewer technologies will likely need to be connected to resources in order to obtain technologies, and may need more direct instruction in their use. In contrast, individuals who already have some comfort with technologies may benefit more from learning problem-solving strategies to support independent use of technologies to work toward individual goals in daily life.

Provide Psychoeducation on the Potential Benefits of Technology

Of course, technology uptake will be dependent on several factors, especially perceived utility (Harris & Rogers, 2023). Thus, providing psychoeducation on the potential benefit of technologies in ADRD care is imperative, particularly for those with limited exposure to technology or ambivalence about its usefulness. This psychoeducation can be guided by qualitative research. For instance, a semi-structured interview study with care partners to persons with ADRD identified six themes of successful technology implementation, including facilitating social connectedness, tracking rest and sleep, promoting leisure and activity, managing activities of daily living, accessing healthcare, and ensuring safety (Mikula et al., 2022). For

Tech-AiD, we used this information to construct a brief presentation with examples to illustrate the potential benefits of technology use in daily life. Health service psychologists could follow a similar approach to build motivation for technology use among their patients with ADRD.

Personalized Goal Setting for Technology Use

Once invested in trying to use technology-based solutions, the patient and any care partners will need to decide what goals might be addressed with technologies. Thus, the health service psychologist must work collaboratively with all involved to set personalized goals. Individualized goal setting plays a crucial role in achieving desired outcomes, and its efficacy in modifying health behaviors has shown promise in the older adult population (Jennings et al., 2018).

Goal Attainment Scaling (GAS; Kiresuk & Sherman, 1968) is a tool commonly used to quantify specific and personalized goals. Moreover, it provides a systematic way to assess and track progress toward goal attainment, offering a more tailored approach to goal setting. The Canadian Occupational Performance Measure (COPM; Law et al., 1990) is another patient-centered outcome tool used to identify specific challenges in everyday activities, providing a foundation for setting goals and building skills. Instruments such as these are recommended for crafting and tracking precise, operationalized goals related to technology use. The first step in this process is to clearly identify goals that can be addressed with technology, beginning with broad goals and gently narrowing toward a goal that meets SMART criteria (i.e., Specific, Measurable, Achievable, Relevant, and Time-Bound; Doran, 1981). For instance, an individual who struggles to keep up with financial responsibilities via mail may identify a broad goal of paying bills on time. While this goal can be met with the support of assistive technologies, attainment is more likely when goals are clearly and precisely defined. Therefore, including details such as the type of bill, date and frequency of payment, and method of payment increases the ease with which individuals in treatment can track goal progress and modify the goal as needed. Further, setting a clear metric for what constitutes goal attainment (e.g., no missed bills for a month) ensures that progress is tracked clearly, and the benchmark for success does not change based on ancillary factors (e.g., the patient's mood).

Problem-Solving Skills for Implementing Technology-Based Solutions

Once the goal has been established, the person with ADRD and/or care partner will need to learn to choose technologies that meet their needs, implement these technologies, and adjust the approach as situations change. This process can likely be achieved through use of evidence-based problem-solving skills. For example, problem-solving therapy is a cognitive-behavioral approach that teaches a systematic process to discover effective solutions for problems (D'Zurilla & Nezu, 2010). A similar method from the occupational therapy field is metacognitive strategy training (MCST). MCST aims to increase an individual's awareness of their thinking processes and abilities to promote engagement and independence in the learning process. Prior research has demonstrated the effectiveness of MCST in enhancing decision-making and functional abilities in older adults, with initial evidence indicating similar benefits for individuals with mild cognitive impairment (Pikouli et al., 2023) and dementia (Gitlin et al., 2010). In the context of technology use, principles of MCST can be applied to help the person with ADRD or care partner become more adept at choosing technology-based solutions, putting them into practice, and troubleshooting their way through obstacles. More specifically, the clinician and patient can collaboratively explore digital features of technologies using a combination of direct instruction and guided discovery, working towards an independently implemented plan that moves toward goal attainment.

Developing a Maintenance Plan

As patients reach their goals and demonstrate greater independence in the use of technologies, the health service psychologist may be considering whether it is appropriate to discontinue therapy. A critical element of the therapeutic process with patients is developing a post-discharge maintenance plan to ensure gains are maintained beyond the treatment phase. A written maintenance plan is especially critical to maintain technology-based gains, which can fade in the absence of continued practice (Scullin et al., 2022). A maintenance plan can reinforce continued technology use as a solution to changing cognitive issues and challenges in day-to-day life. This plan can also identify additional goals not covered during therapy, anticipate potential barriers to reaching those goals, discover potential solutions to overcome barriers, and establish pre-specified timepoints to evaluate progress and assess the need for return to treatment. Of note, return to treatment may be likely among those with ADRD due to the progressive course of neurodegenerative disease. Such a framing acknowledges the need for continued support as cognition worsens, care needs grow, and living circumstances change.

Conclusions and Lessons Learned

With the Tech-AiD framework in mind, we can return to the case of Ms. Miller to discuss how it might be applied in practice. Ms. Miller's story provides an illustration of

how inequity in healthcare compounds the complexity of diagnosing and treating cognitive impairment. Nonetheless, recent advances in digital technologies hold promise for helping older adults with cognitive impairment maintain independence in their daily lives, enhancing quality of life and minimizing strain on care partners. Following the clinical and practice considerations outlined above, several steps are recommended to address Ms. Miller's needs using digital technologies.

First, her doctor noted that she could benefit from undergoing a comprehensive neuropsychological evaluation to properly stage her cognitive decline. However, this service was not immediately available in her rural community. In the absence of such an evaluation, her treating provider had Ms. Miller complete the Quick Dementia Rating System, which yielded a score of 4/30, substantiating her primary care doctor's initial diagnosis of mild cognitive impairment. This diagnosis would suggest that Ms. Miller is at a stage wherein she should be able to appropriately participate in treatment that employs technology-based strategies to maintain independence.

Second, the clinician could objectively evaluate technologies available to Ms. Miller and her care support system and assess comfort and familiarity with these devices and applications. As previously noted, Ms. Miller recently entered the world of smart technologies, upgrading her standard cell phone to a smartphone. She expressed some hesitancy to use this device. Further, her score on the Mobile Device Proficiency Questionnaire was a 4 on the Mobile Device Basics subscale, indicating she can somewhat easily operate the basic settings on her smartphone. However, scores on remaining subscales were all 2 or lower, suggesting that she cannot do or has not tried other mobile device activities involving communication, data and file storage, using the internet, using a calendar, and accessing entertainment. Despite this lack of mobile device skills, Ms. Miller reported some interest in learning how to use the smartphone, motivated by her initial conversations with her son.

Next, the health service psychologist built on this initial interest by providing psychoeducation on the ways other patients have benefitted from implementing technologies, using these examples to elicit possible benefits of technology from Ms. Miller. Along the way, the provider was attuned to sociocultural factors that might influence Ms. Miller's willingness to proceed with technology implementation. For example, one facilitating factor in this case was buy-in from her son, which is important because care partners often serve as technology navigators and guardians, assisting with initial learning and protecting against threats to privacy and well-being. On the other hand, Ms. Miller expressed some hesitation about using a smartphone because she grew up in a rural area where digital technologies were not common and could seem foreign or dangerous. The health service psychologist validated these legitimate concerns, gently challenged unfounded ones, and reinforced expressions of the potential benefits of technologies.

Once adequate motivation to learn digital technologies was established, Ms. Miller next clarified what she wanted to use them to accomplish. Through Ms. Miller's story, the health service psychologist recognized her values of preserving her independence and remaining connected with her family and community. The provider then assisted her in connecting these values with specific, measurable goals using Goal Attainment Scaling. For example, she expressed a desire to speak with her grandchildren more often, as she was limited to seeing them in person about once per month. She then operationalized attainment of this goal to be communicating with them digitally at least once per week.

Once this goal was established, the health service psychologist worked with Ms. Miller to explore technology-based solutions. Since Ms. Miller was relatively new to digital devices, she required some direct instruction at first to better understand her options for communicating with her grandchildren, which included texting, phone calls, and video calls. The clinician then used elements of meta-cognitive strategy training (e.g., guided discovery methods, the GOAL-PLAN-DO-CHECK problem-solving approach) to assist Ms. Miller with evaluating these solutions, developing a plan to implement the chosen solution, and adjusting the plan to achieve the best results.

Ms. Miller chose to video chat with her grandchildren, developing a plan to call her son to schedule a weekly time where they might be available. She anticipated that she might have problems learning to use the video chat feature. The clinician practiced with her during the sessions, showing her a step-by-step process to make a video call and asking Ms. Miller to write down each step so that she could remember it later. She then carried out this plan during the week and agreed to check back in at the next session to discuss the extent to which it helped her achieve her goal of increasing communication with her grandchildren.

At the next session, Ms. Miller reported that she had successfully video chatted with her grandchildren and expressed excitement about this interaction. The health service psychologist referenced the operational criteria established with Goal Attainment Scaling and guided Ms. Miller in checking on her goal progress. She felt she had already reached her goal of communicating digitally once per week with her grandchildren, and she expressed confidence in her ability to maintain this goal now that she had set a scheduled time with her son. The clinician guided Ms. Miller in anticipating obstacles to maintaining her progress. For instance, Ms. Miller noted that there were times when she could not use her phone during the week because the battery had died. She

worried that this might happen again on the days she had scheduled video chats with her grandchildren. The provider guided her in developing a plan to avoid this issue, which included keeping her phone charger in a visible, familiar location in the bathroom. This ensured she would remember to recharge her phone each night while brushing her teeth. Notably, the clinician did not offer this solution directly. Rather, the psychologist asked a series of open-ended questions about potential solutions, and Ms. Miller thought up this solution on her own.

As Ms. Miller made progress with her goals and developed confidence with figuring out and implementing technology-based strategies, she felt ready to terminate treatment. The health service psychologist validated her use of problem-solving skills, and reinforced digital technologies as a potential means of reaching goals. Finally, the therapist assisted Ms. Miller with creating a maintenance plan to continue progress post-treatment. This maintenance plan included additional goals she hoped to pursue (e.g., keeping better track of healthcare on her own), potential obstacles to reaching those goals (e.g., past difficulty accessing written health records), and possible technology-based solutions to reach goals (e.g., using an online patient portal). Further, Ms. Miller established clear dates and times for periodic check-ins (e.g., at three and six months) to review the lessons learned in treatment, evaluate progress towards her goals, and decide whether returning to treatment might be appropriate. She then set calendar reminders on her phone to ensure she completed these check ins down the road.

Ms. Miller's case is unique and will not apply exactly to every real-world patient. Integrating technology use into care of persons with ADRD should be approached through a lens of cultural sensitivity and individualized, person-centered care. Thus, while the outlined recommendations flow logically from the empirical literature, health service psychologists will need to exercise good clinical judgment in determining the best approaches for individual patients. Furthermore, additional research is needed to establish consensus clinical standards for integrating digital technologies into mental healthcare of persons with ADRD and their care partners. The Tech-AiD approach outlined in this paper could provide an initial practice model and a framework for further development and testing of technology-based behavioral interventions.

Key Clinical Considerations

- Digital technologies, like the internet, smartphones, and wearable devices, hold promise for improving outcomes for persons with ADRD and their care partners.
- Practice standards for integrating digital technologies into behavioral interventions for persons with ADRD are currently lacking.
- This article presents a clinical practice framework for assisting persons with ADRD and their care partners with implementing technology-based strategies to promote independence and reduce care burden. We call this framework Technology Assistance in Dementia (Tech-AiD).
- The Tech-AiD framework has six components: 1) assess disease severity, 2) evaluate the technological environment, 3) provide psychoeducation on potential benefits of technology, 4) identify goals that can be addressed via technology, 5) utilize evidence-based problem-solving approaches to guide technology selection and implementation, and 6) develop a maintenance plan.
- The Tech-AiD framework can be modified based on sociocultural context and individual needs to promote optimal outcomes.

Funding This work was funded under a Career Development Award by the National Institute on Aging (NIA) of the National Institutes of Health under Award Number U54AG063546, which funds NIA Imbedded Pragmatic Alzheimer's and AD-Related Dementias Clinical Trials Collaboratory (NIA IMPACT Collaboratory).

Data Availability Data sharing is not applicable to this article as no new data were created or analyzed in this study.

Declarations

Conflict of Interest On behalf of all authors, the corresponding author states that there is no conflict of interest.

References

Barg-Walkow, L. H., Mitzner, T. L., & Rogers, W. A. (2014). *Technology Experience Profile (TEP): Assessment and Scoring Guide*. HFA-TR-1402). Atlanta, GA: Georgia Institute of Technology, School of Psychology, Human Factors and Aging Laboratory.

Benge, J. F., & Scullin, M. K. (2020). Implications for technological reserve development in advancing age, cognitive impairment, and dementia. *The Behavioral and Brain Sciences*, *43*, e157. https://doi.org/10.1017/S0140525X20000126

Benge, J. F., Dinh, K. L., Logue, E., Phenis, R., Dasse, M. N., & Scullin, M. K. (2020). The Smartphone in the Memory Clinic: A Study of Patient and Care Partner's Utilisation Habits. *Neuropsychological Rehabilitation*, *30*(1), 101–115. https://doi.org/10.1080/09602011.2018.1459307

Benge, J. F., Aguirre, A., Scullin, M. K., Kiselica, A., Hilsabeck, R. C., Paydarfar, D., Thomaz, E., & Douglas, M. (2023). Digital Methods for Performing Daily Tasks Among Older Adults: An Initial Report of Frequency of Use and Perceived Utility. *Experimental Aging Research*, *50*(2), 133–154. https://doi.org/10.1080/0361073X.2023.2172950

Boot, W. R., Charness, N., Czaja, S. J., Sharit, J., Rogers, W. A., Fisk, A. D., Mitzner, T., Lee, C. C., & Nair, S. (2015). Computer Proficiency Questionnaire: Assessing Low and High Computer Proficient Seniors. *The Gerontologist*, *55*(3), 404–411. https://doi.org/10.1093/geront/gnt117

Cho, G., Betensky, R. A., & Chang, V. W. (2023). Internet usage and the prospective risk of dementia: A population-based cohort study. *Journal of the American Geriatrics Society*, *71*(8), 2419–2429. https://doi.org/10.1111/jgs.18394

D'Zurilla, T. J., & Nezu, A. M. (2010). Problem-solving therapy. In *Handbook of cognitive-behavioral therapies, 3rd ed* (pp. 197–225). Guilford Press.

Doran, G. T. (1981). There's a SMART way to write management's goals and objectives. *Management Review*, *70*(11), 35–36.

Dowell-Esquivel, C., Czaja, S. J., Kallestrup, P., Depp, C. A., Saber, J. N., & Harvey, P. D. (2023). Computerized Cognitive and Skills Training in Older People With Mild Cognitive Impairment: Using Ecological Momentary Assessment to Index Treatment-Related Changes in Real-World Performance of Technology-Dependent Functional Tasks. *The American Journal of Geriatric Psychiatry: Official Journal of the American Association for Geriatric Psychiatry*, S1064-7481(23)00463-3. https://doi.org/10.1016/j.jagp.2023.10.014

Fabricatore, C., Radovic, D., Lopez, X., Grasso-Cladera, A., & Salas, C. E. (2020). When technology cares for people with dementia: A critical review using neuropsychological rehabilitation as a conceptual framework. *Neuropsychological Rehabilitation*, *30*(8), 1558–1597. https://doi.org/10.1080/09602011.2019.1589532

Galvin, J. E. (2015). The Quick Dementia Rating System (QDRS): A rapid dementia staging tool. *Alzheimer's & Dementia : Diagnosis, Assessment & Disease Monitoring*, *1*(2), 249–259. https://doi.org/10.1016/j.dadm.2015.03.003

Gitlin, L. N., Winter, L., Dennis, M. P., Hodgson, N., & Hauck, W. W. (2010). Targeting and Managing Behavioral Symptoms in Individuals with Dementia: A Randomized Trial of a Nonpharmacologic Intervention. *Journal of the American Geriatrics Society*, *58*(8), 1465–1474. https://doi.org/10.1111/j.1532-5415.2010.02971.x

Harris, M. T., & Rogers, W. A. (2023). Developing a Healthcare Technology Acceptance Model (H-TAM) for Older Adults with Hypertension. *Ageing and Society*, *43*(4), 814–834. https://doi.org/10.1017/s0144686x21001069

Harvey, P. D., Zayas-Bazan, M., Tibiriçá, L., Kallestrup, P., & Czaja, S. J. (2022). Improvements in Cognitive Performance With Computerized Training in Older People With and Without Cognitive Impairment: Synergistic Effects of Skills-Focused and Cognitive-Focused Strategies. *The American Journal of Geriatric Psychiatry*, *30*(6), 717–726. https://doi.org/10.1016/j.jagp.2021.11.008

Jacobs, D. M., Peavy, G. M., Banks, S. J., Gigliotti, C., Little, E. A., Salmon, D. P. (2021). A survey of smartphone and interactive video technology use by participants in Alzheimer's disease research: Implications for remote cognitive assessment. *Alzheimer's & Dementia*, *13*(1), Article e12188. https://doi.org/10.1002/dad2.12188

Jennings, L. A., Ramirez, K. D., Hays, R. D., Wenger, N. S., & Reuben, D. B. (2018). Personalized Goal Attainment in Dementia Care: Measuring what persons with dementia and their caregivers want. *Journal of the American Geriatrics Society*, *66*(11), 2120–2127. https://doi.org/10.1111/jgs.15541

Kiresuk, T. J., & Sherman, R. E. (1968). Goal attainment scaling: A general method for evaluating comprehensive community mental health programs. *Community Mental Health Journal*, *4*(6), 443–453. https://doi.org/10.1007/BF01530764

Kiselica, A. M., Lin, S. S. H., Ranum, R. M., Mikula, C. M., Hermann, G., Boone, A., Scullin, M., Mechanic-Hamilton, D., Wolf, T., Stevens, A., & Benge, J. F. (2024). The Technology in Caring Questionnaire (TCQ): Development and psychometric properties. *Alzheimer's Disease & Associated Disorders*, *38*(1), 77-84. https://doi.org/10.1097/WAD.0000000000000604

Kiselica, A.M., Hermann, G. E., Scullin, M., & Benge, J. F. (under review). Tech that CARES: Enhancing dementia care through everyday technologies.

Kwan, R. Y. C., Cheung, D. S. K., & Kor, P. P.-K. (2020). The use of smartphones for wayfinding by people with mild dementia. *Dementia*, *19*(3), 721–735. https://doi.org/10.1177/1471301218785461

Law, M., Baptiste, S., McColl, M., Opzoomer, A., Polatajko, H., & Pollock, N. (1990). The Canadian occupational performance measure: An outcome measure for occupational therapy. *Canadian Journal of Occupational Therapy. Revue Canadienne D'ergotherapie*, *57*(2), 82–87. https://doi.org/10.1177/000841749005700207

Lee-Cheong, S., Amanullah, S., & Jardine, M. (2022). New assistive technologies in dementia and mild cognitive impairment care: A PubMed review. *Asian Journal of Psychiatry*, *73*, Article 103135. https://doi.org/10.1016/j.ajp.2022.103135

Li, Y., Spoer, B. R., Lampe, T. M., Hsieh, P. Y., Nelson, I. S., Vierse, A., Thorpe, L. E., & Gourevitch, M. N. (2023). Racial/ethnic and income disparities in neighborhood-level broadband access in 905 US cities, 2017–2021. *Public Health*, *217*, 205–211. https://doi.org/10.1016/j.puhe.2023.02.001

Mace, R. A., Mattos, M. K., & Vranceanu, A.-M. (2022). Older adults can use technology: Why healthcare professionals must overcome ageism in digital health. *Translational Behavioral Medicine*, *12*(12), 1102–1105. https://doi.org/10.1093/tbm/ibac070

Mikula, C. M., Perry, C., Boone, A. E., Benge, J. F., Scullin, M. K., & Kiselica, A. M. (2022). Dementia Caregiver Insights on Use of Assistive Technologies. *Work, Aging and Retirement*, *10*(1), 14–24. https://doi.org/10.1093/workar/waac027

Misiura, M. B., Butts, B., Hammerschlag, B., Munkombwe, C., Bird, A., Fyffe, M., Hemphill, A., Dotson, V. M., & Wharton, W. (2023). Intersectionality in Alzheimer's Disease: The Role of Female Sex and Black American Race in the Development and Prevalence of Alzheimer's Disease. *Neurotherapeutics*, *20*(4), 1019–1036. https://doi.org/10.1007/s13311-023-01408-x

Missouri Department of Health & Senior Services. (2024). *Bureau of Senior Programs State Fiscal Year 2024: Programs and Services Directory* (Division of Senior & Disability Services).

Penninkilampi, R., Casey, A.-N., Singh, M. F., & Brodaty, H. (2018). The Association between Social Engagement, Loneliness, and Risk of Dementia: A Systematic Review and Meta-Analysis. *Journal of Alzheimer's Disease: JAD*, *66*(4), 1619–1633. https://doi.org/10.3233/JAD-180439

Pew Research Center. (2024, January 31). Mobile Fact Sheet. *Pew Research Center: Internet, Science & Tech*. https://www.pewresearch.org/internet/fact-sheet/mobile/

Pikouli, F. A., Moraitou, D., Papantoniou, G., Sofologi, M., Papaliagkas, V., Kougioumtzis, G., Poptsi, E., & Tsolaki, M. (2023). Metacognitive Strategy Training Improves Decision-Making Abilities in Amnestic Mild Cognitive Impairment. *Journal of Intelligence*, *11*(9), 182. https://doi.org/10.3390/jintelligence11090182

Roque, N. A., & Boot, W. R. (2018). A New Tool for Assessing Mobile Device Proficiency in Older Adults: The Mobile Device Proficiency Questionnaire. *Journal of Applied Gerontology : The Official Journal of the Southern Gerontological Society*, *37*(2), 131–156. https://doi.org/10.1177/0733464816642582

Scullin, M. K., Jones, W. E., Phenis, R., Beevers, S., Rosen, S., Dinh, K., Kiselica, A., Keefe, F. J., & Benge, J. F. (2022). Using smartphone technology to improve prospective memory functioning: A randomized controlled trial. *Journal of the American Geriatrics Society*, *70*(2), 459–469. https://doi.org/10.1111/jgs.17551

Stern, Y. (2012). Cognitive reserve in ageing and Alzheimer's disease. *The Lancet. Neurology*, *11*(11), 1006–1012. https://doi.org/10.1016/S1474-4422(12)70191-6

Stojanovic, M., Waters, A. B., Kiselica, A. M., & Benge, J. F. (2023). The impact of technology-based compensatory behaviors on subjective cognitive decline in older adults with a family history of dementia. *Applied Neuropsychology. Adult*, 1–9. https://doi.org/10.1080/23279095.2023.2247109

Thordardottir, B., Malmgren Fänge, A., Lethin, C., Rodriguez Gatta, D., & Chiatti, C. (2019). Acceptance and Use of Innovative Assistive Technologies among People with Cognitive Impairment and Their Caregivers: A Systematic Review. *BioMed Research International*, *2019*, Article 9196729. https://doi.org/10.1155/2019/9196729

Wolff, J. L., Benge, J. F., Cassel, C. K., Monin, J. K., & Reuben, D. B. (2021). Emerging topics in dementia care and services. *Journal of the American Geriatrics Society*, *69*(7), 1763–1773. https://doi.org/10.1111/jgs.17341

Woods, S. P., Kordovski, V. M., Tierney, S. M., & Babicz, M. A. (2019). The Neuropsychological Aspects of Performance-based Internet Navigation Skills: A Brief Review of an Emerging Literature. *The Clinical Neuropsychologist*, *33*(2), 305–326. https://doi.org/10.1080/13854046.2018.1503332

Yoon, H., Jang, Y., Vaughan, P. W., & Garcia, M. (2020). Older Adults' Internet Use for Health Information: Digital Divide by Race/Ethnicity and Socioeconomic Status. *Journal of Applied Gerontology: The Official Journal of the Southern Gerontological Society*, *39*(1), 105–110. https://doi.org/10.1177/0733464818770772

Alyssa N. Kaser, BA (she/her), is a doctoral candidate in clinical psychology at the University of Texas Southwestern Medical Center. Her clinical and research interests lie at the intersection of neuropsychological assessment and intervention to help older adults maintain independence and enhance their quality of life.

Cynthia M. Mikula, MS (she/her), is currently a research assistant at the Columbia Center for Eating Disorders. She is interested in researching promotion of health behaviors across the lifespan and is clinically interested in health psychology.

Andrew M. Kiselica, PhD, ABPP-CN (he/him), is a board-certified clinical neuropsychologist and assistant professor of Health Psychology at the University of Missouri. Dr. Kiselica studies how to optimize use of commercial technologies, like smartphones, to improve quality of life among older adults, persons with dementia, and care partners.