



Systematic Review

Digital Planning-Based Technologies to Support Memory-Related Functioning in Older Adults with Mild Cognitive Impairment: A Systematic Scoping Study

Aswen Sriranganathan ¹, Shaylene Kathiravelu ², Tracy Li ^{2,3}, Lindsey Sikora ⁴, Shekinah McClymont ³, Dona Locke ⁵, Melanie Chandler ⁶, Anne Shandera-Ochsner ⁷, Adrian D. C. Chan ^{2,8}, Fateme Rajabiyazdi ^{2,8,9}, Octavio A. Santos ^{2,10}, Chantal Trudel ³, Atul Jaiswal ^{11,12} and Neil Thomas ^{1,2,*}

¹ Faculty of Medicine, University of Ottawa, Ottawa, ON K1H 8M5, Canada; asrir013@uottawa.ca

² Bruyere Health Research Institute, Ottawa, ON K1N 5C8, Canada; skath087@uottawa.ca (S.K.); tracyli4@gmail.com (T.L.); adrianchan@cunet.carleton.ca (A.D.C.C.); fatemerajabiyazdi@cunet.carleton.ca (F.R.); osantos@toh.ca (O.A.S.)

³ School of Industrial Design, Carleton University, Ottawa, ON K1S 5B8, Canada; shekinahmcclymont@gmail.com (S.M.); chantaltrudel@cunet.carleton.ca (C.T.)

⁴ Health Sciences Library, University of Ottawa, Ottawa, ON K1H 8M5, Canada; lsikora@uottawa.ca

⁵ Department of Psychiatry and Psychology, Mayo Clinic, Scottsdale, AZ 85259, USA; locke.dona@mayo.edu

⁶ Department of Psychiatry and Psychology, Mayo Clinic, Jacksonville, FL 32224, USA; chandler.melanie@mayo.edu

⁷ Department of Psychiatry and Psychology, Mayo Clinic Health System, Onalaska, WI 54650, USA; shandera-ochsner.anne@mayo.edu

⁸ Department of Systems and Computer Engineering, Carleton University, Ottawa, ON K1S 5B8, Canada

⁹ Department of Computer Science, University of Calgary, Calgary, AB T2N 1N4, Canada

¹⁰ Department of Psychology, The Ottawa Hospital, Ottawa, ON K1H 8L6, Canada

¹¹ Perley Health, Ottawa, ON K1G 5Z6, Canada; ajaiswal@perleyhealth.ca

¹² Interdisciplinary School of Health Sciences, University of Ottawa, Ottawa, ON K1H 8M5, Canada

* Correspondence: nthomas@bruyere.org



Academic Editors: Voyko Kavcic and Massimiliano Zecca

Received: 9 May 2025

Revised: 27 September 2025

Accepted: 1 October 2025

Published: 8 October 2025

Citation: Sriranganathan, A.; Kathiravelu, S.; Li, T.; Sikora, L.; McClymont, S.; Locke, D.; Chandler, M.; Shandera-Ochsner, A.; Chan, A.D.C.; Rajabiyazdi, F.; et al. Digital Planning-Based Technologies to Support Memory-Related Functioning in Older Adults with Mild Cognitive Impairment: A Systematic Scoping Study. *J. Ageing Longev.* **2025**, *5*, 42. <https://doi.org/10.3390/jal5040042>

Copyright: © 2025 by the authors. Licensee MDPI, Basel, Switzerland. This article is an open access article distributed under the terms and conditions of the Creative Commons Attribution (CC BY) license (<https://creativecommons.org/licenses/by/4.0/>).

Abstract

Background: Mild cognitive impairment (MCI) is a precursor to dementia, with a prevalence of over 15% among community dwellers, with significant economic and social implications. Despite preserved autonomy in daily living, individuals with MCI face challenges in handling everyday technology and memory-related tasks, necessitating digital interventions, such as digital planning-based technologies to support cognitive functioning. **Objective:** The aim of this study is to identify and summarize available research literature on available digital planning-based technologies to support memory-related functioning in older adults with MCI. Specifically, this study seeks to (1) document the types and functions of these technologies, (2) report their effectiveness, and (3) identify gaps in the current evidence. **Methods:** A comprehensive literature search of four databases (Medline, Embase, APA PsycINFO, and CINAHL) was conducted in accordance with Arksey and O'Malley's scoping review methodological framework from inception to February 6, 2024, without restrictions. Inclusion criteria focused on peer-reviewed studies involving adults aged 50 or older with diagnosed cognitive impairment, specifically using digital planning-based technologies for memory support. **Results:** From 1854 sources, 8 studies were included. Five categories of digital planning-based technologies were identified: (1) reminders and alarms, (2) electronic calendars, (3) digital memory notebooks, (4) digital visual mapping, and (5) smart-home integration. Several studies reported improved task performance, memory recall, and executive function, with digital memory notebooks and visual mapping software showing greatest impact on functional independence. While interventions were generally well-received, usability challenges and low adherence were common, often linked to technological familiarity and motivation. **Conclusions:** Digital planning-based

technologies show promise in supporting memory-related functioning in older adults with MCI. While studies report positive outcomes, more research is needed to refine these tools, evaluate long-term effects, and ensure integration into daily life. Expanding the evidence base will be key to improving accessibility and effectiveness for this population.

Keywords: aged; digital planning-based technology; cognition; daily functioning; reminders; alarms; memory aid; digital interventions; internet-based technology; memory support

1. Introduction

Mild cognitive impairment (MCI) is an intermediate state of cognitive decline between normal aging and dementia, with an estimated prevalence of over 15% among community dwellers [1,2]. An estimated 12.2 million people are living with MCI in the United States, and the prevalence is projected to reach 21.55 million by 2060 [3]. In Canada, it is estimated that 1.3 million experience MCI [4], and nearly 10% of Canadians aged 65 and older have some form of MCI that often goes undetected [5]. Sixty percent of individuals with MCI develop dementia in later stages of their lives, often due to underlying neurodegenerative processes [6,7]. MCI also poses a significant economic burden, with estimated monthly per-patient costs ranging from \$2430 to \$2816 in the US, including indirect caregiver costs averaging \$865 [8,9]. In Canada, the economic burden of dementia has been estimated between \$910 million and \$33 billion [10], largely due to increased caregiver stress, lost productivity, and rising care demands [11].

Mild cognitive impairment is characterized by deficits in memory and/or other cognitive domains that do not significantly interfere with activities of daily living (ADLs) [12,13]. However, individuals with MCI may experience difficulties with complex tasks, such as managing appointments, medications or financials, collectively referred to as instrumental activities of daily living (IADLs) [14]. While they are able to live autonomously, these challenges can impact daily functioning and increase the need for support in planning and organizing activities [15]. MCI is increasingly recognized as a transitional stage between normal aging and dementia [13].

Individuals with MCI often also face difficulties in handling everyday technology (ET), such as smartphones, ATMs, self-checkout kiosks, and online service portals. These challenges can affect their ability to manage daily tasks independently and may lead to increased reliance on support or transitions to assisted living [15]. While older adults with MCI are often motivated to improve cognitive function and quality of life, difficulties navigating ET create barriers to leveraging digital assistive interventions designed to support those very goals [16]. As digital tools become more integrated into public and commercial services, older adults with MCI may face barriers that limit their participation in daily life and ultimately reduce quality of life [17].

Recent studies have explored digital assistive technologies to improve memory and support IADLs in individuals with cognitive impairment, helping those with MCI maintain independence. Memory impairment is the most common and often earliest reported symptom of MCI and is closely linked to difficulties in performing daily tasks [18] such as managing schedules, taking medications, and remembering appointments. Digital assistive technology is increasingly used to support daily functioning and independence in individuals with MCI.

Digital engagement, referring to regular use of technologies like smartphones or tablets, has been linked to better cognitive functioning in older adults [19]. The association

likely reflects both the cognitive stimulation provided by digital activities and the role of cognitive ability in technology use. These tools support memory, communication, and social connection [20]. A recent study assessing an interactive digital calendar with mobile phone reminders for people with cognitive impairment found that participants increased their perception of their ability to perform IADLs along with performance satisfaction [21]. Calendars and task management systems from smartphone devices provide adults with MCI with cues and reminders, which have the potential to support task lists and prospective memory [22]. However, challenges with such cognitive aids, such as poor adherence and engagement, persist, and have been attributed to a lack of a multidimensional approach that fails to consider users' attitudes, beliefs, motivations, and preferences [16].

While steps have been taken to support IADLs in older adults with MCI, digital interventions specifically targeting memory-dependent daily functioning in older adults with MCI are limited [20]. This systematic scoping review aimed to review the current evidence on digital planning-based technologies available to support memory functioning in older adults with MCI, with the goal of identifying gaps in knowledge and informing future research directions.

Objective: To systematically map and synthesize the existing literature on the use of digital planning-based technology for individuals with MCI, including the types of technology, their functions, effectiveness, and gaps in the current evidence.

2. Materials and Methods

2.1. Study Design

Arksey & O'Malley's scoping review framework was employed to design and conduct the scoping study [23]. This methodological approach consisted of five stages: identification of the research question, identification of pertinent studies, selection of relevant articles, extraction of the data and charting, and collation and summarization of results. Adopting this systematic framework enabled the team to identify and synthesize the existing evidence on the topic and recognize gaps within the existing scientific literature. The guidelines outlined by Peters and colleagues for conducting a systematic scoping review were followed by defining the study's "population", "concept," and "context," and by detailing the search strategy, inclusion criteria, and approach to data synthesis [24]. In this study, MCI is defined as a condition characterized by noticeable changes in cognitive abilities, including memory, problem-solving, or language, that are greater than expected for normal aging but do not significantly limit daily functioning, allowing individuals to continue to manage IADLs [25].

2.2. Identification of the Research Question

The following research questions were developed to guide this study:

- a. What does the existing literature report on digital planning-based technology to support memory-related functioning for individuals with MCI?
- b. What are the types and functions of digital planning-based digital compensatory aids/tools used to support memory-related functioning for individuals with MCI?
- c. What is the reported effectiveness of these interventions in supporting memory-related functioning for individuals with MCI?

2.3. Selection of Pertinent Studies

The following databases were searched by a health sciences librarian (LS): Medline and Medline in Process via Ovid, Embase Classic + Embase via Ovid, APA PsycINFO via Ovid, CINAHL via EBSCOHost. A search strategy was developed in Medline, and then translated into the other databases, as appropriate (see Appendix A). The Medline

search strategy was peer-reviewed using the Peer Review of Electronic Search Strategies (PRESS) tool by another librarian (PF). All databases were searched from their dates of inception to February 6, 2024. No restrictions were applied to the search. All references were entered into an EndNote file for processing ($n = 2659$), and then into Covidence for deduplication and screening. After removing duplicates ($n = 805$), the total number of studies to be screened was 1854.

2.4. Selection of Relevant Articles

The selection process was implemented by applying given inclusion and exclusion criteria to the studies obtained through the scientific databases search (Table 1). The two-stage screening approach involved first reviewing at the level of titles/abstracts, followed by a full-text review of selected articles. Three independent reviewers (AS, SK & TL) conducted the screening. Any disagreements were addressed during monthly team consultations with senior team members (AJ & NT). The study's selection process, including the number of sources identified, screened, found eligible, and ultimately included, was documented using a PRISMA flowchart (Figure 1). Common reasons for exclusion were studies focusing exclusively on participants with dementia or other neurodegenerative disorders, traumatic brain injury (TBI) as the primary cause of MCI, interventions unrelated to planning or memory support, or technologies not relevant to digital planning.

Table 1. Inclusion and Exclusion Criteria.

Inclusion Criteria	Exclusion Criteria
Peer-reviewed scientific articles	Editorials, letters to editors, thesis/dissertations, and book reviews
Studies where participants were 50 years old or older with diagnosed mild cognitive impairment	Studies in which participants exclusively had cognitive impairment due to an acquired brain injury (e.g., stroke, traumatic brain injury, etc.)
Studies focusing on digital planning-based technologies to support memory-related functioning	Studies involving experimental animal models of cognitive dysfunction
Studies published in any language where English translation is available.	Studies not in the English language or without available translations

2.5. Data Extraction

The final selection of articles was compiled in a Microsoft Excel spreadsheet for data charting. A comprehensive data charting process was employed using a set of descriptors to extract relevant information from the selected articles, including authors, journal title, study time and location, design, population, sample size, purpose, key outcomes, and any other pertinent data related to answer the research questions.

2.6. Collation and Summarization of Results

Following data charting, a descriptive numerical summary and qualitative thematic analysis were conducted to present key findings. Descriptive findings from the spreadsheet were collated and independently coded using content analysis [26]. Numerical summaries were used to report study design, population, sample size, time, location, and purpose, while qualitative synthesis was employed for outcomes. The study adhered to the PRISMA-ScR Checklist for reporting standards [27]. The PRISMA-ScR checklist is available in the Supplementary Material.

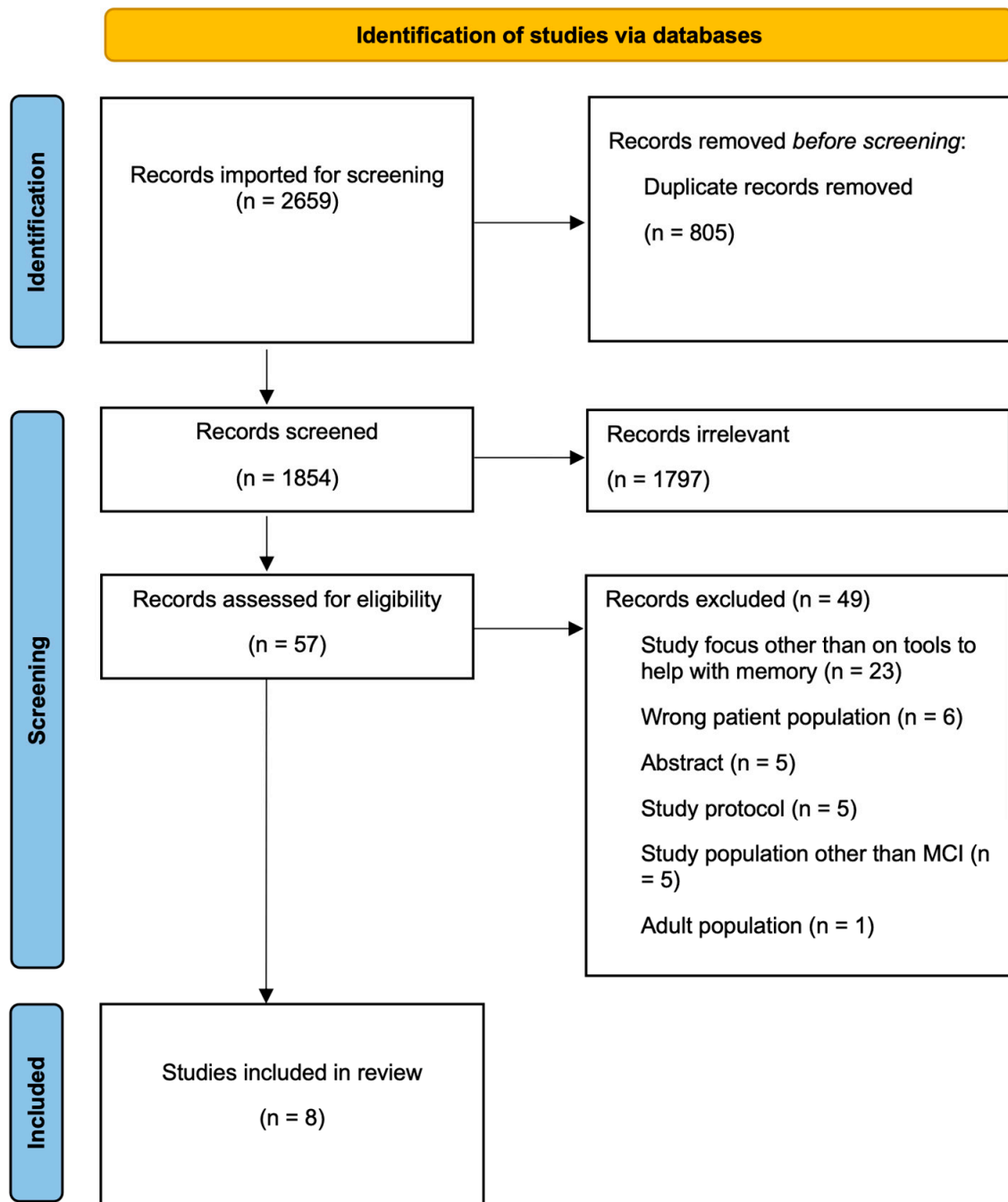


Figure 1. PRISMA flowchart of the study selection process.

3. Results

Of 1854 sources identified from four bibliographic databases, eight ($n = 8$) articles that met all the selection criteria were finally accepted.

3.1. Characteristics of the Included Studies

The studies included in this scoping study were peer-reviewed research articles published between 2016 and 2022 in the United States ($n = 5$; 63%), Sweden ($n = 1$; 13%), Japan ($n = 1$; 13%), South Korea ($n = 1$; 13%). The included articles present data surrounding the use of memory assistive digital planning-based technology for older adults, aged 50 or older, with a diagnosis of MCI. These adults lived in various settings, including at home, in geriatric care facilities, or in memory care facilities. Some were also recruited from memory clinics. Studies included between 7 and 52 participants. The most common study designs

were longitudinal ($n = 2$; 25%) and randomized controlled trials ($n = 2$; 25%), followed by mixed methods ($n = 1$; 13%), cross-over designs ($n = 1$; 13%), quasi-experimental ($n = 1$; 13%), and focus group interview approaches ($n = 1$; 13%).

Table 2 describes the digital planning-based technological interventions and their outcomes for older adults with MCI. The types of interventions utilized in the study included:

- Three active reminder and alarm systems to assist with daily tasks and appointment reminders [28–30].
- Two apps that used an electronic calendar as a reminder system to assist with daily tasks and memory [31,32].
- One digital memory notebook that integrates scheduling, journaling, reminders, and motivational tools to support everyday functioning [33].
- A tablet app used by caregivers to develop a visual map, which assists individuals with MCI to accomplish activities more effectively [34].
- An electronic memory and management aid application with smart-home integration that helps perform daily tasks consistently [35].

Table 2. Intervention description and outcomes on memory-related functioning ($n = 8$).

Authors, Year, Country	Type of Study	Population	Type of Intervention	Technology Used (Device Required)	Functions of Intervention	Memory-Related Functioning Domain
Baric et al., 2019, Sweden [28]	Focus group interviews	20 older adults (mean age 73; range 60–85) with access to an electronic device	Reminders and alarms	RemindMe: An interactive digital calendar with SMS-based reminders (Smartphone)	Active reminders requiring user response; logs responses and scheduled events for personalized activity history	Planning, scheduling, and task execution support
Boatman et al., 2019, USA [34]	Longitudinal, pre-post measure design	7 long-term care residents with MCI or AD (mean age 81; range 68–92)	Digital visual mapping	Tablet-based visual mapping software with ADL-specific templates (Tablet device)	Step-by-step visual prompts using images and keywords to support task sequencing and ADL completion	Support for memory recall and task planning in instrumental activities of daily living
Hackett et al., 2022, USA [29]	Within-participant, counter balanced cross-over design	10 older adults (mean age 80; range 67–93) with MCI or dementia	Reminders and alarms	SmartPrompt: Reminder app informed by neuropsychological theory (Smartphone)	Auditory and visual task prompts, motivational feedback, and structured task completion logging	Prospective memory, motivation, and episodic memory support
Nishiura et al., 2021, Japan [31]	Cross-over randomized stratified study	20 older adults (>65) with dementia and 7 healthy older adults	Electronic calendar	Page-a-day calendar app on Android tablets (Tablet)	Displays date/time with alarms and task prompts; up to five scheduled events with step-by-step cues after alarm dismissal	Time orientation, daily task prompting, global cognition support
Pang & Kim 2021, South Korea [32]	Quasi-experimental with non-equivalent control group,	42 postmenopausal women (>50) with MCI	Electronic calendar	“One Day” calendar application (Smartphone)	Sections for scheduled tasks, to-do lists, and daily journaling to support memory and task organization	Memory contentment, attention, executive function
Raghunath et al., 2020, USA [33]	Iterative usability testing	20 older adults (>50) with MCI ($n = 14$) or traumatic brain injury (TBI) ($n = 3$), and caregivers ($n = 3$)	Digital memory notebook application	Digital Memory Notebook (DMN) (iOS Tablet)	Centralized task management with to-do lists, calendar, notes, and reminders; includes motivational prompts and smart home integration	Prospective and retrospective memory, planning, daily task execution

Table 2. *Cont.*

Authors, Year, Country	Type of Study	Population	Type of Intervention	Technology Used (Device Required)	Functions of Intervention	Memory-Related Functioning Domain
Schmitter-Edgecombe et al., 2022, USA [35]	Longitudinal study	32 older adults (>50) with amnesic MCI	Smart-home integrated memory aid	EMMA (Electronic Memory and Management Aid) app (Smartphone)	Task scheduling, activity logging, real-time prompts, and training reminders; integrated with smart-home for context-aware support	Supports habit formation, prospective memory, and daily task management
Scullin et al., 2022, USA [30]	Randomized controlled trial	52 older adults with MCI or mild dementia	Reminders and alarms	Reminder app and digital voice recorder app (Smartphone)	Prospective memory support, reminder notifications for scheduled tasks (calls and photos)	Prospective memory, IADLs

Abbreviations: AD = Alzheimer's Disease; ADL = Activities of daily living; DMN = digital memory notebook; EMMA = Electronic Memory and Management Aid; IADL = instrumental activities of daily living; MCI = mild cognitive impairment; SMS = Short message service; TBI = traumatic brain injury.

3.2. Types of Technologies Identified and Categorized

Across 8 studies, we found five categories of memory-focused digital technologies: (1) reminders and alarms; (2) electronic calendar; (3) digital memory notebook; (4) digital visual mapping; and (5) smart-home integration.

3.3. Reminders and Alarms

Baric et al. [28] developed a text message reminder system to help participants manage their schedules by sending prompts to their smartphones. These reminders were created by family members or professionals using a digital shared calendar. Responses and scheduled events were stored in a feedback system, which contributed to a personalized history of activities. The feedback system visually summarized completed and uncompleted activities using color codes and provided details on SMS responses, event schedulers, and usage duration. User feedback was collected through focus group interviews. Participants had mixed opinions about the interventions, with most concluding that the technology was challenging to integrate into daily life due to participants having to change their mobile/smartphone routines, despite being easy to learn. Some perceived the intervention as a sign of modernity, whereas others perceived it as a sign of aging and dependence [28].

Hackett et al. [29] assessed the SmartPrompt system, a smartphone-based reminder application, designed to assist individuals by supporting multiple cognitive domains simultaneously and providing motivational rewards. Participants in the SmartPrompt study arm were given cues, such as alarms and instructions requiring photo logging to provide visual confirmation of task completion (e.g., reminders to drink water and submitting a photo of the emptied glass), whereas participants assigned to the unprompted control arm were not. Participants experienced both the SmartPrompt and the unprompted conditions at different times. Ninety percent of participants responded to all alarms correctly, based on predefined criteria for task accomplishment, and 100% responded to at least one. Motivational rewards included device vibrations and customized sounds (e.g., participant's favorite song plays when they accomplish all their daily tasks). All participants who obtained less-than-perfect accomplishment scores in the unprompted group obtained higher accomplishment scores in the SmartPrompt condition. Most participants (67.2%) indicated that they viewed SmartPrompt favorably [29].

Scullin et al. [30] evaluated two smartphone applications, a digital recorder app and a reminder app designed to offload prospective memory intentions. Participants were randomly assigned to one of the two apps. To assess prospective memory performance,

participants were instructed twice a week to remember to complete time- or location-based tasks, such as calling an experimenter's phone number on specific days or to take photos at specific locations, such as their home, grocery store, church, and workplace. The Lawton-Brody IADL scale was completed by care partners at baseline and after the intervention. After four weeks of app use, 66.7% of participants reported perceived improvements in memory functioning and quality of life. Those who used the reminder app more frequently showed better prospective memory performance and improved IADLs. Familiarity with smartphone technology prior to the study was the most significant determinant of app usage and acceptability [30].

3.4. Electronic Calendar

Nishiura et al. [31] developed a prototype electronic calendar that was programmed as an application on Android-based devices. The calendar automatically changed the current date and day of the week with large, easy-to-read letters to differentiate 'today' from other days. The page-a-day calendar changes the date and day of the week each day. Features (e.g., optimal color contrast, large letters) supported participants in easily finding information, with up to five events per day inputted into the schedule. Additional daily tasks are displayed, and schedule time triggers and alarm sound. When users touched the "stop the alarm" icon, the sound stopped, and instructions for the next task were displayed for a few minutes. Positive outcomes were seen in global cognitive functions, as measured by the MMSE, behaviors in daily activities, and impressions of using the calendar in semi-structured interviews [31].

Pang and Kim [32] used a digital calendar app consisting of three sections to improve memory in postmenopausal women with MCI: appointments, which included tasks to be performed at specific times; a list of items to be completed in no particular order; and journaling, which consisted of participants writing about important events that occurred that day. Study Group 1 participated in calendar training and walking exercises, Study Group 2 participated in calendar training only, and the control group received neither. Participants in Group 1 experienced increased memory contentment, whereas Group 2 maintained memory, and the control group had decreased memory satisfaction. Overall, improved executive functions and memory contentment were seen in Group 1. However, changes in depressive symptoms and self-esteem were not significant [32].

3.5. Comprehensive Digital Memory Notebook

Raghunath et al. [33] developed a digital memory notebook (DMN) to assist older adults with MCI in the management of everyday activities through a mobile application. The application integrated key features, such as a today page, to-do lists, and a calendar, designed with user-friendly elements like large text and high-contrast visuals. Participants engaged with the DMN over multiple usability testing iterations, reporting improvements in task completion times over the course of each test and high satisfaction scores across design elements. Familiarity with scheduling tools did not influence usability outcomes, suggesting the DMN's broad accessibility. While most users appreciated the user-centered interface and perceived the DMN as empowering, a notable limitation was the initial difficulty in recalling how to operate specific features outside the experimental environment. Subsequent modifications introduced a "Help" page and motivational prompts, aimed at increasing adoption in real-world settings. Overall, the authors believe the DMN shows promise as a tool to improve functional independence and quality of life for users [33].

3.6. Digital Visual Mapping

One study assessed the effect of visual mapping software on the quality of life and cognitive scores of older adults with MCI residing in a long-term care (LTC) facility for

over three months [34]. Cognitive scores were derived from the Repeatable Battery for Assessment of Neuropsychological Status, which assessed cognitive domains, including immediate memory, visuospatial/constructional skills, language, attention, and delayed memory. Visual maps consisted of pictures and keywords presented in a sequence to assist residents and caregivers in organizing and accomplishing IADLs. Over 40 map templates depicting a wide range of IADLs, such as managing medications, preparing simple meals, handling finances, grocery shopping, using transportation, were loaded onto tablets. Residents and caregivers received training on how to navigate and apply the maps during routine care activities. These maps served as step-by-step guides, allowing residents to reference them as needed when completing IADLs. Quality of life, measured by domains in the Wisconsin University Quality of Life Questionnaire, improved in both residents and caregivers. Residents showed significant improvement in immediate memory, suggesting an increased ability to concentrate and pay attention. However, there was no significant improvement in overall cognitive function [34].

3.7. Smart-Home Integration

Schmitter-Edgecombe et al. [35] assessed the use of Electronic Memory and Management Aid (EMMA), an organizational tool and memory aid designed on a tablet interface to help older adults with MCI manage daily tasks effectively. Paired with smart home technology, EMMA provides users with real-time, context-aware prompts to support consistent use and help form learned habits. By week four of training, participants with EMMA partnered with the smart-home system engaged with the platform more frequently and utilized both basic and advanced features compared to the EMMA-only training group. There was no difference between global cognitive status or depressive symptoms. Achieving proficiency earlier and increased use of the EMMA app during training supported a higher rate of sustained use of the app in participants' everyday lives [35].

3.8. Effectiveness of the Interventions

Across studies, participants generally reported high satisfaction, usability, and willingness to adopt digital planning-based interventions to support memory-related functioning [28,29,34]. These technologies, ranging from reminder apps and visual mapping tools to electronic calendars, were associated with improved task performance, particularly in prospective memory, working memory, episodic memory, and executive functions [31]. Several studies also demonstrated enhanced performance in IADLs, contributing to greater perceived functional independence [31,33,34]. A summary of reported outcomes is presented in Table 3.

Table 3. Summary of Reported Outcomes Across Included Studies.

Outcome Domain	Number of Studies	Number of Studies Reporting Improvement	% of Assessed Studies	Studies Reporting Improvement
Task performance (e.g., task completion, IADLs)	7	6	86%	[29–34]
Specific cognitive functions (e.g., memory, executive function)	6	5	83%	[29–32,34]
Global cognitive function	3	1	33%	[31]
Usability/acceptability	8	8	100%	[28–35]
Adherence/engagement	5	4	80%	[28,30,33,35]

High usability and ease of use consistently emerged as critical factors influencing engagement and sustained use, especially among individuals with prior technology

familiarity [28,30]. Interventions that incorporated motivational features, such as gamification or rewards, showed higher adherence and participant satisfaction [26].

While many studies reported cognitive benefits in specific domains, improvements in global cognitive function were mixed and occasionally non-significant [34,35]. Nonetheless, interventions like the DMN showed notable benefits, including reduced task completion times and increased functional independence, regardless of users' prior experience with technology [33].

Collectively, these findings suggest that while digital planning-based technologies hold promise for supporting everyday functioning in individuals with MCI, successful implementation depends on user-centered design, ease of integration into daily routines, and ongoing support.

4. Discussion

This systematic scoping study mapped and synthesized the existing literature on digital planning-based technologies aimed at supporting memory-related functioning in older adults with MCI. To our knowledge, our review is the first attempt to synthesize the evidence on this topic to directly inform clinical practice, examining scientific articles from scientific databases since their inception. Even though the number of older adults with MCI is projected to increase with age worldwide, there are only a few studies on digital planning-based technology that have been developed, tested, or used to improve memory functioning for older adults with MCI in their daily lives. The review identified 8 studies published between 2016 and 2022, originating from diverse geographical locations, and encompassing five main categories of interventions: reminders and alarms, electronic calendars, digital memory notebooks, digital visual mapping, and smart-home integration. All studies originated from high-income countries, including the US, Japan, South Korea, and Sweden. The findings provide insights into the types and functions of these technologies, their effectiveness, and gaps in the current evidence base.

A key finding is the variety of digital planning-based technologies employed, ranging from reminder and alarm systems [28–30] to interventions incorporating electronic calendars [31,32], visual mapping software [29], and smart-home integration [31]. These technologies offer diverse functionalities, including scheduling appointments, managing tasks, and providing cues and reminders. The diverse features highlight the potential for personalized interventions tailored to individual needs and preferences.

Many studies reported high satisfaction and positive reception among participants, with a general willingness to adopt smartphone-based reminder and digital voice recorder apps [29,30], aligning with broader trends of increasing technology acceptance among older adults [16,19]. Several studies also reported improvements in specific cognitive domains such as memory recall, working memory, and executive functions [29–32,34,35]. As such, mixed findings on global cognitive outcomes are not unexpected. Rather than indicating a discrepancy, this highlights the importance of aligning outcome measures with the intended purpose of the intervention. Future research should focus on evaluating the long-term impact of these tools on functional independence, quality of life, and cognitive maintenance, using measures that reflect real-world use and benefit.

The studies also highlighted the importance of usability and acceptability. Familiarity with technology and ease of use were identified as key factors influencing sustained use and improved memory performance [28,30]. This finding underscores the need for person-centered design principles in the development of these technologies, ensuring they are intuitive and accessible for older adults with varying levels of technological proficiency. Incorporating motivational elements, such as rewards or gamification, also appears promising for enhancing engagement and adherence [29].

Despite motivation to maintain independence, older adults with MCI may struggle to use the very technologies designed to support them. Difficulties with ET, such as unfamiliar interfaces or multitasking demands, can limit uptake and adherence on digital interventions. As essential services increasingly move online, these barriers may worsen functional decline. Given the growing reliance on digital systems in essential services such as healthcare access, banking, and transportation, these barriers not only hinder access to support but also risk exacerbating functional decline [17].

While many studies reported positive user feedback, sustained use of digital tools requires a deeper understanding of user acceptance. Frameworks like the Technology Acceptance Model (TAM), which focuses on perceived usefulness and ease of use, have been widely applied in older adult populations and assistive health contexts. Adapted models like the Healthcare TAM, specifically designed for older adults, incorporate additional factors such as familiarity, trust, and facilitating conditions [36]. Recent evidence from the CREATE team and related reviews highlight the value of integrating TAM and UTAUT frameworks into tool design to enhance useability and adoption among older adults with MCI [37].

Our findings align with previous research highlighting the potential of digital assistive technologies to support cognitive function and independence in older adults. The current review extends this body of knowledge by specifically focusing on digital planning-based technologies and their application in the context of MCI.

Multiple studies have examined the design requirements and needs of individuals with MCI related to the development of digital planning-based technologies and have also designed prototypes. Zubatiy et al. [38] used a distributed cognitive approach to identify considerations for digital calendars based on individuals' current use of calendar systems. Individuals with MCI and their care partners preferred tracking their appointments using phone calendars, with wall calendars also being favored by individuals with MCI specifically. The complexity of using multiple tools for scheduling was highlighted, with some individuals using a combination of techniques to manage upcoming appointments and tasks (e.g., wall calendar, phone calendar, reminders from family, post-it notes, whiteboard) [38]. These systems are at a higher risk of errors and require more involvement from the care partner. Shin et al. [39] used a design thinking process approach to develop a design prototype of a smart pen and digital planner application for individuals with MCI [39]. The design incorporated a familiar object and focused on ease of use to meet the needs that they identified for users. The prototype was reviewed by experts in human–computer interaction and user experience but was not tested with individuals with MCI. Findings from these studies highlight the increasing preference for digital calendar systems and the need for simplification and consolidation of features in these systems to support more than just appointment scheduling.

Two studies specifically examined digital planning-based systems but were excluded from this scoping study at the full-text level of screening because they did not meet the pre-specified exclusion criteria, as they primarily involved individuals with TBI rather than MCI. Luna et al. [40] provided valuable insights into the characteristics of individuals who adopted the EMMA electronic memory aid [35]. This study focused on identifying predictors of adoption but did not evaluate how the EMMA improved memory functioning or other cognitive outcomes in older adults with MCI. Similarly, Chudoba et al. [41] explored the development of the DMN application [33]; however, the DMN was tested in participants with MCI caused by mild traumatic brain injuries or Parkinson's disease. The study also focused on intervention methods and usability outcomes rather than evaluating the DMN's impact on memory functioning or broader cognitive outcomes.

Other studies have incorporated existing tablet applications (iPad calendar, iPad Notes) as part of an external memory aid (EMA) treatment program for individuals with MCI, but did not adapt the applications specifically for people with MCI [42,43]. In weekly group treatment sessions, participants were taught the use of different digital and paper external memory aids and their functional ability to use the EMAs was evaluated post-treatment. A later version of this external memory tool incorporated a paper calendar, but the digital calendar and notes apps were no longer part of the tool [44]. This suggests that although digital planning-based technologies can successfully be used by people with MCI, specialized calendar systems are required for this population and should be designed with input from people with MCI and their care partners.

Although the studies discussed were not included in the final synthesis due to exclusion criteria, they offer valuable insights for further studies. Collectively they highlight the importance of user-centered design, the need for simplified and integrated digital tools, and the role of familiar interfaces in supporting adoption and usability. These studies also point to key directions for future work: the co-design of technologies with users and care partners, the evaluation of functional and cognitive outcomes, and the adaptation of mainstream tools specifically for the MCI population.

Overall, studies examining digital planning-based systems in individuals with MCI have been limited to exploring the design requirements of these systems prior to developing a prototype or pilot testing with a small sample size. To provide sufficient evidence to support the use of digital planner technologies in programs for individuals with MCI and in day-to-day life, larger studies will be needed to show benefits in relevant outcome measures related to maintaining independence, supporting or improving quality of life, improving mood symptoms, or reducing burden level in care partners.

4.1. Implications for Clinical Practice

The findings have several implications for clinical practice and policy. While digital planning-based technologies show promise in supporting memory-related functioning and daily activities for older adults with MCI, the current evidence is limited, with only a small number of preliminary studies available. As such, there is insufficient data to recommend routine use of these technologies in clinical settings.

Healthcare providers should be aware of emerging technologies but exercise caution when considering their integration into care until more robust, high-quality evidence is available. In the meantime, policymakers and stakeholders should prioritize and invest in further research to evaluate the efficacy, usability, and accessibility of these tools. Doing so will help determine their potential role in the management of cognitive impairment, particularly given the increasing integration of digital technologies into everyday life.

4.2. Implications for Policy

Policymakers should advocate for the development and funding of digital health interventions tailored to the needs of older adults with cognitive impairments. This includes investing in research to optimize the design and functionality of these technologies, ensuring they are user-friendly and accessible to a diverse population. The Brain Health and Cognitive Impairment in Aging (BHCIA) Research Initiative in Canada is a strategy established to support research to improve care, services, and wellbeing for people living with dementia, caregivers, and care providers [45]. The National Plan to Address Alzheimer's Disease in the US seeks to involve the use of technology to improve care delivery and support for people with dementia [44]. A review of technology and dementia emphasized that both Canadian and the U.S. strategies identify various possible uses of technology in dementia care, such as in diagnosis, assessment, monitoring, maintaining

functionality, leisure and activity, caregiving, and management [46]. Additionally, the review highlighted that these strategies recognize the importance of policy changes to facilitate the integration of technology into dementia care [46]. The use of technology is now commonplace in everyday life situations and the performance of IADLs. If the needs and limitations of individuals with MCI and dementia are not studied and accounted for, then individuals with cognitive impairment will face increased barriers in their ability to participate in public spaces, further impacting their quality of life [17].

4.3. Limitations

The review has several limitations. First, the limited number of studies meeting our inclusion criteria, the small sample sizes, varied study designs, and the limited geographical scope of the included studies limit the generalizability of the findings. Second, the heterogeneity in the types of interventions and outcome measures used across studies makes it challenging to draw definitive conclusions about the effectiveness of specific technologies. Third, the reliance on self-reported measures of satisfaction and usability may introduce bias, as participants might overestimate the benefits due to social desirability or placebo effects.

5. Conclusions

This scoping review provides a preliminary overview of the existing evidence on digital planning-based technologies for older adults with MCI. Our findings suggest that these technologies hold promise for supporting memory-related functioning and improving quality of life. However, more research is needed to determine the optimal design and implementation of these interventions. Future studies should focus on developing personalized interventions, evaluating long-term outcomes using randomized controlled trials, and exploring the cost-effectiveness and integration potential of these technologies as well as strategies to improve user training and support, particularly for individuals with limited technological experience. As the population ages and the prevalence of MCI increases, developing and implementing effective, accessible, and user-friendly assistive technologies will become increasingly critical. Digital planning-based technologies represent a promising avenue for intervention, offering a personalized and adaptable approach to supporting memory and daily functioning in this vulnerable population.

Supplementary Materials: The following supporting information can be downloaded at: <https://www.mdpi.com/article/10.3390/jal5040042/s1>.

Author Contributions: Conceptualization, T.L., A.S., S.K., A.J., N.T., O.A.S., C.T., F.R., A.D.C.C. and M.C.; methodology, A.S., S.K., L.S. and A.J.; formal analysis, A.S., S.K., A.J., N.T. and O.A.S.; writing—original draft preparation, A.S. and S.K.; writing—review and editing, A.J., N.T., O.A.S., C.T., F.R., A.D.C.C., T.L., S.M., M.C., D.L. and A.S.-O.; supervision, A.J.; funding acquisition, N.T., O.A.S., C.T., F.R., A.D.C.C., A.J. and M.C. All authors have read and agreed to the published version of the manuscript.

Funding: This research was funded by The Burnside Family, through a grant from the Bruyère Health Foundation.

Data Availability Statement: The data presented in this study are available on request from the corresponding author due to privacy and ethics regulations.

Acknowledgments: We thank Peter Farrell, M.I. (University of Ottawa), for peer reviewing the submitted search strategy.

Conflicts of Interest: The authors declare no conflicts of interest. The funders had no role in the design of the study; in the collection, analyses, or interpretation of data; in the writing of the manuscript; or in the decision to publish the results.

Abbreviations

The following abbreviations are used in this manuscript:

EMA	External Memory Aid
EMMA	Electronic Memory and Management Aid
ET	Everyday technology
DMN	Digital Memory Notebook
IADL	Instrumental activities of daily living
LTC	Long-term care
MCI	Mild cognitive impairment
MMSE	Mini-Mental State Examination
PRESS	Peer Review of Electronic Search Strategies
PRISMA	Preferred Reporting Items for Systematic Reviews and Meta-Analyses
PRISMA-ScR	PRISMA Extension for Scoping Reviews
TAM	Technology Assessment Model
TBI	Traumatic brain injury

Appendix A. Search Strategy

Appendix A.1. Medline

1. exp Cognitive Dysfunction/or Cognition Disorders/
2. ((cognit* or mental) adj3 (defect* or decline or declines or disorder or disorders or dysfunction or dysfunctions or impairment or impairments or disability or disabilities)).ti,ab,kw.
3. or/1–2
4. computers, handheld/or smartphone/or cell phone/
5. mobile applications/or user-computer interface/
6. self-help devices/or communication aids for disabled/
7. calendar-based technolog*.ti,ab,kw.
8. digital memory notebook*.ti,ab,kw.
9. compensatory aid*.ti,ab,kw.
10. (smartphone* or smart-phone* or tablet or tablets or (digital adj tool*) or (mobile adj application*)).ti,ab,kw.
11. palm computer*.ti,ab,kw.
12. palm pilot.ti,ab,kw.
13. pocket PC.ti,ab,kw.
14. ((mobile or cell) adj3 (phone* or device*)).ti,ab,kw.
15. ((handheld or hand held) adj (device* or computer*)).ti,ab,kw.
16. self-help device*.ti,ab,kw.
17. personal digital assistant.ti,ab,kw.
18. ambient assisted living.ti,ab,kw.
19. or/4–18
20. 3 and 19
21. (aged or aging or ageing or elder* or ((old or retired) adj2 (people* or patient* or inpatient* or in-patient* or outpatient* or out-patient* or client* or person* or individual* or wom#n or man or men or age)) or older* or geriatr* or gerontolog* or senior* or senescen* or retiree* or sexagenarian* or septuagenarian* or octagenarian* or nonage-

narian* or centenarian* or supercentenarian* or veteran*).ti,ab. or elderly/or elderly patients/or retired people/or old age/or aging/or geriatrics/

22. 20 and 21

Appendix A.2. Embase

1. cognitive defect/or experimental cognitive defect/or mild cognitive impairment/or postoperative cognitive dysfunction/
2. ((cognit* or mental) adj2 (defect* or decline or declines or disorder or disorders or dysfunction or dysfunctions or impairment or impairments or disability or disabilities)).ti,ab,kw.
3. or/1–2
4. personal digital assistant/
5. smartphone/or mobile phone/or smart device/
6. self help device/
7. exp communication aid/
8. exp mobile application/
9. human machine interface/
10. calendar-based technolog*.ti,ab,kw.
11. digital memory notebook*.ti,ab,kw.
12. compensatory aid*.ti,ab,kw.
13. (smartphone* or smart-phone* or tablet or tablets or (digital adj tool*) or (mobile adj application*)).ti,ab,kw.
14. palm computer*.ti,ab,kw.
15. palm pilot.ti,ab,kw.
16. pocket PC.ti,ab,kw.
17. ((cell or mobile) adj2 (phone* or device*)).ti,ab,kw.
18. ((handheld or hand held) adj (device* or computer*)).ti,ab,kw.
19. self-help device*.ti,ab,kw.
20. personal digital assistant.ti,ab,kw.
21. or/4–20
22. (aged or aging or ageing or elder* or ((old or retired) adj2 (people* or patient* or inpatient* or in-patient* or outpatient* or out-patient* or client* or person* or individual* or wom#n or man or men or age)) or older* or geriatr* or gerontolog* or senior* or senescen* or retiree* or sexagenarian* or septuagenarian* or octagenarian* or nonagenarian* or centenarian* or supercentenarian* or veteran*).ti,ab.
23. exp aged/
24. retirement/
25. geriatrics/
26. exp aging/
27. or/22–26
28. 3 and 21 and 27

Appendix A.3. APA PsycINFO

1. cognitive impairment/or mild cognitive impairment/
2. ((cognit* or mental) adj2 (defect* or decline or declines or disorder or disorders or dysfunction or dysfunctions or impairment or impairments or disability or disabilities)).ti,ab.
3. or/1–2
4. computer applications/or computer assisted instruction/or mobile applications/
5. exp mobile devices/

6. calendar-based technolog*.ti,ab.
7. digital memory notebook*.ti,ab.
8. compensatory aid*.ti,ab.
9. (smartphone* or smart-phone* or tablet or tablets or (digital adj tool*) or (mobile adj application*)),ti,ab.
10. palm computer*.ti,ab.
11. palm pilot.ti,ab.
12. pocket PC.ti,ab.
13. ((mobile or cell) adj3 (phone* or device*)),ti,ab.
14. ((handheld or hand held) adj (device* or computer*)),ti,ab.
15. self-help device*.ti,ab.
16. personal digital assistant.ti,ab.
17. ambient assisted living.ti,ab.
18. or/4–17
19. (aged or aging or ageing or elder* or ((old or retired) adj2 (people* or patient* or inpatient* or in-patient* or outpatient* or out-patient* or client* or person* or individual* or wom#n or man or men or age)) or older* or geriatr* or gerontolog* or senior* or senescen* or retiree* or sexagenarian* or septuagenarian* or octagenarian* or nonagenarian* or centenarian* or supercentenarian* or veteran*).ti,ab.
20. exp aging/
21. older adulthood/
22. retirement/
23. geriatrics/
24. or/19–23
25. 3 and 18 and 24

Appendix A.4. CINAHL

Table A1. Search History.

#	Query
S22	S2 AND S17 AND S21
S21	S18 OR S19 OR S20
S20	(MH "Geriatrics+")
S19	(MH "Aged+")
S18	TI ((aged or aging or ageing or elder* or ((old or retired) N2 (people* or patient* or inpatient* or in-patient* or outpatient* or out-patient* or client* or person* or individual* or wom#n or man or men or age)) or older* or geriatr* or gerontolog* or senior* or senescen* or retiree* or sexagenarian* or septuagenarian* or octagenarian* or nonagenarian* or centenarian* or supercentenarian* or veteran*)) OR AB ((aged or aging or ageing or elder* or ((old or retired) N2 (people* or patient* or inpatient* or in-patient* or outpatient* or out-patient* or client* or person* or individual* or wom#n or man or men or age)) or older* or geriatr* or gerontolog* or senior* or senescen* or retiree* or sexagenarian* or septuagenarian* or octagenarian* or nonagenarian* or centenarian* or supercentenarian* or veteran*))
S17	S4 OR S5 OR S6 OR S7 OR S8 OR S9 OR S10 OR S11 OR S12 OR S13 OR S14 OR S15 OR S16
S16	TI personal digital assistant OR AB personal digital assistant
S15	TI self-help device* OR AB self-help device*
S14	TI (((handheld or hand held) N1 (device* or computer*))) OR AB (((handheld or hand held) N1 (device* or computer*)))
S13	TI (((cell or mobile) N2 (phone* or device*))) OR AB (((cell or mobile) N2 (phone* or device*)))
S12	TI pocket PC OR AB pocket PC
S11	TI palm pilot OR AB palm pilot
S10	TI palm computer* OR AB palm computer*
S9	TI ((smartphone* or smart-phone* or tablet or tablets or (digital N1 tool*) or (mobile N1 application*))) OR AB ((smartphone* or smart-phone* or tablet or tablets or (digital N1 tool*) or (mobile N1 application*)))
S8	TI compensatory aid* OR AB compensatory aid*
S7	TI digital memory notebook* OR AB digital memory notebook*
S6	TI calendar-based technolog* OR AB calendar-based technolog*

Table A1. Cont.

#	Query
S5	(MH “Mobile Applications”)
S4	(MH “Computers, Hand-Held+”) OR (MH “Cellular Phone”)
S3	S1 OR S2
S2	TI (((cognit* or mental) N2 (defect* or decline or declines or disorder or disorders or dysfunction or dysfunctions or impairment or impairments or disability or disabilities))) OR AB (((cognit* or mental) N2 (defect* or decline or declines or disorder or disorders or dysfunction or dysfunctions or impairment or impairments or disability or disabilities)))
S1	(MH “Mild Cognitive Impairment”)

References

- Petersen, R.C. Normal Aging, Mild Cognitive Impairment and Alzheimer’s Disease. *Neurologist* **1995**, *4*, 326–344.
- Bai, W.; Chen, P.; Cai, H.; Zhang, Q.; Su, Z.; Cheung, T.; Jackson, T.; Sha, S.; Xiang, Y.-T. Worldwide Prevalence of Mild Cognitive Impairment among Community Dwellers Aged 50 Years and Older: A Meta-Analysis and Systematic Review of Epidemiology Studies. *Age Ageing* **2022**, *51*, afac173. [\[CrossRef\]](#)
- Rajan, K.B.; Weuve, J.; Barnes, L.L.; McAninch, E.A.; Wilson, R.S.; Evans, D.A. Population Estimate of People with Clinical AD and Mild Cognitive Impairment in the United States (2020–2060). *Alzheimer’s Dement.* **2021**, *17*, 1966–1975. [\[CrossRef\]](#)
- Watt, J.A.; Isaranuwatthai, W.; Grossman, L.; Straus, S.E. Disease-Modifying Drugs for Alzheimer Disease: Implications for People in Canada. *CMAJ* **2023**, *195*, E1446–E1448. [\[CrossRef\]](#) [\[PubMed\]](#)
- Fitzpatrick-Lewis, D.; Warren, R.; Ali, M.U.; Sherifali, D.; Raina, P. Treatment for Mild Cognitive Impairment: A Systematic Review and Meta-Analysis. *Can. Med. Assoc. Open Access J.* **2015**, *3*, E419–E427. [\[CrossRef\]](#) [\[PubMed\]](#)
- Busse, A.; Angermeyer, M.C.; Riedel-Heller, S.G. Progression of Mild Cognitive Impairment to Dementia: A Challenge to Current Thinking. *Br. J. Psychiatry* **2006**, *189*, 399–404. [\[CrossRef\]](#)
- Jack, C.R.; Knopman, D.S.; Jagust, W.J.; Shaw, L.M.; Aisen, P.S.; Weiner, M.W.; Petersen, R.C.; Trojanowski, J.Q. Hypothetical Model of Dynamic Biomarkers of the Alzheimer’s Pathological Cascade. *Lancet Neurol.* **2010**, *9*, 119–128. [\[CrossRef\]](#)
- Chandler, J.M.; Rentz, D.M.; Zagar, A.; Kim, Y.; Schwartz, R.L.; Fillit, H. Disease Progression and Costs at the 3-Year Follow-up of the GERAS-US Study. *Alzheimer’s Dement. Diagn. Assess. Dis. Monit.* **2023**, *15*, e12430. [\[CrossRef\]](#)
- Robinson, R.L.; Rentz, D.M.; Andrews, J.S.; Zagar, A.; Kim, Y.; Bruemmer, V.; Schwartz, R.L.; Ye, W.; Fillit, H.M. Costs of Early Stage Alzheimer’s Disease in the United States: Cross-Sectional Analysis of a Prospective Cohort Study (GERAS-US)1. *J. Alzheimer’s Dis.* **2020**, *75*, 437–450. [\[CrossRef\]](#)
- Alzheimer Society of Canada Report Summaries: Prevalence and Monetary Costs of Dementia in Canada (2016): A Report by the Alzheimer Society of Canada Alzheimer Society of Canada. *Health Promot. Chronic Dis. Prev. Canada Res. Policy Pract.* **2016**, *36*, 231.
- Lin, P.-J.; Neumann, P.J. The Economics of Mild Cognitive Impairment. *Alzheimer’s Dement.* **2013**, *9*, 58–62. [\[CrossRef\]](#)
- Winblad, B.; Palmer, K.; Kivipelto, M.; Jelic, V.; Fratiglioni, L.; Wahlund, L.-O.; Nordberg, A.; Bäckman, L.; Albert, M.; Almkvist, O.; et al. Mild Cognitive Impairment—Beyond Controversies, towards a Consensus: Report of the International Working Group on Mild Cognitive Impairment. *J. Intern. Med.* **2004**, *256*, 240–246. [\[CrossRef\]](#)
- Petersen, R.C.; Caracciolo, B.; Brayne, C.; Gauthier, S.; Jelic, V.; Fratiglioni, L. Mild Cognitive Impairment: A Concept in Evolution. *J. Intern. Med.* **2014**, *275*, 214–228. [\[CrossRef\]](#) [\[PubMed\]](#)
- Liu, K.P.Y.; Chan, C.C.H.; Chu, M.M.L.; Ng, T.Y.L.; Chu, L.W.; Hui, F.S.L.; Yuen, H.K.; Fisher, A.G. Activities of Daily Living Performance in Dementia. *Acta Neurol. Scand.* **2007**, *116*, 91–95. [\[CrossRef\]](#) [\[PubMed\]](#)
- Rogers, W.A.; Fisk, A.D. Toward a Psychological Science of Advanced Technology Design for Older Adults. *J. Gerontol. Ser. B* **2010**, *65B*, 645–653. [\[CrossRef\]](#)
- Dieciuc, M.; Zhang, S.; Gray, N.; Lustria, M.L.A.; Carr, D.C.; Charness, N.; Boot, W.R. Terms of Engagement: Understanding the Motivations, Preferences, and Attitudes of Older Adults Toward Mobile Cognitive Assessment and Training. *Gerontol.* **2024**, *64*, gnad048. [\[CrossRef\]](#)
- Gaber, S.N.; Nygård, L.; Brorsson, A.; Kottorp, A.; Malinowsky, C. Everyday Technologies and Public Space Participation among People with and without Dementia. *Can. J. Occup. Ther.* **2019**, *86*, 400–411. [\[CrossRef\]](#) [\[PubMed\]](#)
- Vega, J.N.; Newhouse, P.A. Mild Cognitive Impairment: Diagnosis, Longitudinal Course, and Emerging Treatments. *Curr. Psychiatry Rep.* **2014**, *16*, 490. [\[CrossRef\]](#)
- Benge, J.F.; Kiselica, A.M.; Aguirre, A.; Hilsabeck, R.C.; Douglas, M.; Paydarfar, D.; Scullin, M.K. Technology Use and Subjective Cognitive Concerns in Older Adults. *Arch. Gerontol. Geriatr.* **2023**, *106*, 104877. [\[CrossRef\]](#)

20. Guzman-Parra, J.; Barnestein-Fonseca, P.; Guerrero-Pertiñez, G.; Anderberg, P.; Jimenez-Fernandez, L.; Valero-Moreno, E.; Goodman-Casanova, J.M.; Cuesta-Vargas, A.; Garolera, M.; Quintana, M.; et al. Attitudes and Use of Information and Communication Technologies in Older Adults With Mild Cognitive Impairment or Early Stages of Dementia and Their Caregivers: Cross-Sectional Study. *J. Med. Internet. Res.* **2020**, *22*, e17253. [\[CrossRef\]](#)
21. Andreassen, M.; Danielsson, H.; Hemmingsson, H.; Jaarsma, T. An Interactive Digital Calendar with Mobile Phone Reminders (RemindMe) for People with Cognitive Impairment: A Pilot Randomized Controlled Trial. *Scand. J. Occup. Ther.* **2022**, *29*, 270–281. [\[CrossRef\]](#)
22. Benge, J.F.; Dinh, K.L.; Logue, E.; Phenis, R.; Dasse, M.N.; Scullin, M.K. The Smartphone in the Memory Clinic: A Study of Patient and Care Partner's Utilisation Habits. *Neuropsychol. Rehabil.* **2020**, *30*, 101–115. [\[CrossRef\]](#)
23. Arksey, H.; O'Malley, L. Scoping Studies: Towards a Methodological Framework. *Int. J. Soc. Res. Methodol.* **2005**. [\[CrossRef\]](#)
24. Peters, M.D.J.; Godfrey, C.M.; Khalil, H.; McInerney, P.; Parker, D.; Soares, C.B. Guidance for Conducting Systematic Scoping Reviews. *Int. J. Evid. Based Health* **2015**, *13*, 141–146. [\[CrossRef\]](#)
25. Petersen, R.C. Mild Cognitive Impairment as a Diagnostic Entity. *J. Intern. Med.* **2004**, *256*, 183–194. [\[CrossRef\]](#) [\[PubMed\]](#)
26. Hsieh, H.-F.; Shannon, S.E. Three Approaches to Qualitative Content Analysis. *Qual. Health Res.* **2005**, *15*, 1277–1288. [\[CrossRef\]](#)
27. Tricco, A.C.; Lillie, E.; Zarin, W.; O'Brien, K.K.; Colquhoun, H.; Levac, D.; Moher, D.; Peters, M.D.J.; Horsley, T.; Weeks, L.; et al. PRISMA Extension for Scoping Reviews (PRISMA-ScR): Checklist and Explanation. *Ann. Intern. Med.* **2018**, *169*, 467–473. [\[CrossRef\]](#)
28. Baric, V.; Andreassen, M.; Öhman, A.; Hemmingsson, H. Using an Interactive Digital Calendar with Mobile Phone Reminders by Senior People—A Focus Group Study. *BMC Geriatr.* **2019**, *19*, 116. [\[CrossRef\]](#) [\[PubMed\]](#)
29. Hackett, K.; Lehman, S.; Divers, R.; Ambrogi, M.; Gomes, L.; Tan, C.C.; Giovannetti, T. Remind Me to Remember: A Pilot Study of a Novel Smartphone Reminder Application for Older Adults with Dementia and Mild Cognitive Impairment. *Neuropsychol. Rehabil.* **2022**, *32*, 22–50. [\[CrossRef\]](#) [\[PubMed\]](#)
30. Scullin, M.K.; Jones, W.E.; Phenis, R.; Beevers, S.; Rosen, S.; Dinh, K.; Kiselica, A.; Keefe, F.J.; Benge, J.F. Using Smartphone Technology to Improve Prospective Memory Functioning: A Randomized Controlled Trial. *J. Am. Geriatr. Soc.* **2022**, *70*, 459–469. [\[CrossRef\]](#)
31. Nishiura, Y.; Nihei, M.; Nakamura-Thomas, H.; Inoue, T. Effectiveness of Using Assistive Technology for Time Orientation and Memory, in Older Adults with or without Dementia. *Disabil. Rehabil. Assist. Technol.* **2021**, *16*, 472–478. [\[CrossRef\]](#)
32. Pang, Y.; Kim, O. Effects of Smartphone-Based Compensatory Cognitive Training and Physical Activity on Cognition, Depression, and Self-Esteem in Women with Subjective Cognitive Decline. *Brain Sci.* **2021**, *11*, 1029. [\[CrossRef\]](#)
33. Raghunath, N.; Dahmen, J.; Brown, K.; Cook, D.; Schmitter-Edgecombe, M. Creating a Digital Memory Notebook Application for Individuals with Mild Cognitive Impairment to Support Everyday Functioning. *Disabil. Rehabil. Assist. Technol.* **2020**, *15*, 421–431. [\[CrossRef\]](#)
34. Boatman, F.; Golden, M.; Jin, J.; Kim, Y.; Law, S.; Lu, A.; Merriam, N.; Zola, S. Assistive Technology: Visual Mapping Combined with Mobile Software Can Enhance Quality of Life and Ability to Carry out Activities of Daily Living in Individuals with Impaired Memory. *Technol. Health Care* **2020**, *28*, 121–128. [\[CrossRef\]](#)
35. Schmitter-Edgecombe, M.; Brown, K.; Luna, C.; Chilton, R.; Sumida, C.A.; Holder, L.; Cook, D. Partnering a Compensatory Application with Activity-Aware Prompting to Improve Use in Individuals with Amnesic Mild Cognitive Impairment: A Randomized Controlled Pilot Clinical Trial. *J. Alzheimer's Dis.* **2022**, *85*, 73–90. [\[CrossRef\]](#) [\[PubMed\]](#)
36. Harris, M.T.; Rogers, W.A. Developing a Healthcare Technology Acceptance Model (H-TAM) for Older Adults with Hypertension. *Ageing Soc.* **2023**, *43*, 814–834. [\[CrossRef\]](#)
37. Shang, X.; Liu, Z.; Gong, C.; Hu, Z.; Wu, Y.; Wang, C. Knowledge Mapping and Evolution of Research on Older Adults' Technology Acceptance: A Bibliometric Study from 2013 to 2023. *Humanit. Soc. Sci. Commun.* **2024**, *11*, 1115. [\[CrossRef\]](#)
38. Zubatiy, T.; Vickers, K.L.; Saurman, J.L.; Goldstein, F.; Rodriguez, A.; Mathur, N.; Mynatt, E. A Distributed Cognition Approach to Understanding Compensatory Calendaring Cognitive Systems of Older Adults with Mild Cognitive Impairment and Their Care Partners. In Proceedings of the 15th International Conference on Ubiquitous Computing & Ambient Intelligence (UCAmI 2023), Riviera Maya, Mexico, 28–30 November 2023; Springer: Cham, Switzerland, 2023; pp. 190–201.
39. Shin, Y.; Barankevich, R.; Lee, J.; Kalantari, S. PENCODER: Design for Prospective Memory and Older Adults. In Proceedings of the Extended Abstracts of the 2021 CHI Conference on Human Factors in Computing Systems, Virtual, 8–13 May 2021; Association for Computing Machinery: New York, NY, USA, 2021; pp. 1–7.
40. Luna, C.; Cook, D.J.; Schmitter-Edgecombe, M. But Will They Use It? Predictors of Adoption of an Electronic Memory Aid in Individuals with Amnesic Mild Cognitive Impairment. *Neuropsychology* **2023**, *37*, 955–965. [\[CrossRef\]](#) [\[PubMed\]](#)
41. Chudoba, L.A.; Church, A.S.; Dahmen, J.B.; Brown, K.D.; Schmitter-Edgecombe, M. The Development of a Manual-Based Digital Memory Notebook Intervention with Case Study Illustrations. *Neuropsychol. Rehabil.* **2020**, *30*, 1829–1851. [\[CrossRef\]](#)
42. Lanzi, A.; Bourgeois, M.S. Structured External Memory Aid Treatment for Mild Cognitive Impairment. *Am. J. Speech Lang. Pathol.* **2020**, *29*, 474–484. [\[CrossRef\]](#)

43. Lanzi, A.; Wallace, S.E.; Bourgeois, M. Group External Memory Aid Treatment for Mild Cognitive Impairment. *Aphasiology* **2019**, *33*, 320–336. [[CrossRef](#)]
44. Lanzi, A.M.; Saylor, A.K.; Dedrick, R.F.; Bourgeois, M.S.; Cohen, M.L. The Functional External Memory Aid Tool Version 2.0: A How-To Clinical Guide. *Am. J. Speech-Lang. Pathol.* **2023**, *32*, 96–106. [[CrossRef](#)] [[PubMed](#)]
45. Public Health Agency of Canada. A Dementia Strategy for Canada: Together We Achieve—2023 Annual Report. Available online: <https://www.canada.ca/en/public-health/services/publications/diseases-conditions/dementia-strategy-annual-report-parliament-2023.html> (accessed on 28 October 2024).
46. Astell, A.J.; Bouranis, N.; Hoey, J.; Lindauer, A.; Mihailidis, A.; Nugent, C.; Robillard, J.M. Technology and Dementia: The Future Is Now. *Dement. Geriatr. Cogn. Disord.* **2019**, *47*, 131. [[CrossRef](#)] [[PubMed](#)]

Disclaimer/Publisher’s Note: The statements, opinions and data contained in all publications are solely those of the individual author(s) and contributor(s) and not of MDPI and/or the editor(s). MDPI and/or the editor(s) disclaim responsibility for any injury to people or property resulting from any ideas, methods, instructions or products referred to in the content.