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Digital Health Interventions for the Whole-Process Management of Alzheimer's Disease Continuum: A Scoping Review

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ADMINISTRATIVE INFORMATION

Support - No support.

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Conflicts of interest - None declared.

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Amendments - This protocol was registered with the International Platform of Registered Systematic Review and Meta-Analysis Protocols (INPLASY) on 14 September 2026 and was last updated on 14 September 2026.

INTRODUCTION

Review question / Objective To systematically map the application, technological modalities, and intervention effects of digital health technologies across the Alzheimer's disease (AD) continuum—from subjective cognitive decline (SCD) and mild cognitive impairment (MCI) to clinical dementia—to establish a robust evidence base for AD prevention and chronic disease management.

Background Population ageing has made Alzheimer's disease (AD), subjective cognitive decline (SCD) and mild cognitive impairment (MCI) a heavy global healthcare burden. Available drug therapies for cognitive decline only produce modest benefits and carry risks of side effects, which makes non-pharmacological strategies an area of rising research interest.

Digital health tools such as virtual reality, mobile health applications, telerehabilitation and AI-supported systems have been increasingly tested for cognitive intervention. Still, few works systematically sort out technical approaches, real-world application and intervention effects across the full AD spectrum covering SCD, MCI and dementia. This scoping review intends to summarise existing evidence to inform prevention and long-term clinical care for people with cognitive impairment.

Rationale Although numerous primary studies have tested diverse digital-health interventions for cognitive impairment along the Alzheimer's disease continuum, relevant evidence is widely scattered. Existing reviews mostly focus on single-type digital tools or only target one specific disease stage such as MCI, without providing a panoramic overview covering SCD, MCI and clinical dementia together.

Given the high heterogeneity among primary studies, including varied technical forms, intervention durations, outcome indicators and inconsistent reporting quality, a conventional systematic review with meta-analysis is not suitable at present, since quantitative synthesis cannot be reasonably performed.

A scoping-review methodology is appropriate for mapping broad, heterogeneous evidence, describing the distribution of study characteristics, sorting intervention modalities and identifying existing research gaps. This scoping review will fill the above-mentioned knowledge gap. Its outputs can help researchers understand the overall status of this field and guide the design of future original studies, as well as inform clinical decision-making for digital-health cognitive care.

METHODS

Strategy of data synthesis This scoping review will follow the PRISMA-ScR guidelines and adopt descriptive analytical methods. Given the expected high heterogeneity among the included primary studies, we will not conduct meta-analysis or quantitative effect size pooling in this review.

We will extract key information from eligible studies and sort the data into structured tables. The extracted content mainly includes basic study information, participant characteristics, types of adopted digital health technologies, specific intervention parameters and corresponding outcome indicators. For categorical variables, we will calculate and organise their frequencies and proportions. For continuous variables such as sample size and intervention duration, we will report the minimum value, maximum value, median, mean and standard deviation.

We will further analyse how digital health interventions are distributed across different stages of the Alzheimer's disease continuum, covering SCD, MCI and dementia. A narrative synthesis will be used to sort out common intervention forms, practical implementation patterns and actual intervention effects. Based on the summarised evidence, we will conclude and discuss existing research gaps in this field.

In terms of result presentation, we will adopt multiple visual forms including study flow diagrams, bar charts and summary tables to clearly demonstrate the overall research status and characteristics of the included literature.

Eligibility criteria Participants: This review focuses on populations across the full Alzheimer's disease (AD) continuum, including individuals with subjective cognitive decline (SCD), mild cognitive impairment (MCI), and clinically diagnosed AD patients. Eligible studies should adopt authoritative diagnostic criteria, such as DSM-IV, NINCDS-ADRDA, ICD-11 and NIA-AA. Participants with AD-related cognitive, physical or psychological dysfunction are all acceptable. Studies involving mixed disease populations are included if AD-related subgroups can be clearly distinguished. No limitations are set on participants' age, gender, ethnicity and disease severity.

Concept: This review includes digital health interventions for the prevention, rehabilitation and long-term clinical management of AD. Eligible digital technologies cover multiple common types: telemedicine and telerehabilitation, virtual/augmented/mixed reality cognitive training, serious cognitive games, wearable monitoring devices, smart home sensors, mobile health applications, AI-assisted intervention systems and online medical communication platforms. These interventions can be used independently or combined with conventional medication and routine nursing. Qualified studies must report specific intervention processes and valid outcomes related to application status, implementation effect or clinical performance. Studies only adopting digital tools for AD diagnosis and biomarker analysis, without practical intervention applications, will be excluded.

Context: There are no restrictions on research settings and publication languages. All original primary studies are eligible, including randomized controlled trials, quasi-experimental studies, observational studies, mixed-method and qualitative studies. Exclusion criteria are as follows: studies on non-AD dementia and irrelevant cognitive impairment; studies lacking original experimental data or only publishing research protocols; reviews, conference abstracts, editorials, letters and animal experiments; studies with consistent digital interventions in both experimental and control groups that fail to reflect independent intervention effects.

Source of evidence screening and selection Evidence sources in this scoping review consist of five commonly used Chinese and English databases. Chinese databases include CNKI, Wanfang Data, VIP and SinoMed, while English databases cover PubMed.

All eligible literature will be independently screened by two reviewers. The screening process is divided into two stages: initial screening based on titles and abstracts, and secondary screening by reading the full text strictly according to the predefined PCC eligibility criteria. Irrelevant, non-original and unqualified literature will be eliminated step by step.

Any inconsistencies during the screening process will be resolved through mutual discussion. If consensus cannot be reached, a third professional reviewer will participate in the judgment to ensure the accuracy and standardization of literature selection. No manual language or regional

restrictions will be imposed during the screening process.

Data management All literature retrieved from databases will be imported into Endnote to remove duplicate records. Two reviewers will independently extract relevant data from the included studies according to a unified pre-designed data extraction form. Basic information, study characteristics, intervention details and key outcomes of each eligible study will be sorted and recorded systematically.
Extracted data will be cross-checked by the two reviewers. Minor discrepancies will be settled through discussion. Unresolved disagreements will be judged by a third researcher. All original extracted data will be properly saved and organized in standard Excel tables to ensure data integrity, traceability and consistency throughout the review process.

Language restriction No language restriction was imposed in the search strategy.

Country(ies) involved China.

Keywords Alzheimer's disease, cognitive impairment, digital health, digital intervention, telerehabilitation.

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