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Review

Evidence for health promotion interventions to improve cognitive and physical functioning outcomes in older adults with MCI: A state-of-the-art review

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HIGHLIGHTS

- State-of-the-art review synthesising the current evidence for health promotion interventions in older adults with MCI.
- Dementia prevention through health promotion is increasing.
- Intervening in a high-risk group is important to ensure healthy ageing.
- Multicomponent exercise conducted alongside cognitive training has most evidence for improving cognitive outcomes.
- More evidence needed for nutrition, psychological, and social interventions.

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Behaviour change
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ABSTRACT

Background: Health promotion activities for people with mild cognitive impairment (MCI) may improve their overall health and prevent progression to dementia. We need to understand the best approaches to behaviour change in this population.

Aim: To summarise the types of health promotion interventions and current clinical effectiveness evidence for physical and cognitive functioning outcomes in people with MCI.

Design: State-of-the art review

Method: Medline was searched in April 2025, for systematic reviews synthesising randomised controlled trials testing effectiveness of health promotion interventions in older adults with MCI, published since 2015. Abstracts, titles, and full texts were single screened and, for eligible reviews, the characteristics, intervention type, primary outcome, and evidence for people with MCI, were extracted. Key messages were narratively synthesised across reviews, grouping by type of intervention and outcome measure.

Results: From 1776 titles and abstracts, 57 systematic reviews were eligible. Regular moderate intensity multi-component physical exercise and memory-focussed cognitive training interventions had the strongest evidence base for improving cognitive functioning. However, combining physical exercise and cognitive training was more beneficial for cognitive domains and physical functioning, in comparison to doing them individually. The evidence for nutrition interventions was mixed. One review of psychological interventions showed improvements for wellbeing.

Conclusion: There is evidence that health promotion interventions can support people with MCI and dementia to improve or maintain their cognitive function, through multicomponent physical activity combined with cognitive training. More evidence is needed for nutritional recommendations, psychological interventions, and social inclusion interventions.

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1. Introduction

Mild Cognitive Impairment (MCI) is an intermediate cognitive stage between healthy cognitive ageing and dementia (Nasreddine et al., 2005). MCI is characterised as experiencing subjective memory complaints (SMC) alongside objective cognitive decline, measured using cognitive tests, which do not interfere with an individual's ability to carry out daily activities, such as forgetting names and past events (Gauthier et al., 2006; Winblad et al., 2004). In 2015, the Alzheimer's Society estimated 5–20 % of people over 65 experience MCI in the UK. This prevalence increases as people age, with age specific reports suggesting an increase from 6.7 % in those 60–64 to 25.2 % in those 80–84 (Petersen et al., 2018). Whilst MCI can remain stable or revert to healthy cognitive functioning, there is five times increased risk in those with MCI to progress to develop dementia, particularly Alzheimer's disease (Gauthier et al., 2006; Petersen et al., 2018; Sachdev et al., 2014; Mitchell & Shiri-Feshki, 2009). MCI in older adults is associated with poorer physical health and social and psychological wellbeing, lower quality of life and increased risk of depression and anxiety (Gauthier et al., 2006; Garand et al., 2005; Brenowitz et al., 2014). These impacts mean people with MCI have higher healthcare utilisation, resulting in increased healthcare costs (Gannon et al., 2018).

Health promotion interventions support older adults to increase the control they have over their health to improve health outcomes and live well for longer (World Health Organization, 2023). Current evidence highlights that whilst we are increasing longevity, the time spent in good health is limited. The World Health Organization decade of healthy ageing is an international collaboration, which aims to improve the lives of older adults, their families and their communities through evidence driven initiatives and interventions to improve outcomes (World Health Organization, 2021). The summary of the evidence for health promotion in older adults found just 20 RCTs and 7 systematic reviews for a range of functioning outcomes (Welch et al., 2021). Delivering health promotion interventions to people with MCI can help to improve health outcomes and prevent progression to dementia (Ngandu et al., 2015; Biazus-Sehn et al., 2020; Van Den Brink et al., 2019; Hughes et al., 2013). Some reviews have explored physical activity and cognitive training interventions specifically targeting people with MCI, which showed some evidence of effectiveness for cognitive functioning (Olanrewaju et al., 2016; Rodakowski et al., 2015). However, the evidence for the effectiveness of different potential components of interventions aiming to improve healthy behaviours and reduce dementia risk in people with MCI appears to be mixed, and the field is rapidly evolving to include several recent and ongoing studies.

Therefore, we conducted a state-of-the-art review to summarise the types of health promotion interventions and current evidence of clinical effectiveness for physical and cognitive functioning outcomes in people with MCI.

2. Methods

2.1. Eligibility criteria

Inclusion criteria: Systematic reviews summarising the evidence of RCTs were eligible for inclusion, if focussed on health promotion interventions being delivered to people with MCI. For MCI, we included reviews which discussed SMC, MCI, pre-dementia, and early stages of dementia or any combination of these for older adults living in the community. For health promotion, we included all types that targeted any potential modifiable risk factor for physical or cognitive functioning outcomes, including any form of physical activity, social inclusion, psychological wellbeing, cognitive training, smoking cessation, alcohol reduction, education, etc. Reviews had to be published since 2015, in line with state-of-the-art review methodology (Grant & Booth, 2009), keeping focussed to current advances in the field, but RCTs reported within the reviews could have been published at any timepoint.

Exclusion criteria: Studies that did not differentiate findings for those with MCI or on people in hospital settings only. Non-systematic reviews, or systematic reviews which included evidence that were not RCTs. Reviews published before 1st January 2015. Reviews were not excluded based on language, but no non-English articles were identified.

2.2. Search strategy

Medline was searched on 10th April 2025 using comprehensive search terms for MCI, health promotion, and reviews, which were combined with the Boolean operators 'AND' and 'OR' (Supplementary figure 1). We also conducted forward and backward citation searching of the included articles.

2.3. Screening and data extraction

TR reviewed all titles, abstracts, and full texts, for eligibility. TR extracted all information from included reviews into an Excel spreadsheet, including the systematic reviews included studies characteristics (dates, sample, quality), intervention types(s), primary outcome, and evidence for people with MCI.

2.4. Synthesis and quality assessment

In line with state-of-the-art review methodology (Grant & Booth, 2009), TR narratively synthesised review findings, grouped by intervention type and outcome measure. Key messages regarding consistent and conflicting findings and future recommendations were developed. No formal quality assessment of the systematic reviews themselves was conducted. However, the overall quality assessment of the RCTs included in each systematic review, as rated by the systematic review authors was extracted and reported but this rating did not influence synthesis (Grant & Booth, 2009).

3. Results

After searching and deduplication 1776 papers were identified, and 57 systematic reviews were included after screening (Fig. 1). Forty-six reviews explored the effects on people with MCI only, and 11 included people with MCI and dementia. Reviews were published in 2015–2025, including RCTs published 1985–2024. 1271 RCTs, 587 of which were unique, were included in the 57 reviews, with 104,094 participants. Characteristics of the included studies can be found in Supplementary Table 1.

Summarising the overall quality of RCTs within each review, as assessed by original reviewers, 14 reviews had low or low-moderate quality evidence, 20 moderate or moderate-good quality, and nine good or good-excellent quality evidence. In three reviews quality of the included RCTs was not reported. The quality of the RCTs in each review can be seen in Supplementary Table 1. Twenty-six reviews explored physical exercise interventions, eight cognitive training, 12 combined physical exercise and cognitive training, two nutrition, and nine explored general non-pharmacological interventions. Table 1 shows review characteristics by intervention type.

3.1. Physical exercise

Twenty-six systematic reviews evaluated physical exercise interventions in people with MCI, with 24 conducting meta-analyses (Akalp et al., 2024; Biazus-Sehn et al., 2020; Braz de Oliveira et al., 2023; Chan et al., 2015; Chen et al., 2024; Chen et al., 2024; Deng et al., 2024; Dieckelmann et al., 2023; Han et al., 2023; Huang et al., 2022; Jia et al., 2025; Leng et al., 2018; Lewis et al., 2017; Li et al., 2024; Li et al., 2022; Li et al., 2024; Lin et al., 2023; Venegas-Sanabria et al., 2022; Wu et al., 2021; Yang et al., 2023; Yu et al., 2024; Yu et al., 2021; Zhang et al., 2019; Zhou & Da, 2022; Zhu et al., 2020; Racey et al., 2021),

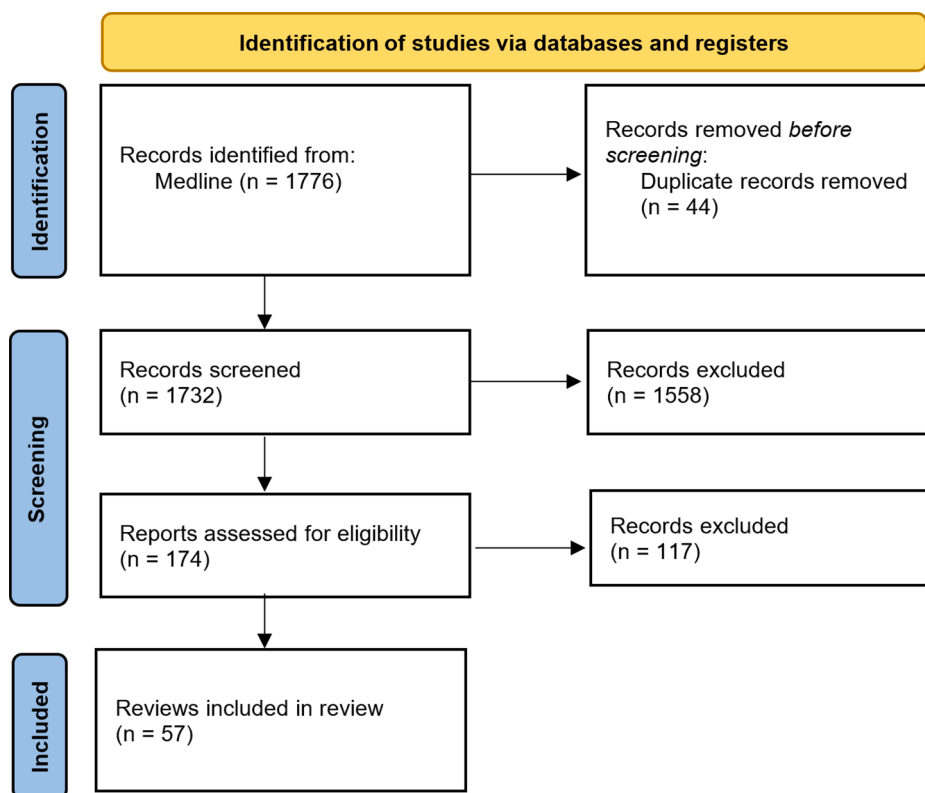


Fig. 1. PRISMA 2020 flow diagram for state-of-the-art reviews (Page et al., 2021).

Table 1

Characteristics of the reviews included for each intervention type.

Intervention type	Number of reviews	Years reviews published	Years included RCTs published	Number of RCTs* (range)	Number of participants
Physical exercise	26	2015–2025	2005–2024	503 (5–72)	38,640
Cognitive training	8	2017–2024	2007–2024	156 (7–32)	9488
Physical exercise and cognitive training	12	2016–2025	2005–2024	192 (4–49)	20,678
Nutrition	2	2018	2005–2017	48 (16–32)	5793
Non-pharmacological interventions	9	2018–2024	1985–2024	372 (18–121)	29,495

* These totals include duplicates across reviews.

including five rated good or good-excellent, 14 moderate or moderate-good, and seven low or low-moderate quality. Many reviews compared the effects of various forms of exercise (such as aerobic, resistance, multi-component) ($n = 19$), with some focussing on dance ($n = 2$), traditional Chinese exercise ($n = 3$), walking ($n = 1$), and aerobic only ($n = 1$).

Overall evidence supported benefits for cognition, particularly global cognition, with the strongest and most consistent effects observed for multicomponent exercise (Han et al., 2023; Huang et al., 2022; Jia et al., 2025; Yang et al., 2023). Aerobic and resistance training also showed positive effects, though findings varied and optimal modalities remain unclear (Akalp et al., 2024; Han et al., 2023; Huang et al., 2022; Jia et al., 2025; Yang et al., 2023). Evidence for traditional Chinese exercises was mixed, with some reviews reporting moderate benefits (Yu et al., 2021) but others finding minimal or inconsistent effects (Zhang et al., 2019). Walking interventions did not improve cognition but enhanced mobility outcomes (Lin et al., 2023). Effects on falls, depressive symptoms, quality of life, and physical function were inconsistent (Chan et al., 2015; Lin et al., 2023; Racey et al., 2021). In summary, physical exercise appears beneficial for cognition, with multicomponent interventions showing the most consistent advantages, although uncertainty remains regarding the superiority of specific modalities.

3.2. Cognitive training

Eight systematic reviews explored cognitive training interventions (Gómez-Soria et al., 2021; Jeong et al., 2025; Kletzel et al., 2021; Li et al., 2022; Sherman et al., 2020; Sherman et al., 2017; Wei et al., 2024; Zhang et al., 2019), with six conducting meta-analyses. The overall quality of the evidence was moderate, with two reviews rating the studies as good quality, three moderate or moderate-good, and one low quality, with unclear quality in two reviews.

Good-quality reviews demonstrated moderate benefits for global cognition (Jeong et al., 2025; Li et al., 2022), but other reviews found only small or no effects (Kletzel et al., 2021; Zhang et al., 2019). Non-computerised training also showed variable effects with generally low or unclear-quality evidence (Sherman et al., 2020; Wei et al., 2024). Overall, cognitive training may support cognitive function in MCI, but findings remain mixed.

3.3. Physical exercise and cognitive training

Twelve systematic reviews examined combined physical exercise and cognitive training (Ali et al., 2022; Booth et al., 2016; Gómez-Soria et al., 2022; Lipardo et al., 2017; Ba & Kim, 2022; Muñoz-Perete et al., 2025; Wati et al., 2024; Xu et al., 2021; Xue et al., 2023; Yang et al., 2020; Yi et al., 2024; Zawaly et al., 2022), with seven conducting

meta-analyses. The quality of the RCTs included in the reviews was mixed, with three rated as good or good-excellent, five rated as moderate or moderate-good, and four rated as low or low-moderate.

The evidence generally indicated greater benefits for global cognition and physical function (e.g., gait speed and balance) compared to exercise alone (Booth et al., 2016; Lipardo et al., 2017; Ba & Kim, 2022; Wati et al., 2024; Yang et al., 2020). These findings were supported by meta-analyses showing small-to-moderate effect sizes (Booth et al., 2016). No consistent advantage was found for simultaneous delivery within the same session versus sequential delivery of the two components (Yi et al., 2024). As with exercise alone, evidence for falls prevention was inconclusive (Ba & Kim, 2022). Taken together, combined approaches appear to enhance both cognition and physical functioning in MCI, with flexibility in delivery.

3.4. Nutrition

Two reviews investigated nutritional interventions, including dietary patterns, supplements, and nutrient intake (Mcgrattan et al., 2018; Solfrizzi et al., 2018). Both reviews were rated as moderate or moderate-good in quality and did not conduct meta-analyses due to intervention heterogeneity. Evidence suggested small potential cognitive improvements, but overall, the evidence was limited, and the findings were inconclusive. Compared with other intervention types, nutrition is under-researched, with insufficient evidence to support firm conclusions.

3.5. General non-pharmacological interventions

Nine systematic reviews explored combined non-pharmacological interventions (Bhome et al., 2018; Ding et al., 2023; Liu et al., 2023; Wang et al., 2023; Peng et al., 2024; Shao et al., 2022; Sheng et al., 2020; Venegas-Sanabria et al., 2024; Zou et al., 2024), with six conducting meta-analyses. Evidence quality in the reviews was quite low, with one good quality, two moderate or moderate-good, four low or low-moderate and two unclear. The non-pharmacological interventions combined intervention types, such as physical exercise, cognitive training, nutrition, psychological wellbeing, and medication adherence.

Multicomponent physical exercise consistently emerged as the most beneficial component for global cognition (Ding et al., 2023; Shao et al., 2022), while cognitive, nutritional, and psychological interventions showed smaller or inconsistent effects (Bhome et al., 2018; Peng et al., 2024; Shao et al., 2022; Sheng et al., 2020). Psychological interventions showed small improvements in psychological wellbeing and global cognition outcomes (Bhome et al., 2018; Sheng et al., 2020). Some reviews suggested additional gains from physical-cognitive rehabilitation, music therapy, and art therapy, though these were based on low-to-moderate quality studies (Wang et al., 2023; Venegas-Sanabria et al., 2024). Overall, multidomain non-pharmacological approaches show promise, but the evidence is highly variable and limited by low study quality.

4. Discussion

In this state-of-the-art review of 57 systematic reviews, regular moderate intensity multicomponent physical exercise interventions had the strongest evidence base of physical exercise interventions for improving cognitive functioning. Cognitive training had the strongest evidence for improving overall and domain-specific cognition. However, combining physical exercise and cognitive training seemed to be more beneficial for cognitive domains and physical functioning, in comparison to doing them individually. The evidence for nutrition interventions was less convincing, with no evidence for improving cognition, but some evidence that these could improve cognitive frailty outcomes. One review of psychological interventions showed improvements for wellbeing.

4.1. Research in context

Multicomponent physical exercise interventions have a strong evidence base for supporting the wider population to engage in more physical activity and improve outcomes, including mortality and quality of life (Posadzki et al., 2020). These improvements in health outcomes have also been seen in older adults with both MCI and dementia, for both physical and cognitive functioning (Chen et al., 2024; Li et al., 2024; Jeong et al., 2025; Ali et al., 2022). The findings from this review confirm these benefits but suggest that greater improvements in both cognitive and physical functioning could occur when multicomponent physical exercise and cognitive training are combined in one intervention, where the exercises can be done simultaneously or sequentially to see the benefits (Yi et al., 2024).

There was less evidence, RCTs and systematic reviews, testing the effectiveness of nutrition, psychological, and social interventions. There was limited, mixed evidence of effectiveness for nutrition interventions, with no meta-analyses conducted. In a review of 56 observational and trial papers in the general population, higher adherence to the Mediterranean, Dietary Approaches to Stop Hypertension (DASH), or Mediterranean-DASH Intervention for Neurodegenerative Delay (MIND) diets were associated with less cognitive decline and a lower risk of dementia, with the strongest evidence for the MIND diet (Van Den Brink et al., 2019). Therefore, dietary interventions may be more effective at preventing cognitive decline in those with healthy cognition, but effects once cognitive decline has begun may be smaller.

In the review by Bhome et al. (2018) comparing different intervention domains, only three RCTs testing psychological interventions were identified and included in meta-analyses (Bhome et al., 2018). Whilst these showed benefits for improving psychological wellbeing outcomes, this highlights the limited evidence exploring psychological interventions to support people with MCI. There were no reviews identified which looked specifically at RCTs testing the effectiveness of social interventions to support people with MCI. One reason for this lack of evidence may be that social inclusion is heterogeneous and is defined, operationalised, and measured in many different ways, making it difficult to compare across RCTs through systematic reviews and meta-analyses (Cordier et al., 2017; Brik & Brown, 2025). Defining these concepts and measures of social inclusion would support intervention development, testing in RCTs, and implementation to improve outcomes (Brik & Brown, 2025). Some of the benefits observed in group-based physical exercise interventions are often attributed to the social support component (Chen et al., 2023). The importance of promoting social participation has been highlighted as an essential component in healthy ageing interventions, especially for people with cognitive impairment where social isolation is higher (Townsend et al., 2021). Therefore, more RCTs are needed to explore the role social participation plays in the benefits of group interventions and refine or develop these interventions to maximise the impact social inclusion can have on improving cognitive and physical functioning, and wellbeing outcomes.

4.2. Strengths and limitations

This state-of-the-art review included a thorough search strategy. Whilst lots of evidence was identified, only one database (Medline) was searched. Therefore, some relevant systematic reviews may not have been included. However, the purpose of the state-of-the-art review methodology is not to capture the whole evidence base, but to synthesise established, high-quality evidence to draw out key insights and trends. Importantly, the included systematic reviews had searched multiple databases and incorporated global RCTs, which contributes to overcoming this limitation. Nonetheless, the findings should be interpreted with awareness that a broader database search might have yielded additional reviews and resulted in different conclusions.

In line with state-of-the-art review methodology, single screening and data extraction were conducted. There was therefore no checking

for potential unconscious bias whereby some reviews could have been excluded when they should have been included. Also, some of the reviews included participants with MCI and dementia, so some of the findings may not be specific to people with MCI.

This review only included systematic reviews of RCTs, as the primary objective was to identify and synthesise evidence on clinical effectiveness based on the most rigorous study designs available. Therefore, this approach inevitably excluded reviews of other study types (e.g. qualitative syntheses, reviews of observational studies, and process evaluations) that may offer valuable insights into complex or hard-to-evaluate interventions such as those targeting social inclusion.

4.3. Future research

This review only included systematic reviews of RCTs. Therefore, observational evidence of some intervention types which may be difficult to conduct RCTs in, e.g., broader social inclusion interventions, have not been included. Conducting RCTs with social inclusion interventions, or conducting a systematic review including RCTs, process evaluations, and observational research would be helpful to better understand how effective social inclusion interventions are for improving the cognitive and physical functioning outcomes of people with MCI.

5. Conclusion

There is evidence that health promotion interventions can support people with MCI to improve or maintain their cognitive function. Interventions that combine physical activity with cognitive training seem to have beneficial outcomes for both physical and cognitive functioning. We need more evidence on specific nutritional recommendations (diets, supplements, nutrients), psychological interventions, and social inclusion interventions.

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Data availability

The data that support the findings of this study are available from the corresponding author, TR, upon reasonable request.

CRedit authorship contribution statement

Tasmin Alanna Rookes: Writing – original draft, Project administration, Methodology, Investigation, Funding acquisition, Formal analysis, Data curation, Conceptualization. **Rachael Frost:** Writing – review & editing, Supervision, Conceptualization. **Louise Marston:** Writing – review & editing, Supervision. **Megan Armstrong:** Writing – review & editing, Supervision. **Yolanda Barrado-Martin:** Writing – review & editing, Supervision. **Kate Walters:** Writing – review & editing, Supervision, Conceptualization.

Declaration of competing interest

The authors declare the following financial interests/personal relationships which may be considered as potential competing interests:

Tasmin Rookes reports financial support was provided by National Institute for Health and Care Research School for Primary Care Research. If there are other authors, they declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

Supplementary materials

Supplementary material associated with this article can be found, in the online version, at [doi:10.1016/j.archger.2025.106049](https://doi.org/10.1016/j.archger.2025.106049).

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