FIGHTING DECLINE: A SYSTEMATIC REVIEW OF INTERVENTIONS TO IMPROVE LEARNING IN ADULTHOOD

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INTRODUCTION

Recent trends, including the rapid aging of the global population and the evolving demands of the modern workforce, underscore the need for effective interventions to support adult learning. Research in the Science of Learning (Privitera, Ng, & Chen, 2023) has explored this topics, providing valuable insights into supporting a productive and adaptable citizenry. However, much of the existing work remains fragmented across individual studies and narrowly focused reviews, precluding a comprehensive understanding of which interventions most effectively enhance learning.

OBJECTIVE

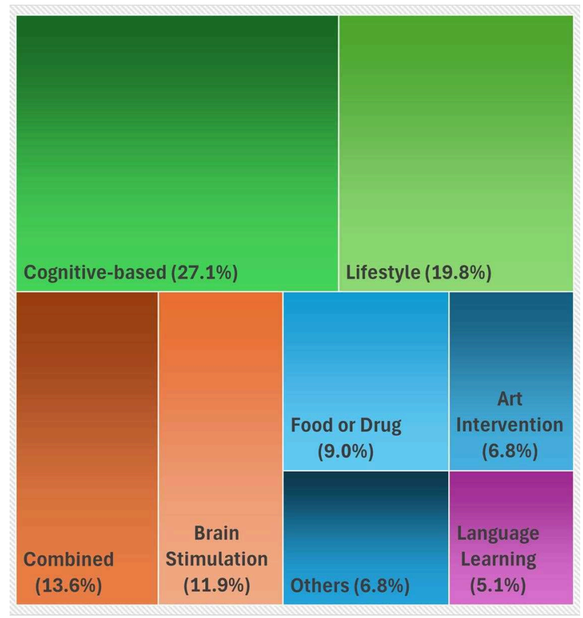
As part of a larger systematic review (Privitera, Ng & Chen, 2025), we aimed to identify and synthesize recent research on interventions designed to improve learning in healthy adults.

RESEARCH QUESTION:
Which interventions are effective in improving learning in healthy adults?

METHODOLOGY

- Following the methodology of a systematic review, we identified and synthesized recent cognitive and brain research on interventions to improve learning in healthy adults.
- Searches were performed on Scopus, Web of Science, and ProQuest databases for studies published or posted between January 1, 2012, and September 1, 2023.
- Studies conducted in healthy adults (age ≥ 20 years) reporting the effects of interventions to improve learning-related cognition or brain function/structure were included.
- A total of 177 intervention studies met our eligibility criteria.
- Risk of bias was assessed using either the Mixed Methods Appraisal Tool (MMAT) or the Critical Appraisal Skills Programme (CASP) checklist.
- **Findings were summarized using an effect direction plot accompanied by a narrative synthesis.**

Intervention Types



KEY FINDINGS & ACTIONABLE INSIGHTS

RESULTS

Our review identified a diverse range of interventions aimed at improving learning including lifestyle and cognitive-based interventions, brain stimulation, arts interventions, language learning, and food or drug interventions. Additionallly, we identified “other” interventions that could not be readily classified within these categories (e.g., AI-based intelligent tutor).

Effective Interventions Included:

Lifestyle Interventions
Aerobic and strength training consistently improved memory, processing speed, and executive function in older adults (e.g., Berryman et al., 2014).

Cognitive-based Interventions
Cognitive training programs, including those for working memory, showed some positive gains, with some effects transferring to new contexts (e.g., Strickland-Hughes & West, 2022).

Arts Interventions
Learning music or engaging in creative expression was linked to improvements in executive function, processing speed, and, in some cases, brain volume in learning-related regions. (e.g., Santos et al., 2020).

Other Interventions
AI-based intelligent tutor software consistently improved learning, self-regulated learning, and academic performance (e.g., Duffy & Azevedo, 2015).

Combined Interventions
Combining different approaches, such as physical exercise with cognitive training, tended to yield the greatest benefits (e.g., Takeuchi et al, 2020).

Note: *Not all interventions were equally effective and effectiveness was modulated by age, education level, and baseline differences in cognitive function and brain structure.*

Actionable Insights

- **Educators and employers**: Strengthen professional development by leveraging adult learners’ strengths and interests through emotion-based and arts-integrated strategies, alongside workplace wellness programs that blend physical activity with cognitive engagement.

- **Policymakers**: Advance lifelong learning by expanding access to community learning hubs and wellness initiatives, while also addressing ageism and promoting positive perceptions of older workersess ageism and to foster more positive societal perceptions of older workers.

Future Research

- More research is needed to identify effective interventions for middle-aged adults, whose unique cognitive and brain changes are not well captured in existing literature.

- Future studies should test promising interventions in real-world learning contexts to assess their ecological validity and generalizability.

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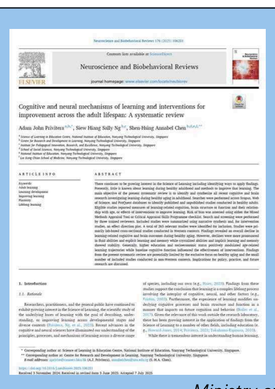

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