

The Role of Information Communication Technologies in Mitigating Age-Related Cognitive Decline



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Abstract

With the increasing use of technology, it is important to identify how information and communication technology (ICT) can help mitigate cognitive decline with age. Experimental studies are essential for evaluating the impact of different types of ICT on cognition. ICT use can potentially help older adults learn new skills, maintain relationships, access information, and ultimately enrich their quality of life. Using the Covidence platform, we began a metanalysis by screening 3,516 scholarly interventional studies based on predefined inclusion and exclusion criteria. Following the initial screening, we proceeded to the full text review and data extraction stages. To ensure the reliability of our findings, two reviewers independently assessed the studies, with a third reviewer resolving any conflicts. We hypothesize that the use of ICT in experimental studies may not yield significant differences in cognition. The mechanisms by which ICT influences cognition remain unclear, but future studies analyzing longitudinal data could determine if ICT use has a lasting effect on cognitive function. If our analysis reveals a positive relationship between ICT use and cognition, it could suggest a promising role for technology in preventing cognitive decline and dementia in older adults.

Background

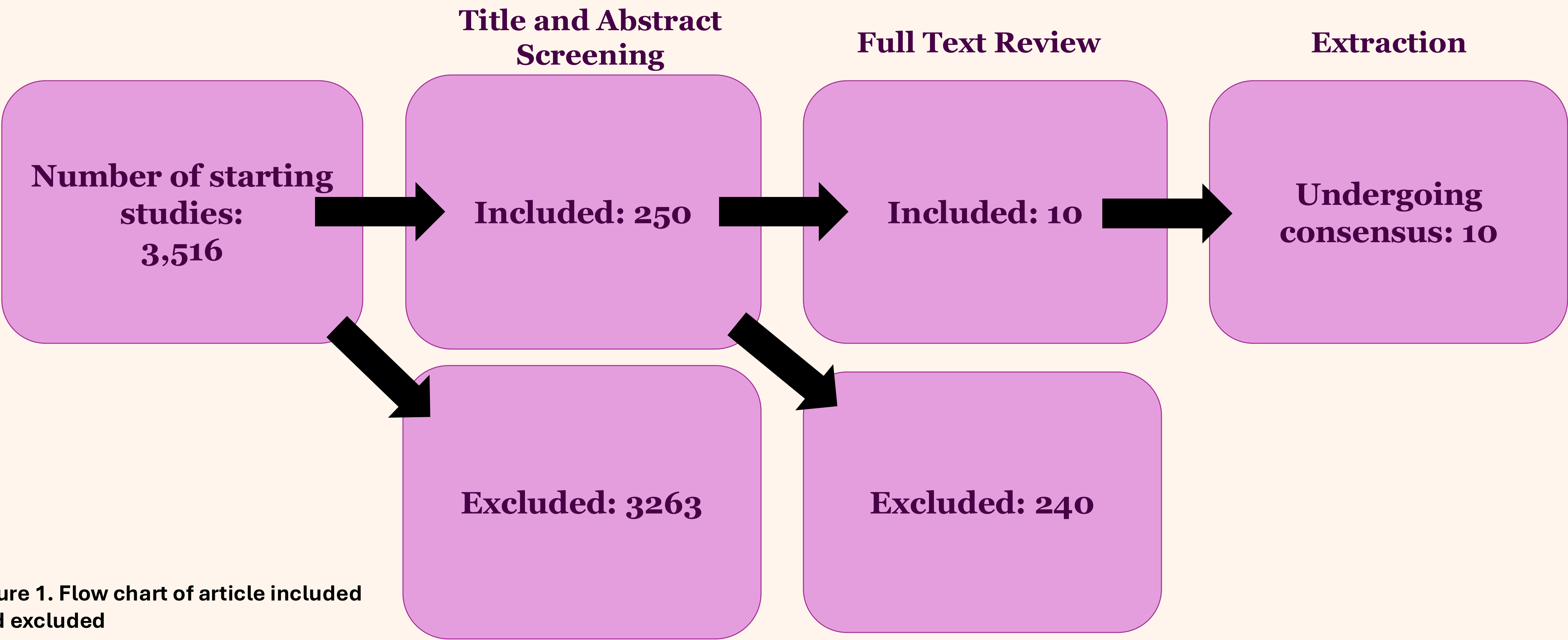
- Existing Facts:
- As adults age, cognitive decline becomes a greater risk and can lead to dementia which affects many aspects of cognition like memory, social ability, and thinking processes.
 - ICTs may stimulate the brain, reducing cognitive decline.
 - Help older adults stay connected via email, video calls, and social media, preventing isolation.
 - Enhance cognition through social interactions and online engagement. or
 - Provide access to health information and enriching activities.

- Shortcomings:
- While various studies have linked ICT use to cognitive improvement, the mechanisms of these effects remain unclear, as this area of research is still relatively new.

- Purpose:
- To identify how information and communication technology (ICT) can help mitigate cognitive decline with age.

Methods

- Utilized Covidence Systematic Review Software to undergo a metanalysis of existing experimental studies
 - Duplicates were identified and manual exclusions occurred
- Designated inclusion criteria
 - Control and intervention group
 - Population of middle-aged and older adults
 - One or more groups using technology (not for cognitive training)
 - Cognitive measures taken before and after intervention
- For each stage of screening
 - Two reviewers came to a consensus about inclusion
 - A third reviewer resolved conflicts
 - Two separate individuals extracted the studies
 - A third individuals carried out a consensus
- Extracted data
 - Title
 - Authors
 - Publication year
 - Control/intervention group
 - # of participants
 - Age (mean)
 - Age (standard deviation)
 - Active or passive control group
 - Length of intervention (weeks)
 - Intensity (number of hours per week)
 - Cognitive Test and Type of Data
 - Mean and SD: pre-ICT, Post-ICT, pre-Control, and Post-control



Results

Our preliminary results are undergoing analysis.

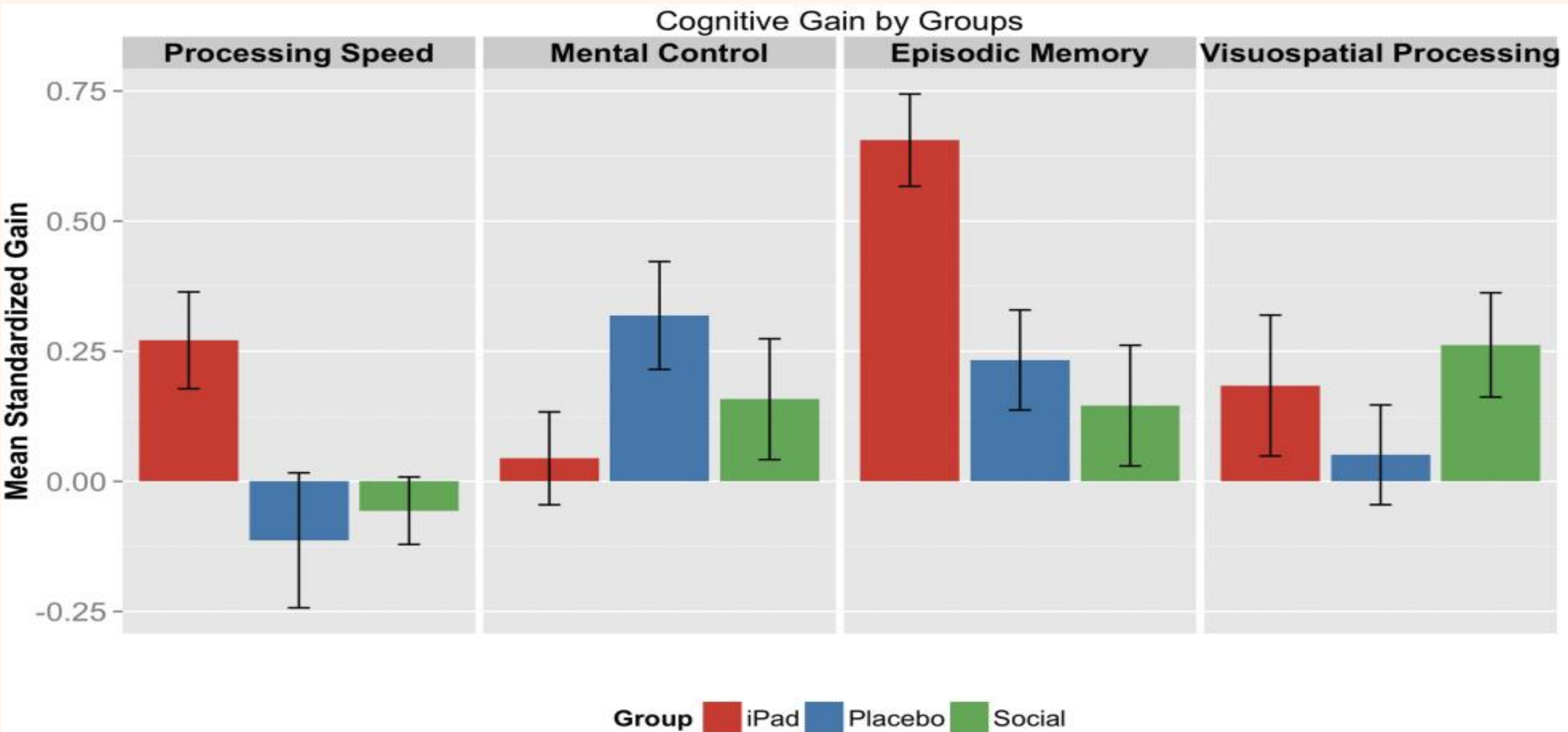


Figure 2. Mean standardized gain scores for iPad, Placebo, and Social Error bars: ±1 SE.

Chan et al. (2016) found that the iPad group showed greater improvement over time in processing speed and episodic memory compared to both the Placebo and Social groups. The study suggested that sustained mental effort, through active engagement, supports improvements in these areas. Although there were some gains in the Social and Placebo groups, the iPad group demonstrated the most substantial progress.

Conclusion

This metanalysis aimed to investigate if ICT use impacts cognition in older adults.

While we have not yet finalized our findings, we predict that we the effects of ICT use on cognition will not be apparent within the short time frames of the experimental studies.

- Strengths
 - Able to analyze a large sample size by combining studies
- Limitations
 - Focused on middle-aged and older adults, which limits the generalizability of the findings to other age groups
- Future Considerations
 - Explore the long-term effects of ICT use through a second, longitudinal study metanalysis
 - Determine whether prolonged ICT use has a sustained impact on cognition in older adults

If our analysis shows a positive link between ICT use and cognitive function, it may indicate that technology plays a promising role in preventing cognitive decline and dementia in older adults.

References

Olegário RL, Fernandes SR, de Moraes R Jr. Efficacy of cognitive training on executive functions in healthy older adults: a systematic review with meta-analysis of randomized controlled trials. *Psychol Health*. 2023 Oct 12;1-28. doi: 10.1080/08870446.2023.2267610. Epub ahead of print. PMID: 37822255.

Chan, M., Haber, s., Drew, L., Park, D. Training Older Adults to Use Tablet Computers: Does it Enhance Cognitive Function? *The Gerontologist*. 2014 56(3): 475-484. DOI: 10.1093/geront/gnu057.

Figure 1. Flow chart of article included and excluded