Immediate and delayed effects of cognitive interventions in healthy elderly: a review of current literature and future directions

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CRD summary
This review concluded that there was no evidence that structured cognitive intervention programs delayed or slowed progression to Alzheimer’s disease in healthy elderly. The review was limited by small, heterogeneous and methodologically limited literature. Despite some limitations, such as failure to assess heterogeneity, possible publication bias and failure to consider quality, the conclusions are likely to be reliable.

Authors' objectives
To investigate the effects of cognitive interventions in healthy elderly.

Searching
The electronic databases MEDLINE, Scopus, The Cochrane Library, Dissertation Abstract International and PsycINFO, Current Controlled Trials and ClinicalTrials.gov were searched for English language papers published after 1992. Search terms were reported. Web of Science was used to identify studies that had cited relevant studies.

Study selection
Randomised controlled trials (RCTs) of cognitive interventions in community-dwelling healthy elderly were eligible for inclusion. Studies that included patients with mild cognitive impairment, Alzheimer’s disease or dementia were excluded. Males and females with a mean age from 69.6 to 82.3 years were included.

A range of intervention types and regimens were used: memory training (such as group-based and computer-based memory training), multimodal training (for example, piano instruction), reasoning training (for example, problem solving) and speed of processing training (such as visual search skills). A number of outcome measures were used, such as Trail Making Test Cards A and B, Weschler Adult Intelligence Scale and memory tests.

The authors stated neither how papers were selected for the review nor how many reviewers performed the selection.

Assessment of study quality
Methodological quality was assessed using a combination of items from a modified version of the Scale to Assess Scientific Quality of Investigations and the Jadad scale. A point was given for each of the following (to give a score out of 8): randomisation; double-blinding; description of withdrawal/dropouts; inclusion/exclusion criteria; control group; statistical analysis described; exclusion of patients with Alzheimer's disease; and follow up. Quality was assessed independently by at least two reviewers.

Data extraction
Type and form of cognitive intervention, Mini Mental State Examination scores (where available), type and form of cognitive intervention and control, outcome measures and effect sizes were extracted. Where effect size was not reported, it was calculated by using the mean difference between scores on post-treatment outcome measures. The authors stated neither how the data were extracted for the review nor how many reviewers performed the data extraction.

Methods of synthesis
Effect size (Cohen's d) was calculated by pooling the weighted effect sizes (by sample size) for each outcome measure. Mean weighted effect sizes for type of training intervention were calculated by grouping outcome measures by memory, reasoning, speed of processing and multimodal and converting them back to Cohen's d.

Results of the review
Ten RCTs were included in the review (n=4,009; range from 16 to 2,802 participants). Average quality score was 5.3
out of 8 (range 4 to 7). Studies commonly did not include a placebo or matched active control and lacked follow-up.

The mean weighted effect sizes (across all outcomes) were 0.12 for memory training (95% CI: 0.068 to 0.167; three RCTs); 0.15 for multimodal training (95% CI: 0.103 to 0.194; five RCTs); 0.16 for reasoning training (95% CI: 0.11 to 0.21; two RCTs) and 0.22 for speed of processing training (95% CI: 0.17 to 0.26; two RCTs).

The type of control group had little influence on effect sizes: effect size was 0.17 in the three trials that included matched active control groups and 0.18 in the no-contact control groups.

**Authors' conclusions**

No evidence was found that structured cognitive intervention programs delayed or slowed progression to Alzheimer's disease in healthy elderly. The review was limited by small, heterogeneous and methodologically limited literature.

**CRD commentary**

The research question was supported by inclusion criteria for study design, intervention and participants, but there were no criteria for outcomes. Several databases were searched including a search for ongoing trials, which reduced the possibility of publication bias. Only English-language studies were sought, which increased the possibility of language bias. Two reviewers performed validity assessment, which reduced possible error and bias. No similar steps were reported for study selection or data extraction. Validity was assessed using appropriate tools. The primary studies were heterogeneous with regard to intervention and follow-up and one large trial provided the majority of participants, which may have biased the pooled results, therefore, pooling of studies may not have been appropriate. However, the authors' conclusions were cautious and are likely to be reliable.

**Implications of the review for practice and research**

**Practice**: The authors stated that the elderly should be assisted in making informed decisions about preventative lifestyle changes by the clinical research community.

**Research**: The authors stated that more RCTs were needed with cognitive training grounded in robust neuroscientific theory, sufficient follow-up, matched active control groups and outcome measures that showed changes in both daily functioning and global cognitive skills. Research also needed to be communicated in a clear and unbiased manner to the public.

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