Extended practice and aerobic exercise interventions benefit untrained cognitive outcomes in older adults: a meta-analysis.

Hindin SB, Zelinski EM

The review concluded that aerobic exercise and extended cognitive practice training interventions for healthy older adults (intended to prevent cognitive decline) improved performance on untrained cognitive tasks. The review had some methodological and reporting issues and the quality of the evidence base was variable, hence the reliability and generalisability of the authors’ conclusions are uncertain.

Authors’ objectives
To examine whether therapeutic interventions of extended practice of cognitive tasks or aerobic exercise lead to significant improvement in untrained cognitive tasks in older adults.

Searching
MEDLINE, PsycINFO and Abstracts in Social Gerontology were searched from 1966 to 2010 for articles in English. Search terms were reported. The search was updated in January 2011. Manual searches were undertaken to locate addition studies. The reference list from a previous meta-analysis was searched.

Study selection
Studies of extended cognitive domain practice of basic tasks such as N-back (continuous performance task) or aerobic fitness interventions hypothesising cognitive improvements versus control in healthy cognitively unimpaired community-residing adult participants aged 55 years and older were eligible for inclusion. Studies that reported only subjective outcomes were excluded. Interventions that taught only strategies such as mnemonics or inductive reasoning were excluded.

The included studies considered various cognitive training or aerobic exercise interventions in adults with a median age of 69.2 years. Interventions generally took place in laboratories, gymnasium facilities, the home and outdoors. Experimenters administered testing. No details of the interventions in individual studies were reported. The median number of training sessions was 30.5 over a median of 13.2 weeks.

The authors did not state how many reviewers performed study selection.

Assessment of study quality
Study quality was assessed using a scale of randomisation, active control group, description of inclusion and exclusion criteria, drop-outs and follow-up, to give a maximum score of 5. Studies that scored 2 or less were deemed poor quality.

The authors did not state how many reviewers assessed quality.

Data extraction
Data were extracted on cognitive effects and used to calculate Cohen’s d effect sizes and 95% confidence intervals (CIs).

The authors did not state how many reviewers extracted data.

Methods of synthesis
Meta-analysis was undertaken to calculate pooled effect sizes (standardised mean differences) and 95% CIs. Between-group effect sizes and within-experimental group effect sizes were computed for untrained cognitive outcome domains (including memory, choice reaction time and executive function). Effect sizes were coded for training type and study quality. Multilevel mixed-effect analyses calculated effects sizes for multiple outcomes from individual studies. Statistical heterogeneity was assessed using the $\chi^2$ statistic.
Results of the review
Forty-two studies were included in the review (3,781 participants, range 13 to 1,292, median 39). Thirteen studies were deemed poor quality and 29 were deemed high quality.

Extended practice (between-group effect size 0.33, 95% CI 0.13 to 0.52; 25 studies) and aerobic fitness training (between-group effect size 0.33, 95% CI 0.10 to 0.55; 17 studies) produced small but statistically significant improvements in cognitive outcomes compared with control. Better study quality was associated with a larger effect size (effect size 0.43, 95% CI 0.24 to 0.63; 29 studies).

Other results were presented in the review.

Authors’ conclusions
Aerobic and extended cognitive practice training interventions for healthy older adults improve performance on untrained cognitive tasks.

CRD commentary
Inclusion criteria for the review were broadly defined and three relevant databases were searched. There was potential for language bias as only articles in English were included. Publication bias was not assessed and could not be ruled out. It was not clear whether attempts were made to reduce reviewer error and bias during the review. Quality assessment indicated that the quality of the evidence base was variable. Study characteristics were not fully presented, which made the generalisability of the review findings unclear. Studies were combined using meta-analysis, but full methods were not presented and this made it difficult to assess the appropriateness of the methods.

The authors’ conclusions reflect the evidence presented but (as the authors noted the clinical significance of the findings was uncertain. The review had some methodological and reporting issues and the quality of the evidence base was variable, hence the reliability and generalisability of the authors’ conclusions are uncertain.

Implications of the review for practice and research
Practice: The authors stated that use of commercial products that resemble extended practice interventions was not endorsed because few had been tested.

Research: The authors stated that further research into training efficacy was needed to address issues such as whether benefits were observed in subpopulations with health problems or with varying education or ability. Further research to determine whether interventions should be first engaged or whether they should be customized to an individual’s cognitive needs was required. Research to identify methods to encourage persistent engagement in cognitively beneficial activities was needed.

Funding
National Institute on Aging, USA.

Bibliographic details

PubMedID
22150209

DOI
10.1111/j.1532-5415.2011.03761.x

Original Paper URL

Indexing Status
Subject indexing assigned by NLM
MeSH
Cognition /physiology; Cognition Disorders /rehabilitation; Exercise /psychology; Humans; Middle Aged; Physical Fitness /psychology

AccessionNumber
12012004959

Date bibliographic record published
21/05/2012

Date abstract record published
05/10/2012

Record Status
This is a critical abstract of a systematic review that meets the criteria for inclusion on DARE. Each critical abstract contains a brief summary of the review methods, results and conclusions followed by a detailed critical assessment on the reliability of the review and the conclusions drawn.