Effects of memory training on the subjective memory functioning and mental health of older adults: a meta-analysis

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Authors' objectives
To examine the effectiveness of memory training on the subjective memory functioning and mental health of older adults.

Searching
PsycLIT and Dissertation Abstracts International were searched from the mid-1970s to September 1994 using the keywords 'mnemonic training', 'cognitive training', 'memory training', 'memory enhancement', 'memory remediation' and 'mnemonics', combined with 'aging', 'elderly', 'elders' and 'older adults'. The reference lists of the retrieved studies and citations from the study of Verhaeghen et al. (see Other Publications of Related Interest no.1) were reviewed. The journals Psychology and Aging, Experimental Aging Research, Educational Gerontology and the Journal of Gerontology were also handsearched from the mid-1970s to September 1994.

Study selection
Study designs of evaluations included in the review
Controlled studies using non-demented participants with a mean age of at least 60 years, which targeted the improvement of memory function through instruction in a relevant technique and provided sufficient statistical data for effect size calculations, were eligible.

Specific interventions included in the review
Memory training strategies (mnemonics), such as the method of loci, compared with combined mnemonic training and expectancy modification, placebo (unstructured practice being the most common placebo technique), expectancy modification or no-treatment control. The specific memory training strategies used were not reported.

Participants included in the review
The participants were non-demented with a mean age of 70.6 years (most were aged over 60).

Outcomes assessed in the review
Subjective measures of memory functioning, in the following categories: overall measures; memory measures; mental health measures; depression measures; and other measures. The overall measures category was the arithmetic average of the effect sizes for the other four categories of measures.

How were decisions on the relevance of primary studies made?
The authors do not state how the papers were selected for the review, or how many of the authors performed the selection.

Assessment of study quality
The Suydam scale (see Other Publications of Related Interest no.2) was used to rate the quality of each study on the basis of the following factors: internal and external validity (particularly the inclusion of a suitable control group); the reliability of the instrument; the appropriateness of the statistical analyses; interpretations of the data; and the adequacy of the report. Two people rated the quality of each study, the correlation between their scores was 0.78. When the judges' quality scores on a factor were within 2 points, the average of the two scores was used. There were only two studies having discrepancies of more than 2 points; these were resolved through discussion.

Data extraction
All coding and effect size calculations for each study were completed independently by the two reviewers. Any discrepancies in coding were resolved by reviewing the study together until consensus was achieved.

**Methods of synthesis**

How were the studies combined?
The effect sizes were calculated using the methods of Hedges and Olkin (see Other Publications of Related Interest no.3). The standardised mean difference between the experimental and control groups at post-treatment (Cohen's d-statistic; see Other Publications of Related Interest no.4) was used as the common measure. The effect sizes were also calculated for each group using pre-test to post-test differences. All the d-values obtained were corrected for small sample size bias, in order to compute the unbiased effect size. When summary statistics were not included in the article, the reported significant difference between the treatment and control groups was inferred.

The effect sizes were determined for the following categories: overall measures; memory measures; mental health measures; depression measures; and other measures. If more than one outcome measure was used in a particular category, the effect sizes from these measures were averaged to determine the effect size for the category.

The efficacy of memory training was examined by comparing post-test results between experimental conditions, and comparing pre-test to post-test effect sizes within each condition. Differences in the latter were analysed in a procedure analogous to analysis of variance, using a series of homogeneity analyses. Confidence intervals (CIs) were calculated.

Correlations were computed to determine whether the study and participant variables were significantly related to the outcome. The effect sizes obtained in this review were then compared with those reported in the study of Verhaeghen et al. (see Other Publications of Related Interest no.1) using objective measures, by comparing the average effect sizes for each experimental condition and by directly comparing effect sizes calculated for the individual studies.

How were differences between studies investigated?
The homogeneity of effect sizes for each experimental condition within each measurement category was determined using the homogeneity statistic Qw.

**Results of the review**

Twenty-five research papers with 27 studies meeting the inclusion criteria were identified in the search and used in this study. The number of participants was 1,150.

The weighted average pre-test to post-test effect size for all conditions in the overall measures category was 0.19 (95% CI: 0.11, 0.27). Homogeneity statistics were non significant; however, there was significant heterogeneity between conditions, indicating differences in training effectiveness across the conditions. Follow-up analyses using an equivalent of the Bonferoni procedure indicated that people in the combined mnemonic training and expectancy modification group improved more than those in the control group. There were no significant differences among effect sizes for the expectancy modification, mnemonic training, placebo and control conditions.

Direct comparisons between conditions at post-test indicated that the mnemonic training group did better than the control group, but was no different from either the expectancy modification or placebo groups. The combined mnemonic training and expectancy modification group was superior to the control condition, and also better than the mnemonic training alone.

In the memory measures category (comparisons of pre-test to post-test effect sizes), it was found that both the combined mnemonic training and expectancy modification group and the expectancy modification group were superior to the control group, whereas the mnemonic training and placebo conditions were equivalent to all other conditions. In the post-test comparisons, the combined mnemonic training and expectancy modification group was superior to both the control and mnemonic training groups, and the mnemonic training group was better than the control group.
None of the homogeneity statistics were significant in the depression and mental health measures categories, indicating that all the groups were equivalent.

In the other measures category, all the homogeneity statistics were non significant, indicating that all conditions were equivalent; however, the mnemonic training group was superior to the control group in a direct comparison at post-test.

For overall measures, memory measures and other measures, the fail-safe Ns were 125, 56 and 10, respectively. These indicated that the superiority of the mnemonic training on these measures was a relatively stable finding. Compared with the control, the fail-safe Ns for the combined mnemonic training and expectancy modification condition on overall and memory measures were 3. Compared with mnemonic training conditions, the fail-safe N for the combined mnemonic training and expectancy modification on overall and memory measures was only 1.

For pre-test to post-test effect sizes, the fail-safe Ns for the mnemonic training group and the combined mnemonic training and expectancy modification group indicated relative stability. The fail-safe Ns for the placebo condition and the expectancy modification condition were low.

The use of pretraining was the only experimental variable that significantly correlated with effect size (correlation 0.55, p<0.05).

With the exception of one study, all effect sizes were lower for the subjective measures of memory functioning than for the objective measures in the Verhaeghen et al. review (t(9)=2.37, p<0.05).

Authors' conclusions
The results suggested that improvement in subjective memory functioning is best accomplished by addressing both the improvement of skills (mnemonic training) and the development of more adaptive attitudes toward memory performance (expectancy modification). For optimal efficacy, the training programme should also include pretraining.

CRD commentary
This review included a clear description of the review questions, the literature search, and the methods of data extraction. The validity and the inclusion criteria were clearly stated, and statistical procedures were also detailed in the paper. Some study details were presented. The use of subcategories of measures led to the presentation of a large amount of data, some of which were based on only a few studies. However, the authors' conclusions are based on results with high fail-safe N values and are fairly well supported by the evidence.

Implications of the review for practice and research
The authors suggest that memory improvement programmes place more emphasis on modifying the participants' attitudes towards aging-related memory loss. The authors advocate the inclusion of subjective measures in memory training programmes if they are intended to be tests of the efficacy of memory training. They recommend that future research focuses on identifying the magnitude of the response to each component of the treatment, and determining how stable the benefits are over time.

Bibliographic details

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Other publications of related interest

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Subject indexing assigned by NLM

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**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.