Working Memory Training Can Negatively Impact Recognition Memory Performance

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Abstract

There has been a great deal of interest in working memory (WM) training, with some researchers arguing that WM training improves performance on fluid intelligence tests and others arguing that WM training does not transfer to other tasks. We compared WM training to mental imagery training and tested participants' performance on a variety of memory tasks before and after a three-week training period. For recognition memory tasks, the participants in the mental imagery training group showed improved performance after training. However, the recognition memory performance of the participants in the WM training group decreased after training. These results indicate that WM training can have negative effects on other types of memory performance.
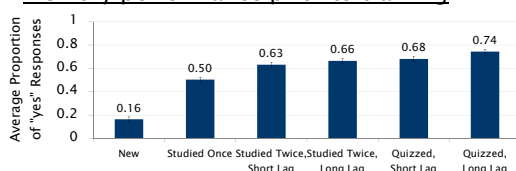
Baseline Tasks

▪ Completed before and after training:

  ▪ Recognition Memory Task

  ▪ WM Tasks (Listening Span, Rotation Span)

▪ We hypothesized that WM training would transfer to the untrained WM tasks and would also improve performance on a recognition memory task containing repeated items

Recognition Memory Task

▪ 84 nouns studied once

▪ 84 nouns studied twice

▪ 84 nouns studied then quizzed

  ▪ Lag of 1 or 9 intervening items between study-study and study-quiz repetitions

fight
alarm
cut
nation
cut
nation
storm
assent
fire
noon
fight
alarm

Quizzed items

▪ Recognition test with all critical nouns and equal number of matched new nouns

Memory performance prior to training:

Average Proportion of 'yes' Responses — bar values: New 0.16, Studied Once 0.50, Studied Twice Short Lag 0.63, Studied Twice Long Lag 0.66, Quizzed Short Lag 0.68, Quizzed Long Lag 0.74

Memory Training

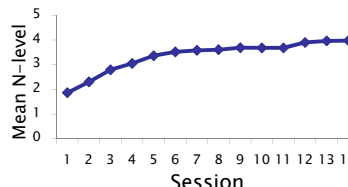### Control Group (25 participants)

▪ No memory training

Mental Imagery Training Group (24 participants)

▪ Were given examples of how to create vivid mental images to remember words

▪ Practiced using mental imagery to recall word lists in three practice sessions (one per week for three weeks)
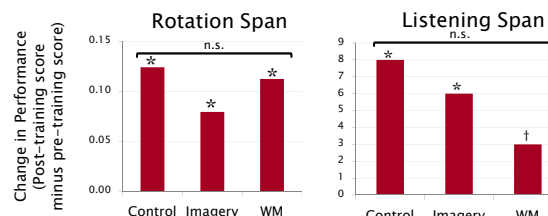
Working Memory Training Group (25 participants)

▪ Completed WM tasks (N-back and Symmetry Span) that increased in difficulty as participants' performance improved

  ▪ 14 training sessions (4-5 per week for three weeks)

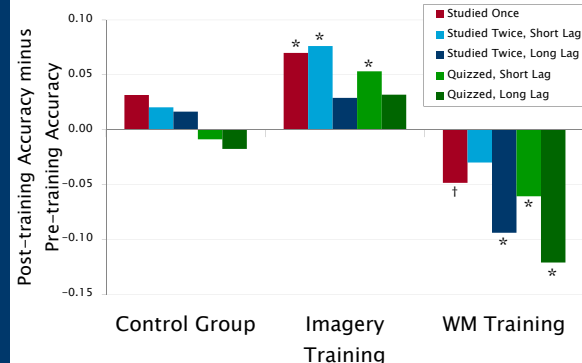▪ Performance on the trained tasks improved significantly over the course of the training

Mean N-level vs Session (1–14)

Results – Baseline WM Tasks

▪ The performance of all three groups improved after the training period

▪ The change in performance (post-training score minus pre-training score) did not differ significantly across the three training groups

  ▪ Critically, the WM training group did not improve more than the other groups on the untrained WM baseline tasks

Change in Performance (Post-training score minus pre-training score) — Rotation Span: Control *, Imagery *, WM * (n.s.); Listening Span: Control *, Imagery *, WM † (n.s.)

Results – Recognition Task

Change in Recognition Memory Performance

Post-training Accuracy minus Pre-training Accuracy by group (Control Group, Imagery Training, WM Training). Legend: Studied Once, Studied Twice Short Lag, Studied Twice Long Lag, Quizzed Short Lag, Quizzed Long Lag.

▪ The control group's performance did not change significantly in any condition

▪ The imagery training group's performance improved significantly in 3 of the 5 conditions

▪ The WM training group's performance declined significantly in 4 of the 5 conditions

Discussion

▪ In addition to finding that WM training failed to transfer to untrained WM tasks, this study found that performance on a recognition memory task declined after WM training

▪ These results indicate that intensive WM training can have unintended consequences for performance on other types of memory tasks

Contact lematze@sandia.gov for reprints, questions, or more information