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## Visual Memory Improvement in Recognition

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# Visual memory improvement in recognition

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# Rationale

- In 2008 Jaeggi and her colleagues demonstrated that fluid intelligence could be improved by training on a visual working memory *n*-back task.
- While improvement on a simple working memory test was noted, no improvement in working memory capacity was found.
- Preece (2011) and Palmer (2011) found that *n*-back training did not improve fluid intelligence. Furthermore Palmer (2011) found that training on a general knowledge/vocabulary task did improve fluid intelligence.

## Purpose of this study

- To investigate whether *n*-back training can increase visual recognition memory.

## Hypothesis

- After training using the single *n*-back task, participants' scores on a test of visual recognition memory will be significantly higher in comparison to participants who undergo general knowledge/vocabulary training.

# Method

- Mixed factorial design
- Between-subjects factor - 2 levels (single  $n$ -back task and combined general knowledge/vocabulary task)
- Within-subjects factor - 2 levels (pre-training and post-training)
- Dependent variable - raw test scores of Test 13, Picture Recognition (WJ III)
- Initial testing
- 20 days of training over a 30 day period
- Final testing phase

## Participants

- 47 participants in total completed the training task
- 21 participants in the active control group
- 26 participants in the experimental group
- Participants' ages ranged from 18 to 68 ( $M = 35.91$ ) in the  $n$ -back group, and ( $M = 40.44$ ) in the active control group.

## Materials

- Test 13, Picture Recognition of the Woodcock-Johnson III Test of Cognitive Abilities (2001) (Fig 1)
- Experimental group -  $n$ -back training task software obtained from Brainworkshop (n.d) and modified to replicate the software used by Jaeggi et al. (2008) (Fig 2)
- Active control group - Definetime, vocabulary task accessed via the East of the Web (n.d.) website and Who Wants to be a Millionaire accessed via the Real Player Games (n.d.) website (Fig 3)

# Results

- Interaction between the training group and pre-post Test 13 scores was **non-significant** indicating that type of training did not have an influence over improvement in visual recognition memory scores, SPANOVA  $F(1,42) = .016$ ,  $p = .899$ , partial  $\eta^2 < .001$ .
- Overall participants **significantly** improved in their Test 13 scores from pre- to post-test SPANOVA  $F(1, 42) = 15.515$ ,  $p = < .001$ , partial  $\eta^2 = .270$ .

## Follow-up Interviews

- Participants spoke about how motivating they found the Definetime task.
- Participants spontaneously described how they used shape recognition strategies to obtain high scores (Fig 1).



**Figure 1.** Example of shapes used by participants for recognition.

## Active control groups

- **Definetime** - those who were higher scorers in Definetime had a **significantly higher** gain in Test 13 scores than those in the lower gain group, one-way between groups ANOVA  $F(1,19) = 6.864, p = .017, \eta^2 = .265$ . This suggests that high Definetime scorers increased their visual recognition memory in comparison to low Definetime scorers.
- **Who wants to be a Millionaire** - there was **no significant difference** in gain in Test 13 scores between the low and high Who Wants to be a Millionaire scoring groups, one-way between groups ANOVA  $F(1,19) = .811, p = .379, \eta^2 = .041$ . This suggests that there was no difference in visual recognition memory improvement between the low and high Who Wants to be a Millionaire scorers .

## Experimental group

**N-back** – there was **no significant difference** in gain in Test 13 scores between the low and high *n*-back scoring groups, one-way between groups ANOVA  $F(1,23) = .879, p = .358, \eta^2 = .037$  (Fig 6). This suggests that there was no difference in visual recognition memory improvement between the low scoring *n*-back group and the high scoring *n*-back group.



**Table 1.** Means and standard deviations of Test 13 gain in low and high performing groups.

Training Group	Low		High	
	M	SD	M	SD
Definetime	0.40	1.71	2.18	1.40
Millionaire	1.70	2.11	1.00	1.41
N-back	0.46	2.47	1.25	1.60

# Conclusion

- Training using the single n-back task does not significantly increase visual recognition memory scores when compared with general knowledge/vocabulary training.
- Participants who obtain high scores in Definetime improve their visual recognition scores significantly more than participants who have low scores in Definetime.
- Participants who have high scores in Definetime use shape recognition strategies.

## Questions for further research

- Is visual recognition memory improved through training?
- Is Definetime a better visual recognition training task than  $n$ -back training?
- Is the  $n$ -back task in the single  $n$ -back form a visual recognition training task?
- Is Definetime a visual recognition training task?
- Was Jaeggi (2008) incorrect to conclude that  $n$ -back training can improve fluid intelligence?
- Do motivational factors affect performance on cognitive training tasks?
- Is visual recognition the driving influence behind the fluid intelligence gains demonstrated by Jaeggi (2008), Preece (2011) and Palmer (2011)?

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