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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 goup - 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).

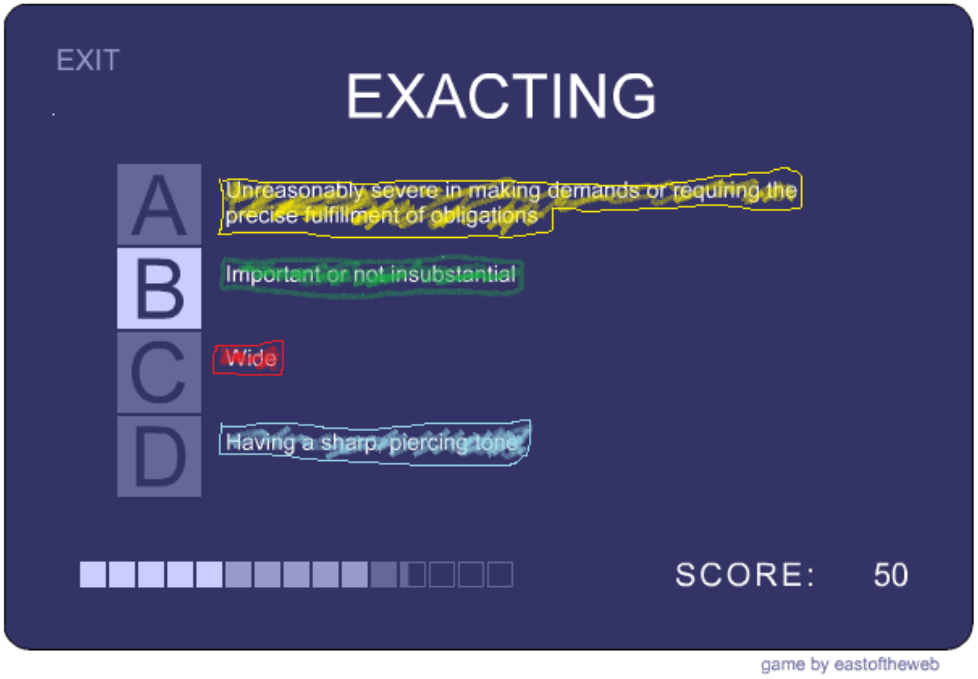

Figure 1. Example of shapes used by participants for recognition.

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.

	Low		High	
Training Group	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)?

References

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