



Stimulus generalizability of metacognitive training on visual working memory

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Introduction

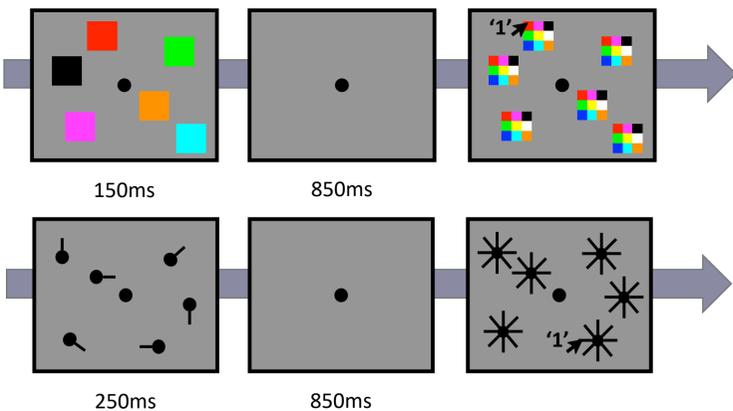
- Visual working memory (VWM) has a severely limited capacity of about 3-4 items at any one moment
- Individuals tend to overestimate the accuracy of their VWM representations, leading to **confident-and-inaccurate** responses (e.g., Adam & Vogel, 2017)
- It is critical to improve correspondence between **highly confident-and-accurate responses (metacognitive accuracy)** as non-correspondence may lead to erroneous behaviours (e.g., car accident due to confident misremembering of vehicle position)
- Can we **improve metacognitive accuracy in younger and older adults through feedback training?**

Methods

Whole Report Task (pre- and post-test)

'Remember as many stimuli as possible'

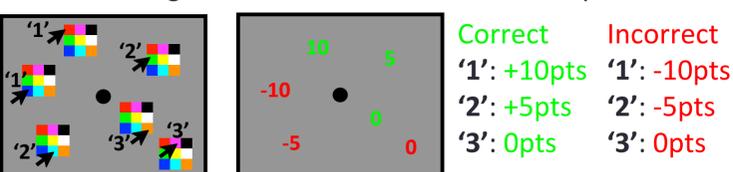
Coloured squares (Expt. 1 + 2), line orientations (Expt. 2)



'Then, report the stimuli in each location along with your confidence in each choice with one of the following: '1': high confidence, '2': low confidence, or '3': guessing'

Performance Feedback (only during 10 Training blocks)

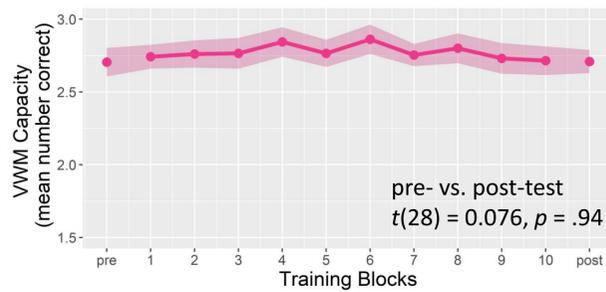
Points rewarded encouraged **confident-and-accurate** but discouraged **confident-and-inaccurate** responses



Experiment 1: Metacognitive Training for Colour VWM

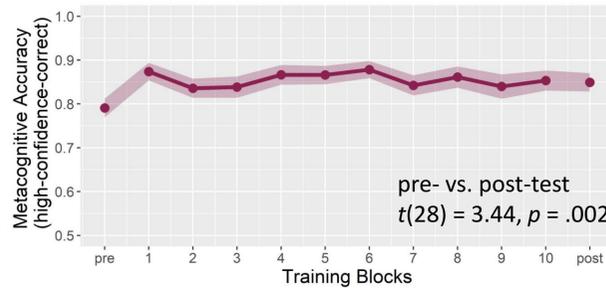
Younger Adults (n = 29, M_{age} = 19.3)

Does metacognitive training **improve VWM capacity**?



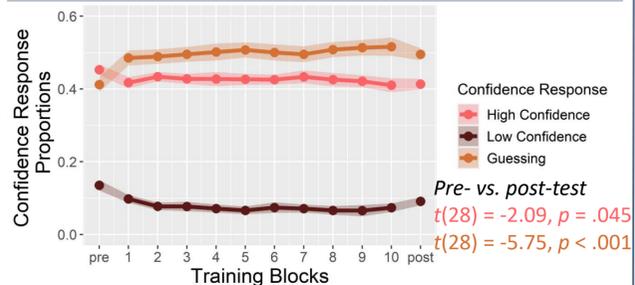
No, VWM capacity remains stable over training and is unaffected by performance feedback.

Does training **improve metacognitive accuracy**?



Yes, and the training effect remains even after feedback is removed!

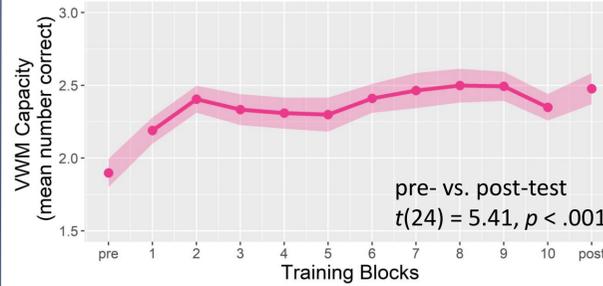
Is the increase in accuracy due to a decrease in **confident-and-inaccurate responses**?



Yes, response proportions for high confident-and-inaccurate responses decreased with a simultaneously increase in observed guessing.

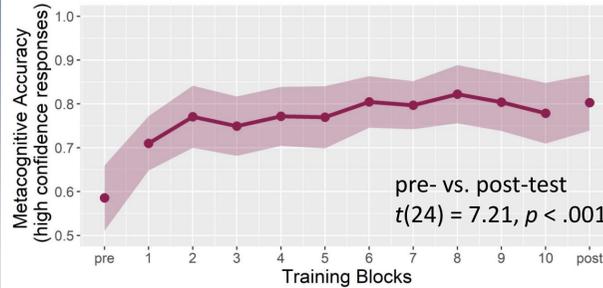
Older Adults (n = 24, *in progress*, M_{age} = 71.4)

Does metacognitive training **improve VWM capacity** in older adults?



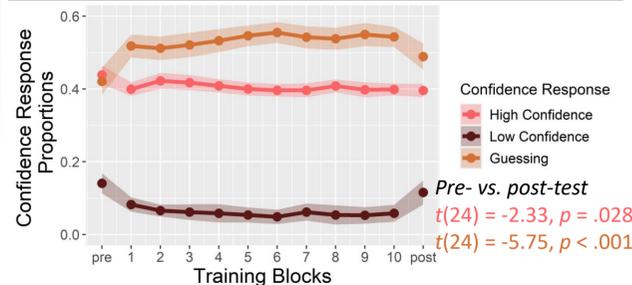
Yes, VWM capacity increases in post-test (vs. pre-test) by about half an item.

Does training **improve metacognitive accuracy**?



Yes, training greatly improves the proportion of high confident-and-correct responses.

Is the increase in accuracy due to a decrease in **confident-and-inaccurate responses**?

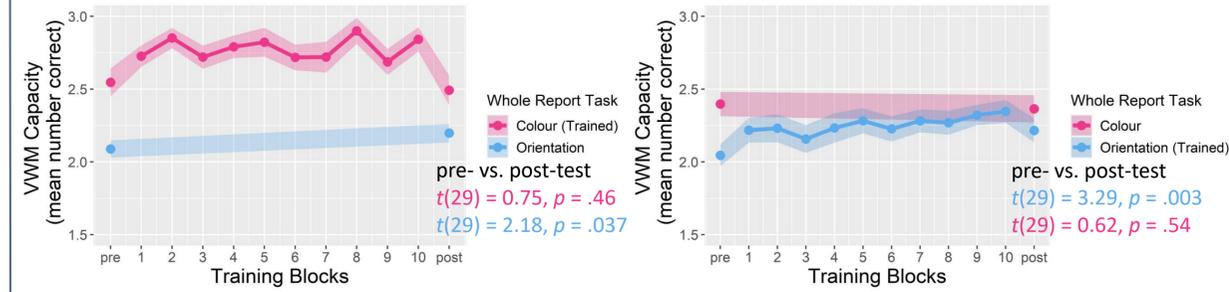


Yes, similar to younger adults, there was a decrease in high confident-and-inaccurate responses and an increase in guessing.

Experiment 2: Examining the Generalizability of Metacognitive Training

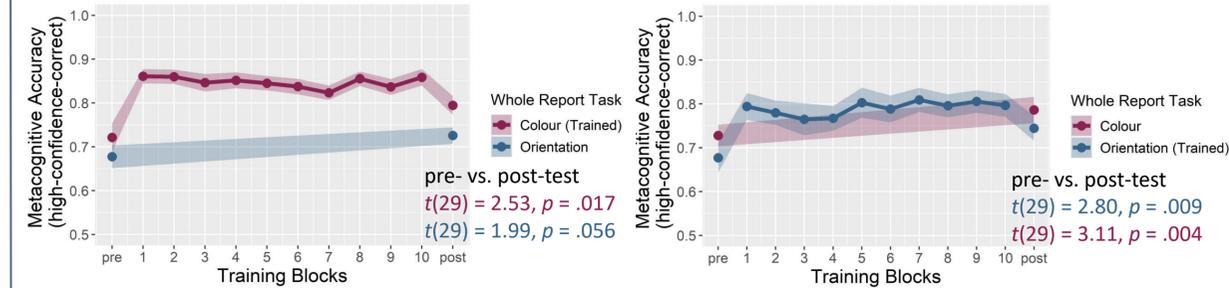
Younger Adults (n = 60, M_{age} = 18.8)

Will **VWM capacity improve** when trained on one stimulus (e.g., colour) and **generalize to another untrained stimulus** (e.g., orientation), or is the effect stimuli specific?



No, regardless of training, VWM capacity for colour did not improve however, **VWM capacity for orientation did improve.**

Will **metacognitive accuracy improvement** for trained stimulus **generalize to untrained stimulus**?



Yes, training one stimulus improves metacognitive accuracy for that stimulus, and **generalizes to the untrained stimulus** as well. This improvement also remains when feedback is removed.

Discussion

- Metacognitive training:
 - Modestly but inconsistently improves VWM capacity**
 - Improves metacognitive accuracy immediately and is sustained** upon feedback removal
 - Improves both VWM capacity and metacognitive accuracy for **older adults**
- Improvements in metacognitive accuracy can be **generalized** to an untrained stimulus
- Future studies will:
 - Further examine the immediate benefit to accuracy from training and determine the necessity of multiple training blocks (*in progress*)
 - Examine the persistence of the metacognitive training effect after training is completed

Acknowledgements

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