Mental Juggling: High Cognitive Load and High Anxiety Negatively Impact ABMT Efficacy

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INTRODUCTION

➤ Attention bias modification training (ABMT): modified dot probe task used to systematically train attention towards or away from threat, and has shown to be a potentially powerful, cost-efficient, and easily accessible treatment for anxiety (Kazdin & Blase, 2011; Dennis & O'Toole, 2014).

➤ It is still unclear under what cognitive conditions ABMT may be most effective.

➤ Previous research manipulated working memory load (WML) to investigate the impact on ABMT has shown conflicting results.

➤ Booth et. al. (2015) found that ABMT under low-WML produced expected change in attention bias (AB) while ABMT under high-WML did not, whereas Clarke et. al. (2017) found the opposite.

➤ A possible reason for these conflicting results could be due to individual characteristics such as anxiety and working memory capacity (WMC) (Eysenck & Calvo, 1992; Eysenck, Derakshan, Santos, & Calvo, 2007; Owens, Stevenson, Hadwin, & Norgate, 2014).

➤ The importance of anxiety and WMC may provide keys to explaining why the non-anxious sample in Clarke et. al. (2017) still benefited from ABMT with a high WML while the trait-anxious sample in Booth et. al. (2015) did not.

➤ This study aimed to clarify the effect of WML on ABMT and to investigate the potential impact of individual differences in WMC and trait anxiety on these effects.
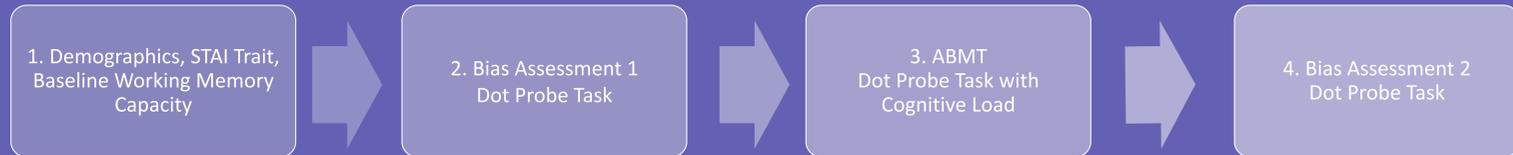
HYPOTHESES

➤ ABMT would be most effective with a low WML compared to a high WML.

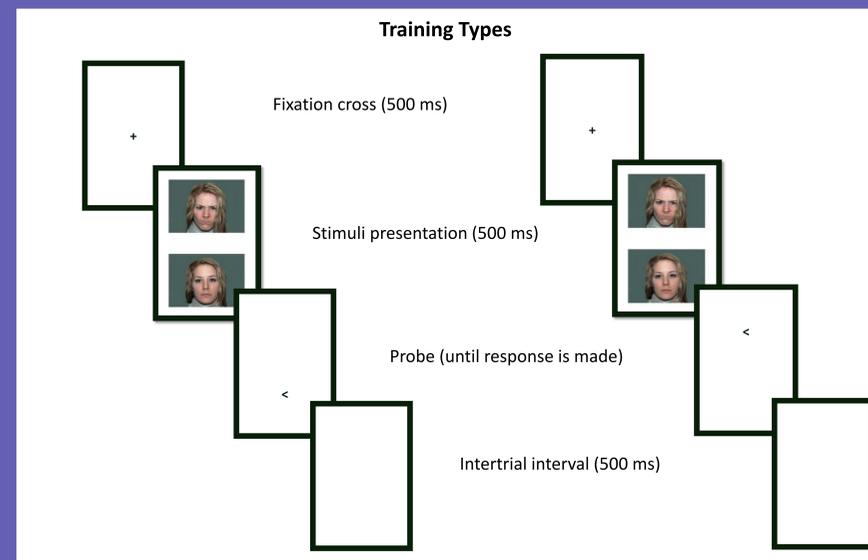➤ Effect of WML depends on WMC and anxiety level.

METHODS

Participants included 204 adults (149 females), aged 18-41 ($M = 19.94$, $SD = 3.56$).
Participants were randomly assigned to one of four ABMT conditions: Attend-threat with a high ($n=48$) or low WML ($n=54$), and avoid-threat with a high ($n=54$) or low WML ($n=48$).
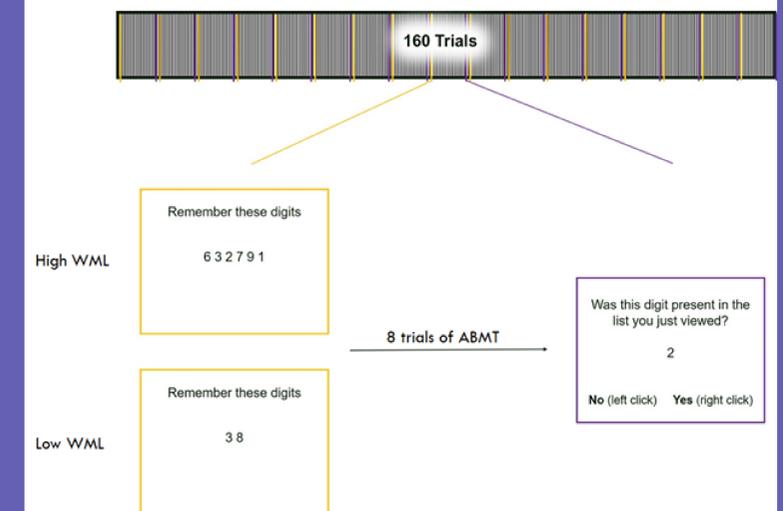
Timeline

1. Demographics, STAI Trait, Baseline Working Memory Capacity → 2. Bias Assessment 1 Dot Probe Task → 3. ABMT Dot Probe Task with Cognitive Load → 4. Bias Assessment 2 Dot Probe Task

ABMT with Working Memory Load

Training Types

Fixation cross (500 ms)
Stimuli presentation (500 ms)
Probe (until response is made)
Intertrial interval (500 ms)

Example of a neutral-cue trial in which the probe follows the neutral face. Example of a threat-cue trial in which the probe follows the angry face. ABMT used same trial types except avoid-threat condition saw neutral-cue trials 100% of the time and attend-threat saw threat-cue trials 100% of the time.
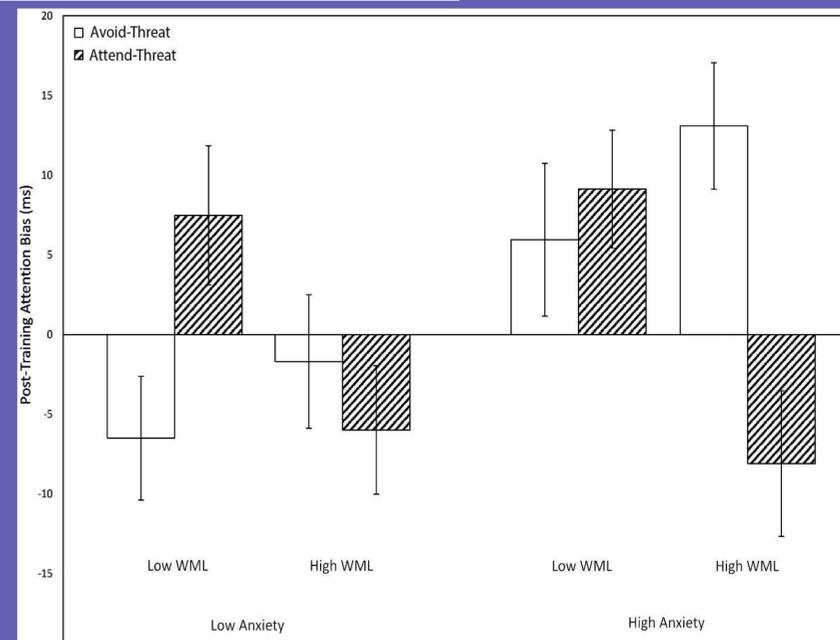
One Session of ABMT

160 Trials

High WML — Remember these digits — 6 3 2 7 9 1
Low WML — Remember these digits — 3 8

8 trials of ABMT

Was this digit present in the list you just viewed? 2
No (left click)   Yes (right click)

Schematic of a single session of attention bias modification training (ABMT) with examples of digit presentation and recognition trials.

RESULTS

Post-Training Bias Assessment Mean Scores from Each Condition

Measure		N	M	SE
Low Anxiety	Low WML → Avoid-Threat	29	-6.506	3.884
	Low WML → Attend-threat	23	7.476	4.363
	High WML → Avoid-Threat	25	-1.688	4.190
	High WML → Attend-threat	27	-5.99	4.025
High Anxiety	Low WML → Avoid-Threat	19	5.952	4.796
	Low WML → Attend-threat	32	9.128	3.699
	High WML → Avoid-Threat	28	13.087	3.969
	High WML → Attend-threat	21	-8.095	4.559

Negative means indicate an attention bias away from threat. Positive means indicate an attention bias toward threat. Mean scores were adjusted for covariates (baseline attention bias and working memory capacity) evaluated at their overall sample means.

☐ Avoid-Threat   ▨ Attend-Threat

Post-Training Attention Bias (ms)

Low Anxiety: Low WML, High WML   High Anxiety: Low WML, High WML

Mean post-training attention bias scores were adjusted for baseline attention bias and working memory capacity which were evaluated at their overall means. Scores below zero indicate an attention bias away from threat. Scores greater than zero indicate an attention bias toward threat.

DISCUSSION

➤ We found that ABMT was most effective in low WML, low anxiety conditions.

➤ We found disruption to ABMT in the high WML, high anxiety groups, which yielded attention biases opposite of the direction of training.

➤ This suggests that ABMT is least effective for individuals with high levels of anxiety who experience a high WML during the task.

➤ Further research can address how to improve ABMT for the highly anxious in this regard to increase its efficacy as a treatment of anxiety.

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