The Effects of Brief Working Memory Training on Electrophysiological Markers of Fear Extinction

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BACKGROUND

- Anxiety disorders are highly prevalent, debilitating, & difficult to treat[1,2]
- Fear Extinction is a key mechanism underlying anxiety disorders and their treatment[3]
- Fear extinction is the reduction of fear to a stimulus that was previously associated with threat (CS+) and may rely on an individual's cognitive abilities to gate prior fear memories from driving behavior[4]
- Improving cognition through working memory training (WMT) may improve fear extinction[5]

OBJECTIVE

The aim of this investigation is to discern whether active WMT leads to a more pronounced reduction in fear response (low difference between CS+ and CS-) compared to those who received a sham training

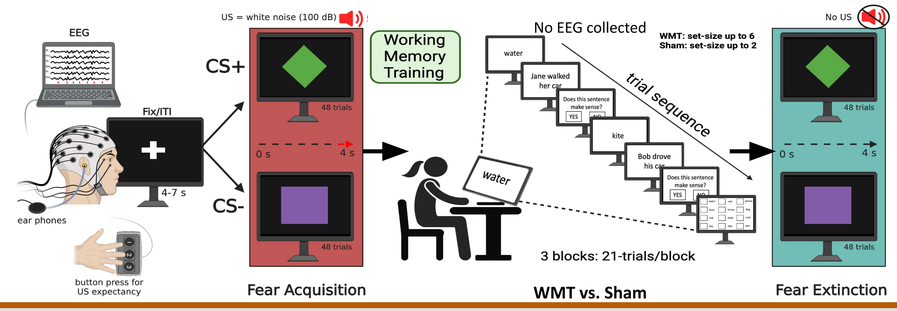
METHOD: SAMPLE AND COLLECTION

39 participants from community and previous studies
Age range from 18-55 (M=26)
16 Identifying Male 23 Identifying Female
ST *n* = 20; WMT *n* = 19
50.0% White, 45.5% Asian 4.5% Native American,, 2.3% Black/AfricanAmerican, 6.8% Other

METHOD: EEG RECORDING & ANALYSIS

- 64-channel active electrodes (10-20 system); Sampling rate: 1000hz; Impedance < 25kΩ; online reference = L Mastoid
- Analyzed using Brain Vision Analyzer:
  - bandpass filtered: 0.1 - 30 Hz
  - re-referenced: average mastoid
  - Ocular ICA correction
  - segmented: -200 - 1000 ms
  - baseline corrected
  - artifact rejection: ± 300 μV; 50 μV window
  - averaged artifact-free trials

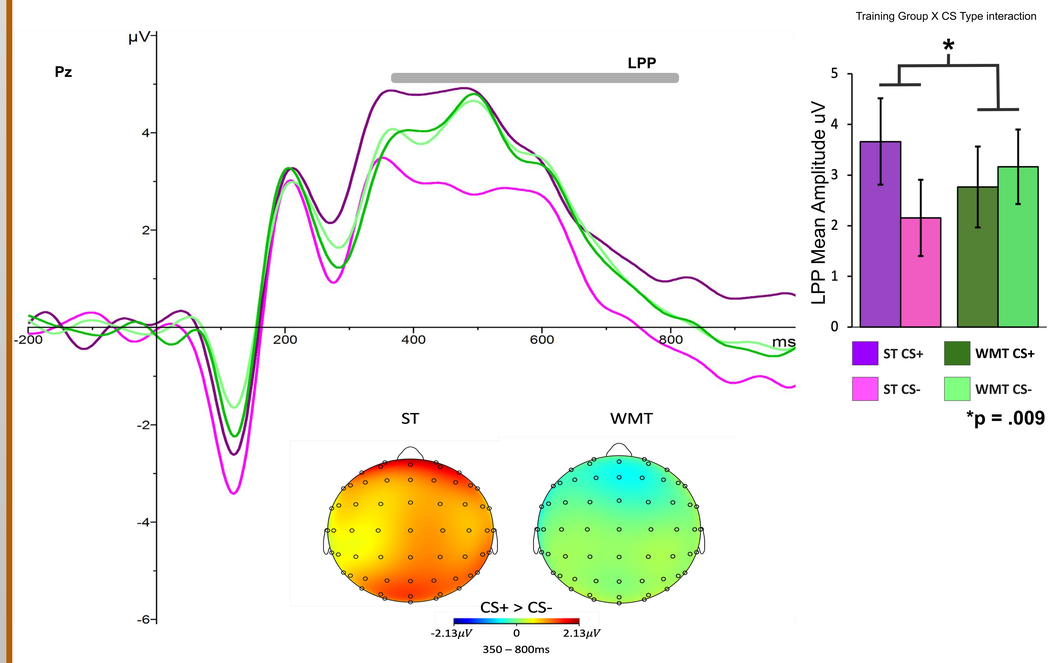
METHOD: STUDY OVERVIEW



METHOD: Late Positive Potential (LPP)

- Analysis focused on the late positive potential (LPP), an EEG marker of emotional memory processing and is increased to emotional stimuli[6]

Results: WMT is associated with lower CS+ vs. CS- compared to ST



INTERPRETATION

- Results show a significant Group x CS type interaction
- Analysis focused on the difference between the CS+ and CS- trials as a marker of excess fear during extinction
- Participants in the WMT group showed significantly lower differential CS+/CS- LPP activity than those in the ST

IMPLICATIONS

- Results identify potential neurocognitive mechanisms underlying fear extinction
- Imply WM as a key component of extinction learning

FUTURE DIRECTIONS

- Conduct experiment with larger sample size, different treatment lengths and imaging techniques
- Possibility of an alternative or adjunctive treatment to fear extinction-based therapies

REFERENCES

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