

Boosting working memory capacity by strengthening the oscillatory functional fronto-parietal pathway

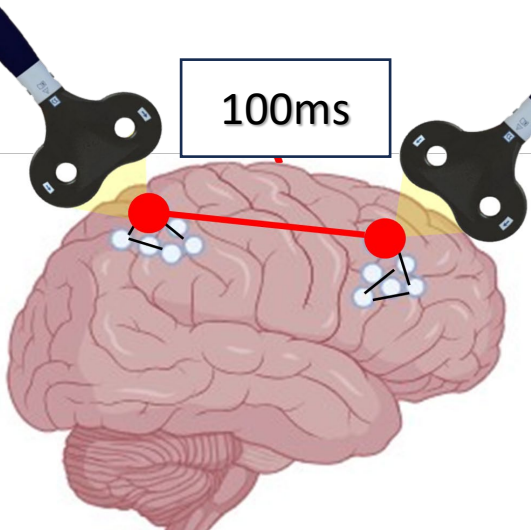
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1. Background and expected results

- **Frontoparietal Network** associated with cognitive control functions such as working memory (WM).
- **Neural oscillations** serve important regulating functions in the interaction between WM and sensory input [1] e.g.:
- **Suppression** of goal irrelevant information by alpha oscillations (α).



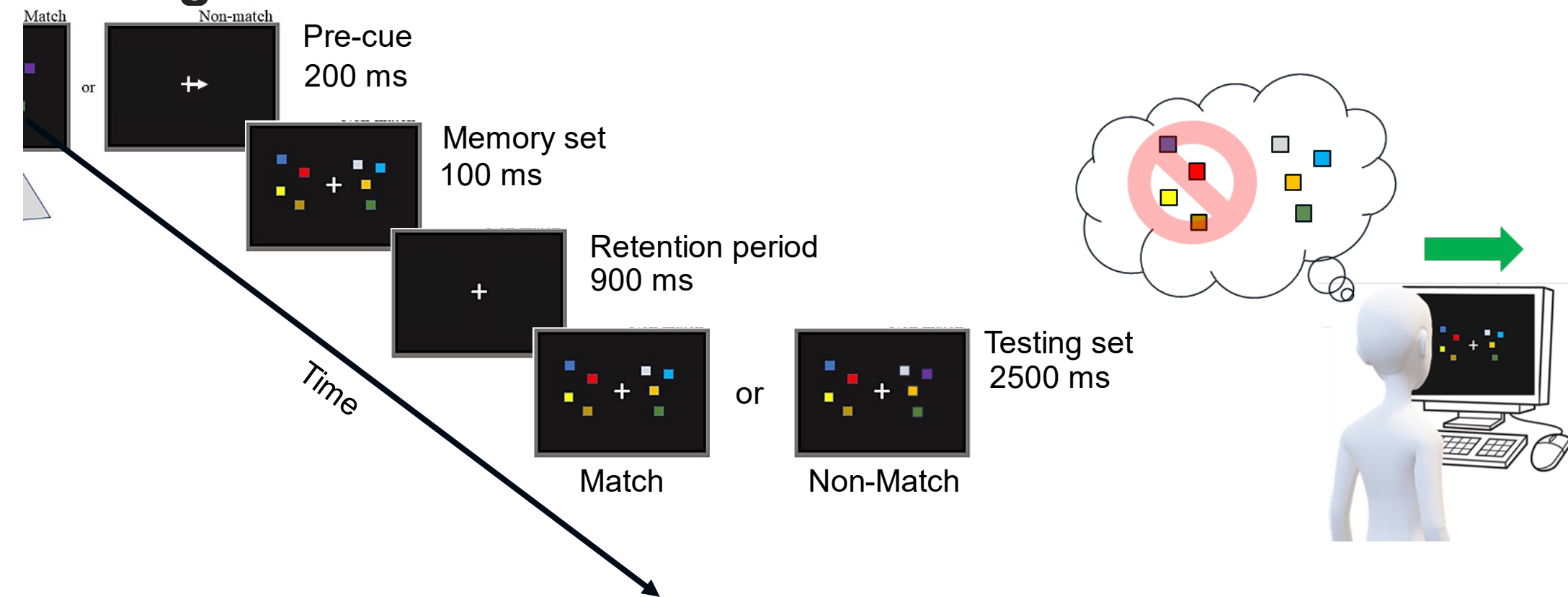
AIM: To improve frontoparietal network oscillatory functional communication and **WM performance** using a novel information-based Transcranial Magnetic Stimulation (TMS) approach, namely:

Oscillatory tuned cortico-cortical paired associative stimulation (ccPAS)

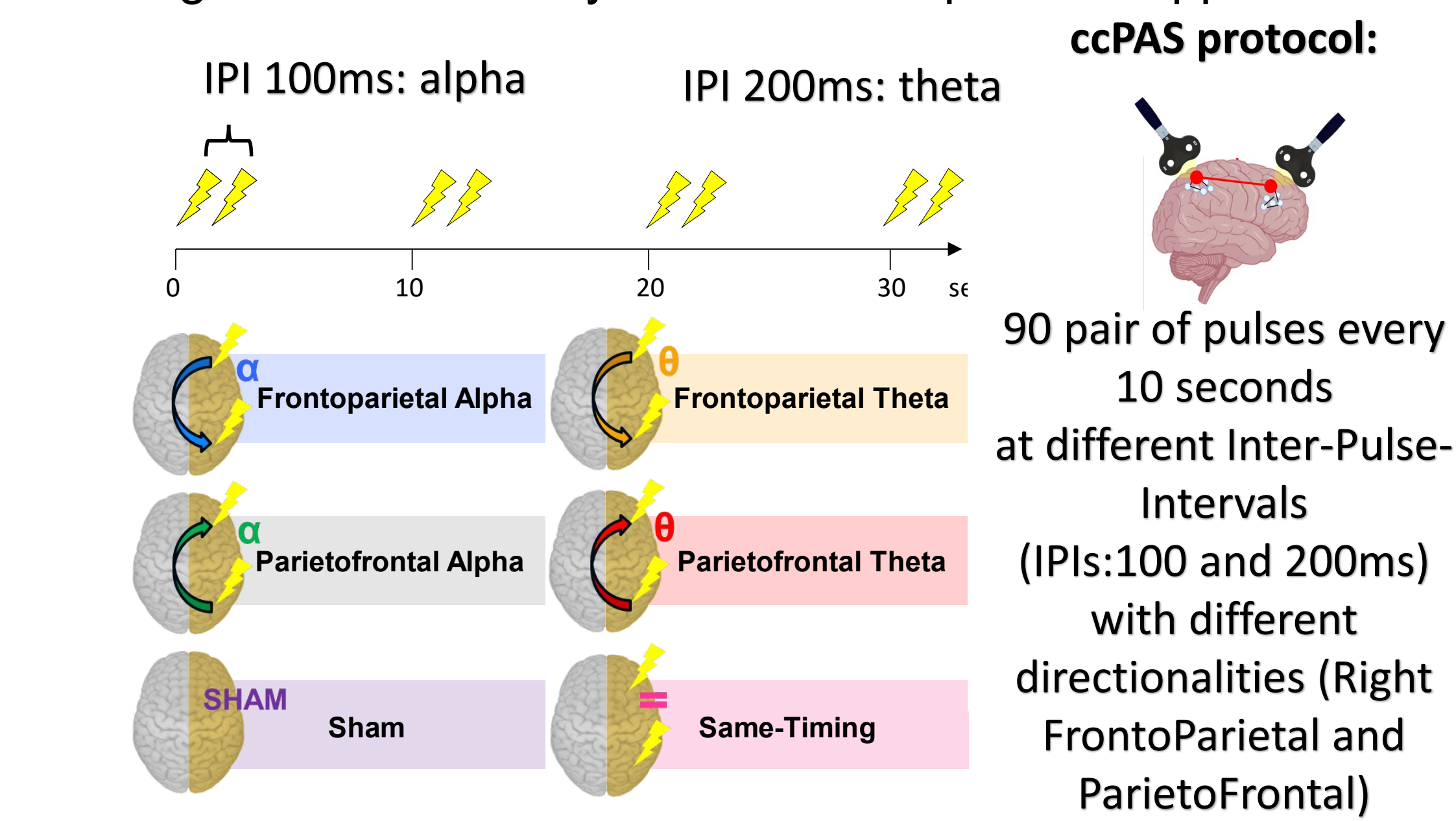
A novel method to target oscillatory specific networks by repeatedly associate target areas in a time-dependent way **to exploit brain plasticity and enhance connectivity**

2. Methods

Change detection WM task before and 30 min after ccPAS



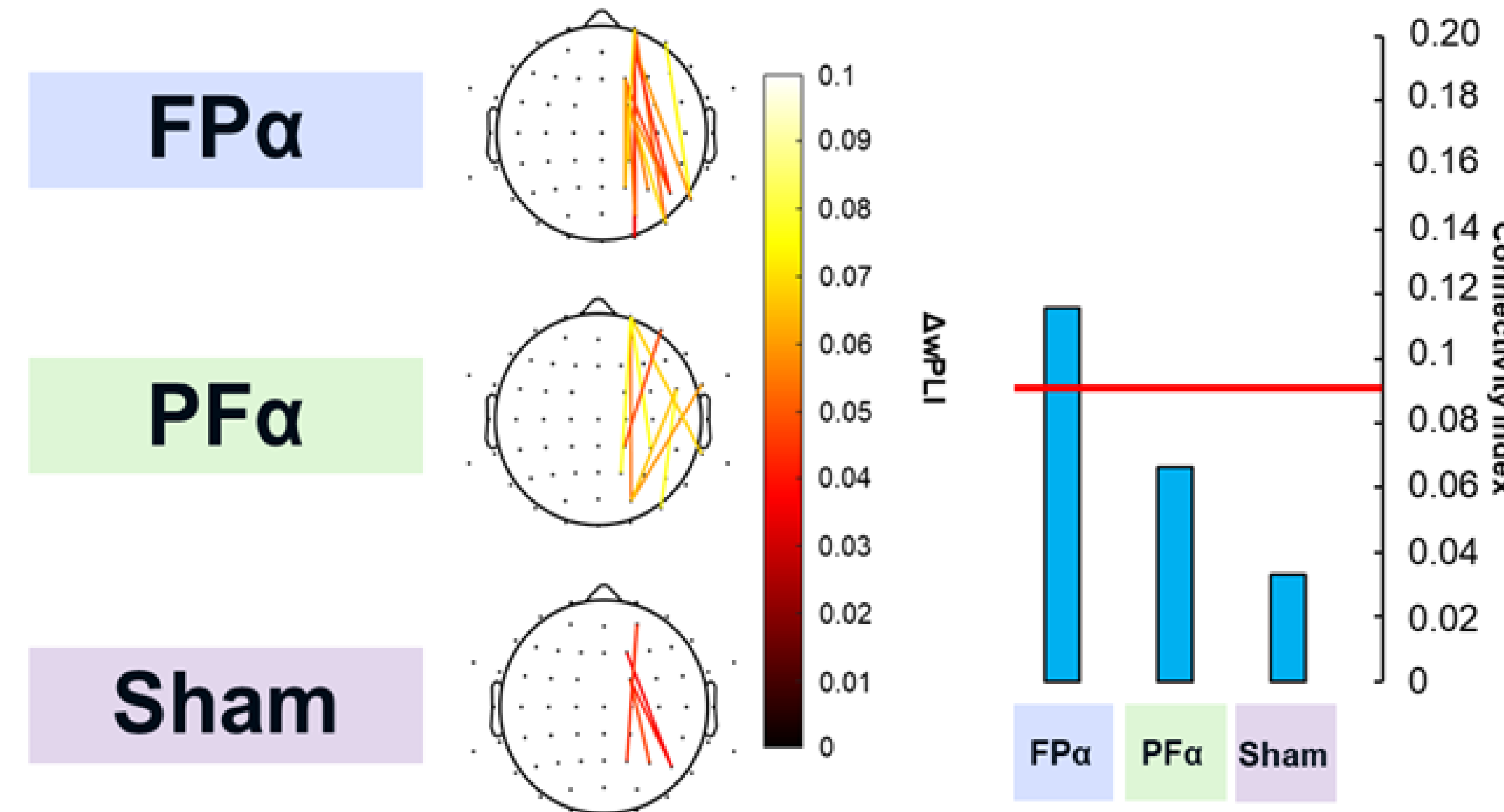
Timing and directionality of the ccPAS protocol application



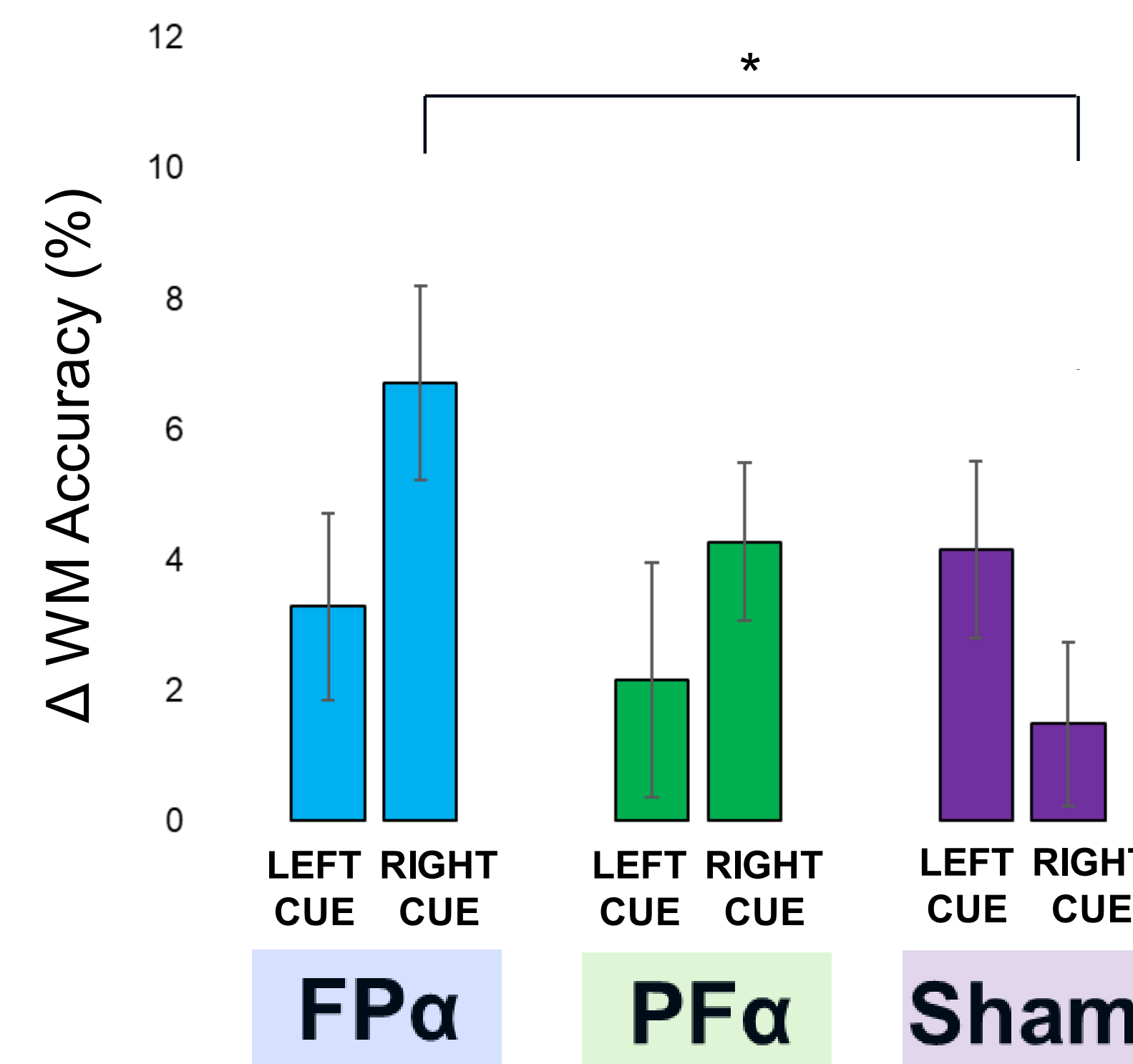
3. Results

Oscillatory-tuned CCPAS effect on connectivity and behaviour is frequency specific and direction specific

EEG results: Enhanced alpha connectivity following FrontoParietal (FP) alpha ccPAS confirm frequency and directionality specificity of connectivity modulation effects

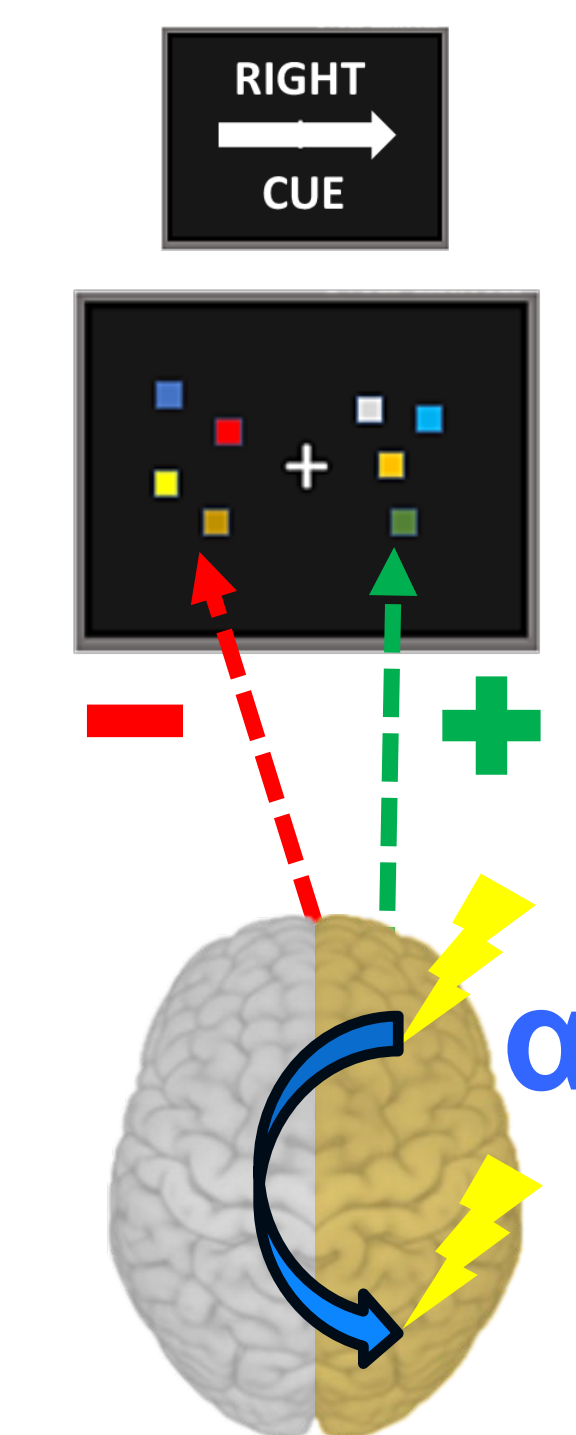


Behavioral results: WM is enhanced following FP alpha ccPAS for stimuli ipsilateral to the stimulated hemisphere. No other significant effects. Results confirm the functional relevance of the frequency and direction specificity effects of ccPAS.



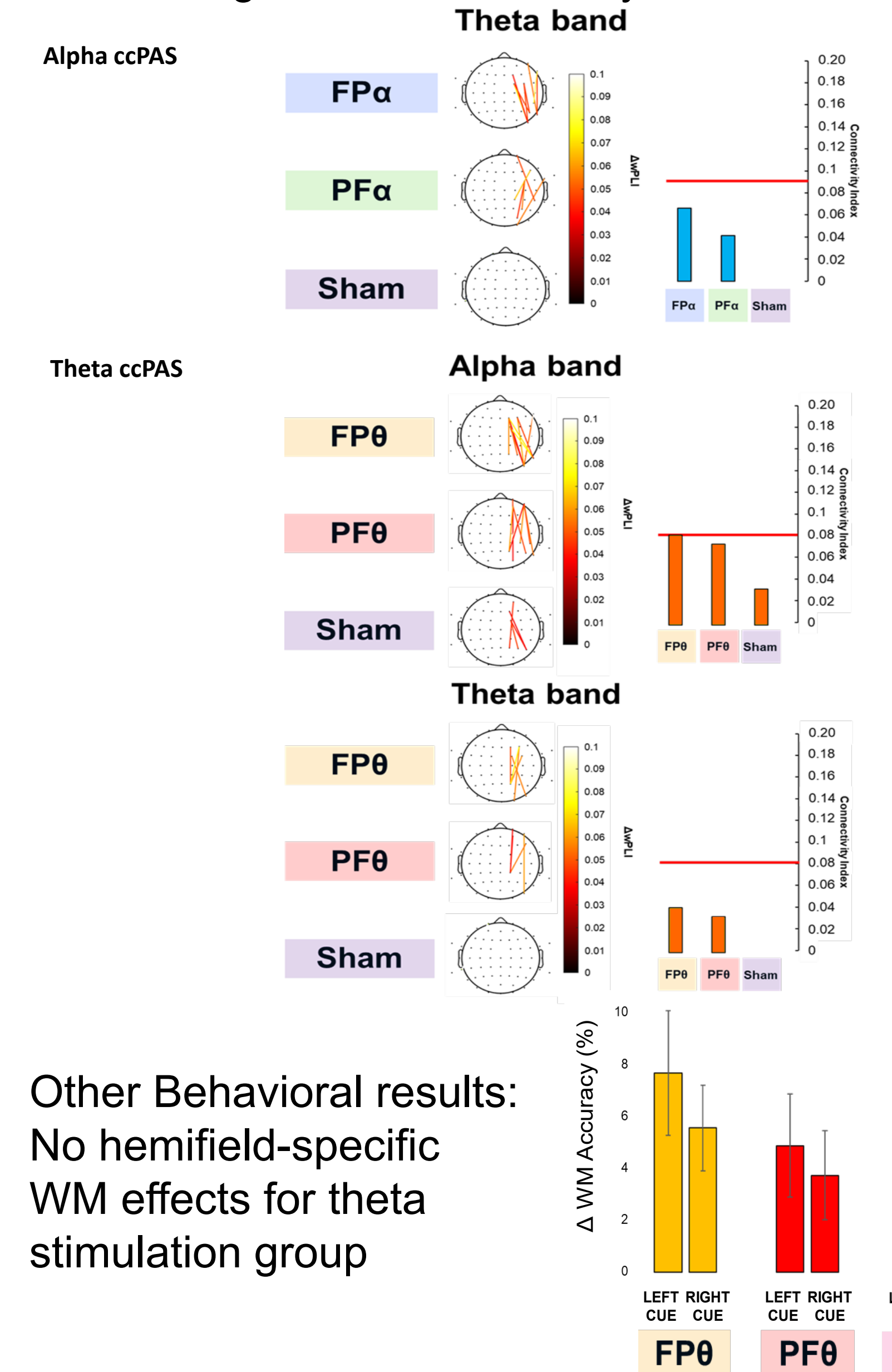
4. Discussion

Oscillatory-tuned ccPAS, induces frequency specific changes with specific WM effects

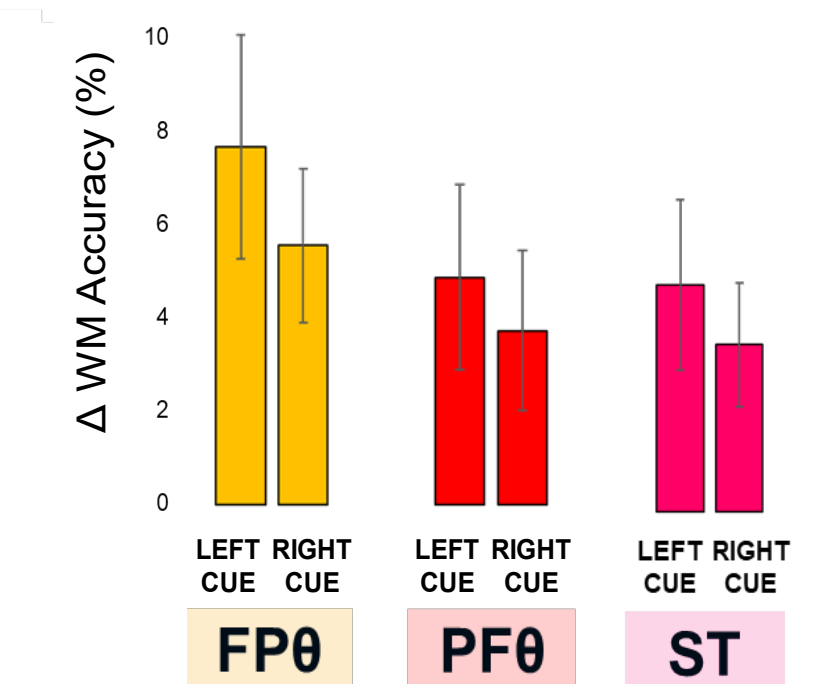


Other EEG results:

No other significant connectivity modulation



Other Behavioral results: No hemifield-specific WM effects for theta stimulation group



5. Conclusions

- Frequency- and direction-specific **ccPAS** effects demonstrate critical **oscillatory-tuned timing** and **direction of stimulation** in modulating frontoparietal connectivity in the alpha-band.
- **Functionally relevant effects:** Behavioural results confirm alpha frontoparietal network involvement in **task-related suppression demands**.
- **Demonstration of causal involvement of alpha rhythms in top-down suppression of irrelevant stimuli** with concurrent release of resources to facilitate memorization of the relevant stimuli.