

Aaaand Action! Is the primary motor cortex the driver of memory guided action planning?

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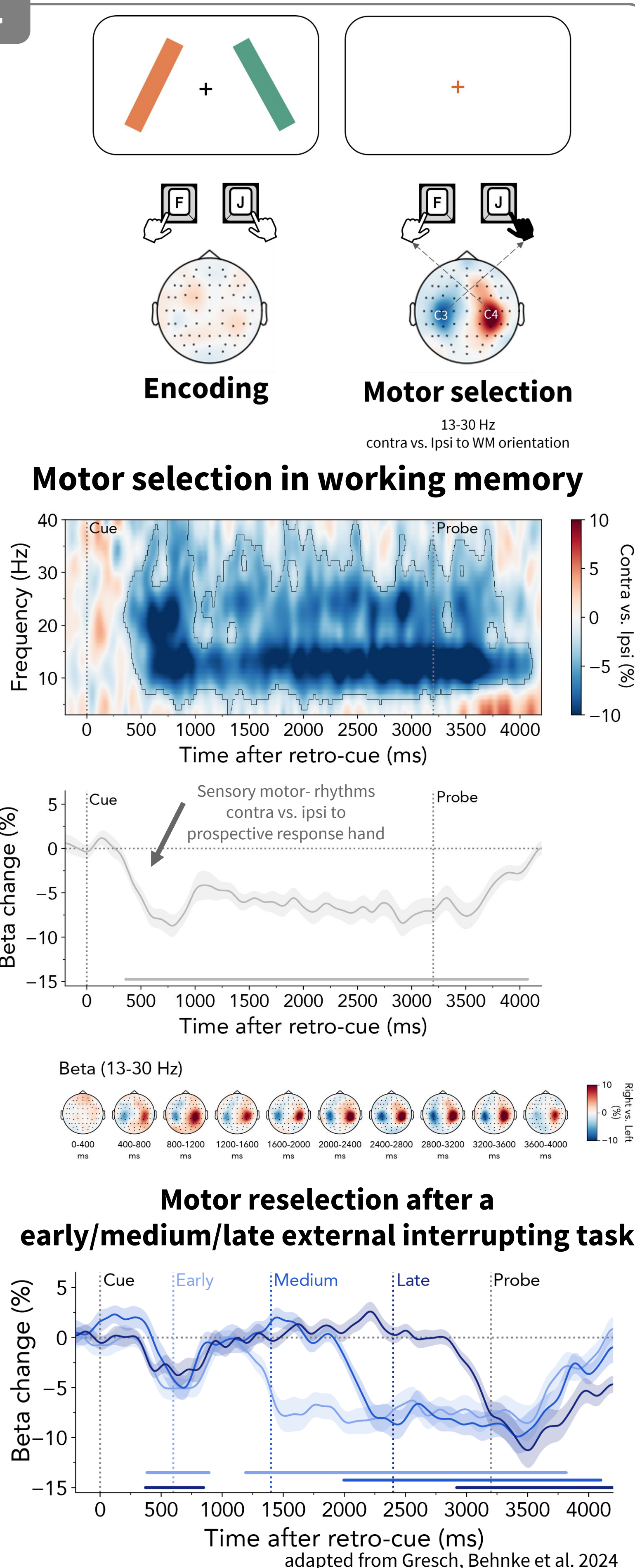
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Background

In our daily life we constantly have to anticipate and prepare for future actions. These future demands can be extracted from memory and transformed into so called action plans before they are eventually executed.

Sensory-motor rhythms (13 – 30Hz) contralateral to the prospective response hand can track action selection and planning. They are referred to as marker of action planning^{1,2}.

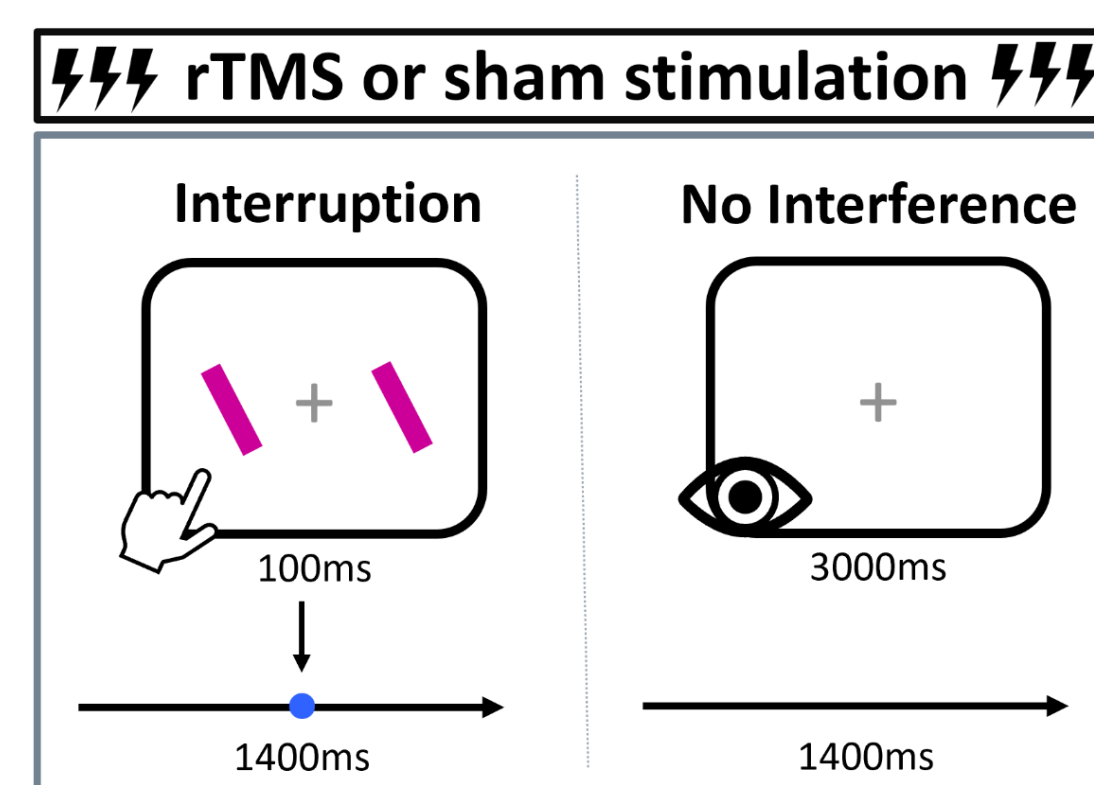
Previous results showed instant action selection after the retro-cue and reselection of motor contents immediately after completion of an external, interrupting task^{1,2}.



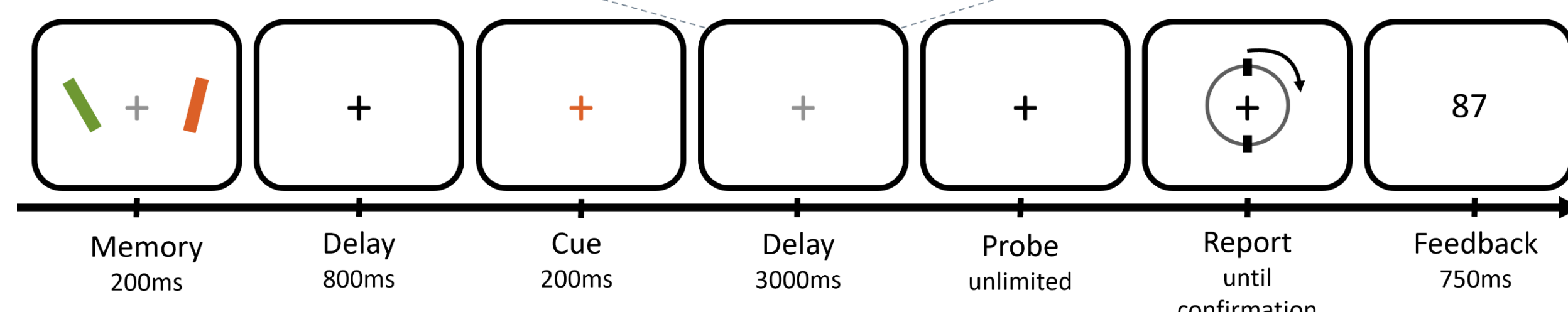
Experimental Design

Study Design

Does rTMS at sensory motor rhythm over M1 interfere with memory guided action planning?



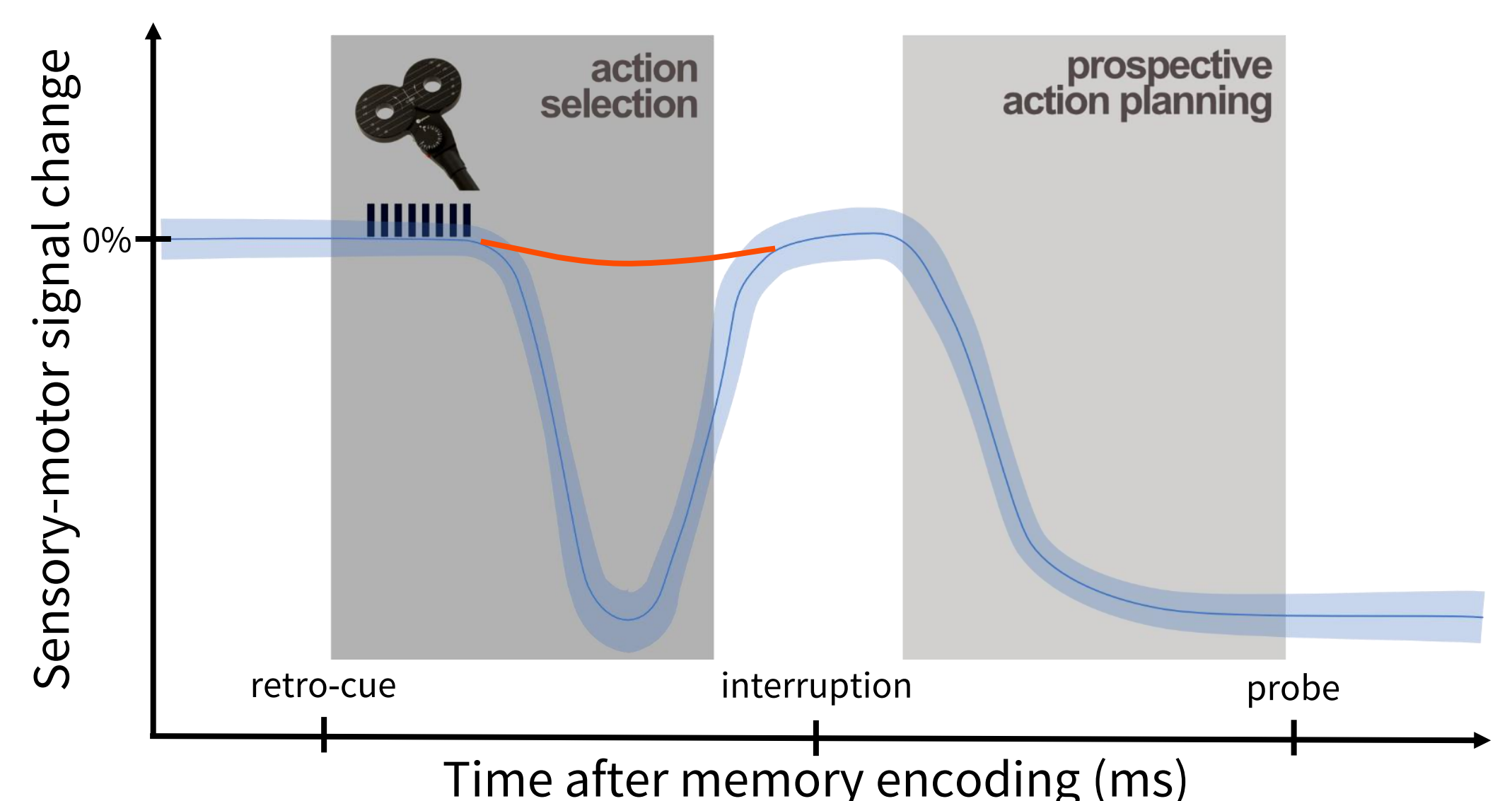
Prospective actions were transiently planned (No Interference) or were interrupted by an external interfering task (Interference) during the delay of a visual-motor working memory task.



Stimulation: 13Hz rTMS vs. sham, 8 pulses, intensity: 80% resting motor-threshold

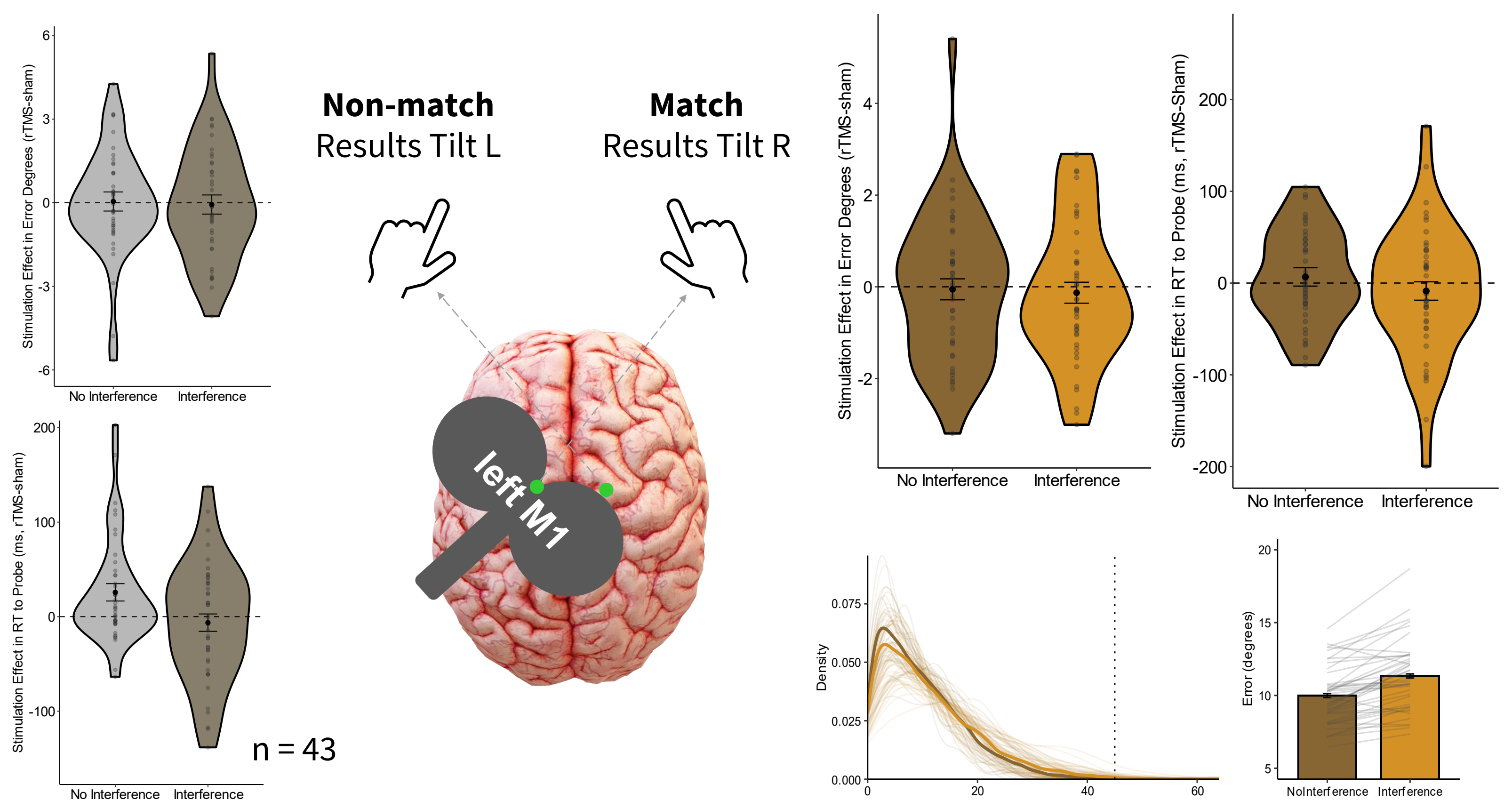
Target: left primary motor cortex

Timepoint: after retro-cue off-set

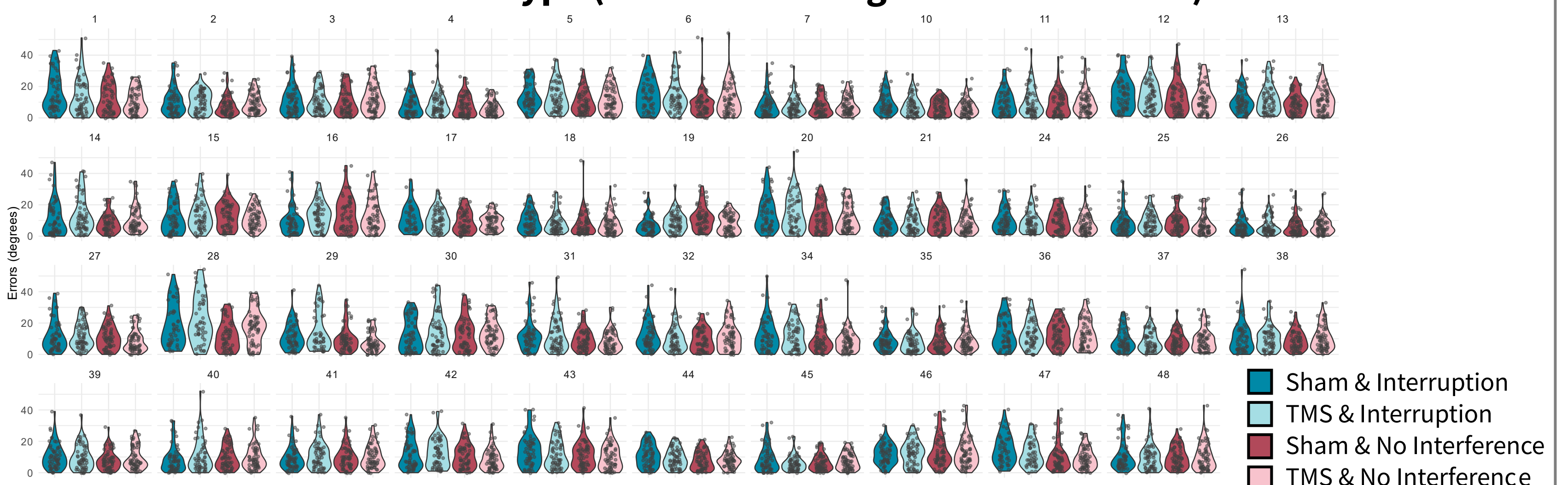


Results

Stimulation Target-to-hand match vs. non-match



Individual participant data: Error Degrees as a function of Stimulation- and Interference Type (stimulation target-to-hand match)



Research Questions

Does sensory-motor rhythms over the motor cortex serve as the neurophysiological mechanism causing memory-guided action planning?

Conclusion

- Results indicate that the neurophysiological signatures observed in the EEG may not originate from the primary motor cortex, but potentially from other motor regions such as the premotor area.
- Alternatively, the results might be explained by insufficient stimulation duration and/or incorrect timing relative to the task.
- This study suggests that the primary motor cortex might not be the neurophysiological driver of guided action planning.