

Background

- Few studies compare brain activity during mental and physical tasks, with fewer looking at dominant vs. nondominant execution and dynamic vs. isometric contractions
- Typically, the right side of body is controlled by the left side of brain and vice versa
- **The purpose of this study was to observe brain activity in both hemispheres of the prefrontal and sensorimotor cortices during physical and imagined, dominant and non-dominant unilateral isometric elbow flexion**

Methods

Participants: Fifteen right-handed healthy college students participated in the study. No participants regularly lifted weights or identified as ambidextrous.

Protocol: A geodesic net with 64 channels was fitted onto the head. Participants were instructed to perform 5 repetitions of unilateral physical and mental isometric dumbbells contractions on their dominant and nondominant sides. Contractions were sustained for 5 seconds separated by 30 seconds of rest.

Analysis: Following artifact removal, specific sensors were grouped to represent left and right sensorimotor and prefrontal cortices. Mean amplitudes for each group were calculated for 500-1000 ms and 2000-2500 ms after initiation. A repeated ANOVA followed by a simple contrast post hoc test was used to assess significance between tasks and cortex hemispheres. Movement related cortical potentials and frequency bands (alpha and beta) were reported.

Results/Conclusion

- Physical and imagined tasks produced bilateral brain activity in sensorimotor and prefrontal cortices
- Physical contractions generally generated more brain activity
- Nondominant physical contractions elicited the greatest activity
- Future research should further investigate brain activity differences under varying conditions for stroke rehabilitation, advanced prosthetics, and the cross-education effect

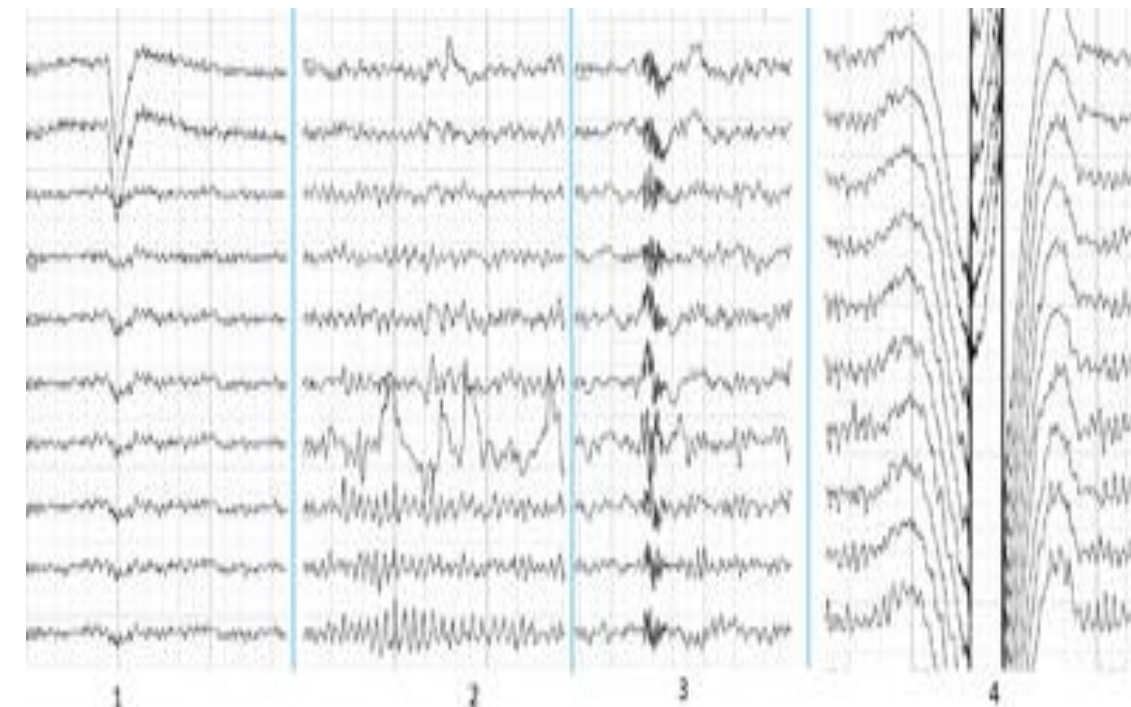
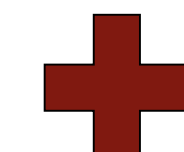
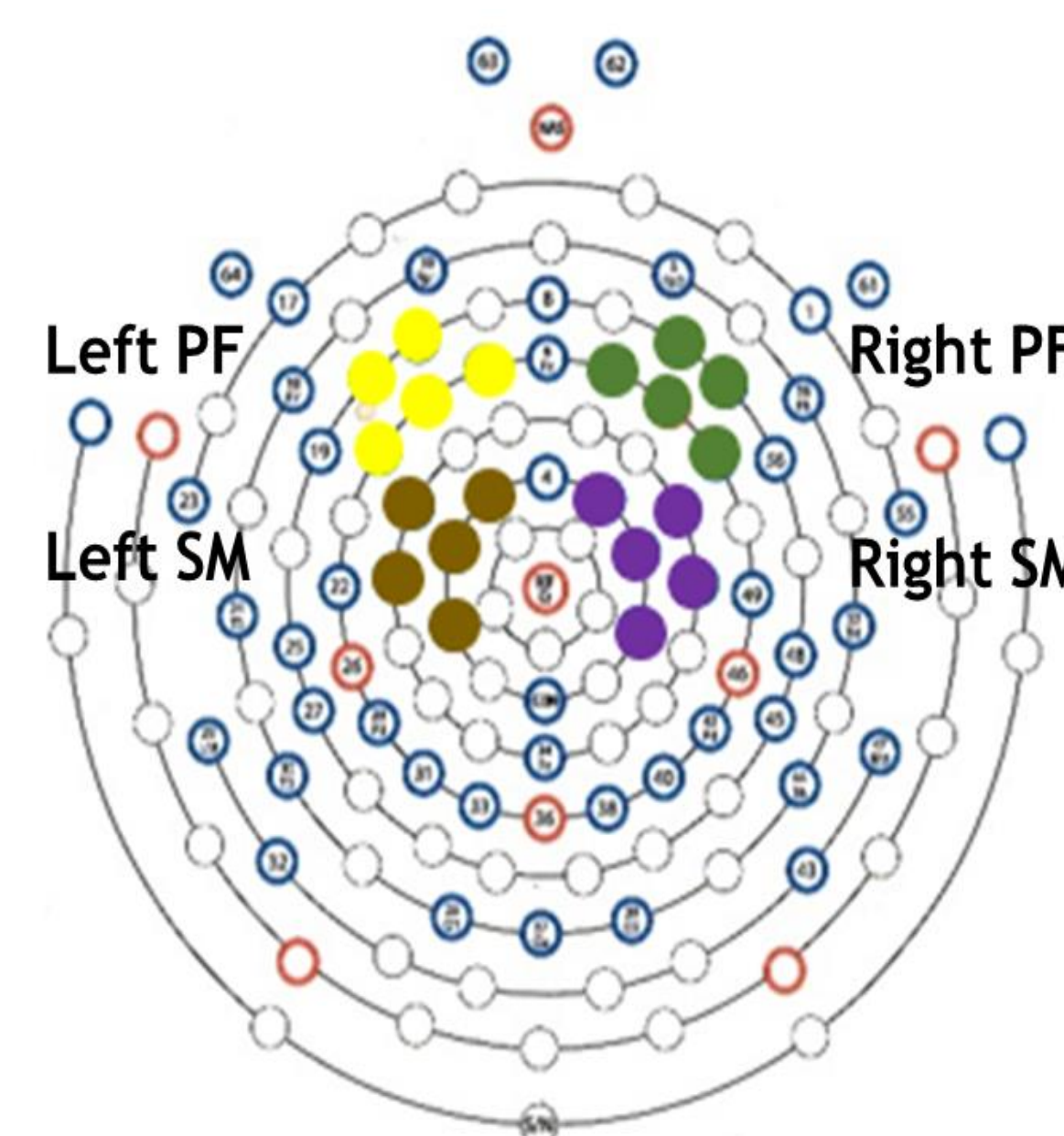
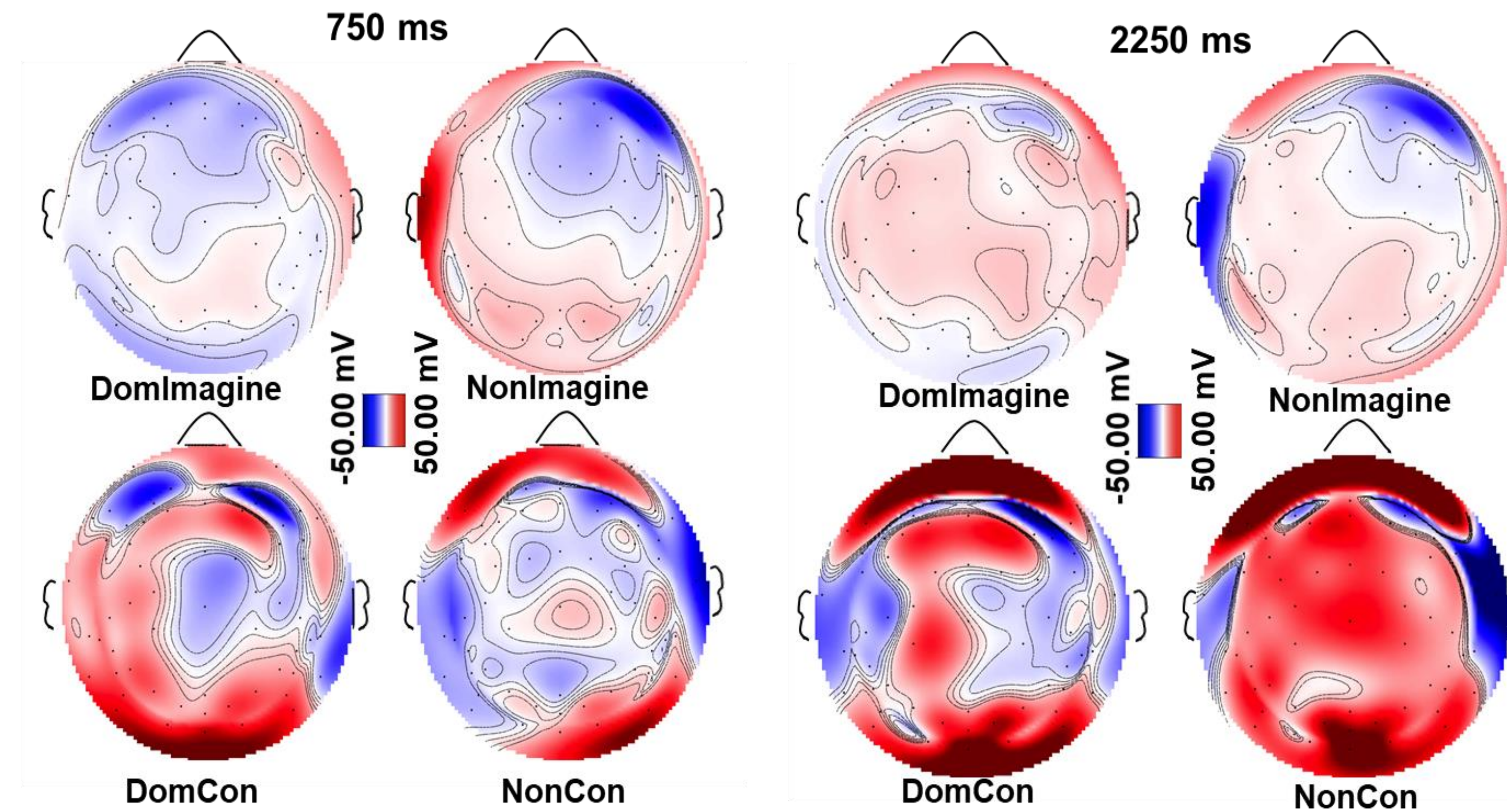


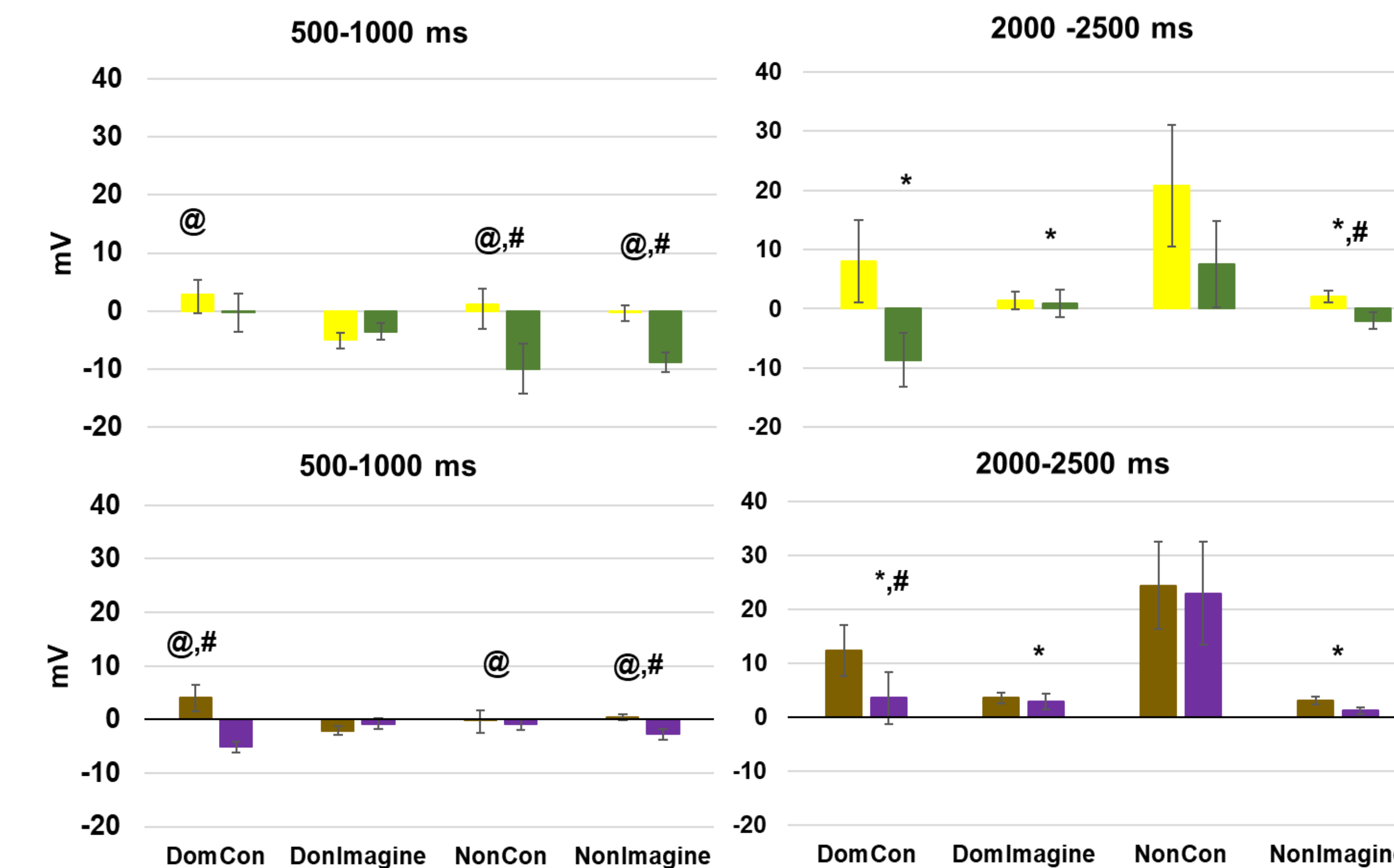
Image of EEG testing procedure



- Left Prefrontal Cortex
- Right Prefrontal Cortex
- Left Sensorimotor Cortex
- Right Sensorimotor Cortex



Topographical plots following sensory layout of EEG amplitude 750 and 2250 ms after initiation of isometric elbow flexion during DomCon, NonCon, DomImagine, and NonImagine. Red and blue shades indicate positive and negative voltage amplitudes, respectively, darker shades represent higher magnitudes.



Mean amplitudes in the left and right hemispheres of the prefrontal and sensorimotor cortices 500-1000 and 2000-2500 ms after initiation of isometric elbow flexion during DomCon, NonCon, DomImagine, and NonImagine. *(difference from NonCon), @ (difference from DomImagine), # (difference between left and right)