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- elbow flexion

by 30 seconds of rest. reported.

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# Brain Activity During Unilateral Physical and Imagined Isometric Contractions Jonathan A. Martinez & Matthew W. Wittstein, Ph.D. & Stephen Bailey, Ph.D. & Stephen Folger, Ph.D.

Department of Exercise Science & Physical Therapy Education Elon University, Elon, NC

#### Background

Few studies compare brain activity during mental and physical tasks, with fewer looking at dominant vs. nondominant execution and dynamic vs. isometric

Typically, the right side of body is controlled by the left side

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

## 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

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

### **Results/Conclusion**

Physical and imagined tasks produced bilateral brain activity in sensorimotor and prefrontal cortices Physical contractions generally generated more brain

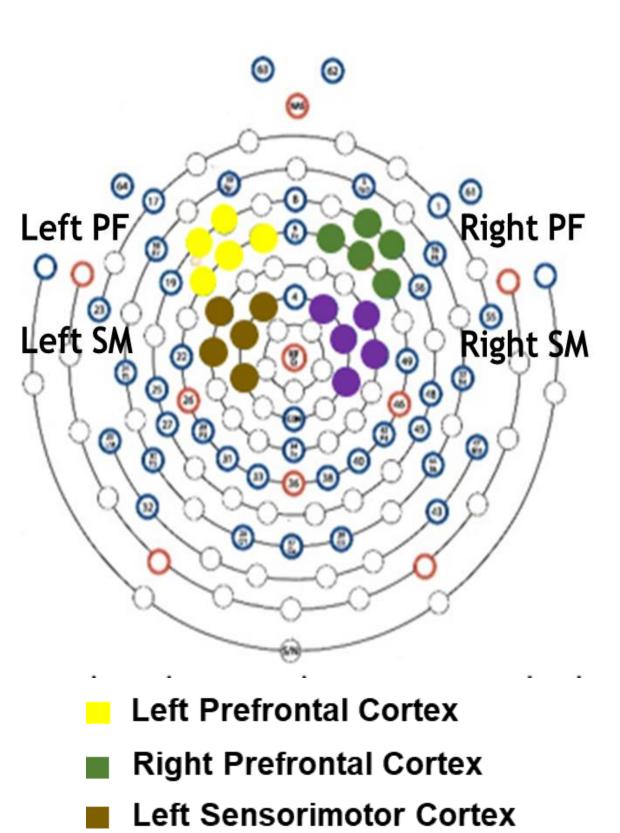
Nondominant physical contractions elicited the greatest

Future research should further investigate brain activity differences under varying conditions for stroke rehabilitation, advanced prosthetics, and the cross-

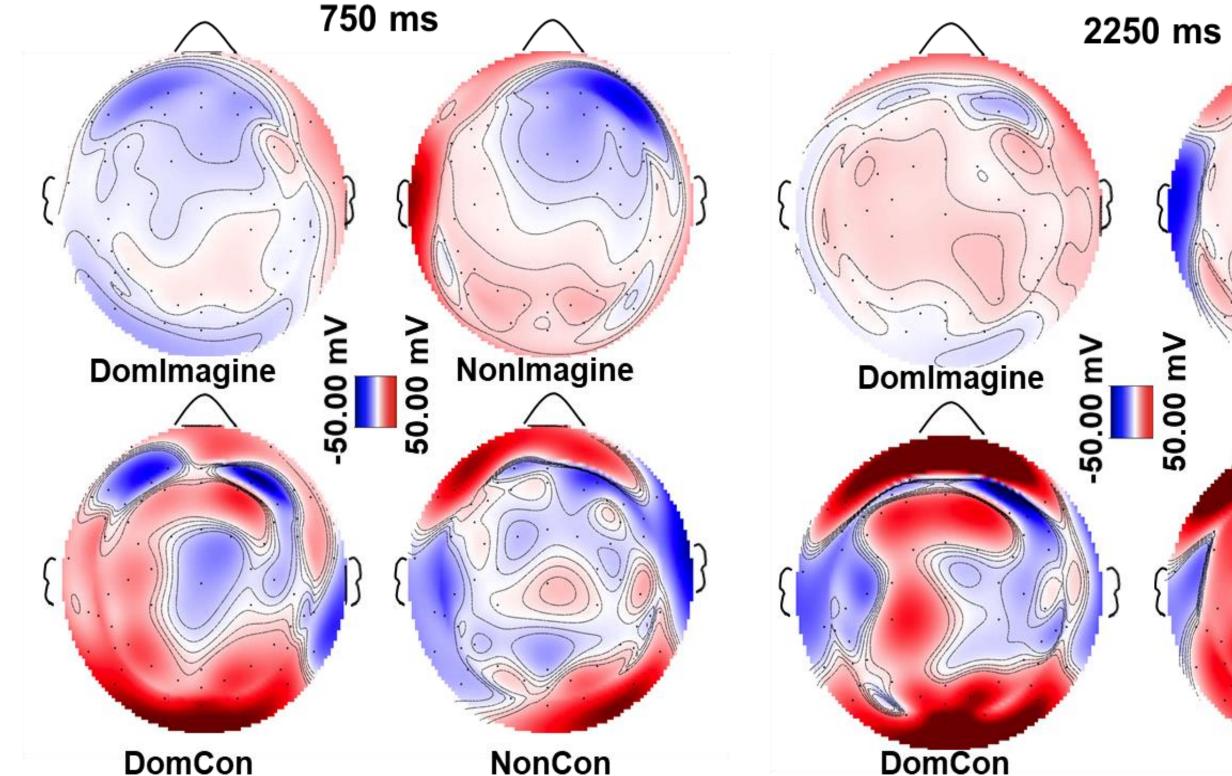


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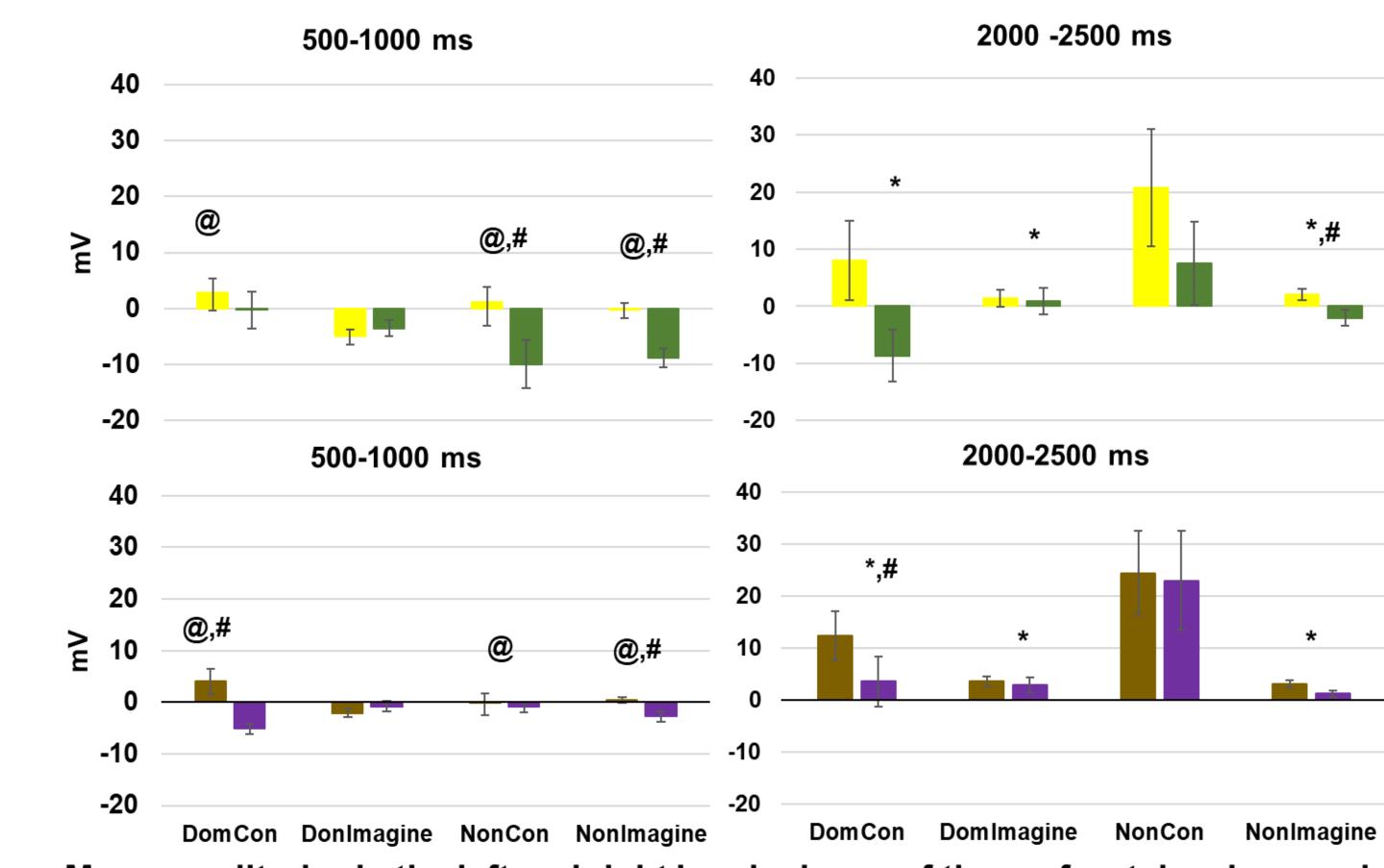
#### Image of EEG testing procedure



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 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)

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