Case Western Reserve University

Human Reactions Under Emergent

Behaviors in Driving Safety

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EBME 318: Biomedical Engineering Laboratory I

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30 November 2016

***Abstract—Recent studies show that during hand movement, the cortical hemisphere on the contralateral (opposing) side of the body is activated. The μ rhythm (also called the μ wave), traditionally defined as an 8-12 Hz band, is related to the motor information. When brought into the context of driving safety, there are countless implications that can be inferred from observing and analyzing the direct effect on μ waves, as a result of various acute stressors, especially those arising in emergency situations.***

1. **Introduction**

The purpose of this experiment is to study the brainwave frequencies during five different states of mind: a state of relaxation, moving the left hand, *imagining* moving the left hand, moving the right hand, and finally *imagining* moving the right hand. Using all fourteen channels of EEG signals recorded during these tests, the data can be analyzed to explore the difference between the relaxation and moving states.

1. **Methods**

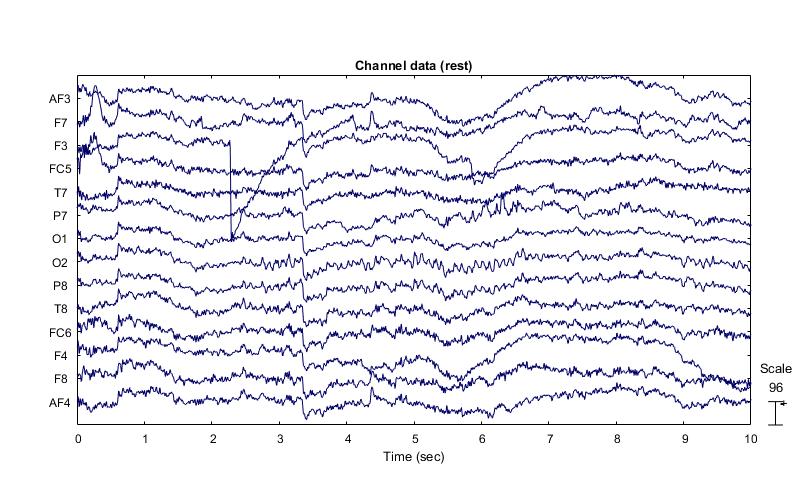
Data acquisition in this experiment was performed via the Brainwear® wireless neuroheadset known as the EMOTIV Epoc+. To ensure a properly conductive interface between the subject’s scalp and the headset, the device’s electrode leads were soaked in a saline solution. With the subject in a seated, relaxed position, the data collection protocol was initiated.

For each aforementioned state of mind, EEG data was recorded in 10-second intervals. Once this baseline was established, the subject performed a sequence of imagined movements (i.e. of the left and right hands) over the course of one long trial, mimicking actions performed by a person while driving.

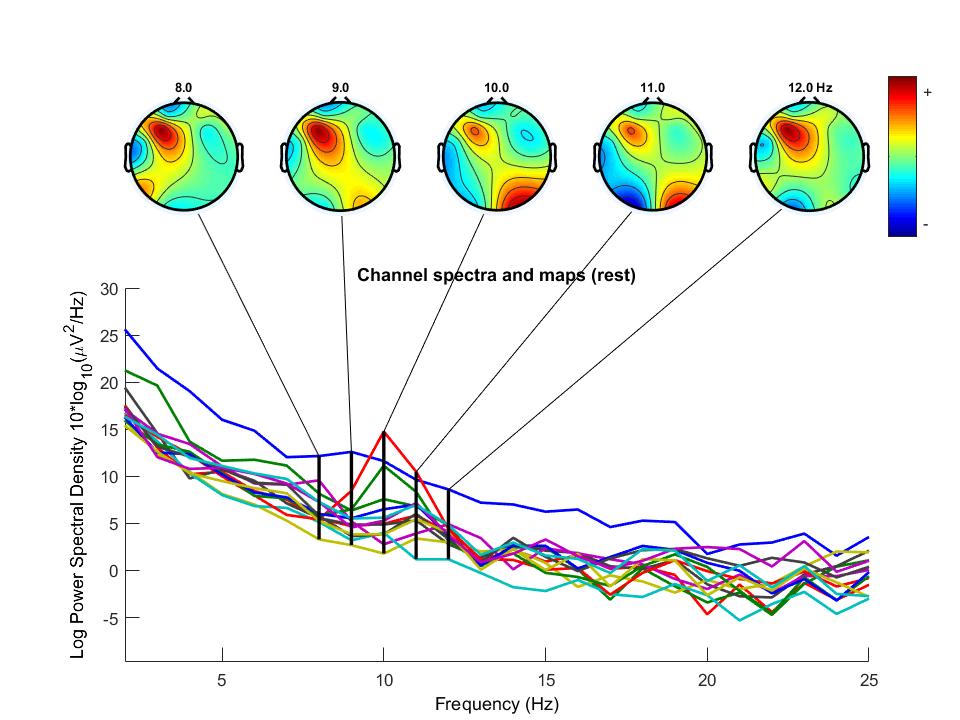
1. **Results**

The results of this experiment can be visualized thanks to the MATLAB add-on called EEGLAB, a widely used toolbox for processing electrophysiological data.

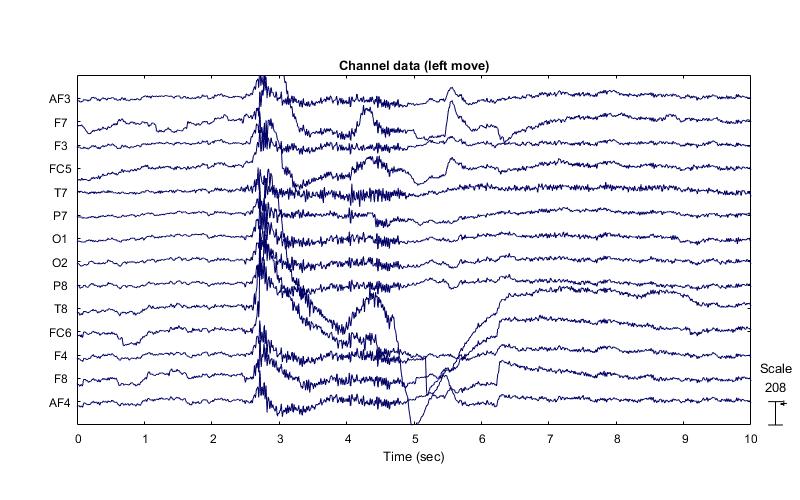
Rest time



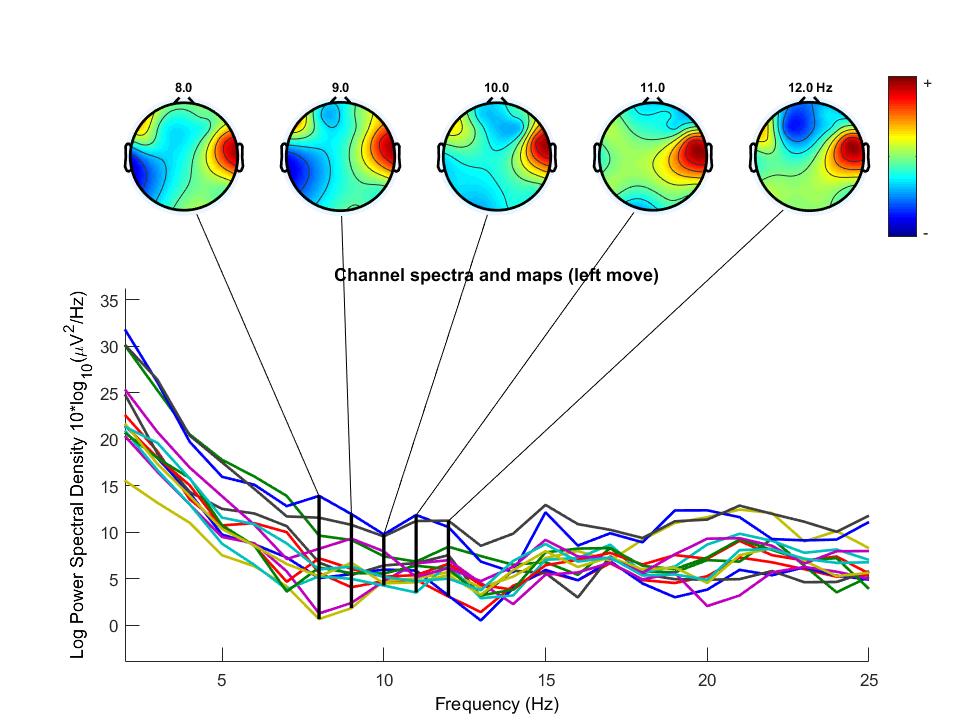
Rest frequency



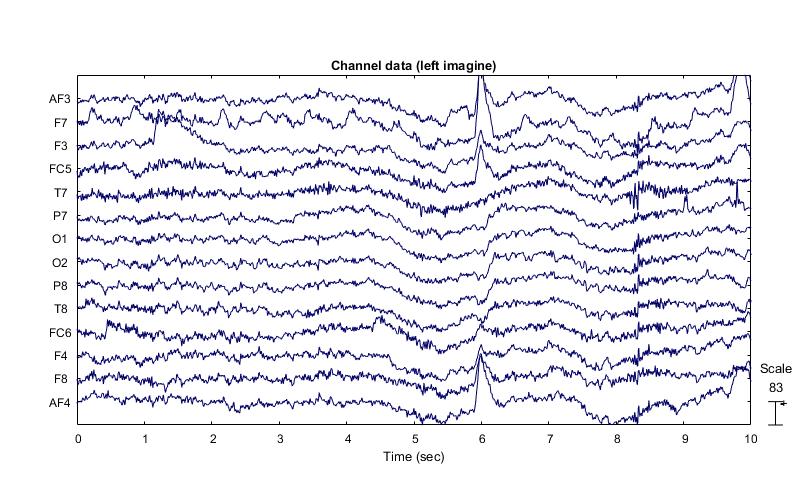
Left move time



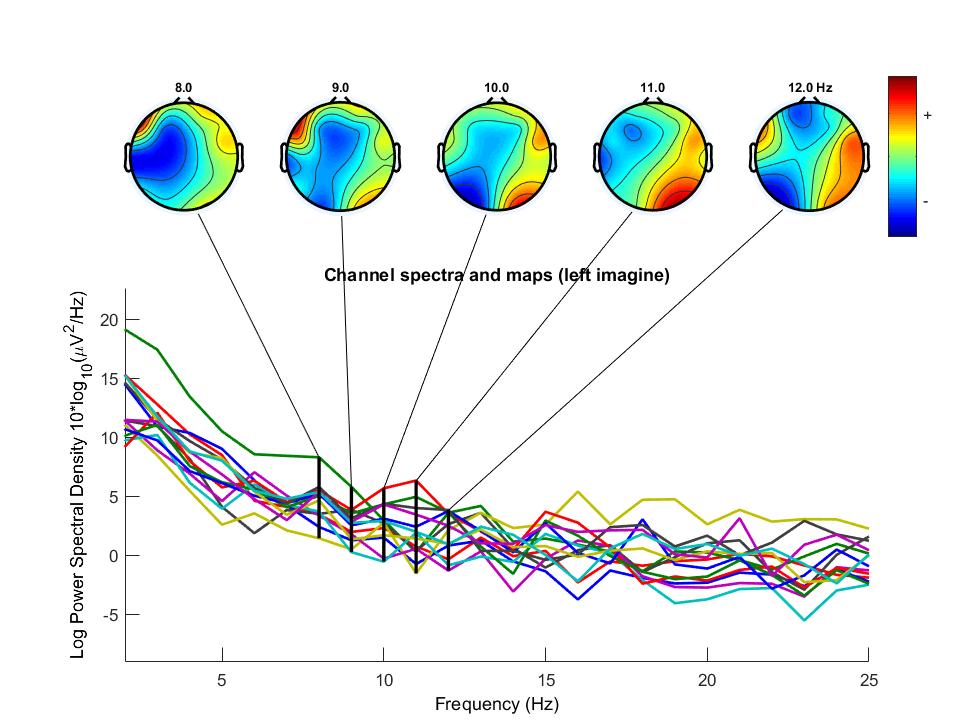
Left move frequency



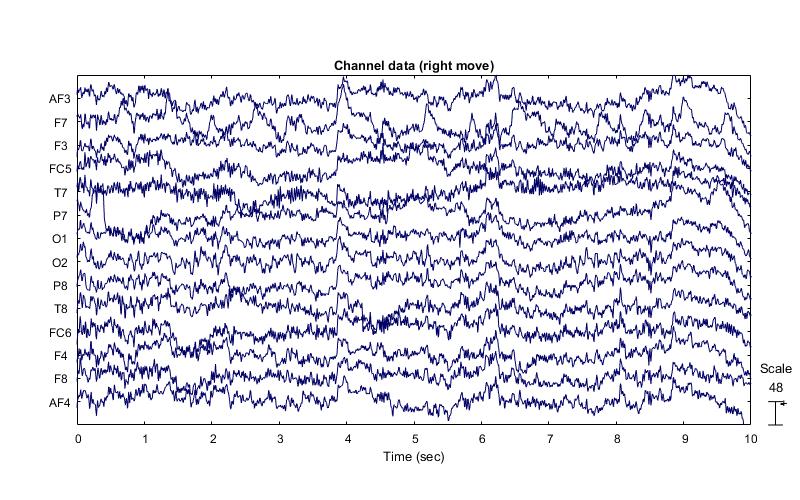
Left imagine time



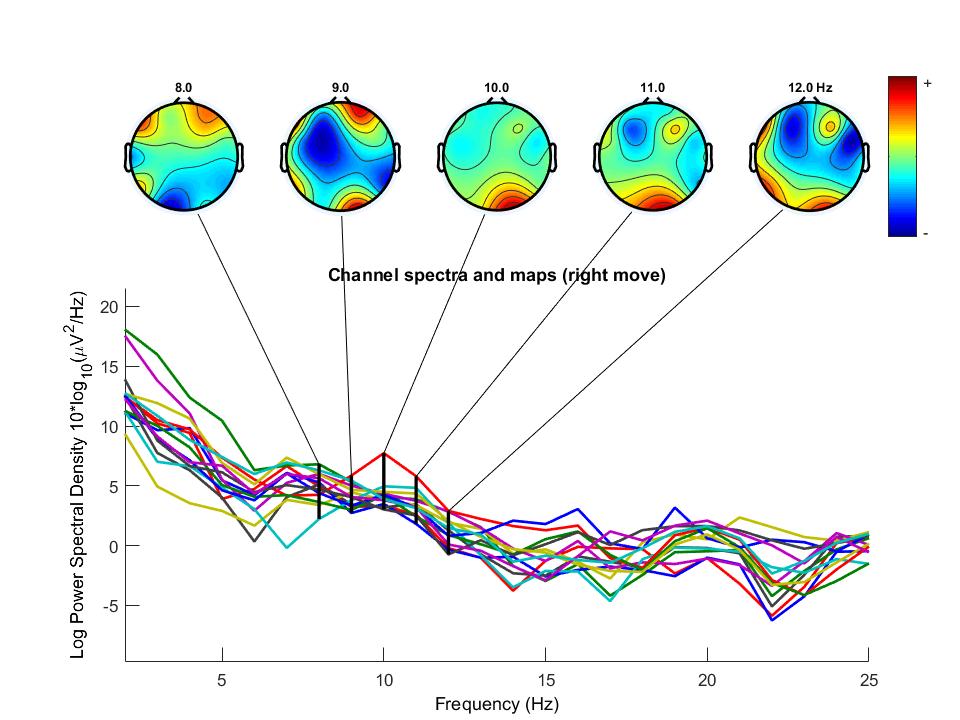
Left imagine frequency



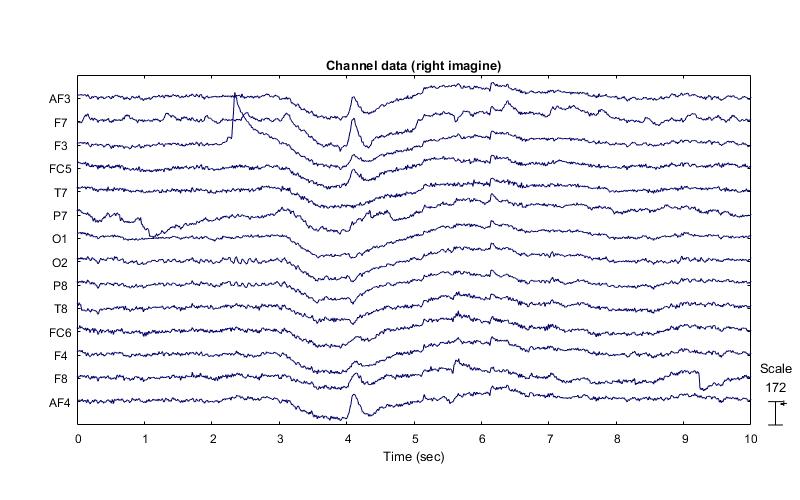
Right move time



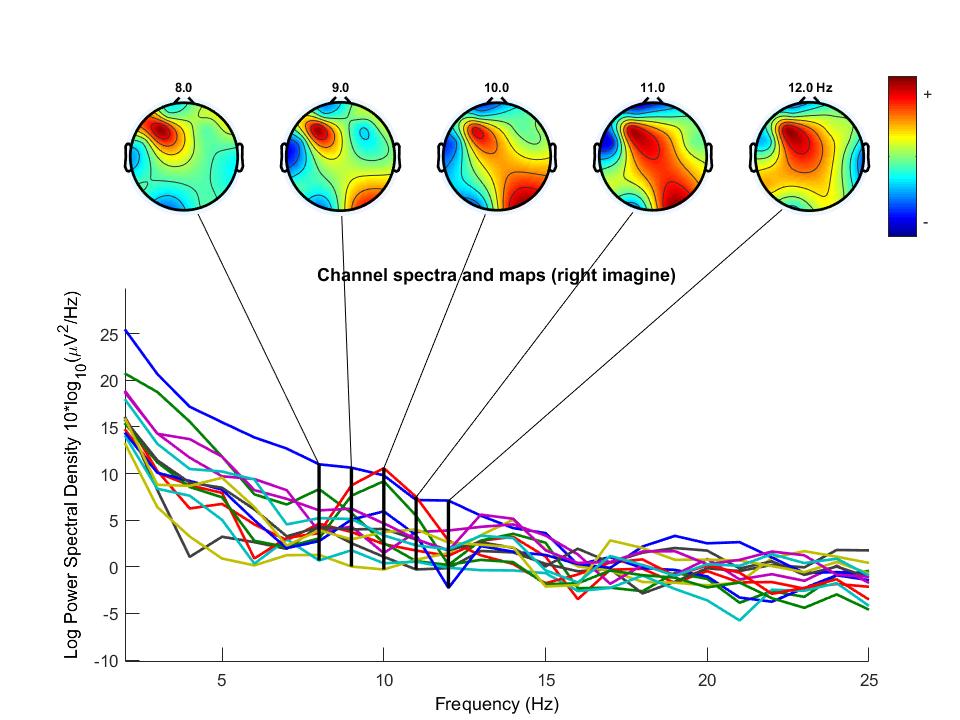
Right move frequency



Right imagine time



Right imagine frequency



1. **Discussion**

The discussion goes here

1. **Conclusion**

The conclusion goes here

**Acknowledgement**

I would like to take a moment to thank both Dr. Yu and Yang for the exciting experience as well as the opportunity to observe and participate in such a fascinating experiment!

# References

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