



Data Analysis of Sequential Motor Planning from Continuous Movement EEG Data using Frequency Analysis and a Classifier.

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Introduction

Sequential Motor Planning – Fluent retrieval and execution of movement sequences

Previous literature:

- Sporn et al(2022) – *Sequential Motor Behaviors – Effects of Reward*
- (Kornysheva et al., 2019) - Discrete Button Presses – *Neural Mechanisms*

Competitive queuing operate on the principle of concurrently activating multiple plan representations(Bullock & Rhodes, 2002).

This involves various structures highlighting the distributed nature of motor control within the brain (Kolb & Whishaw, 2003)

Objective

To analyze whether similar neural mechanisms occur in the context of continuous sequential drawing movements.

It will provide valuable insights into understanding motor control mechanisms, motor skill acquisition and performance optimization.

It has significant implications for designing interventions to enhance motor learning and performance in diverse domains, including rehabilitation and sports training.

Exploring the applicability of competitive queuing mechanisms to continuous sequential movements advances theoretical models of motor planning and execution.

Hypotheses

1. EEG data collected during the sequential drawing task can be effectively classified using Linear Discriminatory Analysis (LDA).
2. The classifier can be applied to detect neural representations of elements during the planning phase of movement execution.

Hypotheses

3. Similar brain regions underlying sequence planning will be found to similar to prior literature (Kornysheva et al.,(2019).
4. Incorporating information about the frequency content of EEG signals will enhance the classifier's performance beyond using the average that is amplitude alone.

Methods

Sporn et al (2022) – Between subjects group design with 13 participants

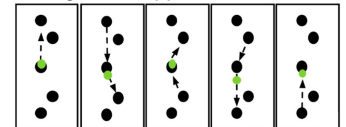
EEG data recorded using BioSemi system.

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Sporn et al. 2022

Task- six consecutive movements starting from either end of a 'k'-shaped path and ending at the opposite end



Sporn et al. 2022

Analysis

Data Preprocessing – Cleaning the raw EEG data.

1. Extract data around movements
2. Break down into frequency components.
3. Use LDA to see if it can be classified into separate different movements
4. If that works, the classifier will be used in the planning period to detect planning of movements.

Exploratory analyses will be conducted to identify the most informative EEG electrodes for successful classification, resembling a Searchlight analysis.

MATLAB alongside Fieldtrip, and EEG Lab toolboxes will be utilized as software tools for data analysis

Summary

Neural mechanisms underlying sequential motor control during continuous actions using EEG data and LDA. By examining CQ in motor planning, it extends previous research from discrete to continuous actions. This findings aim to enhance understanding of motor skill acquisition with implications for rehabilitation and sports training.