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Classification of cognitive problem-solving strategies using MVPA on pre-solution EEG data

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Abstract

There are two strategies that can be employed to solve a problem: analysis and insight. Analysis is the incremental, conscious search for a solution, as in hypothesis testing; insight involves the unconscious restructuring of a problem representation followed by the sudden, conscious realization of the solution (Aha! phenomenon). We attempted to discover features of neural activity during problem solving that could predict which type of cognitive strategy people used on each trial of an anagram task. We used Multivariate Pattern Analysis (MVPA) on 64-channel pre-solution EEG recording that has been time-frequency transformed. Searchlight was employed in which neighboring time-frequency points within a sliding window were used to train a Naive-Bayesian classifier across electrodes to determine the features with the best classification accuracy. In addition, Support Vector Machine was trained using principal components, which resulted in improved classification accuracy than Searchlight, suggesting more distributed nature of informative features in the data.