# Procedure uses brain signals to make prognosis on precision of movement

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Even simple, frequently carried-out movement tasks like opening a door

or grasping an object are sometimes realized better and sometimes worse, sometimes faster, sometimes slower, sometimes more precisely, sometimes less precisely. This variability in performance can be traced back in part to brain activity. An interdisciplinary junior research group at the Cluster of Excellence BrainLinks-BrainTools at the University of Freiburg (led by computer scientist Dr. Michael Tangermann) has developed a self-learning algorithm that allows predictions concerning the precision of an action. The procedure could be used for physical training methods and for improving rehabilitation after strokes. The study was published in the journal *Frontiers in Human Neuroscience*.

With the help of electroencephalography (EEG), scientists already discovered years ago that activity patterns in the brain precede movement. The study from Freiburg is also based on data from EEG signals. Researchers examined 20 healthy participants with an average age of 53 years. These participants had to trace a route on a computer screen by repeatedly pressing a power sensor. Their brain activity was recorded before and during the exercise. A self-learning algorithm defined important characteristics within the complex brain signals, enabling the researchers to predict how well a given participant would carry out the movement. Such machine learning procedures are often used in the context of high-dimension data, for example for improving search engines. The algorithm learns a prescription on the basis of many examples, allowing it to decode unknown data sets in the future.

As a next step, the researchers want to shed light on how such prediction models can be used. For movement rehabilitation for stroke patients, it could be helpful to delay a movement task until the required brain activity has been reached. A training effect of this kind is what the team in Freiburg will work on in a future study together with Freiburg's University Medical Center.

**More information:** Andreas Meinel et al. Pre-Trial EEG-Based Single-

Trial Motor Performance Prediction to Enhance Neuroergonomics for a Hand Force Task, *Frontiers in Human Neuroscience* (2016). DOI: 10.3389/fnhum.2016.00170