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Platform for Assessing and Enhancing Sensorimotor Learning

Humans respond to sensory information by producing a useful motor action, such as manipulating or avoiding an object, interacting socially, kicking a ball, and so on. EEG is an easy to use and noninvasive tool that can be utilized to assess sensorimotor responses. Using EEG, it has been found that the rate at which humans learn and adjust their movements is adaptive and can be represented in specific EEG frequencies. Different EEG frequencies are observed to be associated with distinct sensorimotor learning processes that drive overall learning rate and quality. These observations suggest that the rate at which humans learn new movements may be able to be manipulated through both behavioral and neural intervention.

Researchers at Arizona State University have developed a novel platform for determining a patient's sensorimotor learning states and capabilities as well as providing neuromodulation to enhance sensorimotor function and skills. The platform uses scalp EEG to extract biomarkers that are indicative of sensorimotor learning states, capabilities, and can then subsequently use those biomarkers as targets for online neuromodulation to enhance sensorimotor movements. An algorithm has been developed that uses this information to drive an adaptive learning schedule, tailored to enhance the individual's learning rate and long-term performance.

This platform provides new capabilities to gather information on sensorimotor dysfunction and uses that information to design neuromodulation techniques for rehabilitation and enhanced learning and performance of sensorimotor tasks.

Potential Applications

- Diagnosing sensorimotor function following
  - Traumatic injury (e.g. TBI)
  - Neurodegeneration (e.g. Parkinson's disease, Alzheimer's disease, stroke)
- Neuromodulation/rehabilitation/further enhancement of learning during sensorimotor tasks

Benefits and Advantages

- Non-invasive and gentle
- Low-cost
- User-specific

o Tailored to enhance learning rate and long-term performance

- Drives real-time adaptive changes in learning
- The algorithm can be retrained for further improvements to the learning schedule

For more information about the inventor(s) and their research, please see Dr. Santello's laboratory webpage

For more information about this opportunity, please see Fine et al – Neuroimage - 2017