

Kognisyonun Ritimleri

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Propositions of the thesis

Rhythms of cognition:

Using transcranial alternating current stimulation to entrain neural oscillations with measurable impact on memory performances

Tuba Aktürk

- I. Different oscillatory brain frequencies are associated with specific elements and encoding strategies during memory processing with delta and theta neural oscillations assist multiple items encoding distinctively to optimize memory efficiency. (*This Thesis*)
- II. Transcranial alternating current stimulation is capable of entraining neural oscillatory activity when applied at the individual peak frequency as measured by EEG. However, for enhancing cognitive performance, tACS should be applied slightly below the individual peak frequency. (*This Thesis*)
- III. Unlike often assumed, tACS applied at a frequency based on the electroencephalography-informed individualized frequency, can cause behavioral and neurophysiological after effects of stimulation and thus effects that persist after the tACS stimulation has been discontinued. (*This Thesis*)
- IV. Demonstrating how cognitive processes are represented by brain oscillations in healthy individuals, as well as investigating oscillatory mechanisms disrupted in certain pathologies, provides insight into the potential clinical use of transcranial alternating current stimulation. (*This Thesis*)
- V. Although evidence provided by neuroimaging and electrophysiological methods is mainly correlational by nature, brain-cognition/behavior studies using such methods are invaluable in identifying the temporal structures of neural processes that then can be targeted by non-invasive brain stimulation techniques, especially for the clinical populations as a treatment approach. (*Impact*)
- VI. Given the complex and dynamic working mechanisms of the brain, results of neuroscience studies may not always be linear or straightforward as anticipated, which is what makes working on the "brain" difficult. (*The discipline*)
- VII. As cognitive neuroscientists, we do not yet have a “perfect” tool for understanding the brain. (*The discipline*)

- VIII. Owing to the complexity of the field, it seems inevitable to individualize the setup used in non-invasive brain stimulation as much as possible in order to obtain optimal outputs and minimize the variability. (*The discipline*)
- IX. “Experience without theory is blind, but theory without experience is mere intellectual play.” Immanuel Kant
- X. “Simplicity is the ultimate sophistication.” - Leonardo Da Vinci.