

# The contribution of cerebellar oscillations during others' mental states inference: an EEG-guided High-Definition transcranial alternate current stimulation (tACS) study

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In recent years, neuroscientific research has established the crucial role of the cerebellum in social cognition processes. However, little is known about the specific cerebellar oscillatory frequencies involved in these processes, mostly due to the cerebellum's intrinsic characteristics that make traditional electrophysiological techniques (e.g., EEG and MEG) more complicated to apply. Critically, tACS, offers a unique opportunity to address these challenges.

To fill this gap, an experimental study was conducted to examine the effects of cerebellar high-definition tACS, synchronized to the individual peak of gamma frequency (IGF), determined through EEG recording, on social cognitive tasks. While receiving EEG-guided IGF tACS, healthy participants performed three tasks that required them to infer others' mental state (i.e., action intention, emotion, personality traits) based on contextual information. tACS was delivered, in separate sessions, over the right and the left posterolateral cerebellum (as well as in a sham condition) to provide insights into potential lateralization in the cerebellar contribution.

The results indicated that cerebellar IGF tACS significantly modulates participants' ability to infer others' mental states based on contextual information, with this modulation varying depending on the specific mental state being considered and the lateralization of the stimulation.

These findings provide new evidence on cerebellar oscillatory dynamics involved in social cognition processes, paving the way for potential therapeutic applications, particularly in treating affective and cognitive disorders.

**If you're submitting a symposium talk, what's the symposium title?**

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**Primary author:** BARBATI, Nicole (Università degli studi di Bergamo)

**Co-authors:** CIRICUGNO, Andrea (IRCCS C. Mondino Foundation); Prof. FERRARI, Chiara (Università degli studi di Pavia); CATTANEO, Zaira (Università degli studi di Bergamo)

**Presenter:** BARBATI, Nicole (Università degli studi di Bergamo)

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