Contribution ID: **974** Type: **Poster**

# The Role of Beta Oscillations in Mental Time Travel, Intertemporal Choice and Prospective Memory: A tACS Study

*Saturday, September 13, 2025 2:10 PM (20 minutes)*

Introduction: Future-oriented cognition involves several neurocognitive processes supported by the dorsolateral prefrontal cortex (DLPFC) and beta-band oscillations. This study aimed to investigate the causal role of beta oscillations in the DLPFC during three future-related tasks: Mental Time Travel (MTT), Delay Discounting (DD), and Time-Based Prospective Memory (PM).

Methods: Thirty-four participants (22–29 years) completed the three tasks under two conditions—active and sham stimulation—administered in a counterbalanced within-subjects design, one week apart. Beta-frequency transcranial alternating current stimulation (tACS; 22 Hz, 1.5 mV) was applied bilaterally over the DLPFC (F3–F4).

Results: Results showed that beta-tACS significantly enhanced performance in MTT: participants were more accurate and faster in judging temporal order and showed a stronger tendency to classify undated future events as occurring later. In the DD task, beta stimulation increased temporal discounting, suggesting that future rewards were perceived as more distant. No significant effects were observed in PM, confirming the dissociation between mechanisms for short- and long-range temporal processing.

Conclusions: dlPFC seems causally implied in MTT and its stimulation in beta band may induce a general cognitive enhancement in temporal reasoning. However, the lack of effect on PM could suggests a task-specific neurocognitive mechanisms, or a ceiling effect. This research contributes to our understanding of the neural bases of future-oriented cognition.

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

Not relevant

## If you're submitting a symposium, or a talk that is part of a symposium, is this a junior symposium?

No

**Primary author:** MARSON, Alex (Università di Padova)

**Co-author:** CONA, Giorgia (Università di Padova)

**Presenter:** MARSON, Alex (Università di Padova)

**Session Classification:** Lunch and poster 3

**Track Classification:** Space, time and number