PROJECT

Supervisor:	_____JACOPO LAMANNA_____
Title:	REMEDD – REhabilitation of MEtacognition and Delay Discounting through transcranial Electrical Stimulation: a proactive program for prevention and personalized intervention _____
Curriculum:	_____ COGNITIVE AND BEHAVIORAL SCIENCES _____
Link to the personal page of the University or relevant hospital site website:	https://www.unisr.it/docenti/l/lamanna-jacopo https://www.unisr.it/ricerca/centri/bnc

Description of the Project (max 3,000 characters including spaces)

Background/gap of knowledge

REMEDD project is an innovative initiative that adopts a preventive and proactive approach to psychiatric disorders by focusing on two key psychological factors: metacognition and delay discounting (DD). In everyday terms, metacognition refers to our ability to understand and regulate our own thought processes (Flavell 1979), while delay discounting describes the tendency to devalue rewards that are received later rather than sooner, a phenomenon also known as choice impulsivity. Both factors play a significant role in mental health: lower confidence in one's performance is associated with anxiety and depression symptoms (Saccenti et al. 2024), whereas individuals with major depression, bipolar disorder, obsessive-compulsive disorder, and binge-eating disorder tend to exhibit higher levels of DD (Amlung et al. 2019). We have also demonstrated that this relationship holds true in addiction disorders, with craving levels being directly influenced by the degree of DD (Moro et al. 2024).

It is particularly interesting that, in previous experiments, we showed that non-invasive stimulation of the orbitofrontal cortex (OFC) can modulate both transdiagnostic factors. In fact, when electrodes are placed at positions FP1 and FP2 which, according to computer simulations, specifically target the OFC, transcranial direct current stimulation (tDCS) was found to reduce impulsive choices and enhance positive beliefs about cognitive performance (Moro et al. 2023; Saccenti et al., 2025).

Rationale and hypothesis

Given the close link between metacognition, DD, and various mental pathologies, the project will address two important challenges in mental health. First, it will focus on the early identification of risk factors through assessments of metacognition and delay discounting, before full-blown psychiatric disorders develop. Indeed, early intervention and treatment of subclinical conditions can yield significant socio-economic benefits; research suggests that subthreshold (or "minor") depression affects around 11% of the population, places a significant burden on the healthcare system, and often precedes the onset of major depression (Zhang et al. 2023). Second, the project aims to develop and validate preventive treatments based on non-invasive brain stimulation, namely transcranial electrical stimulation (tES).

Objectives and specific aims

The project aims to achieve three primary outcomes:

i) the development and analysis of a general population database to observe evolutionary trajectories and link transdiagnostic factors to specific symptom domains;

ii) the design and testing of new rehabilitative intervention protocols based on non-invasive stimulation of the OFC using tES variants (tDCS, tACS, tRNS), aiming at improving delay-discounting and metacognition;

iii) Evaluating the preventive and protective effects of the tES protocols on sub-clinical symptomatology over time.

Expected outcomes

This integration of advanced technology and psychological assessment aims to prevent psychiatric disorders and enhance our understanding of the brain networks involved in decision-making and self-awareness. REMEDD also offers a scalable, cost-effective system for healthcare implementation while generating valuable insights into the neural bases of metacognition, delay discounting, and their links to psychopathology.

Skills that the student should acquire (max. 600 characters including spaces):

The PhD student will learn how to conduct neuromodulation experiments based on transcranial electrical stimulation on human subjects and to implement and deliver questionnaires and behavioral and cognitive tasks online and in presence. Furthermore, the student will be trained in advanced data analysis and paper writing. No previous specific training is required, albeit previous experimental experience (e.g. during Master's thesis) in neuroscience would be beneficial.

References (max. 15)

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