

Neural Control of Emotional Action

Karin Roelofs

Donders Institute for Brain Cognition and Behavior, Radboud University, Nijmegen, The Netherlands

The ability to control emotional actions is paramount for successful engagement in human social interactions. This cognitive function hampers occasionally during socially challenging situations but fails systematically in social psychopathologies. In a series of studies, we observed that the anterior prefrontal cortex (aPFC) elicits control over downstream areas such as the amygdala, parietal- and sensorimotor cortex (SMC) when people need to override their automatic approach-avoidance actions. Because the functioning of this neural circuitry is sensitive to emotional states (stress and anxiety) and predictive of long-term stress-resilience, it is relevant to investigate determinants of emotional action control and – critically - to explore ways to enhance this type of control. First, I will discuss recent direct manipulations of this neural circuitry by means of dual-site transcranial alternating current stimulation (tACS). I will show that we can improve emotional action control by facilitating aPFC-theta – SMC-gamma phase-amplitude coupling. Then, I will discuss our observation that the generation of specifically threat-approach actions is often preceded by an initial freezing response. Using a novel passive-active approach-avoidance we investigated how initial threat-anticipatory freezing reactions may impact subsequent approach-avoidance action decisions. Our data suggest that freezing as well as the ability to control automatic approach-avoidance actions is central in explaining human emotional responses and may constitute important factors in explaining stress-related symptomatology.