

Neural signatures of human predictive processes along the autism-schizophrenia continuum

Luca Tarasi

Background and aims. The ASD (autism spectrum disorders) - SSD (schizophrenic spectrum disorders) continuum model (Tarasi et al., 2022) argues that the different decision-making strategies in humans fall along a continuum of predictive approaches at the extremes of which individuals who overuse (SSD) vs. underuse (ASD) predictive information lie. In a previous study, we showed that, even in the general population, there are evincible differences in decision-making style (e.g., believers vs. empiricists) that approximate the characteristics of either pole that can be reliably captured by considering interindividual differences in the modulation of posterior alpha oscillations. The purpose of the present work was to better outline the neuro-functional mechanisms that discriminate between individuals who overweight (believers) vs underweight (empiricists) prior information and assessing the impact that autistic and schizotypal traits have in shaping individual cognitive style.

Methods. We explored behavioral, psychometric, and neural differences between believers (N = 40) and empiricists (N = 40) in a probabilistic perceptual decision-making task using computational (Signal Detection Theory, Drift Diffusion Model), psychometric (AQ and SPQ) and electrophysiological analyses.

Results. The two groups exhibited no differences in task accuracy, but they adopted a different decision-making strategy, with the believers inclining to respond in line with perceptual expectations more than the empiricists. At the neural level, we further confirmed that the empiricists are characterized by a control mechanism based on fronto-parietal theta synchronization, while the believers show an alpha parieto-occipital synchronization serving the priors exploitation. In addition, the analysis of questionnaires scores revealed that, while believers are characterized by a higher score in the odd-belief subscale of the SPQ, empiricists are characterized by a higher number of autistic traits.

Discussion. The work demonstrated that different predictive styles within the general population can be mapped by specific behavioral, electrophysiological, and personality signatures. Posterior alpha amplitude has been shown to be a reliable marker for distinguishing two types of predictive styles, believers and empiricists, which are differentiated by the weight assigned to prior information. Crucially, we have demonstrated that the adoption of a decision-making style is shaped by individual personality traits along the ASD-SSD axis: individuals who adopt an empiricist cognitive style are characterized by a higher prevalence of autistic traits, whereas individuals who adopt a believing cognitive style are characterized by a higher prevalence of positive schizotypal traits. This evidence suggests the presence of a diametrical approach from ASD to SSD in perceptual inference style.