Examining Predictive Coding in the Hierarchy of Visual Perception in the Autism Spectrum Using Fast Periodic Visual Stimulation

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Abstract : Predictive coding has been proposed as a general explanatory framework for understanding the neural mechanisms of perception. As such, an underweighting of perceptual priors has been hypothesised to underpin a range of differences in inferential and sensory processing in autism spectrum disorders. However, empirical evidence to support this has not been well established. The present study uses an electroencephalography paradigm involving changes of facial identity and person category (actors etc.) to explore how levels of autistic traits (AT) affect predictive coding at multiple stages in the visual processing hierarchy. The study uses a rapid serial presentation of faces, with hierarchically structured sequences involving both periodic and aperiodic repetitions of different stimulus attributes (i.e., person identity and person category) in order to induce contextual expectations relating to these attributes. It investigates two main predictions: (1) significantly larger and late neural responses to change of expected visual sequences in high-relative to low-AT, and (2) significantly reduced neural responses to violations of contextually induced expectation in high- relative to low-AT. Preliminary frequency analysis data comparing high and low-AT show greater and later event-related-potentials (ERPs) in occipitotemporal areas and prefrontal areas in high-AT than in low-AT for periodic changes of facial identity and person category but smaller ERPs over the same areas in response to aperiodic changes of identity and category. The research advances our understanding of how abnormalities in predictive coding might underpin aberrant perceptual experience in autism spectrum. This is the first stage of a research project that will inform clinical practitioners in developing better diagnostic tests and interventions for people with autism.