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SYSTEMIC NEUROPHYSIOLOGICAL SIGNALS OF AUDITORY PREDICTIVE CODING

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Abstract

Predictive coding framework posits that our brain continuously monitors changes in the environment and updates its predictive models, minimizing prediction errors to efficiently adapt to environmental demands. However, the underlying neurophysiological mechanisms of these predictive phenomena remain unclear. The present study aimed to explore the systemic neurophysiological correlates of predictive coding processes during passive and active auditory processing. Electroencephalography (EEG), functional near-infrared spectroscopy (fNIRS) and autonomic nervous system (ANS) measures were analyzed using an auditory pattern-based novelty oddball paradigm. A sample of thirty-two healthy subjects was recruited. The results showed shared slow evoked potentials between passive and active conditions that could be interpreted as automatic predictive processes of anticipation and updating, independent of conscious attentional effort. A dissociated topography of the cortical hemodynamic activity and distinctive evoked potentials upon auditory pattern violation were also found between both conditions, whereas only conscious perception leading to imperative responses was accompanied by phasic ANS responses. These results suggest a systemic-level hierarchical reallocation of predictive coding neural resources as a function of contextual demands in the face of sensory stimulation. Principal component analysis permitted to associate the variability of some of the recorded signals.

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