Tracking the Canonical Computations of Perceptual Processing in a Continuous Sensory Flow

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Presentation Abstract Summary The canonical computations involved in sensory processing, such as neural adaptation and prediction-error signals, have mainly derived from studies investigating the neural responses elicited by a single stimulus. Here, we test whether these computations can be tracked in a quasi-continuous flow of visual stimulation, by correlating scalp electro-encephalography (EEG) recordings to simulations of neuronal populations. Fifteen subjects were presented with ~5,000 visual gratings presented in rapid sequences. Our results show that we can simultaneously decode, from the EEG sensors, up to 4 visual stimuli presented sequentially. Temporal generalization and source analyses reveal that the information contained in each stimulus is processed by a “visual pipeline”: a long cascade of transient processing stages, which can overall encode multiple stimuli at once. Importantly, our data suggest that the early feedforward activity but not the late feedback responses are marked by an adaptation phenomenon. Overall, our approach demonstrates how theoretically-derived computations, as isolated in single-stimulus paradigms, can be generalized to conditions of a continuous flow of sensory information.

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