January 29th, 2020

Dear Editorial Board,

We would like to submit the manuscript, “**Parallel fast and slow recurrent cortical processing for target and distractor selection in visual search**” by Donohue, Schoenfeld, & Hopf, to be considered for publication in *Communications Biology.*

Visual attention has been extensively investigated using visual search paradigms, with neuromagnetic recordings (MEG/EEG) and a clever experimental design enabling the disentanglement of the cortical dynamics of parallel target and distractor processing noninvasively in human observers. Although research has revealed feed-back processing in visual cortex to be an essential mechanism by which attention increases visual selectivity, it is unclear how such feedback signals may operate with respect to enhancement and attenuation of relevant and irrelevant sensory input.

Here, we report about a stunning new observation made possible due to the extremely high temporal resolution of MEG recordings combined with the possibility to reliably localize cortical activity. We show that both target selection and distractor rejection in visual search involve multiple parallel fast and slow sweeps of feed-back processing in human visual cortex. We highlight the functional role of those sweeps, by demonstrating that for target selection, the fast sweep overtakes the slow sweep to reach the earliest stage of visual representation in primary visual cortex. This fast sweep serves to enhance the representation of relevant input, thereby setting the stage for successful target identification mediated by the slow feed-back sweep.

The discovery of multiple cortical feed-back sweeps has great implications for models of top-down visual selection like the predictive coding account. The reach of the observation, however, goes far beyond the realm of visual search and attention research, as it verifies the existence of a cortical mechanism that rapidly and adaptively enhances the coding of sensory input, based on top-down signals operating in parallel.

Thank you for your consideration.

Sincerely, on behalf of all the authors,

Jens-Max Hopf

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