EVENT ABSTRACT

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Investigating the interactions between top-down and bottom-up visual processing: The influence of prior expectations on contour integration

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Contour integration is a process which links oriented edge elements that are aligned colinearily into a coherent percept. This process is thought to proceed in a mainly feed-forward and/or recurrent manner, making its percepts very salient and independent of top-down or on-going processes ("pop-out"). However, recent studies have shown that attention can strongly modulate contour integration, suggesting the confluence of bottom-up (sensory input) and top-down (prior expectations) processes might even be a necessary prerequisite for contour integration. To uncover neural substrates and mechanisms underlying the influence of prior expectations and attention on contour integration, we combine psychophysical with electrophysiological investigations: Participants had to carry out two experiments with identical visual stimuli but different behavioural tasks: a detection task (A) and a discrimination task (B). Stimuli consisted of vertical and horizontal ellipses formed by colinearily aligned Gabor elements, which were embedded in a field of Gabors with random orientations and positions. Each hemifield could contain either one vertical, one horizontal, or no ellipse. All combinations of these three basic configurations were possible, totalling to nine stimulus categories for the two hemifields. In experiment A participants had to give a yes response whenever one stimulus contained at least one ellipse, in experiment B observers had to give a yes response only when a target was present (this target could be either a horizontal or a vertical ellipse, in any hemifield of the stimulus). Our first results indicate that reaction times do not differ between stimuli in the detection task but are much faster for the target stimulus in the discrimination task. Event-related potentials (ERPs) for vertical and horizontal ellipses do not differ in the detection task, but start to differentiate after about 300ms in the discrimination task, where one of the ellipses was declared as the target. These results already indicate an influence of prior expectations on contour processing. Further acquisition of behavioral and electrophysiological data is carried out to support the assumption that top-down processes influence contour integration and to uncover underlying neural mechanisms. The final results are thought to build the basis for designing follow-up experiments adressing the question how bottom-up and top-down processes interact during contour integration and more complex tasks in visual perception.

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