

Spatio-temporal dynamics of top-down control: directing attention to location and/or color as revealed by ERPs and source modelling

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This study investigated the nature and dynamics of the top-down control mechanisms that afford attentional selection using event-related potentials (ERPs) and dipole-source modelling. Subjects performed a task in which they were cued to attend to a location, a color or no specific feature on a trial-by-trial basis. ERPs elicited by the location and color cues were compared to ERPs elicited by the reference cues to isolate processes related to directing attention to location and color, respectively. Overall, similar attention-directing effects were observed when location and color were task-relevant, suggesting that spatial and non-spatial attention rely to a great extent on similar control mechanisms. The earliest effects, at 340 ms, were localized to ventral posterior cortex and may reflect processes by which the cue is linked to its associated feature. Intermediate effects of directing attention, around 540 ms, were also localized to similar parts of posterior cortex for spatial and non-spatial attention, but these were located more anteriorly and medially than the dipole solutions obtained at 340 ms. This may reflect contributions from frontal and/or parietal areas involved in the actual execution of the cue instruction. Only late in the cue-target interval, differences in ERP were observed between directing attention to color and location. These originated from anterior and ventral posterior areas and perhaps represent differences in, respectively, maintenance and perceptual biasing processes. In general, these results suggest that the parts of the brain that extract the meaning of the cue and that are able to relate this to current goals generalize over the type of feature that is task-relevant.

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