

An investigation of relationships among visual-attention processes

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Abstract

Behavioral attention research has primarily focused on identifying and characterizing distinct attention processes. To move toward a more integrative understanding of visual attention, we have begun to investigate relationships among attention mechanisms. We systematically tested each observer in a battery of voluntary-attention tasks that collectively evaluated a variety of attention processes (e.g., focusing in time, in space and to objects, distributing attention across space to grasp global structures, shifting, multi-item tracking, and maintaining vigilance). Correlation-based analyses (across a large number of observers) were used to elucidate how behaviorally defined attention processes are mediated by shared, separate, and/or antagonistic underlying mechanisms. The results suggest an antagonistic relationship between the ability to centrally focus attention and the ability to distribute attention (e.g., if one is superior at focusing, one tends to be inferior at distributing). The results also suggest that a global-attention mechanism subserves both global-object processing (including object-based attention) and global-motion processing. Interestingly, this mechanism appears to have its own attention-maintenance mechanism that is not involved in spatial attention processes (e.g., focusing, shifting and tracking). Other findings include that spatial shifting of attention involves separate contributions from the processes of attentive tracking and the rapid engagement of attention, and maintaining focused attention involves the ability to rapidly re-engage attention (suggesting that maintaining focal attention requires rapid and frequent refocusing of strayed attention). Thus, by examining performance correlations among a variety of attention tasks, we have provided insights into the structure of underlying mechanisms that mediate common attention tasks.

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