Notes and Comment

Line-slope vs. line-arrangement discrimination: A comment on Ambler and Finklea's paper

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Ambler and Finklea (1976) have presented data confirming previous findings (Beck, 1966, 1967; Beck & Ambler, 1972, 1973; Olson & Attneave, 1970) that differences in line slope are easier to detect than differences in line arrangement in the attentional periphery (although not at the focus of attention). For example, it is easier to discriminate a T from a tilted T (slope difference) than from an L (arrangement difference) in peripheral vision. Ambler and Finklea concluded that "these experiments support the existence of two functionally different attentional systems. The distributed system is much more sensitive to line slant differences than to line arrangement differences"

It is not difficult, however, to create examples where differences in line arrangement are easier to detect than differences in line slope in the periphery. We have recently completed experiments measuring the discriminability of stimuli varying in line slope, line arrangement, or both slope and arrangement. The task, adapted from Olson and Attneave, was to decide as quickly as possible which of four stimuli, presented at the corners of an imaginary square measuring 4 deg per side, was different from the other three (which were always identical). For a line slope discrimination, diagonal lines were used: three of the stimuli were simply positively sloped lines, while the fourth was a negatively sloped line, or vice versa ($\diagup$ vs. $\diagdown$). Mean reaction time (RT) for this localization task was 1,884 msec. Next, by adding one horizontal and one vertical line to each diagonal, the stimuli are changed into triangle and

arrow configurations ($\triangle$ vs. ∇). These figures differ in both line slope and line arrangement. Mean RT for these arrays dropped to 749 msec. Finally, we may construct triangles and arrows that contain identically sloped lines and so differ only in line arrangement ($\triangle$ vs. ∇). RT for these arrays was 759 msec, virtually identical to the arrays where both slope and arrangement differed.

In summary, these results show two things. First, discriminations based on line arrangement differences in the absence of line slope differences were more than twice as fast as discriminations based on slope differences in the absence of arrangement differences. Second, tasks where both slope and arrangement differences existed were no faster than those where only arrangement differences existed.

We plan to elaborate on our observations in a later report. We should point out that these results do not argue against the idea of two functionally distinct attentional systems, but instead argue against only the notion that the distributed attention system is inherently more sensitive to line slope than to line arrangement. Indeed, we have data suggesting that differences in line arrangement are detected rapidly and in parallel in the visual periphery. For the moment, however, we should simply reiterate Ambler and Finklea's warning: "Experimenters studying visual attention and visual search should be careful about what kinds of discriminations are involved before generalizing their results."

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