Methyphenidate Increases Selectivity of Visual Scanning in Children Referred for Hyperactivity

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Visual scanning patterns were investigated in 32 children referred for symptoms of hyperactivity in a double-blind crossover comparison of methylphenidate and placebo treatments. Total errors, response latency, and visual fixations were recorded as the child scanned computer-generated visual matching-to-sample problems. Results indicated that the number of fixations on the standard stimulus in the matching task was significantly larger in the methylphenidate state. Drug treatment also resulted in a significant increase in the number of systematic comparisons between the standard and the variants in the task. However, the increased selectivity of attention to the standard stimulus was not accompanied by a reduction of total errors. It was suggested that the stimulant drug may increase attentional selectivity even when such a shift fails to produce improvement in task performance.

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A critical feature of hyperactivity is a disorder of attention (Douglas, 1972; Kinsbourne, 1975; Rosenthal & Allen, 1978; Wender, 1971). In accordance with this view, the American Psychiatric Association (1979) has recently changed the diagnostic label for the hyperactive syndrome to Attention Deficit Disorder, with hyperactivity. There are numerous ways to measure attention, and deficits in various laboratory measures of attention have been demonstrated. Relative to control groups, hyperactive children have exhibited a deficit in the ability to be alerted (or aroused) by a warning signal (Cohen & Douglas, 1972; Sroufe, Sonies, West, & Wright, 1973), to remain free from distraction when relevant and irrelevant stimuli are similar (Campbell, Douglas, & Morgenstern, 1971), to selectively focus attention on relevant stimuli and inhibit responses to irrelevant stimuli (Campbell et al., 1971), and to sustain attention (Sykes, Douglas, & Morgenstern, 1973).

Administration of methylphenidate (Ritalin) improves the attention and concentration of hyperactive children on performance of laboratory learning tasks (Conners, Eisenberg, & Sharpe, 1968). However, this favorable response occurs only in about 60% of children referred for symptoms of hyperactivity (Swanson, Kinsbourne, Roberts, & Zucker, 1978; Swanson & Kinsbourne, 1978). Methylphenidate has a favorable effect on hyperactives' ability to maintain attention to a vigilance task (Sykes, Douglas, Weiss, & Minde, 1971), but this postponement of the vigilance decrement occurs regardless of whether the child shows a favorable or an adverse response to the stimulant on a laboratory learning test (Swanson, Barlow, & Kinsbourne, 1979). Stimulants also appear to arrest the decline of vigilance performance over time in normal adults (Weiss & Laties, 1962) and in normal children (Rapoport, Buchsbaum, Zahn, Weingartner, Ludlow, & Mikkelsen, 1978).

Hyperactive children also exhibit a deficit in stimulus selection (Campbell et al., 1971), and it has been hypothesized that stimulant medication improves the ability of the hyperactive to focus attention selectively (Douglas, 1972; Kinsbourne, 1977; Rosenthal & Allen, 1978). However, only a few investigations of the effect of stimulant drugs on selective or focused attention have been reported. Campbell et al. (1971) administered the Children's Embedded Figures Test to hyperactive children in both drug and placebo states and to a normal control group. When the hyperactive group was required to select a simple figure from the complex field in which it was embedded, they isolated significantly fewer figures than the control group. However, treatment with methylphenidate did not affect their ability to select the relevant stimulus from the confusing background.

The ability to attend selectively to task-relevant stimuli and to ignore task-irrelevant stimuli may also be related to performance on the Matching Familiar Figures test (MFF; see Kagan, Rosman, Day, Albert, & Phillips,