The Effects of Methylphenidate on Levels of Processing and Laterality in Children with Attention Deficit Disorder

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Effects of stimulant medication (methylphenidate) on levels (feature, name, semantic) of word processing by the left and right hemisphere were assessed in 31 attention-deficit-disordered children. In a double-blind procedure, same-different decisions were made to tachistoscopically presented word pairs under medication and placebo. Analysis of manual response times failed to show any negative effects of medication. Feature decisions were faster than name decisions, which were faster than semantic decisions. Methylphenidate induced a right visual field advantage (left hemisphere) for the name decision, which was interpreted as a normalization effect. The results suggest that (1) methylphenidate may selectively improve the phonological level of word processing and (2) methylphenidate’s favorable therapeutic effect is produced through inhibition of excessive right hemisphere activity in response to task demands that engage the left hemisphere.

Despite considerable research in the area of stimulant medication and its effects on the cognitive and behavioral aspects of children identified as having attention deficit disorder with or without hyperactivity (ADDH/ADD),

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there remain many questions regarding the nature of this treatment. In fact, not only does the biological mechanism underlying stimulant medication effects remain poorly understood, but our knowledge of the range of effects of medication treatment is also limited. In the last 15 years there have been numerous carefully controlled studies (Abikoff & Gittelman, 1985; Ballinger, Varley, & Nolen, 1984; Hunt, Minderaa, & Cohen, 1985; Rapport, Stoner, DuPaul, Birmingham, & Tucker, 1985; Reid & Borkowski, 1983; Swanson & Kinsbourne, 1978; Sprague & Sleator, 1977) as well as several review articles (Barkley & Cunningham, 1978; Gadow, 1983) and meta-analyses (Kavale, 1982; Thurber & Walker, 1983) that have helped to clarify the nature of stimulant medication effects with children identified as ADDH/ADD. Simultaneously, biochemical and metabolic studies (Hunt, Cohen, Anderson, & Clark, 1984; Phelps, Mazziotta, Gerner, Baxter, & Kuhl, 1983; Shaywitz, Cohen, & Shaywitz, 1978) have successfully identified a number of theoretical possibilities for explaining the biology of the effects of psychotropic medication. Much needs to be done, however, in further refining both the specificity of stimulant effects with ADDH/ADD children and conceptualizations about underlying biological mechanisms.

CAN STIMULANT MEDICATION CONSTRICT COGNITIVE PROCESSING?

Improvements in focusing attention with stimulant medication have frequently been cited as a positive effect (e.g., Barkley, 1977; Rosenthal & Allen, 1978; Ross & Ross, 1982; Swanson & Kinsbourne, 1979). While increased focused attention induced by stimulants is probably a desirable effect for many academic tasks, it is not necessarily beneficial to performance on all tasks. It is possible that some schoolwork may involve multiple cognitive processes that must be activated simultaneously for successful completion of the task. In other words, greater breadth rather than greater focusing of information processing is needed for some academic tasks. It may be that performance of ADDH/ADD children on such tasks is negatively influenced by stimulant medication owing to its apparent canalization of attentional capacity. Solanto (1984) suggested that the decreased activity and increased ability to focus attention seen in ADDH/ADD children following stimulant medication was analogous to the increased constriction and stereotypy observed in the animal literature. Dyme, Sahakian, Golinko, and Rabe (1982) have proposed similarly that thinking in ADDH/ADD children may become perseverative and lacking in flexibility when stimulants are given. In a pilot study with five ADDH/ADD children, Dyme et al. (1982) found task performance, involving shifting from one dimension to another, to be negatively influenced by stimulant medication.