

*A PRELIMINARY ANALYSIS OF INTERACTIVE
EFFECTS BETWEEN COMMON CLASSROOM
CONTINGENCIES AND METHYLPHENIDATE*

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To assess the drug–behavior interaction effects with an 8-year-old boy with attention deficit hyperactivity disorder, common classroom antecedent (e.g., seating arrangement) and consequent (e.g., peer prompts) stimuli were alternated within a school day while drug conditions (methylphenidate vs. placebo) were alternated across days. The results suggested that peer attention maintained disruptive behavior when methylphenidate was absent but not when it was present.

DESCRIPTORS: functional analysis, methylphenidate, ADHD, classroom behavior

There is an extensive literature in behavioral pharmacology that demonstrates that some medications may affect behavior by altering the effects of controlling environmental variables (e.g., Poling, 1986). Of the studies that have evaluated interactive effects between methylphenidate and specific environmental variables, most used between-group designs and did not control for environmental contingencies (i.e., antecedent and consequent stimuli).

Contingent teacher attention (reprimands or praise), peer attention, and time-out (or escape from tasks) are among the most common and influential naturally occurring or programmed consequences that have been found to affect disruptive classroom behavior (e.g., Abramowitz & O’Leary, 1991; Cooper et al., 1993). Methylphenidate (MPH), a stimulant medication commonly prescribed for attention deficit hyperactivity disorder (ADHD), has also been found to affect disruptive behavior in the classroom

(e.g., Pelham, 1993). One important question that remains unanswered is whether MPH reduces disruptive behavior by altering the effects of antecedent or consequent stimuli that are responsible for the maintenance of disruptive behavior. Therefore, the goals of the current investigation were (a) to develop a methodology for concurrently assessing the effects of common classroom contingencies and short-acting medications such as MPH, which has a half-life of 2 to 3 hr (*Physicians Desk Reference*, 1995), and (b) to determine whether the effects of antecedent or consequent stimuli on disruptive behavior were altered by MPH.

METHOD

Participant and Setting

Charlie, an 8-year-old boy who had been diagnosed with ADHD and speech delay, was expected to enter first grade in a regular education classroom. Academic assessment indicated that he was performing at a primer level in both reading and math. Charlie had been receiving MPH (Ritalin®) for approximately 2 years. At the time of this study, he was receiving 5 mg at 8:00 a.m. and at 12:00 p.m. He received no other prescription med-

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ication. Only his morning dose of medication was manipulated during this investigation.

Charlie participated in an ADHD summer program that was held in a classroom at a university laboratory school each weekday morning between 8:30 and 11:30 for 3 weeks. All procedures were conducted in this setting.

Response Definitions and Measurement

Target disruptive behaviors (inappropriate vocalizations, out-of-seat behavior, playing with objects) and response definitions were based on the direct observational procedures for ADHD described by Barkley (1990). *Inappropriate vocalizing* was defined as any vocal noise or verbalization that was not preceded by raising a hand and receiving acknowledgment from an adult. *Out-of-seat behavior* was defined as the child's full body weight not being supported by a chair. *Playing with objects* was defined as touching toys, walls, light switches, or any object that was not at the student's desk and associated with an assigned task. These responses were combined into a single dependent measure referred to subsequently as disruptive behavior.

Using a 10-s partial-interval recording procedure, two observers concurrently but independently scored all responses during nine sessions (28%). Agreement was calculated on an interval-by-interval basis for each response definition by dividing the total number of agreements by the total number of agreements plus disagreements and multiplying by 100%. Interobserver agreement averaged 95% across responses (range, 84% to 100%). Procedural integrity was assessed by having observers record (a) whether the correct consequence (e.g., peer prompt in the peer prompt condition) followed each target behavior during either the same or the subsequent 10-s interval, and (b) each occurrence of teacher or peer attention that occurred noncontingently or independent of a

target response. Correct consequences were scored following 97% (range, 67% to 100%) of the target responses across all conditions. Peer attention occurred contingently following disruptive behaviors an average of 96% of the time (range, 67% to 100%).

Procedure

Each day between 7:30 and 8:00 a.m., Charlie received 5 mg orally of either MPH or placebo within a multielement design. Between 9:00 and 11:00 a.m., each environmental condition described below (e.g., peer prompts) was conducted within a separate multielement design during sessions lasting 10 min. That is, environmental conditions (teacher reprimand, peer prompts, and time-out) alternated within each day, and medication status (MPH or placebo) was alternated across days.

During the teacher reprimand condition, Charlie sat at a desk about 3 m removed and faced away from the other seven students in the class, and was instructed to (a) stay in his seat, (b) remain quiet, and (c) complete easy math worksheets (i.e., those containing problems he had previously completed with 90% accuracy). The teacher stood nearby (approximately 3 m) and provided a verbal reprimand (e.g., "you need to stay in your seat") contingent upon a disruptive target response and ignored all other responses. If the target responses were high in this condition relative to other conditions, it would be most consistent with an hypothesis that these behaviors were maintained by teacher attention in the form of a reprimand. Easy problems were assigned during this condition to decrease the probability of occasional escape-maintained problem behaviors.

During the time-out condition, the seating arrangement and instructions were the same as in the teacher reprimand condition, except that (a) Charlie was asked to complete difficult math worksheets (i.e., those containing problems he had previously com-

pleted with less than 50% accuracy), and (b) he was told that he would be placed in time-out if he did not remain seated and work quietly. Contingent upon a disruptive target response, Charlie's chair was turned to face away from the desk and away from all other people and activities, and the teacher moved away from him for 30 s. After the 30-s time-out, the teacher returned Charlie's chair to its previous position and gestured for him to return to work. If Charlie left his seat during the time-out, sequential prompts (beginning with a verbal prompt, followed by a gestural prompt, and then a physical prompt, if necessary) were used direct him back to his seat. Difficult tasks were used in this condition to set the occasion for escape-maintained problem behavior. Thus, if the target responses were high in this condition relative to other conditions, it would be most consistent with an hypothesis that these behaviors were maintained by escape (i.e., time-out) from difficult tasks.

For the peer prompts condition, a peer confederate was identified and was told, "Charlie has a hard time getting all his work done," and then was asked to be the teacher's "special helper." Immediately prior to each session, the peer confederate was privately instructed to "pay attention to what Charlie is doing, and if you see him get out of his seat or if he says anything, you should say something to him about that." The peer was specifically told to "say whatever you think you should or whatever you think of" and was given some examples of things that he or she could say (e.g., "We are supposed to be working"). The peer was prompted to attend to Charlie by a light touch on the shoulder by the teacher. During the peer attention condition, Charlie was seated with two other students at one of four desks that were adjacent to and facing each other. Charlie was given an easy math worksheet, and all students were provided with the instruction to stay in their seats and work quietly

until asked to stop. The teacher maintained a proximity of approximately 3 m but ignored the behavior of all students. If target responses were high in this condition relative to the others, results would be most consistent with an hypothesis that these behaviors were maintained by peer attention.

RESULTS AND DISCUSSION

Figure 1 shows the effects of MPH relative to placebo during the teacher reprimand, peer prompts, and time-out conditions. The levels of disruptive behavior were relatively low in the teacher reprimand and time-out conditions regardless of whether Charlie received MPH or placebo. Similarly low levels of disruptive behavior were observed in the peer prompts condition on the days when Charlie received MPH ($M = 5\%$; range, 0% to 17%). In contrast, the levels of disruptive behavior were much higher in the peer prompts condition on days when Charlie received placebo ($M = 64\%$; range, 32% to 93%). These results are consistent with the hypotheses that (a) disruptive behavior was maintained by positive reinforcement in the form of peer attention and (b) MPH functioned to alter either the saliency of peers as antecedent stimuli or the reinforcing value of peer attention.

It is possible that medications such as MPH can act as establishing operations (Michael, 1993; Poling, 1986) and thus produce interactions between medication and behavioral treatments by altering the relative reinforcing effectiveness of particular stimuli. Thus, it is possible (although not presently demonstrated) that MPH may have decreased the relative reinforcing value of peer attention (i.e., served as an "abolishing operation," Michael, 1993, p. 193) that was associated with inappropriate behavior. It is also possible that MPH may improve student behavior by establishing a particular task as more reinforcing for some students (e.g.,

