

*THE EFFECTS OF METHYLPHENIDATE ON A FUNCTIONAL  
ANALYSIS OF DISRUPTIVE BEHAVIOR:  
A REPLICATION AND EXTENSION*

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In the present investigation, a functional analysis of the disruptive behavior of a 18-year-old man who had been diagnosed with attention deficit hyperactivity disorder and moderate mental retardation was conducted, both when he was taking methylphenidate and when he was not taking the medication. The results of this functional analysis demonstrated that the participant's disruptive behaviors were reinforced by access to attention only when he was not taking methylphenidate.

DESCRIPTORS: establishing operations, functional analysis, methylphenidate

In a series of experiments, Northup and his colleagues demonstrated the potential for interaction between methylphenidate (MPH) and specific environmental variables in persons with attention deficit hyperactivity disorder (ADHD) and average intellectual functioning (Northup et al., 1999; Northup, Fusilier, Swanson, Roane, & Borrero, 1997). For example, Northup, Jones, et al. (1997) conducted a functional analysis of the problem behaviors of a typically developing 8-year-old boy with ADHD. The results demonstrated that the participant's disruptive behavior was maintained by attention from peers during a placebo condition; however, during an MPH condition, the participant displayed few

problem behaviors when peer attention was provided contingent on problem behavior.

The purpose of the current investigation was to replicate and extend Northup, Jones, et al.'s (1997) findings by examining the effects of MPH on the results of a functional analysis of the disruptive behavior of a person who had been dually diagnosed with ADHD and mental retardation. The results of the functional analysis reported in this paper provide additional data that demonstrate that for some people with developmental disabilities, MPH alters the reinforcing effectiveness of environmental stimuli (i.e., MPH acts as an abolishing operation).

## METHOD

### *Participant and Setting*

David, an 18-year-old man with ADHD and moderate mental retardation, participated in the study. He had been admitted to a neuro-behavioral stabilization unit for the assessment

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and treatment of problem behaviors (i.e., aggression, disruption, and property destruction). David communicated verbally using two- to six-word statements. At the time of his admission, David was receiving a total of 45 mg of MPH per day (i.e., 15 mg at 8:00 a.m., 12:00 p.m., and 4:00 p.m.).

#### *Response Definitions, Data Collection, and Interobserver Agreement*

Disruptions were the targeted problem behavior in this study. Disruption was defined as striking walls or furniture with an open or closed hand from a distance of 30 cm or more. Disruption was recorded using a frequency measure and is reported as number per minute. Two trained observers independently collected data during 51% of the functional analysis sessions. Interobserver agreement was calculated by dividing the number of agreements by the number of agreements plus disagreements and multiplying by 100%. Average interobserver agreement was 98%.

#### *Functional Analysis*

An initial functional analysis, conducted when David was taking MPH, was inconclusive because he displayed no disruptive behavior during the assessment. However, anecdotal information provided by David's parents suggested that he might display disruptive behaviors when he was not taking MPH. When interviewed, his parents described situations in which he appeared to display disruptive behaviors to obtain attention from other people. Therefore, a second functional analysis was conducted using four alternating-treatment designs embedded within an ABAB reversal design. Each session was 10 min long, and all sessions were conducted approximately 1 hr after David had taken his 8:00 a.m. or 12:00 p.m. dose of MPH. The functional analysis was conducted using the assessment procedures developed by Iwata, Dorsey, Slifer, Bauman, and Richman (1982/1994). Four assessment conditions were included in David's functional

analysis: control, demand, attention, and tangible. However, an alone condition was omitted because there were no evidence that suggested that disruptive behavior was maintained by automatic reinforcement.

#### *MPH Manipulation and Placebo Condition*

The psychiatrist who was in charge of monitoring David's MPH prescribed a schedule in which David received MPH on alternating days. During each of his scheduled medication times, MPH either was or was not mixed into applesauce. Each day, David's nurse said, "David, it is time for your medication," and handed him a small cup of applesauce. To assess whether David could discriminate when the applesauce did not contain the MPH pill, he was asked every day of the study whether he had taken his medicine; he said "yes" each time.

## RESULTS AND DISCUSSION

Figure 1 shows the results of David's functional analysis with and without MPH. During the initial MPH phase, David displayed a low rate of disruptive behavior in all conditions ( $M = 0.13$  responses per minute). When David did not receive MPH, high rates of disruptive behavior occurred exclusively in the attention condition ( $M = 2.73$ ). During the reversal to the MPH phase, David again exhibited low rates of disruptive behavior in all conditions ( $M = 0.40$ ), with all disruptive behavior occurring in the first session of the attention condition. Finally, when the no-MPH phase was replicated, David again displayed a high rate of disruptive behavior only in the attention condition ( $M = 2.03$ ).

These results replicated those of Northup, Jones, et al. (1997) by demonstrating that MPH decreases the relative reinforcing effectiveness of attention. In addition, these results also extend the published literature by extending Northup, Jones, et al.'s findings to persons with both moderate mental retardation and ADHD. This

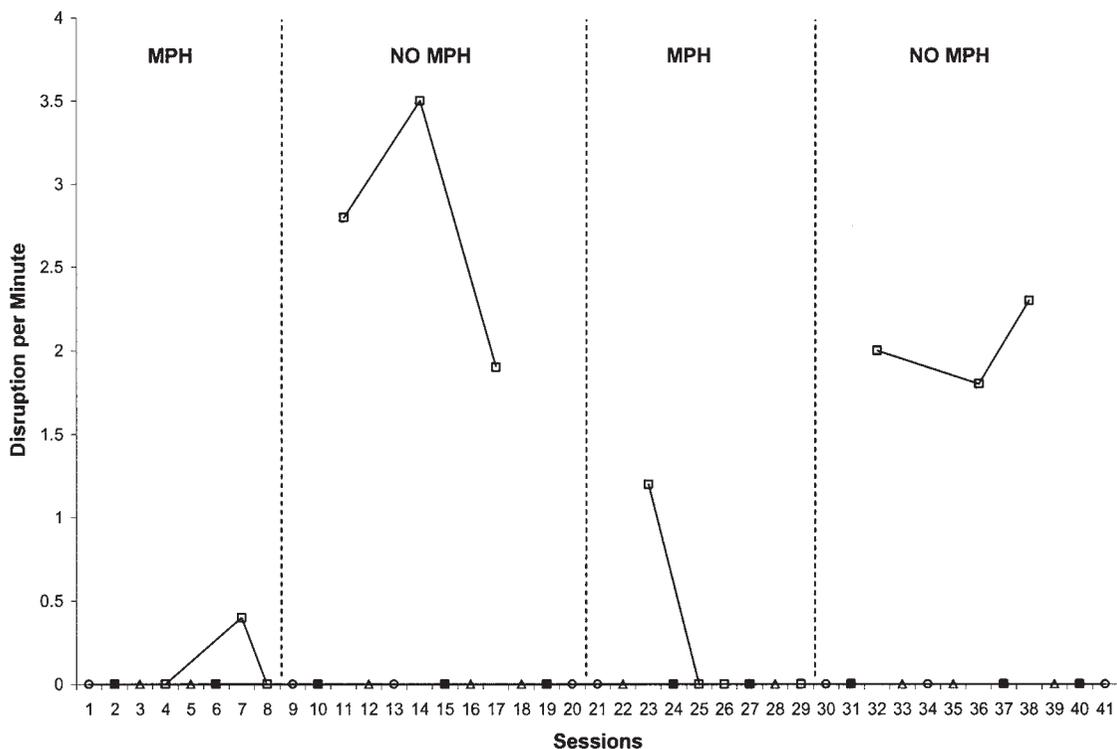


Figure 1. Responses per minute of disruptive behavior with and without MPH during the functional analysis.

result is significant because, to date, no replications or extensions of Northup et al.'s research on the potential for interaction between MPH and specific environmental variables have been published.

The results of our study should be interpreted with caution for several reasons. First, the results are from a single subject. Second, the current study does not meet all the contemporary research criteria for examining drug—behavior interactions in persons with developmental disabilities (see Napolitano et al., 1999, for a description of suggested criteria). For example, a double-blind control procedure was not used. That is, the experimenters were aware when the participant had taken his MPH. However, the people who served as reliability observers were blind to the conditions, and the high interobserver agreement suggests that experimenter bias was not an extraneous variable that affected the results.

In conclusion, the results of this study extend the literature on drug treatments for ADHD by showing that functional analyses can generate information on potentially clinically significant interactions between medication and specific environmental variables.

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