JOURNAL OF APPLIED BEHAVIOR ANALYSIS 2003, **36,** 245–248 NUMBER 2 (SUMMER 2003)

RATE-DECREASING EFFECTS OF THE ATYPICAL NEUROLEPTIC RISPERIDONE ATTENUATED BY CONDITIONS OF REINFORCEMENT IN A WOMAN WITH MENTAL RETARDATION

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Effects of two doses of risperidone on the performance of a matching task under tangible reinforcement and nonreinforcement conditions were measured in a woman with mental retardation. In both conditions, time to complete the task increased and response rates decreased under two doses of risperidone. Accuracy was generally unchanged. These changes were much smaller in the tangible reinforcement condition; thus, reinforcement seemed to protect performance from the rate-decreasing effects of risperidone.

DESCRIPTORS: drug treatment, reinforcement conditions, risperidone, match to sample, mental retardation

Psychotropic drug therapy may reduce undesirable behaviors, but its effects on cognitive skills and task performance in persons with mental retardation have received relatively little attention, and procedures for analyzing such effects are not well developed (Williams & Saunders, 1997). Ultimately, drug therapy should selectively decrease targeted undesirable behaviors but not decrease desired behaviors. The potential impact of nonselective behavior reduction could be significant for people who already suffer debilitating behavioral deficits.

Behavioral pharmacology has established that schedule and type of reinforcement can largely determine a drug's effects on behavior. Often a behavior maintained under a rich reinforcement schedule will be more resistant to the rate-reducing effects of a drug than will a behavior that is maintained under a relatively lean reinforcement schedule (see Branch, 1991, for a discussion). The environmental influences of drug effects on behavior, however, are rarely considered in clinical trials of psychotropic medications. Napolitano et al. (1999) reviewed the applied literature and found no studies in which medication effects were compared across different conditions of reinforcement. The purpose of the present study was to measure effects of risperidone on the performance of a matching task across two reinforcement conditions. The study was an adjunct to a large, double-blind clinical trial of risperidone (Zarcone et al., 2001).

METHOD

Participant

Mary was a 20-year-old woman who participated in the larger clinical drug trial. She was the only participant to receive the current procedures. She was selected because she entered the clinical trial at the time the current study was to start. Her diagnoses were autism, severe mental retardation, intermittent explosive disorder, and bipolar mood disorder. Destructive behaviors in-

This study was supported in part by NICHD Grants HD26927 and HD02528. This report is based on a master's thesis submitted by the first author to the Department of Human Development and Family Life at the University of Kansas. Deborah A. Napolitano is now at Bancroft NeuroHealth. We thank Kathryn J. Saunders and Joseph E. Spradlin for comments on an earlier draft.

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cluded aggression, self-injury (biting hand, hitting head), throwing objects, and screaming. She had limited speech, but could follow simple instructions and had good self-care skills.

Procedure

The drug trial followed an ABCA design in which A was placebo (0.0 mg/day), B was 2.0 mg/day, and C was 2.9 mg/day. All phases were 4 weeks in length and were separated by a 2-week titration period, during which the dose was increased or decreased gradually. Mary and the experimenter were unaware of the dose changes (i.e., double blind). Data taken during titration periods and four sessions prior to Placebo 1 have been excluded from analysis. Procedural details of the drug trial can be found in Zarcone et al. (2001).

Sessions were conducted in a small furnished room 1 or 2 days per week between 9:00 and 10:00 a.m. at her school. Only the experimenter and the participant were present. The game of Perfection® (Hasbro) was used as a matching task. It contained 25 geometric shapes to be placed in 25 matching holes arranged in five rows. On each trial, all rows except one were covered. The five corresponding shapes were put on a plate beside the board. A different row and shape set was used on each trial.

Trials started with the direction "Try to match, Mary." Trials ended when all five shapes were placed correctly. A 2- to 3-min break followed each trial, during which the experimenter reorganized the game board and geometric shapes.

All sessions included five trials with and five without tangible reinforcement, randomly sequenced. In both conditions, shapes placed in nonmatching positions (error) were immediately returned to the plate by the experimenter. In the tangible reinforcement condition, the experimenter praised Mary and gave her a small piece of candy after each correctly placed shape. In the nonreinforcement condition, the experimenter remained silent after shape placement. Note that the two conditions could be discriminated based on the consequences of the first response.

All sessions were videotaped and later scored. A response was scored when Mary released the shape after placing it in a position on the board (correct or incorrect). Trial duration was timed from the end of the start instruction to completion of the fifth correct response. Pieces of candy were placed in Mary's hand, which she typically extended during praise. Two observers scored 20% of the sessions. Event agreement was scored on individual codes when they occurred within 5 s of each other. Duration agreement was scored on a second-by-second basis. Reliability (agreements divided by number of agreements plus disagreements) was as follows: trial duration, 100%; experimenter delivery of praise and edible items, 100%; responses, 94% to 100%.

RESULTS AND DISCUSSION

Placebo 1 mean trial durations were 127.6 s and 80.0 s, mean rates were 11.9 and 18.8 responses per minute, and mean accuracies were 63.0% and 73.6% for reinforced and nonreinforced trials, respectively. Duration was greater in the reinforcement condition because the time taken for reinforcer delivery is included. To equalize the reinforced and nonreinforced measures to more clearly contrast the effects on the two baselines, Figure 1 shows change scores (percentage change from the mean of Placebo 1). Relative to Placebo 1, trial duration (top panel) increased at the 2.0-mg dose and further increased at the 2.9-mg dose. In the second placebo phase, duration decreased to approximately the level of the first placebo phase. There was a much larger increase in trial duration under the nonreinforcement

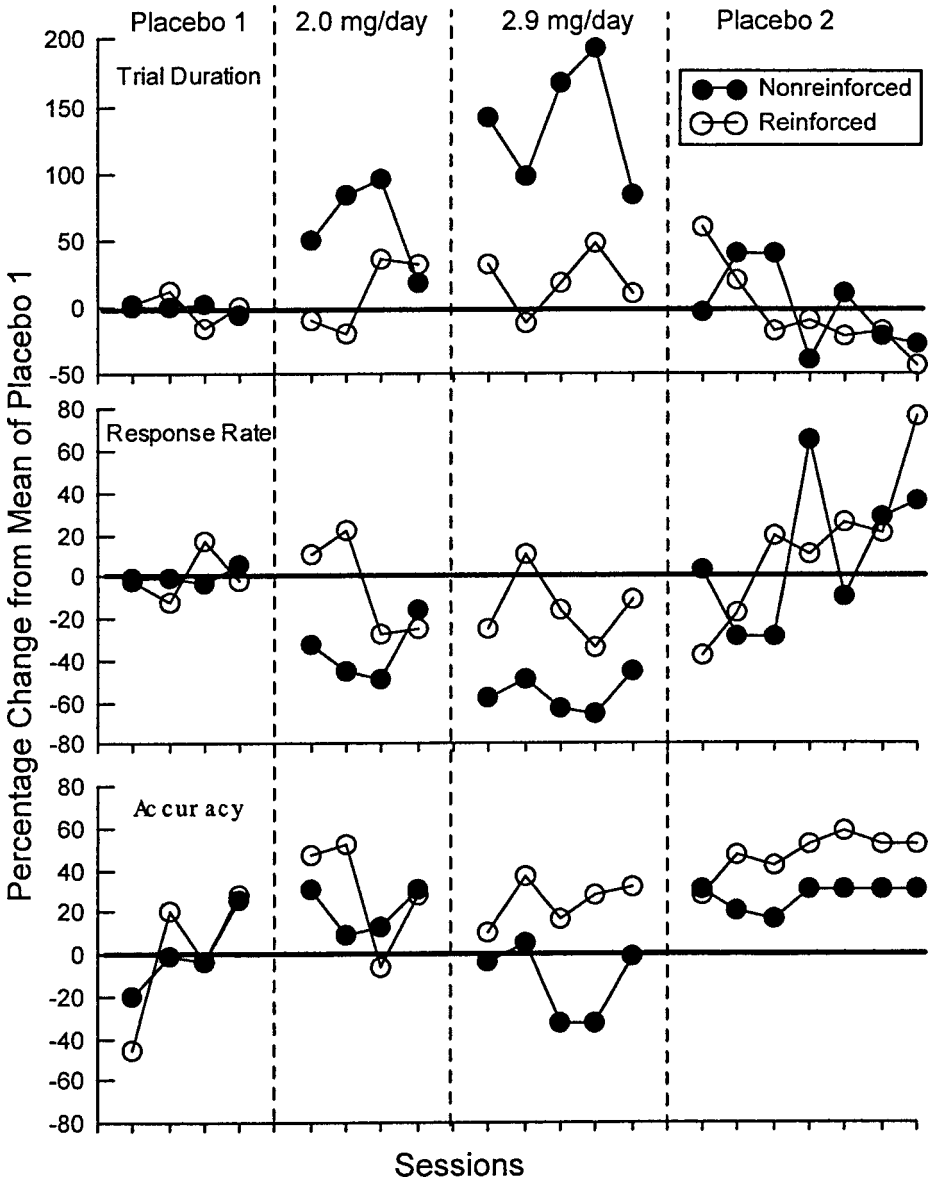

Figure 1. Percentage of placebo for trial duration, response rate, and accuracy for each session (excluding preplacebo and titration sessions). The value for each point is calculated as follows: that session's value minus the mean value for the Placebo 1 phase, divided by the mean value for Placebo 1, then multiplied by 100%. Thus, zero equals no change, positive values indicate increases, and negative values indicate decreases from Placebo 1 levels.

condition than under the reinforcement condition. The middle graph shows that response rate (which included correction responses after an error was made) decreased from Placebo 1 at both doses, and that this decrease was larger under nonreinforcement conditions than under reinforcement conditions. Matching accuracy increased from Placebo 1 under all conditions, except at the highest dose under the nonreinforcement condition (note the increasing trend in Placebo 1 accuracy). These graphs indicate that

risperidone decreased response rate, but usually did not affect accuracy, and that task duration was increased by the rate-decreasing effect of the drug rather than by repeat responses after incorrect placement.

As reported by Zarcone et al. (2001), Mary showed clinically significant improvement under risperidone (Figure 2 of Zarcone et al.). Ratings of problem severity on the aberrant behavior checklist were 45% and nearly 65% lower than placebo under the 2.0 and 2.9 mg doses, respectively. Under Placebo 2, severity returned to Placebo 1 levels. The lethargy subscale was unchanged in all conditions. Thus, these doses reduced undesirable behavior and response rate on the matching task without clinical sedation. These results suggest that risperidone may not selectively reduce undesirable forms of behavior because both targeted undesirable behaviors and at least one class of desirable behaviors were reduced. Clearly, accurate characterization of drug treatment requires measuring multiple response classes.

The primary implication of this study is that environmental variables can determine effects of pharmacotherapy. Behavior that produced tangible reinforcers was less affected by a clinically important dose of risperidone than was unreinforced behavior. The present study has some procedural limitations, primarily the absence of replications across subjects, tasks, and reinforcement conditions. Thus, the exact behavioral mechanism cannot be determined from this study; however, the results are consistent with findings from the basic behavioral pharmacology literature (for reviews, see Branch, 1991; Williams & Saunders, 1997). This single-case study illustrates the need for additional research on the interaction of behavioral contingencies and drug effects in clinical populations, and provides an initial methodological demonstration for such research.

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Received May 13, 2002
Final acceptance February 21, 2003
Action Editor, John Northup