

*THE EFFECTS OF RESPONSE INTERRUPTION AND  
REDIRECTION AND SERTRALINE ON VOCAL STEREOTYPY*

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Although response interruption and redirection (RIRD) has been shown to be successful in reducing vocal stereotypy, recent reports have suggested that selective serotonin reuptake inhibitors (SSRIs) may also reduce these behaviors. The purpose of the current investigation was to examine the effects of RIRD with and without sertraline on automatically maintained vocal stereotypy of a 4-year-old boy with autism. Results suggested that vocal stereotypy decreased when RIRD was implemented and that sertraline did not affect the participant's vocal stereotypy.

DESCRIPTORS: autism, response interruption, selective serotonin reuptake inhibitors, sertraline, vocal stereotypy

Serotonin dysfunction has been hypothesized as being implicated in a variety of behaviors displayed by individuals with autism, including stereotypy (e.g., McDougle et al., 1996). Recent reports have suggested that selective serotonin reuptake inhibitors (SSRIs), which have been prescribed for individuals with obsessive compulsive disorder, may also serve to reduce repetitive behaviors displayed by individuals with autism. Sertraline (Zoloft), which has dopamine uptake-blocking properties, has been evaluated as a treatment for repetitive behavior in individuals with autism in three open-label studies. Results from one study conducted with 42 adults with pervasive developmental disorder suggested that 50 to 200 mg of sertraline per day resulted in improvement on measures of repetitive thoughts and aggression (McDougle et al., 1998). Another study suggested that after 28 days of treatment, 8 of 9 adults diagnosed with mental retardation, 5 of whom had autism,

showed improvement on self-injury as measured by a clinical rating scale (Hellings, Kelley, Gabrielli, Kilgore, & Shah, 1996). In the third case study, 9 children with autism (6 to 12 years old) received 25- to 50-mg daily doses of sertraline for the treatment of anxiety and agitation (Steingard, Zimnitzky, DeMaso, Bauman, & Bucci, 1997). The authors reported that 8 of 9 participants showed improvement based solely on uncontrolled clinical observations. Despite limited data on its effectiveness for reducing repetitive behaviors, sertraline (and other SSRI medications) has been frequently prescribed for children with autism (Soorya, Kiarashi, & Hollander, 2008).

Applied behavior-analytic procedures are an alternative to SSRIs that have been researched and effectively used to reduce both motor and vocal stereotypy (e.g., Ahearn, Clark, MacDonald, & Chung, 2007; Piazza, Adelinis, Hanley, Goh, & Delia, 2000). Most recently, Ahearn et al. evaluated the effectiveness of response interruption and redirection (RIRD) on automatically maintained vocal stereotypy in 4 children (7 to 11 years old) diagnosed with autism. The procedure involved interrupting vocal stereotypy and redirecting it to appropriate vocalizations. An ABAB design was used to determine the effectiveness of RIRD on vocal stereotypy. Vocal demands (e.g., social ques-

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tions) were presented following the occurrence of vocal stereotypy and were continuously presented until the child complied with three consecutively issued demands without stereotypy. In addition, if participants independently vocalized appropriately (e.g., asked for an item), the teacher delivered praise and the requested item (if applicable). For each child, RIRD decreased rates of vocal stereotypy substantially more than those observed in baseline. For 3 of the children, an increase in appropriate communication (e.g., mands and tacts) was also observed.

The current investigation examined the effects of RIRD with and without sertraline in the treatment of automatically reinforced vocal stereotypy displayed by a young child diagnosed with autism.

## METHOD

### *Participant, Setting, and Materials*

James was a 4-year-old child with autism and communication delay. He was enrolled in an intensive applied behavior-analytic preschool program during the course of the study. He had been prescribed and was taking 10 mg of sertraline for his vocal and motor stereotypy for 3 months prior to the beginning of the study. Stereotypic behavior was reported by his clinical team and parents to occur at unacceptable levels despite the medication. This high level of stereotypy was not only interfering with his learning, but it also prevented James from participating in a variety of activities with his peers. Although response blocking was being used to redirect motor stereotypy, no treatment other than medication was in place for vocal stereotypy.

Experimental sessions were conducted once per day in a room in James' school (1.5 m by 3 m) equipped with a wide-angle video camera, microphone, video recording equipment, materials for the session, and a table with two chairs. A paired-stimulus preference assessment (Fisher *et al.*, 1992) was conducted with a variety of

toys that presumably did not match the sensory consequence that maintained the stereotypic behavior. Moderately preferred toys were selected and were present during sessions.

### *Response Measurement, Experimental Design, and Interobserver Agreement*

*Vocal stereotypy* was defined as any instance of noncontextual or nonfunctional speech and included sustained vowel sounds, varying pitches of a sound, and spit swooshing at an audible level. Examples included "ee, ee, ee, ee" outside the context of a vocal imitation task. Nonexamples included repeating a sound immediately after the experimenter, making a request, or labeling items. An *appropriate vocalization* was defined as the emission of a verbal utterance known to function as a mand or a tact (e.g., "all done," "toy").

Data on vocal stereotypy and appropriate vocalizations were collected using a data sheet with continuous 1-s intervals. Vocal stereotypy is reported as percentage of intervals, and appropriate vocalizations are reported as a frequency measure because they were discrete and varied little in duration. Observers recorded time spent in and the number of RIRD implementations. Observers did not record data on vocal stereotypy or appropriate vocalizations when the experimenter implemented RIRD. Furthermore, the experimenter stopped the session clock each time he or she implemented the procedure and restarted it following delivery of social praise to ensure that time spent implementing RIRD was taken out of the 5-min total session time.

The effects of RIRD and sertraline removal were evaluated using an ABABC reversal design in which A was sertraline only, B was RIRD plus sertraline, and C was RIRD only.

Interobserver agreement data were collected by an independent rater during approximately 31% of treatment sessions across conditions. Mean interobserver agreement was 99% (range, 98% to 100%) for vocal stereotypy and 91% (range, 75% to 100%) for appropriate vocalizations.

### Functional Analysis

A functional analysis of vocal stereotypy was conducted as described by Ahearn et al. (2007). Vocal stereotypy occurred across all conditions of the functional analysis and most frequently during the alone condition, suggesting that vocal stereotypy was maintained by automatic reinforcement (Figure 1, top).

### Procedure

*Sertraline.* The experimenter was present, and moderately preferred toys were in sight but out of reach. The experimenter interrupted every instance of vocal stereotypy by removing any item with which James was engaged. Mands were followed by social praise and the item. James took a daily dose of 10 mg of sertraline.

*RIRD plus sertraline.* This condition was the same as the sertraline-only condition except that the experimenter interrupted every instance of vocal stereotypy by removing any item and presenting vocal demands, consisting of a series of vocal imitation tasks involving sounds that James had already mastered (e.g., "ah," "ma," "mo," "ee," "oh," and "bee"). None of his appropriate vocalizations were used as demands during intervention. The experimenter presented vocal demands until James responded correctly three times in the absence of vocal stereotypy. Social praise followed correct responses. Appropriate mands again resulted in delivery of social praise and the requested item.

*RIRD.* The medication was systematically faded across 5 days while RIRD continued to be implemented. The fading dosages of 6 mg, 4 mg, and 0 mg were determined by the developmental pediatrician who had originally prescribed the medication.

*Follow-up.* Follow-up sessions were conducted 2 weeks later to allow time for the sertraline to no longer be physiologically active. During follow-up, only RIRD was implemented.

## RESULTS AND DISCUSSION

Figure 1 (middle) depicts the percentage of vocal stereotypy and frequency of appropriate vocalizations across all conditions. During the sertraline-only phase, mean percentage of intervals with vocal stereotypy was 49%, and the mean number of appropriate vocalizations was 6.3 per session. When the experimenter implemented RIRD, the mean percentage of intervals with vocal stereotypy decreased to 20% by Session 4 and remained fairly low ( $M = 11.6\%$  across the last 12 sessions). The total number of appropriate vocalizations per session concurrently increased across the condition ( $M = 22.4$ ). During the reversal condition, both the percentage of vocal stereotypy and the number of appropriate vocalizations returned to original levels. When the experimenter reintroduced RIRD, there was an immediate decrease in vocal stereotypy ( $M = 8.8\%$ ) and an increase in appropriate vocalizations ( $M = 15.8$ ). When sertraline was titrated and removed and at the 2-week follow-up, there was no change in the percentage of vocal stereotypy or frequency of appropriate vocalizations.

Figure 1 (bottom) depicts the length of time (in seconds) that the experimenter spent implementing RIRD and frequency of implementations across treatment sessions. When the experimenter first introduced RIRD, the time spent implementing the procedure decreased from 194 s (Session 4) to 134 s (Session 18), 35 and 20 implementations per session, respectively. During the second introduction of RIRD, the time spent implementing the procedure decreased from 156 s to 33 s (Session 37), 31 and 10 implementations per session, respectively.

These results replicate those of Ahearn et al. (2007) in that vocal stereotypy decreased with the introduction of RIRD, while appropriate vocalizations (mands) increased. In addition, when sertraline was removed, the participant's low levels of vocal stereotypy were not

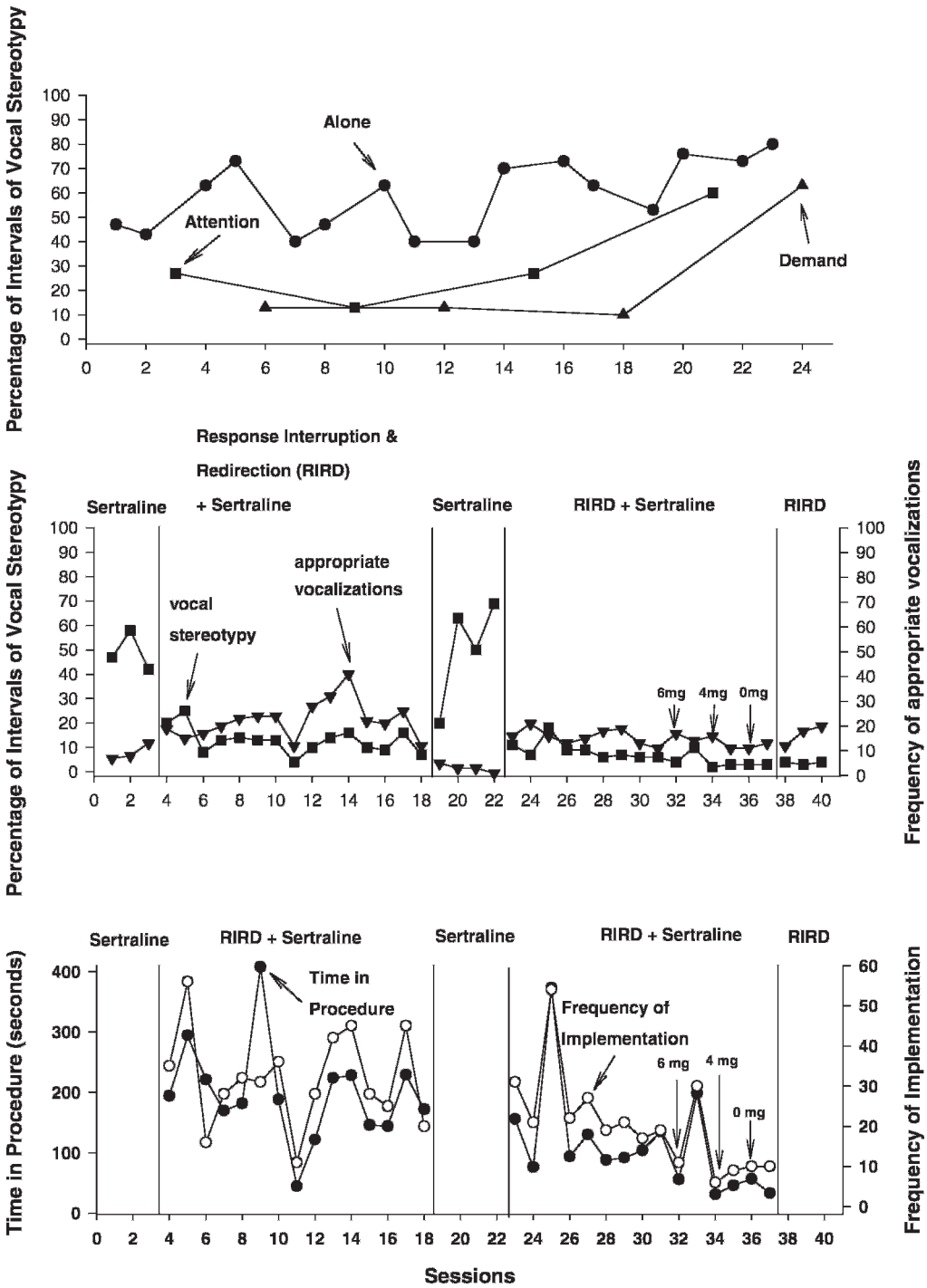


Figure 1. Percentage of intervals with vocal stereotypy for James during functional analysis sessions (top). Percentage of intervals with vocal stereotypy (left axis) and total number of appropriate vocalizations (right axis) during response interruption and redirection intervention (RIRD) with and without sertraline (middle). Length of time (seconds) spent implementing RIRD (left axis) and frequency of RIRD implementations across treatment sessions (right axis) across all conditions (bottom).

disrupted. These results were maintained during follow-up in which RIRD continued to be implemented. Although this study showed that the time spent implementing RIRD decreased over time, anecdotal data collected during school hours suggested that the procedure was initially being implemented as often as 100 times per day. Future research should evaluate the effectiveness and feasibility of an RIRD-based procedure conducted across the entire day under naturalistic conditions.

The current study is the first to evaluate the effects of an SSRI medication in combination with a behavioral intervention in the treatment of vocal stereotypy displayed by an individual with autism. Although no decreases in motor stereotypy were observed as a function of this intervention, future research should evaluate the effects of sertraline and RIRD on both topographies of repetitive behaviors.

Although these results support the effectiveness of RIRD, it suggests that sertraline was not effective in treating vocal stereotypy displayed by this participant. Had sertraline been exerting suppressive effects on the target behavior, its removal should have resulted in an increase in vocal stereotypy. An important limitation of the study is that sertraline administration was never alternated in a reversal design to demonstrate experimental control. Once sertraline was removed and vocal stereotypy remained low, James' family did not want to reintroduce it. Future studies should attempt to alternate introduction and removal of medications systematically using reversal or crossover designs. Another possible limitation is that the 10-mg dose may have been inadequate to produce a therapeutic effect. There are currently no objective dosage guidelines for the use of psychotropic medications in children, especially those with autism (Martin, Scahill, Charney, & Leckman, 2003). Future studies could evaluate the effectiveness of different doses of sertraline in

reducing repetitive behaviors in children with autism to assist in providing that empirical evidence necessary to develop dosage guidelines.

Of note, the results of the current study were relevant only to the participant evaluated. However, the procedures employed could be expanded for the study of other individuals receiving similar interventions and with similar topographies of behavior. We believe that the current investigation provides a practical method for determining the effects of specific medications on problem behaviors in clinical settings. Single-subject research designs can be used to monitor the effects of medications on problem behaviors in the same manner that these designs are used to evaluate behavioral interventions. The evaluation of drug-behavior interactions in the clinical setting is an area in which behavior analysts have much to contribute.

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