

*RESPONSE INTERRUPTION AND REDIRECTION: CURRENT
RESEARCH TRENDS AND CLINICAL APPLICATION*

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The objective of this paper is to provide a review of recent literature on response interruption and redirection (RIRD), a treatment for stereotypy. We discuss procedural variations and the potential mechanisms that are responsible for the effectiveness of RIRD. Clinical considerations and suggestions for future research are also discussed.

Key words: autism, redirection, response interruption, stereotypy

For many individuals with autism and other developmental disabilities, stereotypy occurs at levels that may impede development of appropriate academic and social behaviors. However, identification of effective treatments may be difficult, because stereotypy is often maintained by automatic reinforcement (Vollmer, 1994). Some studies have shown that reinforcement-based procedures, such as differential reinforcement and noncontingent reinforcement, reduce levels of stereotypy. In contrast, other research suggests that punishment-based procedures, such as response blocking, may be necessary treatment components (see Rapp & Vollmer, 2005, for a review). Response interruption and redirection (RIRD) was first described by Ahearn, Clark, MacDonald, and Chung (2007) as an effective treatment for vocal stereotypy. The authors characterized RIRD as a variation of response blocking because the therapist interrupted the response by delivering demands contingent on the occurrence of stereotypy and redirected the individual to emit a more appropriate response (e.g., when the individual emitted noncontextual vocalizations, the therapist delivered social questions, e.g., “What’s your name?”). The purpose of this paper is to provide a brief review of the RIRD

literature that has been published since Ahearn et al. and to present considerations for clinical practice and future research.

We identified eight studies published in the *Journal of Applied Behavior Analysis* from 2007 through 2012 that evaluated RIRD as a treatment for stereotypy across 18 participants (Ahearn et al., 2007). Participants ranged from 3 to 11 years old and had a diagnosis on the autism spectrum; one participant also had a diagnosis of Down syndrome (Athens, Vollmer, Sloman, & St. Peter Pipkin, 2008). All studies reported substantial decreases in levels of stereotypy during RIRD compared to baseline levels. However, we identified a number of procedural variations across studies that may have influenced results. Throughout this review, we will highlight some of these variations and discuss areas in which future research is needed.

SETTING AND MATERIALS

Consistent with Ahearn et al. (2007), all studies were conducted in a controlled setting. Some studies did conduct sessions in a more naturalistic setting (i.e., home or school); however, RIRD was not implemented during naturally occurring activities. Thus, the efficacy and practicality of implementing RIRD in the natural environment are still unknown. Six studies included leisure items during sessions (see Table 1), and four of these (Casella, Sidener, Sidener, & Progar, 2011; Colón, Ahearn, Clark,

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Table 1
Procedural Variations of RIRD Studies Reviewed

| Reference | Sex and age (years) | DV _s | Materials | | Session duration | | RIRD task | | Reinforcement | |
|--------------------------|---------------------|------------------------------------|---|-------------------------|---|------------------|-----------|------------------|---------------|-------------------------|
| | | | Leisure items/ removal | SD | Total | Included RIRD | Matched | Comp required | Comp | Alternative behavior |
| Ahearn et al. (2007) | 2 M, 2 F 3–11 | VS AV | No/NA | No | 5 min | No | Yes | Yes | Yes | Yes (with item) |
| Ahrens et al. (2011) | 4 M 2–6 | VS MS AV comp | Part. 1: No/NA Part. 2–4: Yes/ND | Yes Therapist | Exp. 1 5 min Exp. 2 10 min 30 min cap | No | Yes | No | Yes | Yes (with item) |
| Athens et al. (2008) | 1 M 11 | VS | Yes/Yes | No | 5 min | Yes | Yes | ND | Yes | ND |
| Casella et al. (2011) | 2 M 4–7 | VS AV RIRD (dur) | Yes/Yes | Yes therapist | 5 min 30 min cap | No | No | Yes | Yes | No |
| Colón et al. (2012) | 2 M 8–10 | VS AV | Yes/ND | No | 5 min | No | Yes | Yes | Yes | Yes (with item) |
| Love et al. (2012) | 2 M 8–9 | VS AV RIRD (freq) | Yes | Yes colored shirt | 5 min | No | Yes | Yes | Yes | Yes |
| Miguel et al. (2009) | 1 M 4 | VS AV RIRD (dur and freq) | Yes | No | 5 min | No | Yes | Yes | ND | Yes (with item) |
| Schumacher et al. (2011) | 1 M, 1 F 5–8 | VS | No/NA | Yes red card | 10 min | Yes | Yes | Yes | ND | No |

Note. VS = vocal stereotypy; AV = appropriate vocalizations; MS = motor stereotypy; Comp = compliance; ND = not described.

& Masalsky, 2012; Love, Miguel, Fernand, & LaBrie, 2012; Miguel, Clark, Tereshko, & Ahearn, 2009) used preference assessments to identify preferred items. In addition, three of the six studies reported item removal during RIRD (see Table 1). It has been suggested that enriching the environment with leisure items may limit the ability to assess functional control of RIRD (Ahearn et al.). Moreover, removing preferred items contingent on stereotypy during RIRD may function as negative punishment. Results of Love et al. (2012) suggest that access to preferred items may increase the effectiveness of RIRD. To determine the most effective and efficient procedure, researchers should compare RIRD

with and without leisure items available, as well as the removal and nonremoval of leisure items (when they are present) to identify the operant mechanisms that are responsible for decreasing stereotypy.

Another variation was the inclusion of stimulus control procedures. Four studies used signals to enhance stimulus control (e.g., the therapist wore a black shirt when RIRD consequences were to be implemented; Love et al., 2012; see Table 1). Establishing discriminative control may increase the probability of generalization, especially when it is implemented in the natural environment (Rapp, Patel, Ghezzi, O'Flaherty, & Titterton, 2009). However, none of the studies tested

stimulus control by presenting the signal in the absence of programmed consequences, under novel conditions, or by achieving zero levels of behavior. Thus, researchers should continue to evaluate the utility of establishing discriminative responding during RIRD.

FUNCTIONAL ASSESSMENT

To identify the maintaining variables of stereotypy, all but two studies reported using functional analysis. One study (Casella et al., 2011) used indirect assessment, and one study (Schumacher & Rapp, 2011) did not describe assessment procedures. Results suggested that stereotypy was maintained by automatic reinforcement for 15 participants (Ahearn et al., 2007; Ahrens, Lerman, Kodak, Worsdell, & Keegan, 2011; Colón et al., 2012; Love et al., 2012; Miguel et al., 2009) and either attention or automatic reinforcement for two participants (Athens et al., 2008; Casella et al., 2011). We recommend that future researchers report the identified function of stereotypy, because it may influence the effectiveness of RIRD. For attention-maintained behavior, RIRD may serve as direct social attention; for escape-maintained behavior, it may provide brief escape from the current task. However, RIRD may be effective for stereotypy maintained by both social and nonsocial variables. Therefore, the differential effects of RIRD on stereotypy that is, in part, maintained by social consequences should be evaluated.

RESPONSE DEFINITIONS AND MEASUREMENT

All studies defined vocal stereotypy as non-contextual vocalizations and, when relevant, defined motor stereotypy as hand flapping, body rocking, and clapping. In all studies, appropriate vocalizations were defined as contextually appropriate mands or tacts. The type of measurement system used, however, varied and included total duration, interval recording, and

count measures. Based on the studies reviewed, discontinuous measures appear to be reliable and may be preferable for practitioners.

Sessions lasted 5 or 10 min in all studies reviewed. Although these session durations allow more efficient treatment evaluations, future research should evaluate the effects of RIRD when implemented consistently for longer durations. Furthermore, researchers may consider evaluating within-session response patterns to determine whether the treatment effects are maintained when session durations are lengthened.

It should be noted that total session duration may have extended beyond the reported session time; time in RIRD was not included as part of the session in six studies (i.e., the therapist paused the session timer during the procedure; see Table 1), and only two of those studies (Casella et al., 2011; Miguel et al., 2009) reported the duration of RIRD implementation. Without this information, it is difficult to evaluate the intrusiveness or clinical utility of the procedure.

Furthermore, in only three studies (Ahrens et al., 2011; Athens et al., 2008; Schumacher & Rapp, 2011) did data include stereotypy that occurred during RIRD sequences. It is possible for individuals to engage in stereotypy during or between demands delivered as part of RIRD even when the requested responses are matched topographically to the stereotypic response. Thus, including or excluding data on stereotypy during RIRD may influence the reported outcomes. Future research should evaluate whether data analysis methods could lead to misinterpretation of RIRD's effectiveness. Such analyses also will allow us to determine the most conservative data analysis method.

RIRD SEQUENCE DELIVERY

In four studies (Ahearn et al., 2007; Ahrens et al., 2011; Casella et al., 2011; Love et al., 2012), the therapist first attempted to gain the participant's attention or eye contact by

stating the participant's name before delivering the RIRD sequence. The other four studies (Athens et al., 2008; Colón et al., 2012; Miguel et al., 2009; Schumacher & Rapp, 2011) did not include a description of how RIRD was initiated. Future research should evaluate this variation, because it may increase compliance to RIRD instructions and thus the procedure's effectiveness. Another variation was the type of demands delivered during the RIRD sequence. Although the majority of studies reported using topographically matched demands (e.g., instructions that required vocal responses for vocal stereotypy), one study (Casella et al., 2011) used unmatched demands and one study (Ahrens et al., 2011) used both. Collectively, results suggest that the topography of the demand does not affect the outcomes of the procedure. This extension demonstrates that RIRD may be effective for participants who have limited vocal repertoires or who exhibit noncompliance to demands that require vocal responses. However, a more thorough evaluation of how demand type affects outcomes should be conducted. For example, researchers may consider using a stimulus avoidance assessment to identify possible demands (Fisher, Piazza, Bowman, Hagopian, & Langdon, 1994). Comparing the level of avoidance behaviors evoked by different tasks may aid in identifying the least intrusive or aversive demands that also will decrease levels of stereotypy most effectively.

The number of demands delivered during RIRD sequences and the response requirements also varied across studies. In six studies, the participant was required to comply to three consecutive demands before the RIRD sequence was terminated (see Table 1), whereas in two studies, the therapist presented one (Athens et al., 2008) or three (Ahrens et al., 2011) demands but did not require compliance. However, in all but one study (Athens et al., 2008), the absence of stereotypy was required for at least three consecutive demand deliveries before the RIRD sequence was termi-

nated (5 s of no stereotypy was required in Athens et al., 2008). Therapist prompts for compliance also varied across studies. Contingent on an incorrect or no response, in one study (Schumacher & Rapp, 2011) the demand was repeated, whereas in three studies (Ahrens et al., 2011; Athens et al., 2008; Casella et al., 2011) compliance was prompted. In one study (Athens et al., 2008) leisure items were removed if prompts were ineffective. These variations should be evaluated systematically in future research because the response requirement may affect the total time spent in RIRD and because the use of prompts or removal of leisure items may affect the effectiveness of the procedure.

CONSEQUENCES FOR COMPLIANCE AND OTHER APPROPRIATE BEHAVIOR

Praise for compliance during RIRD was delivered in six studies (see Table 1), either for each correct response or after the entire response requirement to terminate the RIRD sequence. Although compliance may be a desired outcome, results of Ahrens et al. (2011) suggest that compliance to redirection is not necessary to decrease stereotypy. Further, it is possible that praise for compliance may function as the terminal reinforcer for an interlocking contingency in which stereotypy serves as the initial response. This, in turn, may increase the frequency of stereotypy for individuals for whom praise functions as a reinforcer. To date, no studies have compared the effects of RIRD with and without reinforcement for compliance.

In five studies, praise for appropriate vocalizations was provided, and in four of those studies, a requested item was delivered if available (see Table 1). In the remaining studies, either the appropriate vocalization was acknowledged (Casella et al., 2011), consequences were not provided (Schumacher & Rapp, 2011), or consequences were not described (Athens et al., 2008). When targeting reductions in vocal stereotypy, mands and tacts serve as appropriate

and potentially competing alternative responses. Use of reinforcers that have been identified through systematic evaluation will increase the future frequency of appropriate vocalizations, which may subsequently compete with stereotypy, as demonstrated by Dickman, Bright, Montgomery, and Miguel (2012) through use of a token economy. The same may be true for motor stereotypy and appropriate toy play; however, none of the reviewed studies systematically evaluated the efficacy of praise. Thus, future studies should evaluate the effectiveness of praise as a reinforcer, as well as the necessity and potential additive effects of reinforcement for appropriate behavior during RIRD.

CLINICAL IMPLICATIONS AND FUTURE RESEARCH

Despite procedural variations, RIRD was proven to be useful in reducing levels of stereotypy across all reviewed studies. However, several gaps in the literature are apparent. Most notably, only two studies (Casella et al., 2011; Love et al., 2012) reported treatment integrity and social validity measures. Future research should include these measures. In addition, researchers should examine the effectiveness of RIRD when implemented with varying levels of integrity that more closely resemble what may occur in the natural environment. The dearth of research demonstrating positive effects of RIRD in the natural environment is another notable gap in the literature.

Researchers must now begin to compare the many procedural variations of RIRD described in the current literature to increase the efficiency and generality of RIRD. This, perhaps, can be accomplished by evaluating methods that decrease the length of RIRD implementation. For example, future researchers should evaluate the number of demands necessary to produce desired outcomes. Further, researchers should evaluate the necessary components of RIRD. For example, one might evaluate the effectiveness of RIRD

with and without reinforcement for compliance, appropriate vocalizations, or both. In addition, an evaluation of removal of leisure items may begin to shed light on the underlying mechanisms that are responsible for the effects of RIRD.

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