



Assessment and Treatment of Stereotypical Behavior Displayed by Children with Autism Spectrum Disorders

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Abstract

This chapter provides definitions for various forms of motor and vocal stereotypy and describes some characteristics of individuals who display problematic levels of stereotypy. Thereafter, the chapter describes procedures for measuring, assessing, and treating stereotypy. Specifically, the chapter outlines several behavioral procedures for decreasing or eliminating stereotypy during leisure or free periods and academic work periods. In part, each procedure requires practitioners to identify one or more preferred items that either (a) compete directly with the client's engagement in stereotypy or (b) are provided as a consequence for the client's appropriate behavior. This chapter concludes by highlighting several practical limitations of each intervention and considerations for practitioners when selecting behavioral interventions to treat stereotypy.

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9.1 Stereotypy

9.1.1 What Is Stereotypy?

Stereotypy is a class of behaviors that can be broken down into two major subtypes: motor and vocal. Common examples of stereotypy may include hand flapping, toe walking, spinning, incessant pacing, body rocking, limb posturing, object spinning, surface rubbing, finger flicking, vocal humming, and reciting vocal scripts (see Table 9.1; DiGennaro-Reed, Hirst, & Hyman, 2012; Rapp & Vollmer, 2005). Although there is not universal consensus among researchers about how to define this class of behavior, stereotypy is generally defined as noncontextual, repetitive, and/or invariant motor or vocal responses that persist in the absence of social consequences (Lanovaz & Sladeczek, 2012; Rapp & Vollmer, 2005). Because stereotypy results in some form of sensory stimulation, it is often referred by practitioners or caregivers as a “self-stimulatory” or “sensory” behavior, or sometimes it is simply called “stimming.” However, we shall refer to the technical term, stereotypy, throughout this chapter.

In behavioral science, identifying consequences that support or maintain problem behavior is a critical component to provide an effective intervention. This is done using a functional analysis (e.g., Iwata & Dozier, 2008), and behavior is then categorized as either social or nonsocial (sometimes called “automatic” reinforcement,

Table 9.1 Examples of response definitions for stereotypy

Response form	Response definition
Vocal stereotypy	• Noncontextual vocal utterances, including unintelligible sounds, or words, excluding coughing and sneezing
Mirror viewing	• Oriented towards a mirror while standing within 60 cm
Object banging	• Hitting a surface with an object he or she is holding in his or her hand
Pacing	• Two or more walking steps in a forward motion
Hand flapping	• Moving hand up and down two or more times bent at the elbow
Surface hitting	• Contact of any part of his or her body with another item or surface two or more times
Face expressions	• Any repetitive (minimum of two instances within 2 s) lip movements such as repetitive puckering (excluding chewing), blowing/sucking air with rigid or stationary lips, repetitive blinking minimum of two times within 2 s, or squinting eyes for more than 2 s
Spinning	• Full rotation (360 degrees) of own body while standing or sitting on the floor
Spitting/saliva play	• Expelling saliva past the plane of the lips, or making contact with the saliva once expelled
Finger movements	• Any repetitive or invariant fine motor movements, two or more repetitive movements within 3 s or lasting longer than 3 s
Object tapping	• Touching an object using one or both hands and removing the hand within 1 s excluding rubbing the surface of objects, drumming the fingers on objects, and tapping self
Hand gesturing	• Straightening and flexing the fingers accompanied by holding them in various positions, including holding the hand or fingers still or flexing or tapping the fingers against objects
Finger spelling	• Extending one or more fingers in the air with elbow bent or waving hand or having a limp wrist suspended in the air
Body rocking	• Two or more forward and backward torso movements for 2 s or more
Jumping	• Two or more instances of both feet leaving the ground for 2 s or more
Ear covering	• Contact of one or both hands with one or both ears for 2 s or more
Hand gazing	• Rotation of a hand in front of face for 2 s or more

Vollmer, 1994), both of which can involve positive or negative reinforcement. Examples of social positive consequences include events that are added following the occurrence of behavior such as access to attention, tangible items (e.g., toys), or edible items. By contrast, social negative consequences are those that include termination or delay of unpleasant environmental events. Automatic positive consequences often include stimulus events generated directly by behavior such as sensory products (e.g., visual, auditory, or proprioceptive stimulation). Rapp and Vollmer (2005) concluded that a preponderance of studies show that stereotypy was maintained by some form of automatic positive reinforcement. For example, a child with autism spectrum disorder (ASD) may engage in hand flapping that generates visual stimulation, which then functions as an automatic positive reinforcer for engaging in hand flapping (e.g., Rapp, 2008). A note of caution: Practitioners should only consider catego-

rizing behavior as stereotypy if it meets both the *structural* and *functional* definition. In other words, behavior must both structurally look like stereotypy (noncontextual, repetitive, and invariant) and be identified in a formal assessment to function as a non-socially reinforced behavior. This assessment will be discussed in more detail in the section below (*Process of Treating Stereotypy*). If assessment results indicate that repetitive and invariant behavior is maintained by social consequences (e.g., repeating words or nonsense phrases to obtain adult attention, a tangible item, or escape from a situation), then practitioners should not refer to the response(s) as “stereotypy,” but rather treat it as a socially maintained behavior (see Chap. 11 for assessment and treatment of socially reinforced problem behavior). Though a response might look like stereotypy, referring to it as such can lead a practitioner to treatment options that will likely be ineffective. In summary, the descriptor *stereotypy* con-

notes that the behavior (a) is repetitive and invariant in form and (b) produces its own source of reinforcement (Rapp & Lanovaz, 2016; Rapp & Vollmer, 2005).

9.1.2 Who Displays Stereotypy?

In a review of the literature, Chelbi, Martin, and Lanovaz (2016) found that stereotypy was reported in 61% of participants diagnosed with a developmental disability (DD) and 88% of participants diagnosed with ASD. From a developmental standpoint, engaging in some repetitive motor responses (i.e., stereotypical behavior) is typical for most children (e.g., Smith & Van Houten, 1996); however, these otherwise developmentally typical behaviors can evolve somewhat differently for children with ASD. Smith and Van Houten (1996) compared the repetitive behavior of typical children to that of children diagnosed with DD. Specifically, the two groups of children were observed as they watched television, conversed, waited, and played with Legos™. Although the percentage of time children in each group engaged in stereotypy was similar (comparisons were made with both developmental and chronological age matches), observer rated the stereotypy displayed by the children with DD as strange or bizarre. That is, children with DD displayed more obvious repetitive behavior that involved gross-motor movements. Moreover, the children with DD allocated more visual focus to their stereotypical movements than did their age-matched peers.

In a similar study, MacDonald et al. (2007) tracked stereotypy displayed by typically developing children and compared those levels to stereotypy displayed by children with ASD. On the whole, MacDonald et al. found that levels of stereotypy were greater for children with ASD compared to their age-matched typical peers. Notably, the gap across groups widened as they grew older from 2 to 4 years old. Specifically, 4-year-olds with ASD displayed more stereotypy than (a) their same-aged typical peers and (b) 2- and

3-year-olds with ASD. This finding suggests that stereotypy will likely become more problematic if left untreated.

9.1.3 Treating Stereotypy

As a common behavioral feature of ASD and other neurodevelopmental disabilities, stereotypy has been a subject in over 30 years of research across health disciplines. Nevertheless, it remains a difficult class of behavior to treat with either behavioral or pharmacological interventions. From a conceptual standpoint, one reason why stereotypy is particularly difficult to manage stems from the client's ability to freely access the sensory stimulation produced by it (Lanovaz & Sladeczek, 2012; Rapp, 2008; Rapp & Vollmer, 2005; Stangeland, Smith, & Rapp, 2012). In other words, a client can experience the reinforcing stimulation at any time by simply engaging in stereotypy; the stimulation he or she seeks to obtain and behavior he or she emits to obtain it are inextricably linked. Another difficulty in treating this behavior is that the specific stimulation (auditory, proprioceptive, tactile, etc.) produced by engaging in stereotypy is not often clear. This makes the reinforcing consequence (i.e., the type of stimulation produced) difficult for practitioners to manipulate. By contrast, when treating problem behavior maintained by social events, practitioners can identify the specific maintaining consequence (e.g., attention, escaping from a task). Thereafter, a practitioner can arrange to withhold that social consequence contingent on the problem behavior, provide that social consequence contingently upon the occurrence of a more socially appropriate behavior, or both. As with socially reinforced behavior, the goal of treating stereotypy is to provide a functionally similar consequence (i.e., similar stimulation) for engaging in appropriate behavior. In short, treating stereotypy involves unique challenges that can be addressed with specific assessment and treatment procedures.

9.1.4 When Should Stereotypy Be Treated?

An individual's engagement in stereotypy can be problematic because it can interfere with socially appropriate interactions, academic work, or both (e.g., Cunningham & Schreibman, 2008; Enloe & Rapp, 2014; Lanovaz, Robertson, Soerono, & Watkins, 2013). Specifically, individuals who engage in stereotypy are often too interested in, and distracted by, their own stereotypy resulting in (a) delays to engaging in the appropriate behavior, such as responding to a peer or a teacher, (b) failure to focus and acquire academic skills, and (c) failure to learn, or to choose to engage in, age-appropriate activities (Koegel & Covert, 1972; Koegel, Firestone, Kramme, & Dunlap, 1974; Lovaas, Litrownik, & Mann, 1971).

Practitioners should be aware that interventions for stereotypy might produce other, unintended, behavioral changes for that child. In a review on the indirect effects of treating stereotypy, Lanovaz and Robertson et al. (2013) found that reducing stereotypy was typically associated with non-programmed increases in other behaviors, many of which were less desirable than stereotypy. In some instances, suppression of one form of stereotypy (e.g., hand flapping) was associated with increases in other forms of stereotypy (e.g., body rocking) or increases in other undesirable behavior (e.g., aggression). On the other hand, it is possible that intervention for one specific, targeted form of stereotypy (e.g., pacing) could decrease another form of stereotypy (e.g., hand flapping) that was not specifically targeted for intervention. To summarize, some undesirable behavior might be a side effect or by-product of specific treatments. To minimize the production of undesirable behavior, Lanovaz et al. recommended that practitioners specifically target a socially appropriate behavior to increase when decreasing stereotypy.

In addition to interfering with academic and social skill acquisition, stereotypy may also interfere with learning and enrichment opportunities (e.g., Cunningham & Schreibman, 2008). That is, parents of children who display stereotypy may inadvertently avoid community environments

like parks and restaurants. For example, Cunningham and Schreibman (2008) suggested that parents might be apprehensive to bring their child to public locations due to perceived risk of their child encountering unpleasant social interactions (e.g., ridicule from peers) for engaging in stereotypy. Nevertheless, the literature is not clear about what level of stereotypy is perceived negatively by peers, parents, or educators. To this end, a child's engagement in low-level stereotypy might not require intervention. On a broader level, engagement in high levels of restrictive and repetitive behavior, which includes stereotypy, have been associated with increased caregiver-reported stress (Harrop, McBee & Boyd, 2016). Overall, both the potential for barriers to engaging in appropriate behavior of the client and undesirable interactions between the caregiver and the child suggest that treatment of stereotypy is warranted in many cases. Caregiver stress notwithstanding, if a child's stereotypy is non-harmful in a given context (i.e., it does not interfere with either academic tasks or social interactions), treating the behavior may not be necessary (Cook & Rapp, *in press*).

9.1.5 Process for Treating Stereotypy

For the remainder of this chapter, we refer to three levels of personnel within the process of assessing and treating stereotypy: practitioners, instructors, and caregivers. A practitioner will be a graduate-level trained professional who has specific training in stereotypy. This individual will likely hold the credential of board-certified behavior analyst (BCBA), doctoral level BCBA (BCBA-D), or licensed psychologist with behavior-analytic training. Practitioners are responsible for the following steps:

1. Developing clear response definitions for stereotypy
2. Identifying an appropriate system of measurement
3. Conducting an assessment to confirm that the behavior in question is stereotypy

4. Identifying an appropriate intervention for stereotypy
5. Training instructors and caregivers to deliver the chosen intervention
6. Monitoring the ongoing effects of the intervention

An instructor is an individual who is trained by a practitioner to conduct assessment procedures (e.g., data collection), implement a behavioral intervention, or both. Instructors often include associate-level board-certified behavior analysts (BCaBAs), registered behavior technicians (RBTs), and special educators; but they may also include other individuals specifically trained in and supervised by the practitioner. Caregivers typically include family members (e.g., parents and siblings) that have a personal relationship with the client, or someone else legally responsible for the clients' daily living and well-being. In the following sections, we describe how to assess and treat stereotypy displayed by children with ASD and related neurodevelopmental disorders.

9.1.6 Defining and Measuring Stereotypy

Developing a clear definition of stereotypy is a fundamental component of both assessment and treatment. Some individuals display multiple, distinct forms of stereotypy. Practitioners should develop specific definitions for each response form that are specific to that individual. Table 9.1 provides several examples of response forms and the corresponding response definitions. After the practitioner develops clear response definitions, the next step is to select an appropriate measurement system for the assessment and treatment of stereotypy. Because stereotypy is often deemed problematic due to the amount of time the respective individual devotes to the behavior, stereotypy is typically measured as a duration-based event. As such, we recommend using momentary time sampling (MTS; Cooper, Heron, & Heward, 2007) because it (a) provides a sensitive and reliable measure of duration events (e.g., Becraft, Borrero, Davis, & Mendres-Smith, 2016;

Meany-Daboul, Roscoe, Bourret, & Ahearn, 2007), (b) can be used to concurrently measure multiple response forms (e.g., Rapp, Cook, McHugh, & Mann, 2017), and (c) is viewed favorably by practitioners and instructors (Hanley, Cammilleri, Tiger, & Ingvarsson, 2007; Kolt & Rapp, 2014). As it pertains to (b) and (c), some studies suggest that instructors can engage in other data collection or related activities while collecting data with MTS (Becraft et al., 2016; Hanley et al., 2007; Rapp, Colby-Dirksen, Michalski, Carroll, & Lindenberg, 2008).

To collect data with MTS, divide the total observation or session time (e.g., 10 min) into smaller intervals (e.g., 10 s) and observe the individual for engagement in stereotypy at the very last second of the interval (see Fig. 9.1 for a sample data sheet for collecting data with 10-s MTS during a 10-min observation period). If the individual is engaging in the target stereotypy at that second, circle "Y" (yes) for that interval. If the individual is not engaging in the target stereotypy at that second, circle "N" (no) for that interval. To illustrate this process, we will provide an example for a 10-min session. Using the data sheet in Fig. 9.1, begin by starting a session timer. When the timer reaches the 10-s mark, record "Y" or "N" in the manner described above. When the session timer reaches the 20-s mark, record data in the same way. Continue recording data until the session timer reaches 10 min. At this point, stop the timer and count how many intervals you recorded "Y" to identify the total number of intervals in which the individual engaged in stereotypy throughout the session (see *Determining if a Behavior is Stereotypy* for graphing these totals). This value should be divided by the total number of intervals (60) and then multiplied by 100% to arrive at the percentage of 10-s intervals with stereotypy. For example, if 38 intervals were scored with a "Y" for body rocking, then this individual can be said to engage in body rocking for 63.3% of intervals during that 10-min session. The practitioner should plot this percentage as one data point on a linear graph (described in the next section).

Researchers have found that MTS can detect moderate and large behavior changes in duration

Date: _____
 Start and End Time: _____
 DC Initials: _____
 Circle One: Primary / Secondary
 Session: _____
 Condition: _____

Seconds	Engagement	VS	MS
Minute 0-1			
10-11	Y N	Y N	Y N
20-21	Y N	Y N	Y N
30-31	Y N	Y N	Y N
40-41	Y N	Y N	Y N
50-51	Y N	Y N	Y N
60-01	Y N	Y N	Y N
Minute 1-2			
10-11	Y N	Y N	Y N
20-21	Y N	Y N	Y N
30-31	Y N	Y N	Y N
40-41	Y N	Y N	Y N
50-51	Y N	Y N	Y N
60-01	Y N	Y N	Y N
Minute 2-3			
10-11	Y N	Y N	Y N
20-21	Y N	Y N	Y N
30-31	Y N	Y N	Y N
40-41	Y N	Y N	Y N
50-51	Y N	Y N	Y N
60-01	Y N	Y N	Y N
Minute 3-4			
10-11	Y N	Y N	Y N
20-21	Y N	Y N	Y N
30-31	Y N	Y N	Y N
40-41	Y N	Y N	Y N
50-51	Y N	Y N	Y N
60-01	Y N	Y N	Y N
Minute 4-5			
10-11	Y N	Y N	Y N
20-21	Y N	Y N	Y N
30-31	Y N	Y N	Y N
40-41	Y N	Y N	Y N
50-51	Y N	Y N	Y N
60-01	Y N	Y N	Y N

Seconds	Engagement	VS	MS
Minute 5-6			
10-11	Y N	Y N	Y N
20-21	Y N	Y N	Y N
30-31	Y N	Y N	Y N
40-41	Y N	Y N	Y N
50-51	Y N	Y N	Y N
60-01	Y N	Y N	Y N
Minute 6-7			
10-11	Y N	Y N	Y N
20-21	Y N	Y N	Y N
30-31	Y N	Y N	Y N
40-41	Y N	Y N	Y N
50-51	Y N	Y N	Y N
60-01	Y N	Y N	Y N
Minute 7-8			
10-11	Y N	Y N	Y N
20-21	Y N	Y N	Y N
30-31	Y N	Y N	Y N
40-41	Y N	Y N	Y N
50-51	Y N	Y N	Y N
60-01	Y N	Y N	Y N
Minute 8-9			
10-11	Y N	Y N	Y N
20-21	Y N	Y N	Y N
30-31	Y N	Y N	Y N
40-41	Y N	Y N	Y N
50-51	Y N	Y N	Y N
60-01	Y N	Y N	Y N
Minute 9-10			
10-11	Y N	Y N	Y N
20-21	Y N	Y N	Y N
30-31	Y N	Y N	Y N
40-41	Y N	Y N	Y N
50-51	Y N	Y N	Y N
60-01	Y N	Y N	Y N

Fig. 9.1 Data sheet for collecting data on stereotypy and object engagement using 10-s momentary time sampling during 10-min observation sessions

events for sessions as long as 30 min and interval sizes up to 30 s (e.g., Devine, Rapp, Testa, Henrickson, & Schnerch, 2011). Additionally, MTS with 1-min intervals can detect large behavior changes when sessions are 30–60 min in duration. Nevertheless, if the observation sessions (i.e., each session resulting in one data point) are only 5–10-min durations, practitioners should use MTS with 10-s intervals. The larger intervals are typically less labor intensive because the practitioner needs to observe the target behavior only at the last second of the interval. If a practitioner is conducting a 30-min session, we recommend he or she use 1-min intervals to record stereotypy with MTS (see Fig. 9.2). To provide an example of scoring with 1-min MTS for a 30-min session, we will refer to the data sheet in Fig. 9.2. Start a session timer, and when the timer reaches the 1-min mark record “Y” if the individual is engaging in the target stereotypy only at that second. If the individual is not engaging in the target behavior at that particular second, circle “N.” When the session timer reaches the 2-min mark, record data in the same way. Continue recording data in this manner until the session timer reaches 30 min. At this point, stop the timer and count how many intervals you recorded “Y” to identify the total number of intervals in which the individual engaged in stereotypy throughout the session. As previously noted, the practitioner should graphically depict this data point in a linear graph for visual inspection.

Another option for practitioners is to collect continuous duration data or second-by-second data with a laptop computer program or tablet. As one example, Bullock, Fisher, and Hagopian (2017) described a free data collection system called “BDataPro.”¹ In addition to enabling the observer to capture rate (frequency over time) and percentage of time engaged in the target behavior, it also provides a platform for data storage and analysis.

¹This data collection program can be downloaded at <https://www.kennedykrieger.org/patient-care/patient-care-programs/inpatient-programs/neurobehavioral-unit-nbu/bdatapro-software-for-real-time-behavior-data-collection>

Date: _____
 Start and End Time: _____
 DC Initials: _____
 Circle One: Primary / Secondary
 Session: _____
 Condition: _____

Minute	VS		MS	
1	Y	N	Y	N
2	Y	N	Y	N
3	Y	N	Y	N
4	Y	N	Y	N
5	Y	N	Y	N
6	Y	N	Y	N
7	Y	N	Y	N
8	Y	N	Y	N
9	Y	N	Y	N
10	Y	N	Y	N
11	Y	N	Y	N
12	Y	N	Y	N
13	Y	N	Y	N
14	Y	N	Y	N
15	Y	N	Y	N
16	Y	N	Y	N
17	Y	N	Y	N
18	Y	N	Y	N
19	Y	N	Y	N
20	Y	N	Y	N
21	Y	N	Y	N
22	Y	N	Y	N
23	Y	N	Y	N
24	Y	N	Y	N
25	Y	N	Y	N
26	Y	N	Y	N
27	Y	N	Y	N
28	Y	N	Y	N
29	Y	N	Y	N
30	Y	N	Y	N

Fig. 9.2 Data sheet for collecting data on vocal stereotypy (VS) and motor stereotypy (MS) using 1-min momentary time sampling during 30-min observation sessions

9.1.7 Determining if a Behavior Is Stereotypy

Prior to treating stereotypy, a practitioner should formally assess whether the target behavior persists in the absence of social consequences. Behavior that does not persist in the absence of social consequences would (a) not meet the functional criterion for stereotypy and (b) require a different intervention aimed at manipulating social variables (see Chaps. 10 and 11). Intervening on stereotypy without a formal assessment carries the risk of ineffective treatment. Therefore, it is essential for practitioners to conduct a formal screening to determine whether stereotypy persists in the absence of social consequences. This can be accomplished with an adapted functional analysis consisting only of alone sessions (Querim et al., 2013). Because the instructor is typically in the room to collect data during this analysis, researchers have referred to the “alone” conditions more precisely as No Interaction (NI) conditions. Specifically, there are no consequences (or no social interaction) in response to the individual engaging in stereotypy. Additionally, there should be no other stimulation (e.g., toys, computers, materials) present during the assessment. In short, the individual is observed in a bare room, where they are most likely to “keep busy” by engaging in stereotypy. The practitioner should conduct 5- or 10-min NI sessions and collect data using 10-s MTS on the occurrence of stereotypy during these sessions.

As illustrated in Fig. 9.3, at least three NI sessions should be conducted and the assessment should continue until a stable or predictable trend is achieved. The pattern in Fig. 9.3 suggests that the targeted behavior is automatically reinforced (i.e., not maintained by social consequences) and would thus meet the definition of stereotypy. To conduct this assessment, use a data sheet similar to the one depicted in Fig. 9.1. If the target behavior decreases to zero or near-zero levels across the consecutive NI sessions (as illustrated in Fig. 9.4), then the behavior is likely not automatically reinforced and should not be deemed

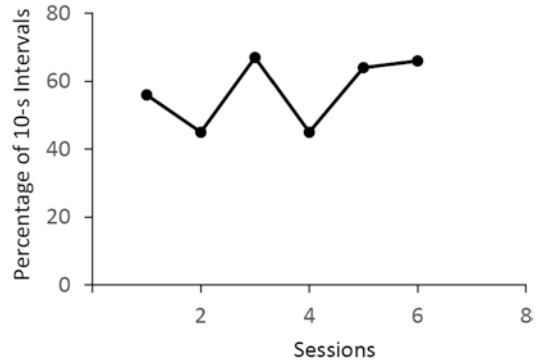


Fig. 9.3 Hypothetical data showing repetitive behavior that persists across sessions without social consequences. This behavior is maintained by a nonsocial source of reinforcement and would meet the definition of stereotypy

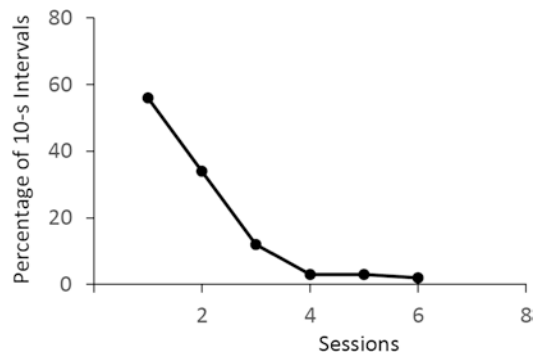


Fig. 9.4 Hypothetical data showing repetitive behavior that decreases without social consequences across sessions. This behavior is *not* maintained by a nonsocial source of reinforcement and would *not* meet the definition of stereotypy

“stereotypy.” In this case, the practitioner should seek other assessments to identify the function of the behavior (e.g., pacing maintained by attention) to then identify an appropriate functional intervention.

As previously noted, data for the occurrence of stereotypy should always be graphically depicted in single-case designs (SCDs) for visual analysis by the practitioner. Although replication of treatment effects is the cornerstone of SCDs (e.g., Kazdin, 2011), several recent studies have shown that a basic baseline and treatment designs (AB designs) are often sufficient. These designs for evaluating and monitoring effectiveness of a program simply demonstrate some initial base-

line sessions (baseline or “A” phase), followed by the sessions with the intervention in place (“B” phase). Typically, replication involves graphs with reversals (e.g., ABAB), which demonstrate the effectiveness of a given treatment; however, the simple AB design can also be useful for demonstrating clear behavior changes in clinical settings. This is particularly apparent for AB designs when (a) the interventions have considerable empirical support, (b) the baseline contains at least five data points or observation sessions, and (c) the baseline data path is relatively stable across sessions (Bartlett, Rapp, & Henrickson, 2011; Krueger, Rapp, Ott, Lood, & Novotny, 2013; Lanovaz, Huxley, & Dufour, 2017; Lanovaz, Turgeon, Cardinal, & Wheatley, 2018; Novotny et al., 2014). Visual analysis of data depicted in AB design graphs can also be supplemented with visual aids and statistical analysis (e.g., see Fisher, Kelley, & Lomas, 2003).

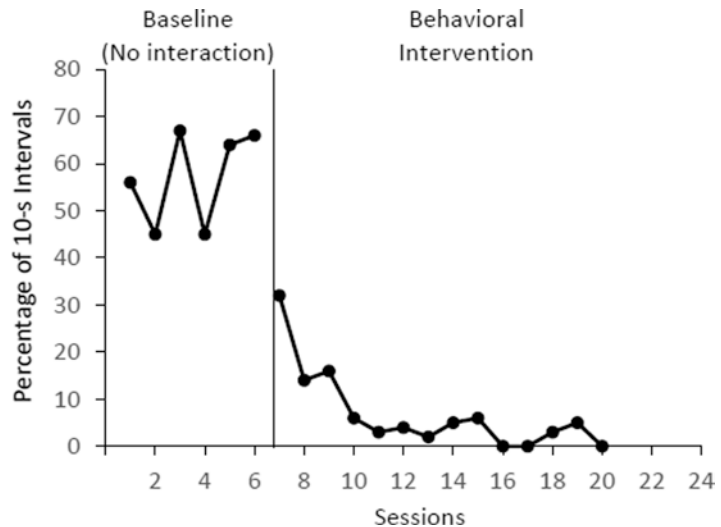
Practitioners should graph their data as the percentage of intervals with stereotypy across sessions (see Fig. 9.5). For each session, practitioners should count the total number of intervals in which stereotypy occurred and divide that number by the total number of intervals in the session. For example, if using 1-min intervals to collect data during a 30-min session, there would be a total of 30 intervals. If stereotypy occurred for 17 of those intervals, a practitioner should

divide 17 by 30 and multiply the result by 100%. Then, a data point should be placed at 56.67% for that session. Graphically depicting the percentage of intervals with stereotypy allows the practitioner to visually analyze the effects of the chosen intervention and to make data-based decisions. The baseline phase should contain a data path with at least three to five data points; the data path should be relatively stable or increasing across sessions. If a data path containing five or more data points (i.e., sessions) in the treatment phase shows that stereotypy is not decreasing, the practitioner should discontinue the treatment and select another option. Treatment options are discussed in the next section.

9.1.8 Empirically Supported Treatments

The stereotypy literature presents various treatment options. Each individual treatment that we recommend in this section met the three general criteria outlined by Kratochwill et al. (2010, p. 21) for combining SCD studies. First, the treatment in question was demonstrated effective by at least five SCD studies that either met evidence standards or met evidence standards with reservations. Second, the treatment in question was evaluated by at least three different research

Fig. 9.5 Hypothetical data plotted in an AB design graph showing stable levels of stereotypy in the baseline phase and a clear reduction in stereotypy following the introduction of the behavioral intervention phase



teams. Third, the effects of the treatment were demonstrated at least 20 times across papers.

9.1.9 Treatment Stimulus Identification

A preference assessment is necessary to empirically identify items that can be provided either contingently on appropriate behavior (i.e., contingent reinforcement) or noncontingently to compete with stereotypy (i.e., noncontingent reinforcement). Numerous studies have shown that preference assessments identify items that are likely to function as reinforcers (i.e., they strengthen behavior over time) when provided contingently on (appropriate) behavior. As such, practitioners should conduct regular preference assessments when working with clients who display stereotypy.

The free operant stimulus preference assessment involves 10-min sessions in which the practitioner presents six or more items concurrently to the client (Roane, Vollmer, Ringdahl, & Marcus, 1998). The room used for the assessment will have these items spread throughout the space, but should otherwise be free of any other items (e.g., educational materials). Depending on the ability of the individual, the practitioner may need to give brief access to each item, as well as verbal and physical prompts to engage with each item, before beginning the assessment. Upon starting assessment, the practitioner will say to the client “you can play with whatever you want” and then allow the client free access to the items for 10 min. The practitioner does not interact with the client during this time, even if the individual is not engaging with any items. The data sheet depicted in Fig. 9.6 can be used to collect data on item engagement for this assessment. Note that the observer should score “no item” if the client is not engaged with an item at the end of an interval.

Typically, we define item engagement as physical contact with the item. If a visual stimulus is used (i.e., iPad), then we define item engagement as touching or looking at the item. At the end of the 10-min session, the practitioner

should count the total intervals in which item engagement occurred with each item. The practitioner should then divide the number of intervals with item engagement for *Item 1* by the total number of intervals in the session (60, 10-s intervals in this example) and multiply that number by 100%. For example, if a client engaged with *Item 1* for 15 intervals, then the equation would look like $15/60 \times 100\%$. When calculated, we find that the individual engaged with *Item 1* for 25% of the intervals. The practitioner should repeat these calculations for all items presented. The results should be graphically displayed in a bar graph to identify high-, medium-, and low-preference items. Figure 9.7 illustrates how the results for three 10-min sessions should be graphically depicted. As an additional resource for practitioners, a study by Weldy, Rapp, and Capocasa (2014) includes a step-by-step video demonstrating how to conduct and collect data during this type of preference assessment.²

A free operant preference assessment will identify items that can be used in the treatments that are described in subsequent sections. Although there are other methods for assessing a client’s preference for potential reinforcers, this assessment is efficient and has been used repeatedly in the treatment literature (e.g., Rapp & Lanovaz, 2016). That is, stimuli identified with a free operant assessment have a high likelihood of functioning as a reinforcer (i.e., increasing future behavior) when provided contingently upon the occurrence of other appropriate behaviors (e.g., academic or social skills the practitioner aims to increase). In addition, research suggests that individuals display less problem behavior (e.g., aggression) during free operant preference assessments than during other preference assessment methods (Kang et al., 2010, 2011; Tung, Donaldson, & Kahng, 2017). Nevertheless, practitioners should be aware that some stimuli identified as highly preferred for the client may not compete with the reinforcing effects of stereotypy or, alternatively, could increase stereotypy

²This presentation can be downloaded from http://repository.stcloudstate.edu/cpcf_gradresearch/1

Data Sheet 2 - Preference Assessment

Stimuli:	
1	
2	
3	
4	
5	
6	

Participant: _____
 Date: _____
 DC Initials: _____
 Session: _____
 Condition: _____
 Circle: Primary/Secondary

Interval	1	2	3	4	5	6		VS	MS
Minute 0-1									
10									
20									
30									
40									
50									
60									
Minute 1-2									
10									
20									
30									
40									
50									
60									
Minute 2-3									
10									
20									
30									
40									
50									
60									
Minute 3-4									
10									
20									
30									
40									
50									
60									
Minute 4-5									
10									
20									
30									
40									
50									
60									

Fig. 9.6 Data sheet for 10-s momentary time sampling depicting the first 5 min of a session. This data sheet can be used for free operant stimulus preference assessments

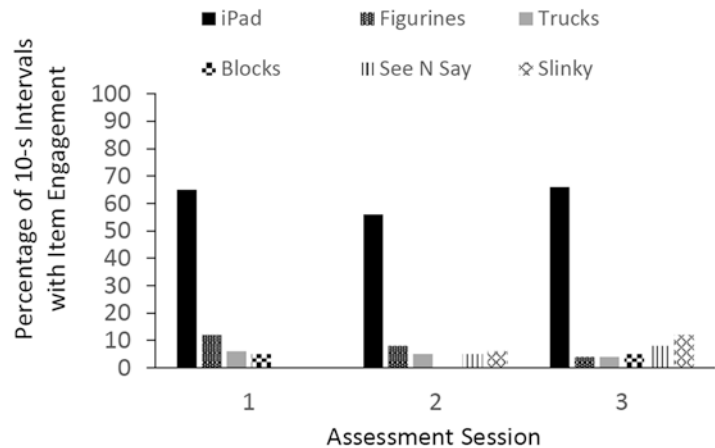
and free operant competing stimulus assessments. *VS* vocal stereotypy, *MS* motor stereotypy

(e.g., object stereotypy) while the client engages with the item (e.g., Rapp et al., 2013).

If a practitioner implements an intervention based on the results from a preference assessment and stereotypy does not decrease, he or she should consider identifying an item that is both preferred and competes with stereotypy. In addition, it may be advantageous to use edible items (also identified with a preference assessment; see below) as consequences for appropriate behavior that compete with stereotypy. Although edible

items are unlikely to be functionally matched to most forms of motor stereotypy (i.e., they are unlikely to produce the same sensory stimulation as stereotypy), there is some empirical support for using such items as one component of an intervention to decrease stereotypy (e.g., Brogan, Rapp, Sennott, Cook, & Swinkels, 2018; Lanovaz, Rapp, & Ferguson, 2013). For example, edible items can be used as reinforcers when teaching alternative skills that will ultimately compete with a client’s stereotypy. Other prefer-

Fig. 9.7 Hypothetical results from three free operant stimulus preference assessments



ence assessments, such as the multiple stimulus without replacement assessment (DeLeon & Iwata, 1996), are useful for identifying preferred edible items with clients. A demonstration of how to conduct and collect data for this assessment is also provided by Weldy et al. (2014).³ This assessment can be used when assessing either tangible items or edibles.

As previously noted, sometimes preference assessments identify highly preferred items that inadvertently increase stereotypy (Brogan et al., 2018; Frewing, Rapp, & Pastrana, 2015; Rapp et al., 2013). To reduce the probability of such an outcome, practitioners can conduct a free operant competing stimulus assessment (Frewing et al., 2015). A free operant competing stimulus assessment is procedurally identical to a free operant preference assessment, but it involves some additional data collection (see again Fig. 9.6 for corresponding data sheet). When initially selecting items for a free operant competing stimulus assessment, a practitioner should use their best judgement for choosing items that are potentially matched to the target stereotypy. For instance, for an individual who engages in vocal stereotypy, it is quite possible the reinforcing sensory product is auditory stimulation. Thus, the preference assessment should include several items that produce sound (e.g., videos, auditory toys, musi-

cal instruments). It is also beneficial to include other items that are not potentially matched.

To obtain reliable results with a free operant competing stimulus assessment, at least three 10-min sessions should be conducted (Frewing et al., 2015). In addition, observers should collect data on both item engagement *and* stereotypy using 10-s MTS (see far-right columns of Fig. 9.6). That is, at the observation period (e.g., at the 10-s mark), the observer will score “Y” under the corresponding item column *and* he or she will also score a “Y” under a stereotypy column (e.g., vocal stereotypy) if the person is also engaged in vocal stereotypy at the same second. After the sessions are completed, calculations are made separately for the percentage of intervals with item engagement and the conditional percentage of stereotypy associated with each item. To calculate the conditional percentage of stereotypy for *Item 1*, first count the number of intervals in which both stereotypy and item engagement occurred with *Item 1* were scored. Next, divide that number by the total number of scored intervals for *Item 1*. Finally, multiply that quotient by 100% to obtain the conditional percentage of stereotypy associated with *Item 1*. Repeat this process for each item.

The *conditional percentage* of stereotypy for each item should then be compared to the *background percentage* of stereotypy (total stereotypy with or without items) throughout the preference assessment. The *conditional percentage* of stereotypy occurs when stereotypy is conditional on engaging with an item. That is, both stereotypy

³The MSWO assessment demonstration with data sheet can be downloaded from http://repository.stcloudstate.edu/cpcf_gradresearch/2/

and item engagement (with a given item) occur simultaneously during an observation interval (i.e., “Y” is scored for both within one interval). To illustrate, assume that an individual manipulates a book for 20 intervals of a session that contains 60 intervals total. Assume further that the individual hand flaps while manipulating a book for 17 intervals. The *conditional percentage* of hand flapping while manipulating the book would be calculated as 17 divided by 20 (the total number of intervals looking at a book with and without hand flapping), and then multiplied by 100% for a *conditional percentage* of 85%. That is, the individual hand flapped for 85% of the intervals for which he or she manipulated the book.

Background percentage is the stereotypy that occurs throughout the session, regardless of engagement (with any item or no item), in other words, all stereotypy that is scored within a given session. To calculate the *background percentage* of stereotypy during the preference assessment, count the total number of intervals in which stereotypy was scored, then divide that number by the total number of

intervals in the assessment, and multiply the quotient by 100%. In keeping with the prior example, assume that the individual flapped his or her hands for 37 intervals (sometimes while playing with a ball, sometimes while looking at a book, and sometimes when there was no item engagement), then divide 37 by 60 (the total number of intervals in the session), and multiply that quotient by 100% for a *background percentage* of 61.7%. If the *conditional percentage* of stereotypy for an item is lower than the *background percentage* of stereotypy, then the assessment has identified an item associated with lower percentages of stereotypy; research suggests that this item may be used to decrease stereotypy (Brogan et al., 2018; Frewing et al., 2015). In this example, because the conditional percentage of hand flapping while engaged with the book (85% of intervals) was higher than the background percentage (61.7% on intervals), it is unlikely that the book will decrease stereotypy when provided noncontingently as the treatment for stereotypy.

Figure 9.8 shows hypothetical results from a free operant competing stimulus assessment.

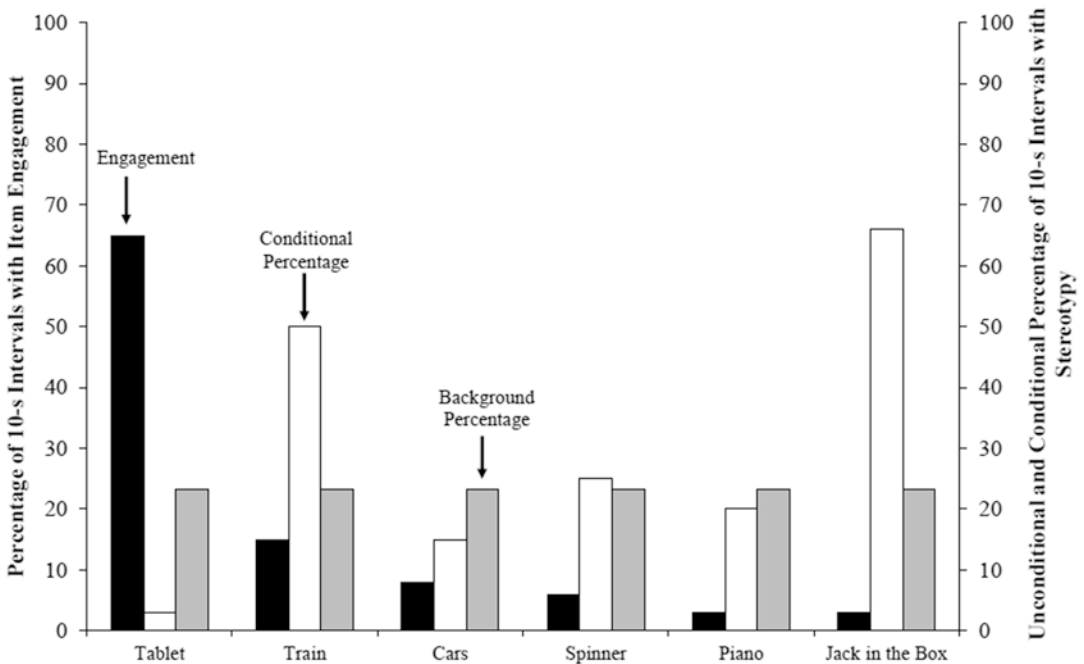


Fig. 9.8 Hypothetical results from three free operant competing stimulus assessments. Black bars represent item engagement, white bars represent the conditional

percentage of stereotypy when engaged with the stimulus, and grey bars represent the background percentage of stereotypy in the sessions

Specifically, the results show that the individual engaged with the tablet for the highest percentage of intervals (about 65%), suggesting that the tablet was a highly preferred item. In addition, the results show that the *conditional percentage* of stereotypy while manipulating the tablet (3% of intervals) was lower than the *background percentage* of stereotypy (23% of intervals). Taken together, the assessment indicates that the tablet was both preferred and correlated with low levels of stereotypy. As such, using it as a reinforcer (contingently on appropriate behavior or noncontingently for prevention) is likely to decrease stereotypy when used systematically in an intervention. If the *conditional percentage* of stereotypy for an item is higher than the *background percentage* of stereotypy (as with the book in the example above), then the practitioner should either (a) use a different item that is associated with decreased stereotypy or (b) repeat the assessment with new items.

9.1.10 Treatment Selection

Practitioners have several options when treating stereotypy. The context in which the practitioner will be delivering treatment is one factor that may influence treatment choice. There are two broad contexts during which most behavioral interventions are provided: leisure and academic. Leisure contexts include routine free time or play periods during which (a) the client is not engaged in academic or vocational instruction and (b) a caregiver is able to complete other tasks (e.g., prepare a meal or instruct another child) that are not compatible with constant monitoring of the client's behavior. Leisure contexts may include other time periods that a child is required to manage their own behavior in a restricted setting such as riding in a car, waiting to be seen at the doctor's office, or visiting a family member's home. We generally attempt to target leisure periods that are 10 to 30 min in duration.

Academic contexts may include homework time, one-to-one skill practice, or group instruction; these contexts typically involve an instructor or a caregiver that must be available to perform multiple duties within the treatment plan. Some duties that

the instructor or caregiver can expect to perform during academic treatment include providing praise or other reinforcers for correct academic behavior and blocking motor stereotypy. Interventions for academic contexts typically involve more specific actions from the instructor or caregiver as opposed to interventions during leisure time, which typically require initial actions followed by progressively fewer actions from the instructor or caregiver. Prefontaine, Lanovaz, McDuff, McHugh, and Cook (2017) developed a four-module app called the iSTIM (individual stereotypy treatment-integrated modules) to guide wait-listed caregivers through the process of measuring stereotypy, identifying preferred items, and selecting an appropriate intervention involving either contingent or noncontingent reinforcement (NCR) procedures. The iSTIM app (not yet available at the time of this publication) could serve as a supplement to guide practitioners through the assessment and treatment process.

9.1.10.1 Treatment during Leisure Periods

Practitioners should consider noncontingent reinforcement, or NCR, as the first option when treating stereotypy during leisure periods. Briefly, NCR as a treatment for stereotypy involves providing matched items (see procedures for the free operant competing stimulus assessment above) continuously throughout the session to provide reinforcement (the matched sensory product) as a preventative procedure. In other words, the individual will not need to engage in stereotypy to obtain a reinforcer (e.g., vocal stereotypy for auditory stimulation) because they will already be experiencing that reinforcing stimulation (auditory stimulation from preferred music). Practitioners should use NCR as a first-line treatment because it is easy to implement and is the least restrictive treatment option when compared to other treatments suggested in this chapter.

To implement NCR,⁴ an instructor or a caregiver should provide continuous access to the item (identified in either the free operant pref-

⁴The reader should not confuse NCR using music, a strongly supported procedure, with music therapy (see Chap. 6).

erence assessment or the free operant competing stimulus assessment) and collect data on stereotypy and item engagement using the system described above (i.e., 1-min MTS across 30-min sessions or 10-s MTS across 10-min sessions). If the client does not engage with the preferred item(s) for continuous periods of time, practitioners should use verbal and physical prompts to increase appropriate item engagement, which should decrease the likelihood that the client engages in other undesirable behavior (Lanovaz, Rapp, & Ferguson, 2013; Lanovaz, Rapp, Maciw, Dorion, & Prgent-Pelletier, 2016). If the graphically depicted data for the NCR intervention show clear reductions in stereotypy across several sessions, the practitioner should continue to implement NCR and may switch to less frequent monitoring of the client's behavior. We recommend conducting intermittent "probe" sessions to ensure that lowered stereotypy maintains over time. Probes should be conducted more frequently (e.g., twice a day for 5–10 min) at first, and then less frequently (e.g., one 10-min probe every 2 or 3 days) if the client continues to engage with the items.

If graphically depicted data show that stereotypy is not decreasing with NCR, practitioners should consider using NCR with a response cost (RC) component. Response cost is a type of treatment in which a practitioner removes a preferred item contingent on the client's engagement in stereotypy (Athens, Vollmer, Sloman, & St. Peter-Pipkin, 2008; Falcomata, Roane, Hovanetz, Kettering, & Keeney, 2004; Watkins & Rapp, 2014). To implement *NCR with RC*, provide the client free access to preferred item. Allow the individual to retain access to the item unless he or she engages in stereotypy. Contingent on stereotypy, the instructor or caregiver should immediately remove the preferred item (without commenting, and otherwise minimizing attention) for 10 to 15 s. After this period elapses, the instructor or caregiver returns the item to the individual and repeats the process as needed. The RC component of this intervention constitutes a negative punishment procedure.

Briefly, negative punishment consists of removing of a preferred item or activity contingent on behavior that results in a decrease in that behavior over time. Typically, such procedures exert behavior-decreasing effects within three to five sessions. To this end, practitioners should collect data on the number of times RC is implemented during each session. If both the number of times RC is implemented and engagement in stereotypy in each session do not decrease during the three-to-five session period, practitioners should consider another treatment option.

Before implementing *NCR with RC*, practitioners should determine whether removing the preferred item will evoke other problem behaviors (e.g., crying, aggression) from the client. If a client engages in high-intensity problem behavior following the removal of a preferred item, do not implement NCR with RC. Likewise, if the client commonly engages in excess problem behavior when preferred items are removed, a separate treatment for this type of behavior should be sought (see Chaps. 10 and 11).

9.1.10.2 Considerations for Treatment during Leisure Periods

Although both NCR and *NCR with RC* are empirically supported treatments for stereotypy during leisure periods, each has some limitations. The first limitation is that most research on NCR uses 10-min sessions; thus, there is limited empirical evidence for predicting how the effects of NCR will maintain over longer session durations. The second limitation, as previously noted, is that NCR may decrease one form of stereotypy but increase other forms of stereotypy (Rapp, 2005; Rapp et al., 2013; Van Camp et al., 2000). Practitioners should monitor other forms of stereotypy (i.e., collect data on other forms as "non-targeted" responses) to ensure that such increases do not occur. If increases in other forms of stereotypy are detected, additional treatment components may be required. Third, as discussed above, *NCR with RC* could induce other problem behaviors (e.g., aggression to others or aggression to property) when items are removed contingently on stereotypy.

9.1.10.3 Treatment during Academic or Work Periods

Most clients who display stereotypy are required to participate in academic programs, vocational tasks, or both. We refer to both contexts as “work periods.” Treatment of stereotypy during work periods may require different procedures than during leisure periods because noncontingent access to preferred items might interfere with working behavior. As such, we will discuss three treatment options to consider during work periods: (a) differential reinforcement of other behavior (DRO), (b) stimulus control procedures, and (c) response interruption and redirection (RIRD). Each of these procedures is fundamentally more complex than those described for leisure contexts (i.e., NCR, and *NCR with RC*). As such, we recommend the use of these procedures only by practitioners who have previously implemented complex behavioral procedures with appropriate supervision (e.g., someone who is familiar with, and has previously used, DRO to treat other problem behavior).

To set up a DRO procedure, a practitioner should identify a preferred item; this item will be provided contingently on the omission of stereotypy for a predetermined duration (e.g., Vollmer & Iwata, 1992). Specifically, we will describe the use of a trial-based DRO (Brogan et al., 2018; Rapp et al., 2017), which is a variation of a resetting DRO procedure for which there is considerable empirical support. Using a trial-based DRO (Rapp et al., 2017), each trial is scored as either successful (i.e., the client abstained from stereotypy for the duration of the trial) or failed (i.e., the client emitted stereotypy and the trial was then terminated). Following a pre-specified number of consecutive successful trials, the practitioner systematically increases the duration of the trials.

The conceptual framework behind DRO is that a functionally similar reinforcer is delivered for omitting stereotypy. In this way, stimulation that is similar to that which is generated by engagement in stereotypy is provided in the absence of stereotypy. During the time interval for which stereotypy is to be omitted, instructions or alternative work tasks can be provided. These

work tasks may have separate programmed contingencies such as praise or tokens for correct responses and error correction for incorrect responses (see Chap. 11). Technically, if a practitioner includes programmed contingencies for work tasks, then the intervention contains two broad components: a DRO procedure for stereotypy and a differential reinforcement of alternative behavior (DRA) procedure for appropriate behavior. Regardless of whether a DRA will be included in the broader DRO session, a reasonable time period for which the client will be required to refrain from stereotypy needs to be determined. The initial time period should be calculated from baseline data.

To determine an initial interval duration for the DRO procedure, the practitioner should conduct at least one 10-min baseline session from which he or she will measure the length of time between the client’s bouts of stereotypy (the interresponse time [IRT]). After completing the sessions, the practitioner should calculate the mean IRT from the baseline session and set the starting DRO criterion at or slightly below the mean. For example, if a client emitted stereotypy with IRTs of 30 s, 12 s, 7 s, 37 s, 28 s, 22 s, and 18 s, the mean IRT is 22 s. For a mean IRT of 22 s, the first criterion could be set at 22 s or 17 s (5 s less than the mean). When considering terminal criterion for a DRO, practitioners should note that most research shows that exceeding 5-min omission periods is difficult, particularly with vocal stereotypy (Rapp & Lanovaz, 2016).

The instructor should begin the DRO intervention session by informing the client (using language appropriate to the client’s language ability) that he or she can have the preferred item if he or she does not engage in “[target stereotypy].” The instructor should ensure that the client can see the timer. If the client refrains from engaging in stereotypy for the entire trial duration, the instructor should score a successful trial and deliver access to a preferred item for about 30 s (the access periods should be increased as the omission criterion increases). If an instructor is delivering a reinforcer for correct responding on academic tasks, he or she should deliver the higher preference item contingent on meeting the DRO require-

ment. For example, during a 30-s DRO criterion, the caregiver or instructor can provide edibles contingent on prompted or independent correct responding during the work segment and then provide access to the preferred item (e.g., iPad™) for omitting stereotypy during the 30-s interval or trial. If a client engages in stereotypy before the criterion duration elapses, the instructor interrupts the stereotypy, scores a failed trial, verbally reminds the client of the DRO rule, and resets the timer for a new trial. The preferred item should only be delivered if the client refrains from engaging in stereotypy for the entire duration of the trial. As noted above, edibles (not the DRO reinforcer) can be provided for correct responding on work tasks during the interval or trial, as a separate contingency.

It is important to collect and plot data on client’s performance during each trial of the DRO procedure (see Fig. 9.9 for an example using trial-based DRO). As noted above, the instructor should record successes and failures for each attempted omission period. Contingent on five or more consecutive successes, the duration of the

next interval size can be systematically increased. Contingent on five consecutive failures, practitioners should decrease the criterion by half. Some individuals may experience more success in a DRO preparation than others. Research suggests that the upper range of the DRO interval will be about 5 min. When setting the terminal goal, consider how using the intervention can be applied in a generalized context. If a practitioner is unsuccessful in decreasing stereotypy using DRO, a stimulus control procedure could be an alternative intervention option.

Stimulus control procedures involve establishing visual stimuli (e.g., cards, a bracelet) to signal when stereotypy is and is not allowed (Anderson, Doughty, Doughty, Williams, & Saunders, 2010; Cook, Rapp, Gomes, Frazer, & Lindblad, 2014; Lydon, Moran, Healy, Mulhern, & Young, 2016; O’Connor, Prieto, Hoffman, DeQuinzio, & Taylor, 2011; Rapp, Patel, Ghezzi, O’Flaherty, & Titterington, 2009; Schumacher & Rapp, 2011). Based on the status of the current literature (i.e., strength of evidence), stimulus control procedures should be considered when (a) one or more

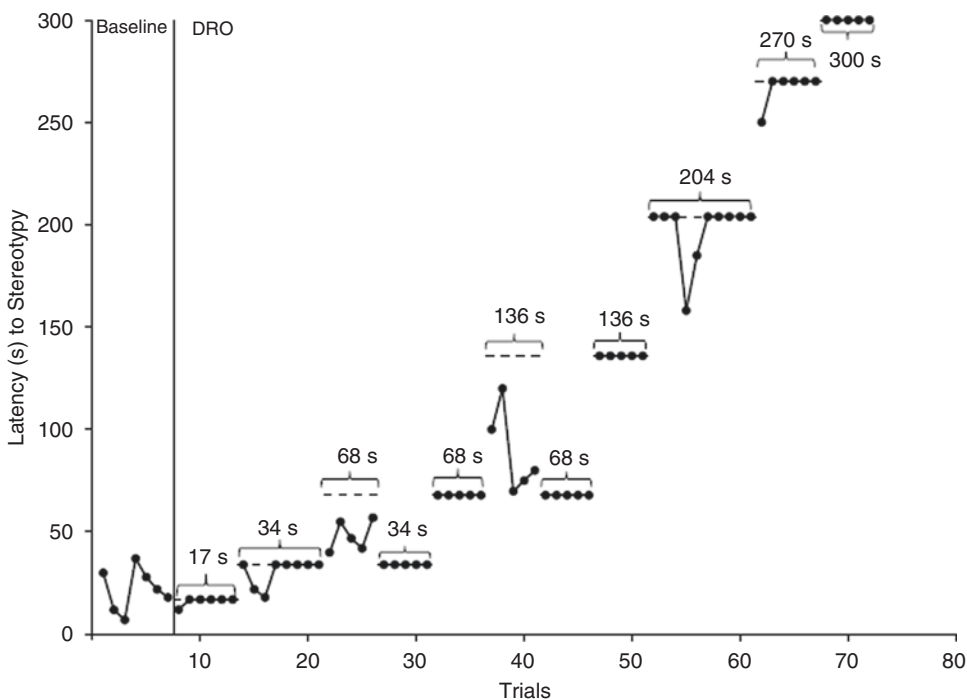


Fig. 9.9 Hypothetical results from a trial-based differential reinforcement of other behavior (DRO) treatment

preferred items cannot be identified for the client, (b) engagement with preferred items does not reduce stereotypy, (c) response cost with preferred items is ineffective, or (d) DRO does not consistently reduce stereotypy. Moreover, there must be at least one context in which engagement in stereotypy is not viewed as an inappropriate behavior. An additional feature to a stimulus control procedure may involve teaching individuals to request access to stereotypy contingent on academic engagement or other appropriate behaviors (e.g., Anderson et al., 2010; Slaton & Hanley, 2016). To arrange this contingency, clear contexts need to be established as to when stereotypy is and is not freely available; these signaled contexts are taught using stimulus control procedures.

To set up a stimulus control procedure, the practitioner should help the instructor select visual stimuli to signal the conditions. Researchers have used different colored cards: for example, a green card to signal that stereotypy is available and a red card to signal that stereotypy is not available (i.e., the instructor will provide a consequence for engaging in stereotypy). Practitioners should choose a signal that is salient to the individual receiving treatment (i.e., it should be large, at eye level, and placed where the individual will be oriented). In what follows, we illustrate the stimulus control process using green and red cards to signal when stereotypy is and is not permitted, respectively.

To implement a stimulus control session, an instructor should show the individual the green card and say, "It's green time!", and then allow the client to freely engage in stereotypy without programmed consequences. At the end of the green card condition (hereafter denoted "green condition"), the instructor should immediately remove the green card and replace it with the red card. The instructor should point to the red card and say, "It's red time, keep your hands in your lap" (or other appropriate references to refrain from stereotypy). If the client engages in stereotypy during the red card condition (hereafter denoted "red condition"), the instructor should provide the predetermined consequence. Consequences should be selected based on previously observed effects on stereotypy. For exam-

ple, results from previous treatment or observations could indicate that providing a verbal reprimand (e.g., the instructor firmly stating, "Hands down" or "No flapping") stops the behavior in the moment. However, if previous experience providing verbal reprimands does not decrease the behavior, a different consequence should be considered. Other possible consequences include blocking (e.g., gently placing the individual's hands on his or her lap for 2 s), response cost (if combined with NCR or a token procedure), or RIRD (discussed in the next section). The instructor or caregiver should provide the consequence immediately each time the individual starts to engage in stereotypy during the designated red condition.

When the stimulus control procedure is fully developed, instructors or caregivers should provide various types of instruction during the red condition. Presumably, the client will comply with academic or vocational instruction (and receive contingent praise, edibles, or both) and abstain from stereotypy during the red condition. Completion of the red condition should be immediately followed by a brief period of free access (without tasks) to stereotypy during the green condition. At the end of the green period, the instructor or caregiver re-presents the red condition with the corresponding tasks, and the process is repeated as needed across the instructional period. Data should be collected on the client's stereotypy using methods described above (e.g., 10-s MTS) and graphically depicted to allow for visual monitoring of the results of the stimulus control intervention.

Although initial training with the stimulus control procedure should be conducted with equivalent durations with each condition, the terminal goal should be to both extend the red condition duration and decrease the green condition duration. For example, Cook et al. (2014) initially alternated 5-min sessions with red and green conditions. Thereafter, we gradually increased the red condition to 10 min and decreased a no-card condition, which was comparable to the green condition, to 1 min. In this way, the client displays little, if any, stereotypy during 10-min work segment to gain free access to stereotypy during a 1-min free

period. If graphically depicted data show that stimulus control procedures involving response cost, response blocking, or mild reprimands do not reduce stereotypy, practitioners should consider the use of RIRD.

Procedures that involve RIRD consist of interrupting stereotypic behavior as soon as it occurs and prompting the individual to engage in three compliant responses following demands from an instructor. For instance, an instructor implementing RIRD for hand flapping would require the client to display a gross-motor imitation response such as “clap hands,” “pat legs,” or “pat head,” each of which is topographically incompatible with hand flapping. When implementing RIRD, instructors should also provide praise for socially appropriate behavior such as completing academic tasks without stereotypy. Although research demonstrates that RIRD can decrease motor stereotypy, vocal stereotypy, or both (Ahearn, Clark, MacDonald, & Chung, 2007; Ahrens, Lerman, Kodak, Worsdell, & Keegan, 2011; Miguel, Clark, Tereshko, Ahearn, & Zarcone, 2009; Schumacher & Rapp, 2011), RIRD is more intrusive than the other treatments described in this chapter. As such, practitioners should implement RIRD only after the other treatments have not decreased stereotypy to clinically acceptable levels.

When considering RIRD, it is important to note that if RIRD is to be implemented by caregivers, the practitioner should provide adequate training and continuous monitoring of treatment fidelity. Research has shown that it may be common for caregivers to implement and discontinue RIRD at incorrect times, which could have broad deleterious effects on treatment outcome (Giles, Swain, Quinn, & Weifenbach, 2017). Further, as previously noted, RIRD could be more effective when combined with a procedure that involves positive reinforcement (Lerman & Vorndran, 2002; but see Lydon, Healy, Moran, & Foody, 2015). As such, we recommend embedding RIRD in another intervention for stereotypy with a positive reinforcement component like a stimulus control procedure (e.g., providing contingent access to stereotypy). As with NCR plus response cost, the effects of RIRD should be visually evident within three to five treatment sessions.

9.1.10.4 Considerations of Treatment during Academic Periods

When considering the treatment options presented here (DRO, stimulus control, and RIRD), the first option should be DRO because it is a reinforcement-based procedure and less intrusive than punishment-based procedures like RIRD. However, DRO is not without limitations.

9.1.10.5 Considerations of DRO

One potential disadvantage of a DRO procedure is the limited terminal-interval durations that have been demonstrated in the literature. Although some studies have increased the DRO interval to 10 min or more, many studies conclude with a terminal duration of less than 1 min, which is of limited practical utility. As such, the terminal DRO interval must fit the context of either academic or vocational training. The second consideration is that DRO may be more difficult to implement for vocal stereotypy than for motor stereotypy. Vocal stereotypy is not easily blocked, whereas blocking can be practically applied to motor stereotypy. As such, the effects of DRO on vocal stereotypy may be limited. If DRO is not effective, stimulus control procedures are a viable option, but have their own considerations.

9.1.10.6 Considerations of Stimulus Control Procedures

One disadvantage of stimulus control procedures is that they have not been evaluated for periods of low supervision. For example, if a practitioner wants to implement the red condition during periods of independent work, the extent to which the red card will inhibit stereotypy without the close presence of the instructor or caregiver is unknown. Moreover, the average duration of the inhibitory (red card) condition in the literature is 6 min (Lydon et al., 2016). In short, the presence of an instructor is required for this procedure. Second, stimulus control procedures typically require a mild aversive consequence for engaging in stereotypy during the red condition. Third, this procedure requires a place and time wherein engagement in stereotypy is acceptable.

9.1.10.7 Considerations of RIRD

Procedures involving RIRD may be limited due to its aversive nature, and do not involve reinforcement unless combined with another procedure. As such, we caution practitioners about using this procedure in isolation and recommend that practitioners first attempt the other treatments discussed. Further, some studies suggest that the effects of RIRD on stereotypy could be overstated for some individuals due to methodological issues (Carroll & Kodak, 2014; Rapp & Lanovaz, 2016; Wunderlich & Vollmer, 2015). Despite the limitations noted here, DRO, stimulus control, and RIRD may be viable treatment options for some individuals during contexts involving academic work and other tasks. Ultimately, a practitioner's treatment selection should be dictated by the treatment context, a client's programming goals, and available resources.

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