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**THE EFFECTS OF A MULTIPLE SCHEDULE AND RIRD INTERVENTION
ON THE VOCAL STEREOTYPY OF A STUDENT WITH
AUTISM SPECTRUM DISORDER**

by
Kathleen Scully

A Thesis

Submitted to the
Department of Interdisciplinary and Inclusive Education
College of Education
In partial fulfillment of the requirement
For the degree of
Master of Arts in Special Education
at
Rowan University
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Thesis Chair: Amy Accardo, Ed. D.

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Dedication

I would like to dedicate this thesis to my mother and father, Kevin and Nancy Scully

Acknowledgment

I would like to express my appreciation to Professor Amy Accardo for her guidance and help throughout this research. The skills I have learned throughout the process will stay with me throughout my professional career, and aide to make me a better educator. I look forward to whatever challenges that come my way knowing that I am now prepared to take them on.

Abstract

Kathleen Scully
THE EFFECTS OF A MULTIPLE SCHEDULE AND RIRD ON VOCAL
STEREOTYPY

2015-2016

Amy Accardo, Ed.D
Master of Arts in Special Education

The purpose of this study was to use a research based intervention package to decrease the levels of vocal stereotypy and increase appropriate vocalizations and attending behavior in a student with ASD. Through use of an ABAB reversal design, a multiple schedule intervention was introduced, with the evidence-based practice Response, Interruption, and Redirection (RIRD) implemented at set intervals. The multiple schedule was then faded out of the intervention and RIRD was run solely throughout the day in a classroom setting. Results revealed a decrease of vocal stereotypy and an increase in attending behavior for the participant across phases. Results suggest teaching through stimulus control with discrimination training using a multiple schedule in order to control the levels of vocal stereotypy, coupled with the evidence-based practice of RIRD to increase appropriate vocalizations is effective in reducing stereotypy and increasing attending behavior.

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Chapter 1

Introduction

Stereotypy has been defined as “repetitious acts with invariant topographies that have no apparent function” (Shawler & Miguel, 2015, p. 112). Stereotypy is especially high for individuals with autism spectrum disorder (ASD) (Wunderlich & Vollmer, 2015). The two major forms of stereotypy are motor and vocal. Motor stereotypy is defined as repetitive motor movements such as hand flapping, jumping and clapping; vocal stereotypy is defined as individuals engaging in “repetitive sounds, words, breathing, and/or delayed echolalia of previously heard dialogues” (Shawler & Miguel, 2015, p. 112). In addition, vocal stereotypy may “interfere with skill acquisition and can have adverse social consequences” (Ahearn, Clark, & McDonald, 2007, p. 263).

Statement of Problem

Individuals with ASD will often engage in high levels of vocal stereotypy. Several studies (Wunderlich & Vollmer, 2015; Ahearn et al., 2007) detail how the effects of engaging in this behavior can lead to isolation from peers, along with the inability to engage in day to day activities. Wunderlich and Vollmer report that vocal stereotypy has been shown to make social interactions difficult and rare (2015). Individuals engaging in vocal stereotypy often become stigmatized by their peers, furthering them from appropriate interactions (Shawler & Miguel, 2015). Furthermore, high levels of stereotypy may result in placement in a more restrictive educational setting (Shillingsburg, Lomas, & Bradley, 2012). Individuals who partake in this behavior can be supported with interventions to help decrease the levels of stereotypy that are present.

Interventions may be put in place to redirect the vocalizations, while also teaching the individual to regulate the levels.

Interventions for the reduction of vocal stereotypy can prove to be extremely difficult because “of the competing contingency of automatic reinforcement produced by engaging in stereotypy” (O’Connor, Prieto, Hoffmann, DeQuinzio & Taylor, 2011, p. 232). The act of engaging in this behavior for individuals with ASD is often self-soothing, and reinforcing making stereotypy difficult to reduce (Dozier, Wilson, Iwata, Thomason-Sassi & Roscoe 1999; Lovaas, Newsom, & Hickman, 1987; Rapp & Rincover, 1978). Interventions that use procedures that teach positive replacement behaviors may be effective to teach individuals replacement skills. Response interruption and redirection (RIRD) is an evidence based practice used to reduce vocal stereotypy in individuals with ASD (Neitzel, 2009). RIRD “involves presenting vocal demands to interrupt vocal stereotypy until the participant complies with these demands in the absence of the problem behavior” (Shawler & Miguel, 2015, p. 113). The goal of RIRD is to compete with the vocals that are occurring from the levels of vocal stereotypy (Ahearn et al, 2007). RIRD can benefit individuals with ASD as an increase in appropriate vocalizations cannot occur simultaneously with vocal stereotypy (Shawler & Miguel, 2015). With RIRD, individuals can be prompted to increase their use of appropriate language (Ahearn et al., 2007). The increase in appropriate vocalizations can lead to an increase in attending as well as social interactions. Both of these skills are affected by vocal stereotypy (Wunderlich & Vollmer, 2015; Ahearn et al., 2007).

Another intervention that can serve to reduce the levels of vocal stereotypy in individuals with ASD is to teach stimulus control and discrimination training, also known

as the implementation of a multiple schedule (Brusa & Richman, 2008; O'Connor et al., 2011). Discrimination training is defined as “a teaching procedure that reinforces specific behavior in the presence of certain antecedent stimuli and withholds reinforcement of that same behavior in the presence of other antecedent stimuli” (O'Connor et al., 2011, p. 232). When using the multiple schedule intervention, individuals engaging in vocal stereotypy are taught to only engage in the behavior in the presence of a certain stimuli (example: green card) and to disengage from this behavior in the presence of a separate stimuli (example: red card) (Brusa & Richman, 2008; O'Connor et al., 2011). According to O'Connor and colleagues, one stimuli represents a kind of free period for the individual, while the other is paired with positive redirection if the vocal stereotypy occurs during this time. With time the goal is to increase the levels of stimulus control, with the free period becoming lessened, as the more restrictive stimuli increases (2011).

Several recent studies have been conducted with the goal of decreasing stereotypy in a child exhibiting high levels of vocalizations using either the RIRD or the use of a multiple schedule (Ahearn et al., 2007; Brusa & Richman, 2008; O'Connor et al., 2011). Ahearn, Clark, Chung and MacDonald investigated the effect of RIRD on the vocal stereotypy of four students with ASD (2007). All participants engaged in high levels of vocal stereotypy which interfered with their educational activities and impeded activities outside of the classroom. Following intervention, vocal stereotypy decreased for all participants, and two of the four participants increased their appropriate language (Ahearn et al., 2007).

O'Connor and colleagues investigated the use of discrimination training and a multiple schedule to reduce the vocal stereotypy for one 11 year old individual with ASD

(2011). The individual was taught discrimination training, using red and green cards. The green card signified engaging in motor and vocal stereotypy was allowed, while the red card signified motor and vocal stereotypy would be blocked. The study showed a decrease in both motor and vocal stereotypy while in the red condition, proving an understanding of the discrimination between the two stimuli (O'Connor et al, 2011).

Similarly, Brusa and Richman investigated teaching an individual when and where engaging in stereotypic behavior is appropriate using stimuli discrimination in the form of a red and green card (2008). This study involved an eight year old boy with ASD who engaged in high levels of motor stereotypy. At the conclusion of the study, the participant engaged in motor stereotypy in highest levels during the green condition, while he exhibited far fewer occurrences of motor stereotypy in the red condition.

The purpose of this study is to fade the multiple schedule and keep RIRD in place to decrease the levels of vocal stereotypy in a young student with ASD. The individual will be taught through stimulus control with discrimination training in order to control the levels of vocal stereotypy, coupled with the evidence-based practice of RIRD to increase appropriate vocalizations. The present study will build on the recommendation of O'Connor et al. (2011) and Brusa and Richman (2008) to implement discrimination training via a multiple schedule approach, combined with the recommendation of Ahearn et al. (2007) to reduce vocal stereotypy using the evidence based practice of RIRD.

The study will focus on a student with very high levels of vocal stereotypy who is currently in a self-contained classroom. Vocal stereotypy has been occurring since he learned to speak, and has progressively become more severe with age. In the classroom setting, it is reported to be interfering with his ability to attend and his capacity to learn.

Moreover, the student's parents are concerned about the high levels and are hoping to reduce it with interventions. For this study, the individual will be taught to discriminate between a green and red card. While in the green condition the individual will have the ability to engage in vocal stereotypy without interruption. In the red condition, the individual will be interrupted through the use of RIRD when he engages in vocal stereotypy. As the vocal stereotypy in this student decreases, the opportunities for overall functioning including engagement and social interaction may increase. All opportunities to use appropriate vocalizations and reciprocal conversations with peers will be positively reinforced.

Significance of the Study

This study will contribute to the literature through a focus on implementing an evidence based practice, RIRD, combined with a second intervention of discrimination training using a multiple schedule approach. This study was developed to improve the functional communication and quality of life for an individual with ASD with levels of vocal stereotypy that are interfering with daily functioning and social communication. This study hypothesizes that a reduction in stereotypy will coincide with an increase in appropriate attending skills and allow for increased opportunities for social behavior for this student. Furthermore, starting the intervention at school and transitioning it to the home environment may be largely beneficial to the family members. A redirection of the student's vocalizations will prove significant to the family as the family members strive to improve communication among themselves and work toward more meaningful interactions. In addition, future findings on the topics of RIRD combined with the

multiple schedule to reduce vocal stereotypy may help to provide guidance for professionals in the field struggling to reduce vocalizations present in their students.

Using RIRD in a school or home setting to decrease levels of vocal stereotypy can prove to be challenging. RIRD can prove to be extremely distracting for not only the individual engaging in the vocal stereotypy but also for those around them. The constant redirection of vocals can serve as a distraction for those in the area of the individual engaging in vocal stereotypy. As a result, this study began with the added student support provided by a multiple schedule in the form of discrimination training and stimulus control using a red and green card. Vocal stereotypy free access was available during the green interval session of the multiple schedule. This intervention was then faded to just the use of RIRD through an ABAB research design. This approach may also aide colleagues whom are searching for an appropriate intervention that positively supports students with ASD.

Purpose of the Study

The purpose of the study was to combine two research-based techniques as an intervention package to decrease the levels of vocal stereotypy in an eight year old student with ASD, and to increase appropriate vocalizations and attending behavior. The study investigated the use of discrimination training using a multiple schedule in combination with the evidence-based practice of RIRD.

Research Questions

1. Will implementation of an RIRD and multiple schedule package reduce the vocal stereotypy of an individual with ASD?

2. Will implementation of RIRD and multiple schedule intervention package to reduce verbal stereotypy increase the attending behavior of an individual with ASD?

Chapter 2

Review of the Literature

Stereotypy is exhibited in two forms, vocal and motor. In a study conducted by Cunningham & Schreibman (2008), they describe the behaviors to be “highly heterogeneous in presentation” (p. 470). Referring to the behaviors as being able to be “verbal or nonverbal, fine or gross motor-oriented, as well as simple or complex” (p. 470). For the purpose of this study, the focus is on vocal stereotypy. Vocal stereotypy can manifest itself through the use of repetitive vocals. For example, such behaviors may include vocal scripting of shows or movies, humming, word approximations, and noises (Ahearn, et al., 2007; Shawler & Miguel, 2015). Vocal stereotypy can be seen in individuals with ASD. Vocal stereotypy may “interfere with skill acquisition and can have adverse social consequences” (Ahearn et al., 2007, p. 263). Several treatments have been used to aide individuals with ASD to decrease their levels of vocal stereotypy (Ahearn et al., 2007; Boyd, McDonough, & Bodfish 2011; Brusa & Richman, 2008; Cassella, Sidener, Sidener & Progar, 2011; Howe, 2014; O'Connor et al., 2011; Shawler, et al., 2011).

This chapter will detail the research related to vocal stereotypy and individuals with ASD, along with the evidence-based practice of RIRD, and the use of a multiple schedule intervention.

Vocal Stereotypy & ASD

Vocal stereotypy may manifest more frequently in individuals with ASD and intellectual disabilities (Ahearn et al., 2007). In a study by Wunderlich and Vollmer, they report up to 60% of individuals with an intellectual disability exhibit stereotypy (2015).

Vocal stereotypy can have effects on not only the learning of the individual engaging in the behavior, but also the socialization of the individual (Lang et al., 2010). Stereotypy occurs in individuals with and without ASD, yet researchers report it occurs with increased frequency in the ASD population (Shillingsburg et al., 2012). While stereotypy takes several forms, vocal stereotypy is highly prevalent in individuals with ASD (Ahearn, et al., 2007).

Impact of Stereotypy on Socialization

Vocal stereotypy produces non-contextual vocalizations that are automatically reinforced (O'Connor, et al., 2011). Individuals who engage in this behavior lose opportunities to use appropriate vocalizations, thereby interfering with the ability to create meaningful relationships with those around them due to it being viewed as socially awkward (Shawler & Miguel, 2015). Shillingsburg, et al. studied a young boy named Carl whom engaged in high levels of vocal stereotypy (2012). Carl's vocal stereotypy took the form of loud verbalizations, causing distractions to those around him. High levels of vocal stereotypy impeded his ability to engage with others, and resulted in placement in a far more restrictive setting. In another study of students with ASD, Lang, et al. observed children over a three year period (2010). The researchers found that "even when matched with children according to mental age, children with autism tend to engage in significantly more stereotypic and repetitive behaviors and fewer appropriate play behaviors" (p. 268). The stereotypy appears to interfere with the ability to appropriately engage with others. Lang et al. (2010) reported how a possible "relationship between stereotypy, challenging behavior, and play is that when stereotypy is interrupted during a play intervention, for example, access to this source of automatic reinforcement is

denied” (p. 269). In other words, the motivation to engage in stereotypy obstructs the ability to appropriately play.

Impact of Stereotypy on Learning

Much as stereotypy can have a direct impact on an individual’s ability to engage socially with others, it can interfere with an individual’s skill acquisition (Ahearn, et al., 2007). Ahearn also noted, stereotypy is often automatically reinforced, making the treatment of this extremely difficult. Due to this highly reinforcing effect for the individual, stereotypy may compete with any outside stimuli. For example, if a teacher is attempting to teach a group lesson on addition and the individual is engaging in vocal stereotypy, the individual is unable to appropriately listen and take in the information being presented. Cunningham and Schreibman (2008) state “stereotypy may interfere not only with initial learning acquisition, but also with the extent to which children engage in learned and more appropriate alternative behaviors during free time” (p. 471).

Applied Behavior Analysis (ABA)

Applied behavior analysis is an evidence-based practice used most often with individuals with ASD. Applied behavior analysis (ABA) is a science and, therefore, involves progressive approaches and outcomes (Leaf et al., 2016). ABA involves the breaking down of skills to make them more easily understood by individuals with ASD. According to Szapacs, (2006) “the goals of any intervention employing ABA principles are four-fold: (a) to increase positive behaviors, (b) to decrease negative behaviors, c) to teach new skills, and (d) to generalize and maintain learned skills” (p. 12). Furthermore, according to Lead and colleagues, intervention based on ABA principles should take the form of both one to one instruction and small and large group instruction (2016). The use

of ABA “has made significant and lasting contributions to the evidence-base for the treatment of repetitive behavior in ASD” (Boyd, McDonough, & Bodfish, 2012, p. 1243). One of the most well known components is the evidence-based practice, Response Interruption and Redirection (RIRD). The use of discrimination training with the multiple schedule, another ABA based strategy, may be used in conjunction with RIRD and will be discussed in further detail below.

RIRD

Several studies have been conducted with the goal of decreasing vocal stereotypy by running the evidence-based practice RIRD (Sidener & Progar, 2011; Shawler & Miguel, 2015). Research has primarily used observations of individuals with ASD to determine if the implementation of RIRD effectively decreases levels of vocal stereotypy (Sidener & Progar, 2011; Wunderlich & Vollmer, 2015; Shawler & Miguel, 2015; Cassella et al., 2011). Researchers have reported positive results running RIRD in the form of social questions, with data collected on the vocalizations using a 10 second-momentary time sampling procedures (Cassella et al., 2011).

Cassella et al. conducted a study of the effectiveness of RIRD on reducing vocal stereotypy (2011). The two participants were boys ages 7 and 4 who were diagnosed as having severe ASD. Both individuals engaged in high levels of vocal stereotypy throughout their day. The stereotypy the boys exhibited was in the form of repetition of words and phrases. The study collected data using a 5s time sampling method. An ABAB reversal design was used to show the effectiveness of RIRD on the individuals’ vocal stereotypy. During baseline procedures, the vocal stereotypy was not interrupted nor were demands placed, however during training sessions if the participants engaged in

vocal stereotypy the researchers implemented the RIRD. Instead of running an RIRD that requested a vocal response, the RIRD requested a physical response (i.e. touch your head; clap your hands, etc.). Prompts were delivered if the required motion was not completed by the participant within five seconds. The study results showed a significant decrease in the vocal stereotypy of both individuals following the implementation of RIRD (Cassella et al., 2011).

Further investigating the details of RIRD, Shawler and Miguel investigated whether the topography of the demands placed on an individual must match their stereotypy (2015). For example, if an individual engages in motor stereotypy (e.g. hand flapping, jumping, etc.), does RIRD being implemented in the form of motor demands prove to be more effective? On the other hand if an individual engages in vocal stereotypy, should RIRD presented require a verbal output (e.g. answer social questions, repeat words, etc.)? The study focused on five individuals between the ages of 5 and 12 known to have high levels of vocal stereotypy which interfered with their educational progress. Each individual was currently in a local agency that was providing them treatment. The vocal stereotypy was measured using continuous duration recording, whereas the total number of times stereotypy occurred was divided by the total number of minutes of the entire session. All sessions were five minutes in length. As with the study conducted by Cassella et al. (2011), all instances of vocal stereotypy were ignored during baseline conditions, however during training procedures RIRD was run in the form of motor (mRIRD) or vocal (vRIRD). The topography of RIRD was meant to match the kind of stereotypy being presented by the individuals. At the end of the study, the researchers were able to determine that matching RIRD to the topography of the

stereotypy is not a significant variable in the effectiveness of the RIRD. However, it was noted that mRIRD was far more practical to prompt individuals than vRIRD (Shawler & Miguel, 2015).

In Ahearn, Clark, Chung and MacDonald's study (2007), the researchers sought to investigate if running RIRD can increase appropriate vocalizations while decreasing vocal stereotypy. Study participants included two boys and two girls between the ages of 3 and 7 diagnosed with ASD. All individuals engaged in high levels of vocal stereotypy which interfered with their educational activities as well as impeded with activities outside of the classroom. Data on the vocalizations was collected using a 10 second momentary time sampling. The study aimed to measure the vocal stereotypy under four different conditions (alone, play, demand and attention). Each participant had their highest levels of vocalizations in different areas, while one showed high levels across all conditions. RIRD was run using an ABAB withdrawal design, with baseline sessions being five minutes long. As with the previous studies, vocal stereotypy was not interrupted during baseline. Following baseline data, the vocalizations were interrupted in the training phase using the RIRD. RIRD was run using social questions or vocal imitation depending on the participants' ability levels. Three of the four participants received the RIRD in the form of social questions, while one followed the vocal imitation due to her inability to effectively answer social questions. Vocal stereotypy decreased for all participants with the implementation of RIRD, and three of the four participants increased their appropriate language (Ahearn et al., 2007).

RIRD as an Evidence-Based Practice

RIRD is an evidence-based practice with systematic research to support its effectiveness (Neitzel, 2009). Neitzel recommends RIRD be “used to decrease interfering behaviors, predominately those that are repetitive, stereotypical, and self-injurious in nature” (p.1). RIRD appears to be extremely effective when working to decrease behaviors which are sensory-maintained, as alternate behaviors are looked at as a way to replace the interfering behaviors, such as vocal stereotypy (Neitzel, 2009). An example provided by Neitzel explains that teaching a learner to use more appropriate language when engaging in this behavior will work to redirect the non-contextual vocalizations (2009). For learners exhibiting vocal stereotypy Neitzel reports the most effective ways to redirect the learner as “a. saying the learner’s name in a neutral tone of voice, b. establishing eye contact with the learner, and c. asking a social question to prompt the learner to use an alternative vocalization” (p. 6). Neitzel further details that data collection should be taken throughout the process to ensure the implementation of RIRD is effective (2009). If RIRD is not working, the behavior being targeted requires a further in depth look.

Multiple Schedule

Another treatment procedure for individuals with ASD to decrease vocal stereotypy is the use of a multiple schedule. A multiple schedule uses stimuli discrimination to aide individuals in determining when it is an appropriate time to engage in vocalizations, and when it is not an appropriate time to engage in vocalizations (e.g., Brusa & Richman, 2008; O’Connor et al., 2011). O’Connor and colleagues investigated discrimination training as an aide in the reduction of vocal stereotypy for an individual

with ASD (2011). The study had one participant, an 11 year old boy who engaged in both motor and vocal stereotypy. The individual was first taught using discrimination training, using red and green stimuli. The red stimuli signified that the attempts at motor and vocal stereotypy would be blocked, while the green condition signified that attempts to engage in motor and vocal stereotypy would not be blocked. The stimuli cards would start large and slowly fade to smaller in size as the participant understood the difference between the two. Stereotypy was scored on a 10 second partial interval basis. During baseline the stereotypy was not interrupted and the green/red card was not presented. During the red condition if motor stereotypy occurred, the motor movement was prompted to stop, for example if hand flapping occurred the therapist prompted hands down. If vocal stereotypy occurred the activity was paused until the vocalizations stopped. Following the red condition, during the green condition any attempts at stereotypy were not blocked. Sessions were five minutes in length. This procedure was done in several environments to promote generalization of the skill. The study showed a decrease in stereotypy during the red condition, along with an increase in appropriate behaviors (O'Connor et al, 2011).

Similarly, in Brusa and Richman's study (2008), the researchers investigated teaching individuals when and where engaging in stereotypic behavior is appropriate using stimuli discrimination in the form of a red card/green card. This study involved an eight year old boy with ASD who engaged in high levels of vocal echolalia. In addition he engaged in high levels of motor stereotypy. Data was collected using 10 second partial intervals. Researchers looked at four conditions (alone, play, attention and demand). For this particular study, they focused on redirecting the motor stereotypy of

string play as opposed to the vocal stereotypy. During baseline conditions, there were no attempts to block motor stereotypy. The participant was taught to discriminate between the red and green card as a sign for when he was able to engage in motor stereotypy. During the red condition, if the individual engaged in motor stereotypy the researcher blocked any attempt to engage in motor movements that were inappropriate, while in the green condition he was able to engage in motor movements without interruption. When the card was presented to the participant, an SD was spoken to let him know what was expected of him. For example during the red condition, the researcher would state that the participant can play with anything but the string. The string was the toy which caused the highest levels of motor stereotypy. At the conclusion of the study, the participant was able to engage in motor stereotypy only during the green condition, while using appropriate motor movements in the red condition. The schedule of the cards was again changed as a degree of understanding was shown by the participant. This study may have shown similar results had the researchers focused on the individual's vocal stereotypy as opposed to motor stereotypy (Brusa & Richman, 2008).

Summary

Research has shown that RIRD, an evidence-based practice, can be used effectively to decrease levels of stereotypy for individuals with ASD (e.g. Ahearn et al., 2007; Cassella et al., 2011; Neitzel, 2009; Shawler & Miguel, 2015). Providing individuals with appropriate language while interrupting the inappropriate vocalizations seems to decrease the levels of vocal stereotypy while increasing appropriate language. All studies reviewed showed success when the RIRD was run effectively by the researchers. In addition, the studies have shown that matching the topography of the

stereotypy to RIRD does not seem to be a significant variable in the decrease of vocalizations.

Another method that has been shown to decrease stereotypy, despite the limited research, is the use of a multiple schedule with stimuli discrimination (e.g., Brusa & Richman, 2008; O'Connor, et al., 2011). The use of a multiple schedule with discrimination control teaches the individual engaging in vocal stereotypy to discriminate between free access to vocals and when it is not free access to vocals. Both studies examined used red/green cards as the stimuli to represent when the free access and limited access to vocalizations would occur (Brusa & Richman, 2008; O'Connor, et al., 2011). Results showed that when appropriate discrimination training was taught, the individual was able to accurately discriminate between the two conditions.

The purpose of this study is to combine both the RIRD and the multiple schedule interventions with one another to decrease the levels of vocal stereotypy in an 8 year old student with ASD, and systematically fade the multiple schedule as an understanding of discrimination is shown. This study will build upon the methods recommended by O'Connor et al (2011), and Brusa & Richman (2008) to reduce stereotypy. The individual will be taught through stimulus control with discrimination training in order to control the levels of vocal stereotypy, coupled with the evidence-based practice of RIRD to increase appropriate vocalizations.

Chapter 3

Method

Setting

School. The study was conducted in an urban community school in New Jersey. The comprehensive public school is part of an Abbot district due to its low socio-economic status. It is one of four elementary schools within the district, and it has approximately 630 students in attendance. In order to serve the high population of students and needs, the school has general education, inclusion, self-contained and ABA classrooms.

Classroom. The study was conducted throughout the day, with the highest amount of time designated to the ABA classroom. The classroom is comprised of three students, all of which are diagnosed as being on the autism spectrum. Students in the class each work one on one with paraprofessionals, whom are designated to teach students programs that fit their individual needs. The classroom itself shares a common area with two other ABA classrooms. All together, there are 14 students who share the common area, ranging in age from Kindergarten thru fifth grade. In addition to the main common area, there are two other classrooms, two Smart-board rooms and two lunch rooms in this area. In addition to the 14 students, there are also 12 aides and two other teachers sharing the area.

Students in the ABA program attend specials with typical peers from other classes in the school. They do not attend lunch with typical peers, instead they eat in the common area together with the other two ABA classes. Recess is provided to the students by the ABA teachers, and during this time they are generally with other students

in the ABA program, however, occasionally other classes will join them on the playground.

Participants

Student. A total of one student participated in this study. This student has engaged in high levels of vocal stereotypy since the age of two when he began to use verbal language. The student is half Asian and half Caucasian, with the mother being Asian and the father being Caucasian. Therapies for this child include ABA, occupational therapy and speech therapy. He currently receives speech twice a week, and occupation therapy once a week.

This student is a seven year old male in an ABA classroom. When engaging in high levels of vocal stereotypy, he is easily distracted and inconsistent with his academic performance. He is able to engage at higher levels on tasks on some days, yet on other days his ability to attend is very low. This child requires frequent redirection and prompting from an aide in order to stay on task and remain focused. Often times when he is engaging in vocal stereotypy, he is unable to attend to anything or anyone else around him. The vocals vary in length when they occur. Sometimes they can last continuously without interruption for up to five minutes, while others are spurts that occur in short bursts. These vocalizations of several minutes with vocal stereotypy, and several minutes without, occur throughout the entire school day. The vocals typically consist of scripting and mumbling. In addition to the vocal stereotypy getting in the way of his ability to attend, it also interferes with his ability to interact with those around him. When engaging in the vocal stereotypy, the student does not respond to others and does not appear to notice anyone around him. Aggressive behaviors can occur when the teacher

attempts to interfere with these vocals, however these aggressions also occur when a transition is presented from preferred to non-preferred, or if something does not go the way he assumed it would go. For example, if the student wants to play with an item and it is broken, we will observe aggression. This aggression often takes the form of hitting, scratching, biting and throwing objects.

At home the parents report that the student engages in extremely high levels of vocal stereotypy and they find it very hard to get him to attend. The parents also report that at times they fall into a pattern of allowing free access to electronics, but they have recently put restrictions on his ability to play with these. This is important as both at home and at school an increase in his vocal stereotypy during and after playing with an electronic device has been noted.

Teacher. An ABA teacher was in charge of collecting the data throughout the study. In addition to the ABA teacher, a trained paraprofessional collected the data throughout the day. The paraprofessional was trained by the teacher for a period of five days prior to the paraprofessional independently taking data. Other paraprofessionals in the room were taught to collect data, in case the teacher or aide was absent. Throughout the study this did not occur, so only the ABA teacher and paraprofessional were involved with the data collection.

Measurement Materials

A MotivAider. A MotivAider is a small electronic device that can be set at a variety of different intervals. The timer can be set to go off on a fixed or interval schedule with a small vibration going off at the designated time. For the purpose of this study the MotivAider was set on ten second intervals as recommended by O'Connor et al.

(2011). When ten seconds elapsed a small vibration would occur to notify the individual wearing it. The MotivAider was set to a loop and continuously went off at ten second increments unless switched off.

During the ten second trials, the trained paraprofessional and/or teacher would look to see if the individual was engaging in vocal stereotypy. This is known as partial interval recording. If the behavior of vocal stereotypy occurred during these sessions the individual collecting data would mark either a + for yes it did occur or – that it did not occur.

This device was also used during circle time to measure this students attending ability, both before the intervention, during and after. The MotivAider was again set to ten second increments.

A momentary time sampling data sheet. The student was observed throughout his day, starting from arrival until dismissal. Data collection occurred during transitions, while attending specials, during lunch, as well as in recess. Data collection ended once the student left the classroom to go home for the day. A momentary time sampling data sheet was used to collect data on the student's ability to attend in circle time. With momentary time sampling, the teacher was looking to see if at the time the MotivAider buzzed, the student was engaged and attending to the lesson at hand. The time was separated into ten second increments. (See the sample data sheet in Figure 1.) Multiple copies were used in order to take data throughout the day.

Interval	Vocals	
1		
2		
3		
4		
5		
6		
7		
8		
9		
10		
11		
12		
13		
14		
15		
16		
17		
18		
19		
20		
21		
22		
23		
24		
25		
26		
27		
28		
29		
30		
%		

Figure 1. Sample data sheet for time sampling.

Research Design

A single subject design with ABAB phases was used. During phase A, baseline data was collected for five days by the researcher and the paraprofessional using the partial interval data sheet. Before the implementation of phase B, the student was taught

to discriminate between a red card and a green card using a multiple schedule. The student was told that the red card was a symbol to not engage in vocal stereotypy, and to use appropriate language. The green card was a symbol that engaging in vocal stereotypy would not be disrupted. Each occurrence of vocal stereotypy would result in staff immediately interrupting using, Response Interruption and Redirection (RIRD). The RIRD and multiple schedule intervention was then removed for a second phase A to regain baseline. During the second phase B, the student was redirected every single time he engaged in vocal stereotypy using the Response Interruption and Redirection (RIRD) without the use of a multiple schedule. The multiple schedule was faded during intervention II as the student showed success with his ability to lower the levels of vocal stereotypy with RIRD in the red condition.

During each phase the paraprofessional and/or teacher took data using ten second momentary time sampling data sheet. If when the timer buzzed, the student was focused and engaged in the lesson, the teacher marked a +. If the student was not engaged during this time, the teacher would mark a -. Prior to any intervention, baseline data on attending was taken to see if it would increase throughout the time of the intervention.

Procedures

Instructional design. The baseline data (phase A) was collected over the course of five days. The researcher and paraprofessional observed and recorded the behaviors throughout the day using a ten second momentary time sampling. A vibrating MotivAider was used to prompt the researcher and/or paraprofessional when the ten seconds had elapsed. Table 1 below shows the amount of time in each condition.

Table 1

Times in each condition

Step	Schedule 1: RED WAY	Schedule 2: GREEN WAY
1	60 seconds	10 seconds
2	60 seconds	15 seconds
3	60 seconds	20 seconds
4	60 seconds	30 seconds
5	45 seconds	30 seconds
6	45 seconds	45 seconds
7	30 seconds	45 seconds
8	30 seconds	60 seconds
9	30 seconds	90 seconds
10	30 seconds	2 minutes

After baseline and before phase A, the student was taught to discriminate between a red card and a green card. The discrimination training lasted 5 days.

During phase A, the multiple schedule intervention was put into place. During the red condition RIRD was run, however in the green condition the student was given free access to vocals. The student was told the green card was free time and he was able to engage in free use of vocals during this time without interruption from the instructor. Data was collected on the multiple schedule with RIRD for five days. Once the student was successful in the step, the teacher would move to the next step on time increments. Success to move up a step was determined to be if the vocals were 60% or less throughout his day. Once the ten second increment vibrated on the MotivAider, the researcher and paraprofessional noted if the student was engaging in vocal stereotypy. Using the momentary time sampling data sheet, if the student was engaging in vocal stereotypy when the MotiVaider vibrated, it was marked as a +, if no vocal stereotypy

was observed, it was marked as a -. During this time, the student was expected to comply with three consecutive appropriate responses to RIRD in order to get out of the condition.

The second phase A entailed a return to baseline, in which both RIRD and the multiple schedule interventions were removed. Data collection continued as in previous phases. The phase continued for five days.

For the second phase B, the multiple schedule was discontinued as the student showed an understanding of the discrimination between the two stimuli and RIRD was implemented to be run every time the student engaged in vocal stereotypy. Each time the student engaged in vocal stereotypy, the researcher and/or paraprofessional would initiate RIRD. RIRD consisted of social questions. Three consecutive appropriate responses to the social questions were needed in order to end RIRD. Again data was taken using the momentary time sampling. At the ten second mark, the paraprofessional and/or researcher would mark + if the student was engaging in vocal stereotypy, and – if the student was not engaging in vocal stereotypy. If the researcher and/or paraprofessional were implementing RIRD at this time, it was marked as a + if the student was unable to appropriately respond, and a – if appropriate responses were being spoken. This condition was run for five days.

Measurement Procedures

Momentary time sampling. During data collection, the researcher marked vocalizations using ten second increments. After each ten second interval, a vibrating MotivAider allowed the researcher and/or paraprofessional to know when the ten seconds had elapsed. If at the ten second mark the student was engaging in vocal stereotypy, the researcher marked a +. If appropriate language was exhibited the researcher and/or

paraprofessional marked a -. This was used for both RIRD and multiple schedule. In addition, this data sheet was used to collect the attending data during circle time.

Attending data was collected during all interventions to see if an increase would occur in different conditions. Data was collected using momentary time sampling in ten second increments.

Data Analysis

The momentary time sampling data was calculated in percentages and presented in a visual graph to compare the difference among phases (see Chapter 4). The total percentage was based on the amount of intervals able to be completed throughout the day. These varied depending on the length of the school day and if behaviors occurred. If student aggression was shown, all interventions were stopped until the behaviors were placed under control.

Chapter 4

Results

Vocal stereotypy was treated using an intervention package of RIRD and a multiple schedule to decrease the levels of vocal stereotypy, while also working to increase the attending behavior of one student with ASD.

Vocal Stereotypy

Research question 1 asked will implementation of an RIRD and multiple schedule intervention reduce the vocal stereotypy of an individual with ASD. Table 2 reveals the student's level of vocal stereotypy across phases. The number of vocalizations was converted to percentages to represent the portion of the day the student was engaging in vocal stereotypy.

Table 2

Vocal Stereotypy: Mean and Standard Deviation

Baseline (A)		Intervention (B)		Baseline (A)		Intervention (B)	
		Multiple Schedule & RIRD				RIRD	
Mean	SD	Mean	SD	Mean	SD	Mean	SD
(%)		(%)		(%)		(%)	
69.2	9.28	38.2	17.0	22.4	3.65	10.8	2.4

Figure 2 reports the levels of vocal stereotypy visually across phases.

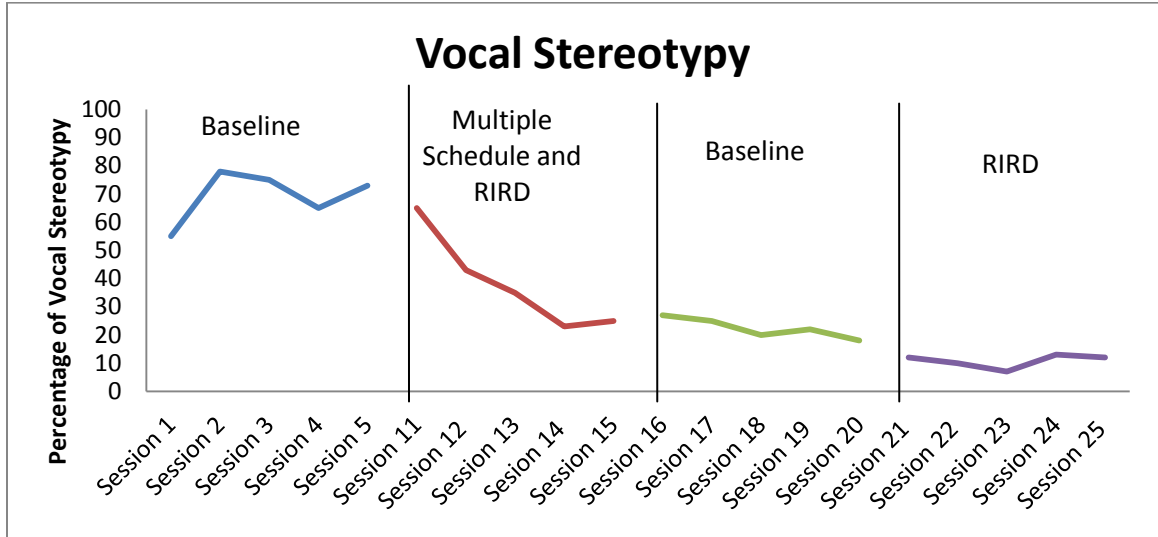


Figure 2. Vocalizations

A visual analysis of data in Figure 2 show a downward trend of vocal stereotypy across all phases. From the original baseline data to the initial intervention of the multiple schedule with the RIRD the level of vocal stereotypy decreased. The return to baseline saw a slight increase, however there was still a downward trend ($M = 22.4\%$). With the second intervention of the RIRD, the data shows a further decrease in vocal stereotypy ($M = 10.8\%$).

Mean of vocal stereotypy with multiple schedule and RIRD. This student began with an initial baseline of vocal stereotypy at 69.2%. This means that about 69% of his day was spent engaging in vocal stereotypy. When introducing the intervention of the multiple schedule with RIRD, the mean decreased from 69.2% to a mean of 38.2% which is a decrease of 31%.

Mean of vocal stereotypy with RIRD. When returning to baseline following the intervention of multiple schedule combined with RIRD, the mean fell to 22.4%. With the implementation of RIRD without multiple schedule, the mean dropped to 10.8%. From the return to baseline to RIRD intervention there was an 11.6% difference.

Attending Behavior

Research question 2 asked, will implementation of an RIRD and multiple schedule intervention to reduce verbal stereotypy increase the attending behavior of an individual with ASD? Table 3 presents the student's level of attending across phases. Attending was described as the ability for the student to sit with feet on floor, hands down, oriented towards teacher or materials with no interfering motor or vocal stereotypy.

Table 3

Attending: Mean and Standard Deviation

Baseline (A)		Intervention (B) Multiple Schedule & RIRD		Baseline (A)		Intervention (B) RIRD	
Mean	SD	Mean	SD	Mean	SD	Mean	SD
41.60	12.86	55.80	14.50	35.20	8.41	51.00	13.51

Figure 3 reports the levels of attending visually across phases.

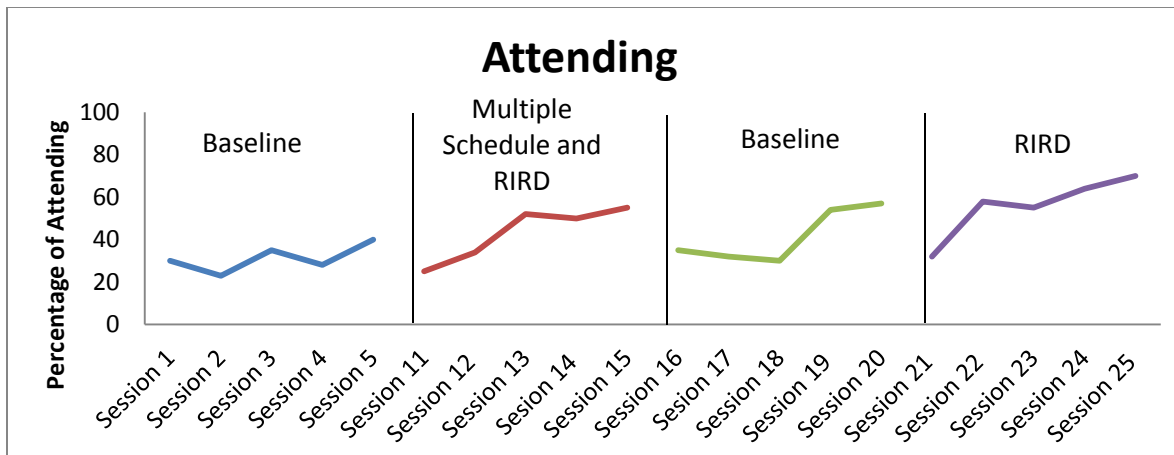


Figure 3. Attending

A visual analysis of Figure 3 reveals the level of attending with the multiple schedule and RIRD increased, however the return to baseline did not show a large difference in attending behavior. From the start of the intervention when baseline was ran, the total percentage of time the student showed attending behaviors was a mean of 41.6, at the end of the multiple schedule paired with RIRD the mean of attending behavior increased by 14.2%. Following a return to baseline there was a decrease in his ability to attend by 20.6%. The multiple schedule was faded and RIRD was then run solely. From the return to baseline, RIRD showed a 15.8% increase in the student's ability to attend. There was an upward trend in the level of attending for this student with both interventions of multiple schedule and RIRD put into place.

Mean of attending with multiple schedule and RIRD. This student began with a mean score of 41.6% in attending at baseline. When the multiple schedule was put into place the mean increased by 14.2% to a total mean of 55.8% at intervention.

Mean of attending with RIRD. This student began with a mean at return to baseline of 35.2%. This was a decrease from the start of the data collection and since the

completion of the multiple schedule. When the RIRD was put into place, his ability to attend increased by 15.8% to a total mean of 51%. This percentage was lower than with the combined multiple schedule and RIRD in place.

Chapter 5

Discussion

The purpose of the study was to use a research based intervention package to decrease the levels of vocal stereotypy in an eight year old student with ASD, and to increase appropriate vocalizations and attending behavior. The study investigated the use of discrimination training using a multiple schedule in combination with the evidence-based practice of RIRD.

The results showed that the student decreased vocal stereotypy continuously, from baseline through both intervention phases. Initial baseline data showed the mean percentage of total occurrences of vocal stereotypy as 69.2%. Following this with the implementation of the multiple schedule paired with RIRD, the student total number of occurrences of vocal stereotypy decreased to 38.2%. This is a 31% difference, a marked drop in vocal stereotypy. When the intervention was returned to baseline, the vocal stereotypy further decreased to 22.4%, indicating a steady decline even after the intervention of the multiple schedule paired with RIRD stopped.

Study findings suggest the use of a multiple schedule intervention worked effectively in positively introducing the implementation of RIRD. It appears using a multiple schedule initially provides the student with positive support which can be faded as discrimination training of multiple stimuli is maintained by the student. This allows for an easier transition for the student engaged in vocal stereotypy, as opposed to starting with the implementation of RIRD intervention. Once the multiple schedule was faded away and the implementation of RIRD was put into place, the reduction of vocal stereotypy increased. The vocal stereotypy mean at the return of baseline of 22.4%,

further decreased to 10.8% with the implementation of RIRD without the multiple schedule. The RIRD used alone showed a 27.4% decrease from when the intervention was used with the multiple schedule paired with RIRD. Results corroborate the research of Ahearn et al., (2007) in which RIRD was used effectively to decrease vocal stereotypy.

Throughout this intervention, data was also taken using momentary time sampling to see if there was a connection between the reduction of the vocalizations and an increase in engagement. From the start of the study the engagement level of the student increased from an initial baseline mean of 41.6%, to a mean of 55% with the implementation of the multiple schedule paired with RIRD. This showed a 13.4% increase in this student's ability to attend. When returning to baseline, the mean of attending dropped to 35.2% showing the student was unable to maintain attending skills without the implementation of an intervention for his vocal stereotypy. When the multiple schedule was faded away and RIRD was introduced solely, engagement rose from a mean of 35.2% to 51%. This is a 15.8% increase in the student's ability to attend with RIRD alone. The data showed an upward trend in the level of attending for this student when both interventions were paired together. Results corroborate the research of Ahearn et al., (2007) in which RIRD was used effectively to increase attending behavior.

Limitations

One major limitation to this study is the time frame in which it was conducted. This study was a master's thesis conducted during the summer semester. A limited time frame between university IRB approval and the end of the school year led to the study being conducted for only 4 weeks, up to the last week of school. As a result, each phase

of the study was limited to one week. This limited the data collected, and the study would likely have been improved if each phase could have lasted several weeks.

Another limitation of the study was the school setting. The student was participating in different parts of the day with general education students. When implementing the multiple schedule and RIRD, it was often extremely distracting to the other students. The presentation of the interventions immediately garnered attention from people, which was not only distracting to the student but also to the researcher and aide running the interventions. Had the other students been more focused and redirected to their work, the level of attention would have decreased thus taking the attention from the student who was being provided with the intervention. At times the student may have been overwhelmed with the excess of attention, which may have interfered with accurate data collection.

The student was observed during the end of the school year, where most demands are limited and the schedule is greatly reduced to incorporate more opportunities for free play. It would have been better for the student to first be exposed to the intervention during the time of regular scheduling and school procedures. The best time to observe the student would be during the regular school day when he was in a routine and not distracted by many changes in an end of the year schedule. School days were shortened to half day schedules at the end of the year, only further limiting the amount of time to run the intervention appropriately.

A limitation to the research is not being able to attribute the results to multiple schedule or RIRD as they were used in combination. While the data showed some increase in the reduction of vocal stereotypy when the multiple schedule was faded, it is

difficult to say it was simply due to RIRD, since the multiple schedule was a part of the beginning of the intervention. This same statement can be made with attending. Both interventions were used in combination to collect data on the student's attending skills, thereby results cannot be attributed to one or the other.

Finally, a limitation inherent to single subject design is small sample size. The study was conducted with one student. This was due to only one student demonstrating the behavior of vocal stereotypy from which the study covered. Data from this study may not be generalizable beyond this one student participant, and additional research with a larger sample size is warranted.

Implications and Recommendations

While the study has its limitations, the data does show both interventions helped the student to reduce his vocal stereotypy and improve his ability to attend in the classroom setting. Prior studies also report strong results and therefore demand continued research on the use of a multiple schedule and RIRD to reduce vocal stereotypy (Ahearn, et al., 2007; Brusa & Richman, 2008; Cassella, et al., 2011; Howe, 2014; Neitzel, 2009; O'Connor, et al., 2011; Shawler & Miguel, 2015; Wunderlich, K. L., & Vollmer, T. R. 2015) with increased numbers of participants. Of note, the student appeared more frustrated with the implementation of RIRD, as opposed to multiple schedule and RIRD, because it did not allow for any time to engage in vocal stereotypy. Future research is warranted investigating multiple schedule and RIRD in combination, and allowing a set amount of time for vocals to occur, similar to the multiple schedule, e.g. in a certain room, one time per day. This may allow for a reduction in the vocals overall while relieving some stress associated with the intervention.

Conclusion

This study was successful in that it reduced the vocal stereotypy in the student, while increasing his ability to engage in the classroom. A focus on training of all support staff involved to accurately run the intervention is recommended for future studies. In addition, the school day should be on a regular schedule with limited distractions from running the interventions appropriately. All data should be maintained over time with maintenance data collected, however due to the time restriction this was not feasible for this study. Multiple people should be collecting data on the student to ensure inter-observer agreements. Further research is needed to validate the findings and extend the use of both the multiple schedule and RIRD as an effective means for reducing vocal stereotypy.

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