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# Using Differential Reinforcement of Low Rates of Behavior to Reduce Perseverative Speech

Taylor Schauer
*California State University, Monterey Bay*

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Taylor Schauer

APPROVED BY THE GRADUATE ADVISORY COMMITTEE

_____
Kerrie Chitwood, Ph.D.
Advisor and Program Coordinator, Master of Arts in Education

_____
Casey McPherson, Ph.D.
Advisor, Master of Arts in Education

_____
Erin Ramirez, Ph.D.
Advisor, Master of Arts in Education

Kris Roney Digitally signed by Kris Roney
Date: 2017.05.25 15:00:30 -08'00'

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Kris Roney, Ph.D. Associate Vice President
Academic Programs and Dean of Undergraduate & Graduate Studies

**Abstract**

Autism spectrum disorders (ASD) can be characterized by social, communication and behavioral challenges, including perseverative speech. Individuals who engage in perseverative speech often have difficulties engaging in appropriate social interactions and perseverative speech can impede learning. Therefore, it is important to identify systems of reinforcement that are able to decrease this behavior. Three students with ASD were selected for this study based on the prevalence of their perseverative speech. A multiple-baseline research design across participants was used to study the effectiveness of using Differential Reinforcement of Lower Rates of Behavior (DRL) in decreasing the frequency of perseverative speech. The results showed a consistent decrease in perseverative speech with one participant, but unstable data during intervention with the second participant. Overall, the average frequency of perseverative speech decreased with the second participant. The third participant was unable to enter the intervention stage due to unstable baseline data. The current study indicates that DRL may be effective in reducing the frequency of perseverative speech for a subset of students with ASD.

*Key Words:* autism spectrum disorder (ASD), perseverative speech, differential reinforcement (DR), differential reinforcement of lower rates of behavior (DRL)



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## Literature Review

Autism spectrum disorder (ASD) can be characterized by social, communication, and behavioral challenges (The U.S. Department of Health & Human Services, 2014). The Diagnostic and Statistical Manual of Mental Disorders (DSM-5) outlines the diagnostic criteria for ASD within four sections. The criteria include persistent deficits in social communication and social interaction, restricted, repetitive patterns of behavior, interests, or activities, including stereotyped or repetitive speech (American Psychiatric Association, 2013). Stereotypic behaviors have been defined as repetitive acts that can limit a person's ability to learn and develop adaptive skills (Matson, Kiely, & Bamburg, 1997) and stereotypic behaviors are amongst the most problematic behaviors that children with ASD demonstrate (Luci, 2003). Furthermore, these behaviors can impede learning for individuals with ASD and can cause social interactions to be challenging.

Arora (2012) defines perseveration as any repetitive behaviors that are displayed by a person in the verbal domain, such as repetitive language or repetitive discussion of a topic. Perseveration also includes actions in the physical domain, such as gestures or physical action with objects (Arora, 2012). Other terms that are used to describe this behavior are verbal perseveration, perseverative verbalizations and unconventional verbal behavior. The term perseverative speech is used in this research study to describe these verbal behaviors.

Verbal perseveration can be broken down into three distinct categories: phrasal, sentential and topic. Phrasal refers to the repetition of a phrase or phrases, sentential is the repetition of a sentence and topic is when a student fixates on specific themes (Arora, 2012). Some students repeat the same phrase or sentence, while other students continue to bring up the same topics,

even after they have been addressed. Prizant (1996) discusses the term unconventional verbal behavior (UVB), which includes perseverative speech. He notes that UVB may increase in new situations and could be caused by stress or anxiety. Due to the lack of research in this area, intervention studies that focus on areas of communication and intervention techniques are needed (Prizant, 1996).

Perseverative speech may interfere with student learning and social interactions. Arora (2012) describes some of the difficulties that arise when students engage in perseveration and how it can interfere with these social interactions. Perseveration can be problematic, due to the distracting nature of the behavior. This behavior can also be a source of stigma for people with ASD (Arora, 2012). In order for people with ASD to learn how to interact appropriately with others, perseveration needs to be addressed and decreased. By decreasing this behavior, it will be easier for a person with ASD to have social interactions, and for the other person to interact with them. Rehfeldt and Chambers (2003) note that deficiencies in language and communication exhibited by persons with ASD are sometimes under environmental control, and arranging the variables in the environment can reduce these impairments. According to Kostinas, Scandelen, & Luiselli (2001), people with developmental disabilities often lack the abstract thinking abilities that would give them insight about obsessions and compulsions. Due to this lack of awareness, people with disabilities may not be able to monitor or regulate their own behavior. Having systems of reinforcement in place can serve as an antecedent intervention by setting a student up for success and using positive reinforcement to increase socially appropriate behaviors (Chowdhury & Benson, 2010).

**Differential Reinforcement**

Some studies have shown that differential reinforcement (DR) of on-topic speech, meaning non-perseverative speech, can be effective in reducing the rates of perseverative speech (Fisher, Owen, & Rodriguez, 2013). DR is a non-aversive, reinforcement-based behavioral intervention used with many individuals with developmental and intellectual disabilities (Chowdhury & Benson, 2010). DR contingencies consist of procedures that reinforce incompatible behaviors, alternate behaviors, other behaviors and low rates of behaviors (Chowdhury & Benson, 2010). For example, students who engage in aggressive behavior, in the form of hitting others, would receive reinforcement for engaging in incompatible or alternate behaviors (e.g., having their hands in their pockets), other behaviors (e.g., completing a work task requiring the student to use their hands) or low rates of behaviors (e.g., engaging in lower frequencies of aggressive behaviors than the average frequency). Fisher et al. (2013) used a treatment that isolated a student's perseverative speech as a reinforcer that could be accessed by remaining on-topic during the conversation partner's turn. During these teaching sessions, the conversation partner would have a turn to talk and the participant would be required to stay on the topic chosen by the partner. If the participant began talking about a topic that was part of his perseverative speech (i.e., Batman, Star Wars, etc.) during the other person's turn, the time would start over and reinforcement would be delayed.

Although perseverative speech was decreased during these sessions, the participant was still engaging in perseverative speech during the reinforcement period. Using DR in this treatment decreased the behavior, but the behavior was intermittently reinforced with attention during the participant's turn to talk. Using perseverative speech as a reinforcer would not be

ideal in this situation because this intermittent reinforcement could maintain the behavior of perseverative speech and a long-term decrease may not be possible. The results of this study have limitations because there were multiple components in the treatment, which makes it difficult to pinpoint the independent contributions of each part (Fisher et al., 2013). In order to determine the effectiveness of DR, further research must be done on the effects of DR in isolation.

**Differential reinforcement of lower rates of behavior.** Differential reinforcement of lower rates of behavior (DRL) is a system of reinforcement that falls under the broader umbrella of DR (Chowdhury & Benson, 2010). When using a system of DRL, a reinforcer is contingent upon a student engaging in a lower rate of the targeted behavior during a set interval of time (Chowdhury & Benson, 2010). In order to determine the number of responses that are accepted during an interval of time, the average frequency of occurrences of a targeted behavior must be determined during baseline. Once the average frequency is determined, that number is lowered slightly (e.g., one less than the average). If a decrease in frequency is seen during intervention, the accepted frequency of perseverative speech is systematically lowered in order to continuously decrease the behavior. For example, if a student engages in an average of 20 episodes of perseverative speech during a half hour interval, the allowed frequency may be set at 18 and the student will only gain access to a reinforcer if they engage in 18 or less episodes of perseverative speech.

In a DRL procedure, reinforcement is provided at the end of a session if during the entire session, the targeted behavior occurred at a number equal to or below a pre-determined criterion (Chowdhury & Benson, 2011). The goal is not to eliminate perseverative speech, but to decrease

the frequency of these repetitive statements to a point they become more socially appropriate and less distracting. A study by Kostinas et al. (2001), examined the effects of DRL combined with a response cost procedure to decrease perseverative verbalizations in an adult with mental retardation and obsessive-compulsive disorder. Results indicate a marked reduction in perseverative verbalizations, but noted that subjects might be motivated more by the avoidance of negative consequences, response cost, than the presentation of positive reinforcement. Though this may be true, it is ethically important to attempt to use systems of positive reinforcement before using more aversive techniques, such as response cost procedures. Chowdhury & Benson (2011) noted that DR is an example of such a non-aversive, reinforcement based behavioral intervention. Being that perseverative speech is not a dangerous behavior, DRL would be an appropriate system of reinforcement in targeting this behavior (Chowdhury & Benson, 2011). DRL is most often used to decrease the rate of a behavior that occurs too frequently, but does not eliminate the behavior entirely (Chowdhury & Benson, 2011). Using DRL to decrease perseverative speech could systematically decrease the behavior instead of intermittently reinforcing the perseverative speech.

DRL was used in one study that focused on reducing children's requests for teacher attention (Austin & Bevan, 2010). Austin and Bevan (2010) implemented this system of reinforcement with typically developing children in primary school to decrease their excessive requests for teacher attention. This study resulted in a decrease of the requests once the intervention was implemented. During the second treatment phase, the behavior was nearly eliminated (Austin & Bevan, 2010). These data, as well as the research done by Fisher et al. (2013) around DR, suggest that systems of reinforcement are effective in reducing requests for

attention and perseverative speech. Austin and Bevan (2010) also demonstrated experimental control in their study by using a reversal design.

In addition to being successful with children, DRL was shown to be effective in reducing perseverative verbalizations in an adult male with moderate intellectual disability and obsessive-compulsive disorder (Kostinas et al., 2001). Similar to Austin and Bevan's (2010) findings, these perseverative verbalizations were reduced when the man gained access to reinforcing activities contingent upon engaging in a lower frequency of the behavior. The behavior was reduced further when this DRL contingency was implemented and combined with a response cost procedure (Kostinas et al., 2001). A reduction in perseverative verbalizations improved social interactions for this participant and resulted in better acceptance by his peers. Another positive outcome was that the participant had more positive community experiences due to the decrease in perseverative verbalizations (Kostinas et al., 2001). Though the intervention resulted in numerous positive outcomes, some limitations must be considered.

A limitation of this study is that with the combined treatments, it becomes difficult to pinpoint the independent effects of DRL. Another limitation of this study is that the subject remained consistently below the criteria, with perseverative verbalizations eventually being eliminated. For this reason, there was no need to adjust the criteria downward in an attempt to produce a gradual decrease in responding (Kostinas et al., 2001). During the response cost portion of the intervention, the subject was given tokens and they were taken away each time he engaged in perseverative verbalizations. Staff noted that he was motivated to keep the tokens, which does not provide an accurate look at the effectiveness of the DRL procedure if the motivation was solely to keep the tokens (Kostinas et al., 2001). Conclusions cannot be drawn

from a study with combined treatments because it is not possible to derive the effectiveness of one treatment when multiple treatments are being used. More research on DRL in isolation would need to be conducted in order to determine the effectiveness of the reinforcement system.

### Gaps in the Literature

The literature showed that there is not much research on using DRL with students with ASD and even less having to do with perseverative speech. Though different types of DRL schedules have the potential to address a range of problem behaviors, they have remained under researched in comparison to other reinforcement-based interventions (Austin & Bevan, 2010). Not only is there a lack of research, but also another limitation of this research is the inability to generalize the findings. The use of nonrandom sampling and small sample sizes makes it difficult to generalize, which presents a challenge in understanding the effects of DRL with a different sample or population (McMillan, 2016).

## Method

This study was designed to research the effectiveness of DRL in reducing perseverative speech in students with ASD. Due to the lack of relevant literature surrounding perseverative speech and since DRL schedules are under researched in comparison to other systems of reinforcement, further research is needed (Austin & Bevan, 2011). Furthermore, this study focused on DRL in isolation in an attempt to determine the effects.

### Research Question

Does DRL decrease perseverative speech in secondary grade students with ASD in a non-public school classroom?

### Hypothesis

Based on prior research (Fisher, Rodriquez, & Owen, 2013; Kostinas, Scandelen, & Luiselli, 2001), my hypothesis was that students receiving DRL would decrease (i.e., engage in a lower frequency count) the frequency of their perseverative speech.

**Research Design**

The research design for the present study was a multiple baseline design (A-B) across participants. Using this design, research was done on several participants and experimental control was shown by systematically implementing the intervention with each participant.

**Independent variable.** The independent variable is DRL: reinforcement was delivered when the frequency of perseverative speech in a specific period of time was less than or equal to a predetermined criterion (Chowdhury & Benson, 2010). In order to determine the number of responses that were accepted during an interval of time, the average frequency of episodes of perseverative speech was determined during baseline. Once the average frequency of perseverative speech was determined for each participant, that number was lowered slightly (e.g., one less than the average). Once a decrease in frequency was seen during intervention, the accepted frequency of perseverative speech was systematically lowered in order to continuously decrease the behavior.

**Dependent variable.** The dependent variable, perseverative speech, is the repetitive use of language in which students repeat the same word, phrase, or topic (e.g., talking about dinosaurs, asking the same question, etc.) after it has already been addressed (Arora, 2012). A new occurrence was counted after the absence of perseverative speech for 30 seconds or if the student began a new topic within those 30 seconds.

**Setting & Participants**

Purposeful sampling was used to select participants that had the characteristics (i.e., autism and perseverative speech) of interest. The population of interest was students with ASD who engaged in perseverative speech. For this study, three students were selected from a non-public school for students with ASD and/or developmental disabilities in Central California who met this criterion. Confidentiality was maintained by assigning pseudonyms to each student in the study. Students received instruction from a 1:1 instructional aide in a classroom of 10 students. Student ages ranged from 15 to 19. Based on teacher reports and daily frequency data, these students engaged in high rates of perseverative speech that interfered with their learning.

**Student 1.** David is a Persian American male age 18, in a non-public school receiving 1:1 instruction throughout the day, but is grouped with peers during recess and lunch times (5.25 hours). He is diagnosed with ASD. He engages is perseverative speech in the form of conversation topics and phrases.

**Student 2.** Lloyd is a white male age 19, in a non-public school receiving 1:1 instruction throughout the day, but is grouped with peers during recess and lunch times (5.25 hours). He is diagnosed with ASD. He engages in perseverative speech in the form of conversation topics and phrases.

**Student 3.** Ingrid is an Asian-American female age 15, in a non-public school receiving 1:1 instruction throughout the day, but is grouped with peers during recess and lunch times (5.25 hours). She is diagnosed with ASD. She engages in perseverative speech in the form of words and phrases.

**Measures**

To measure perseverative speech, a frequency count of the number of times the target students engage in perseverative speech was used. Instructors recorded frequency data of perseverative speech on a frequency count data sheet for each session (see Appendix A). At the start of a half hour, a frequency count was started to record the frequency of perseverative speech during that session. A new occurrence of perseverative speech was counted after the absence of perseverative speech for 30 seconds or if the student began to talk about a new topic within those 30 seconds.

**Validity.** Perseverative speech is the repetitive use of language in which students repeat the same word or phrase or bring up the same topic repeatedly after it has already been addressed (Arora, 2012). The researcher scheduled a training session for each instructor, one per participant, to describe the research and intervention. Instructors were trained to recognize perseverative speech, understand the definition and how to count a new occurrence. This ensured that perseverative speech was the only behavior being measured and recorded during the sessions.

**Reliability.** Interrater reliability was established by having different instructors, the researcher included, take frequency data for each of the students. Each student was paired with the same instructor during all the sessions to ensure that rotating instructors did not affect the frequency of perseverative speech with that student. Sessions were conducted at the same time each day to ensure that the time of day was not a confounding variable. Opportunities were established for two instructors to overlap with the same student during the same intervals so that data could be compared to check for reliability. Observer overlap occurred for 20% of the sessions and there was at least 80% agreement during overlap.

**Intervention**

The intervention began with the researcher conducting a preference assessment for each student. The preference assessment was conducted by presenting multiple items and activities to the students that instructors had noted to be reinforcing to the student. The students were given a choice between all of the preferred items and activities. Once a student chose an item or activity, they were allowed to take a short break (e.g., 30 seconds) with the reinforcer and then the process was repeated. The preference assessment was complete once a student chose the same reinforcer at least three times, meaning it was a strong reinforcer.

After identifying a strong reinforcer for each student involved in the study, a baseline frequency for perseverative speech was taken for each student. The trained instructors took baseline data during at least five half-hour sessions. The mean frequency for each student was calculated. Once the mean was calculated, that number was decreased slightly (e.g., one less than the mean frequency) from the mean (Austin & Bevan, 2010) and that number served as the set number of episodes of perseverative speech allowed during each session (half hour interval of time).

The intervention was explained to the students so they knew how they could access the reinforcer. A visual board with open boxes depicting the allowable amount of perseverative speech was presented to the students. A red line was placed at the top of the allowable number of boxes to indicate the allowable frequency (see Appendix B). A reinforcer was chosen by the student. Each time a student engaged in perseverative speech, one box was checked off to show how many more times he or she could engage in perseverative speech. If the only checks were below the line, the reinforcer was delivered. If there were any checks above the line, the student

did not gain access to the reinforcer. When using a DRL procedure, reinforcement was delivered at the end of the session if the student engaged in a frequency of perseverative speech that was equal to or below the pre-determined frequency (Chowdhury & Benson, 2011). Once five stable data points were collected during baseline, intervention began for David. Subsequent participants moved from baseline to intervention once they had at least five stable data points, and when David showed an increase or pattern consisting of at least five consecutive data points.

**Procedures**

The frequency of perseverative speech was recorded during baseline in half hour increments. Baseline data was taken in the absence of an intervention in order to get a reliable frame of reference for comparing future data (McMillan, 2016). The mean frequency was determined based off of the frequencies taken from each half hour interval. The allowed frequency was slightly lower than the mean frequency determined during baseline (Austin & Bevan, 2010). A multiple-baseline design was used for the research study. After baseline data was collected, the mean frequency of the target behavior was determined. Once five stable data points were collected during baseline, intervention began for David. The instructor let the students know how many times they were allowed to engage in perseverative speech during each half hour increment.

Motivation was established for a set reinforcer (e.g., item, activity, edible) and the instructor presented the student with a visual containing a certain number of boxes (boxes based off of the number of times the student was able to engage in perseverative speech). Each time the student engaged in perseverative speech, the instructor acknowledged the speech and also checked off one box. If the only checks were below the red line at the end of the 30-minute

period, the student gained access to the reinforcer. If and when a box above the red line was checked off, the instructor no longer acknowledged the perseverative speech and the student did not earn the reinforcer at the end of the 30-minute period of time. At the end of the session, the instructor reviewed the rules of the intervention with the student to remind them of how they could earn the reinforcer. The allowed frequency of perseverative speech was systematically decreased slightly (e.g., one less than the previously determined frequency) once a downward trend in the data was observed at the previously determined frequency. This ensured that the intervention was effective for the students before trying to decrease the frequency of perseverative speech.

Lloyd moved from baseline to intervention once he had at least five stable data points, and when David showed a downward trend in the data consisting of at least five consecutive data points. Ingrid moved from baseline to intervention once she had at least five stable data points, and when Lloyd showed a downward trend in the data consisting of at least five consecutive data points.

**Fidelity.** The researcher and instructors taking data were trained before the research began to ensure fidelity in data collection and the intervention (see Appendix C). Interrater reliability helped to establish that the intervention was only being given to the students once they had established a baseline.

**Ethical Considerations**

One ethical consideration was the concern that participants would decrease their verbal communication as they were being encouraged not to talk. This concern was addressed by training instructors to reinforce and give attention to appropriate communication and language.

By reinforcing appropriate language, students were still motivated to communicate. There were no threats to bodily injury and the research did not take away from instructional time.

**Validity threats.** The researcher scheduled a training session to describe the research and intervention. Instructors were trained to recognize perseverative speech, understand the definition and how to count a new occurrence. This ensured that perseverative speech was the only behavior that was being measured and recorded during the sessions. This also ensured that everyone was measuring perseverative speech in the same way and that the instructors and researcher were taking honest and accurate data so that the results were not biased.

**Social Validity**

At the completion of the study, instructors completed a four-point Likert scale (i.e., 1 = strongly disagree to 4 = strongly agree) social validity questionnaire (see Appendix D). The questionnaire, adapted from Berger, Manston and Ingersoll (2016), consists of nine questions designed to understand the perceived usefulness, significance and satisfaction with the implemented intervention (Kennedy, 2005). The instructors who implemented the interventions were the responders. Responses were kept confidential and descriptive statistics were conducted to gain insights regarding the intervention.

The answers from the questionnaire pertaining to David expressed agreement in the following areas: the treatment was acceptable for increasing the student's skills, the instructor would be willing to carry out the treatment if they wanted to increase the student's skills, and the instructor would suggest the use of this treatment to other individuals. The instructor disagreed with the following areas: the treatment was effective, using the treatment improved skills across multiple contexts, the student's skills would remain at an improved level after the treatment ends,

the treatment improved school functioning, the treatment quickly improved the student's skills, and the treatment decreased the level of stress experienced by the student's instructors.

When the instructor completed the questionnaire for Lloyd, she agreed with the following statements: the treatment was effective, the treatment was acceptable for increasing the student's skills, the treatment improved school functioning, the treatment quickly improved the student's skills, the instructor would be willing to carry out this treatment if they wanted to increase the student's skills, and the instructor would suggest the use of this treatment to other individuals. The instructor disagreed with the following sections: using the treatment improved skills across multiple contexts, the student's skills would remain at in improved level even after the treatment ends, and this treatment decreased the level of stress experienced by the student's instructors.

**Data Analysis**

Once a pattern was identified during the baseline phase of the research, the intervention began for the first student. After a change in behavior was observed in the first student, intervention began for the second student. A change in behavior was determined by looking at the data. Since DRL is a reinforcement system that systematically decreases the behavior, data was analyzed to identify appropriate times to decrease the frequency of target behavior allowed for each student. The frequency was systematically decreased based on downward trends in the data. If perseverative speech consistently began to occur at a lower frequency, it was clear that the frequency of allowed perseverative speech should be decreased. An ongoing analysis of the frequency occurred in order to determine appropriate times to decrease the frequency for each student. A decreased frequency for each student showed that there was strong experimental control.

**Interobserver Agreement**

A secondary researcher was trained on the intervention and data collection procedures. For 20% of sessions, that researcher was present and collected her own data. Interobserver agreement was calculated by dividing the total number of agreements by the total number of agreements plus disagreements and multiplying that number by 100 to determine the percentage. The aim was to achieve at least 80% agreement between the two raters. There was 90% agreement across all sessions.

**Procedural Fidelity**

For 20% of the sessions, a secondary researcher took data on whether or not the researcher correctly implemented the procedure as previously described (see Appendix C). Procedural Fidelity was calculated by dividing the total number of correct implementations by the number of opportunities to implement the procedure and multiplied by 100 to determine percentage. The principal researcher correctly implemented the procedure 100% of all sessions.

## Results

The impact of DRL on perseverative speech for all three participants is depicted in Figure 1. The y-axis measures the frequency of perseverative speech and sessions observed are documented on the x-axis. The dotted line represents the change between the baseline and intervention phases. David has a dependent variable ranging from 0 to 10. Over the course of the baseline phase, David engaged in perseverative speech an average of 3.3 times with a range from 1 to 6. Once intervention was implemented, David was allowed to engage in perseverative speech two times in order to access his reinforcer. During intervention, David had a range of 0 to 6 instances with an average of 2.3 instances.

Lloyd had a higher frequency of perseverative speech during baseline and therefore, the y-axis for his graph ranges from 0 to 15. Over the course of the baseline stage, Lloyd engaged in perseverative speech an average of 8.1 times with a range from 1 to 14. Once intervention was implemented, Lloyd was allowed to engage in perseverative speech seven times in order to access his reinforcer. During intervention, Lloyd had a range of 0 to 7 instances with an average of 3.2 instances.

Ingrid had a higher frequency of perseverative speech during baseline and therefore, the y-axis for her graph ranges from 0 to 80. Over the course of the baseline stage, Ingrid engaged in perseverative speech an average of 31.6 times with a range from 14 to 62. Due to the unstable data during baseline, intervention was not implemented for Ingrid.

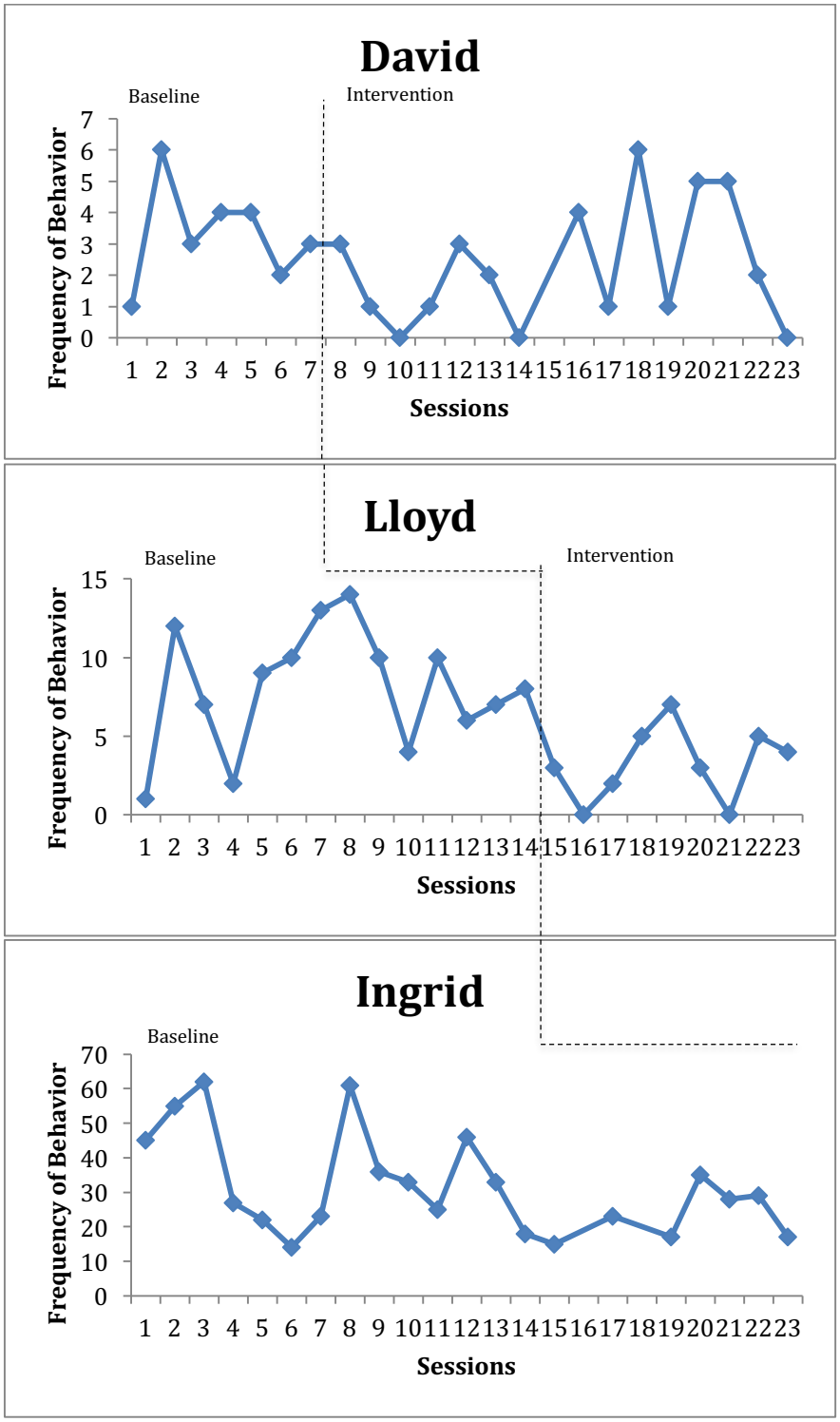



*Figure 1.* The graph depicts the impact of DRL on perseverative speech for three participants.

## Discussion

This study was designed to research the effectiveness of DRL in reducing perseverative speech in students with ASD. The hypothesis was that using DRL as an intervention would decrease the perseverative speech with these students. In the case of Lloyd, the hypothesis was confirmed, as there was an immediate decrease in the frequency of his perseverative speech. Though Lloyd had a low percentage of non-overlapping data, 22%, the range between data points decreased from 1-15, to 0-7. Throughout intervention, the frequency of Lloyd's perseverative speech ranged from 0 to 7, but he consistently remained under the allowed frequency and gained access to his reinforcer every day. The immediacy and consistency of the decrease in frequency following intervention shows that there was a functional relationship between the use of DRL and decreasing Lloyd's use of perseverative speech.

David's data was unstable and therefore his results are inconclusive. The first day of intervention, David did not gain access to his reinforcer, but there was a decrease in frequency of the behavior the following two days. After the second and third day of intervention there was an increase in David's perseverative speech with some bouncing data throughout intervention. Though he engaged in less than the allotted frequency of perseverative speech during nine sessions, there were six sessions in which he engaged in a higher frequency and did not gain access to the reinforcer. David had 20% non-overlapping data throughout the intervention. The high percentage of overlapping data and the unstable data during intervention does not indicate a functional relationship between the DRL and perseverative speech for David.

Overall, there was a decrease in the average frequency of perseverative speech in both participants who received the intervention. David's baseline average was 3.3 and it dropped to

2.3 during intervention. Lloyd's baseline average was 8.1 and it decreased to an average frequency of 3.2. Although there was overlapping data and instability within phases, both participants were able to decrease their overall use of perseverative speech. By decreasing perseverative speech in students with ASD, there are increased opportunities for learning and interactions with others.

The results of the current study are similar to the findings of Kostinas and colleagues (2001), wherein there was a decrease in the perseverative speech. Though the current study had mixed results, this could have been due to the fact that a response cost procedure was not used. The present study only used a system of reinforcement, rather than combining DRL with a response cost procedure. Furthermore, Fisher and colleagues (2013) also used a form of DR, though not DRL, to reinforce appropriate behavior and also observed a decrease in the behavior. This DR system was used to increase on-topic behavior, while decreasing inappropriate, perseverative, behavior (Fisher et al., 2013). Though the current study did not focus on increasing on-topic behavior, the goal of decreasing perseverative, off-topic, speech was the same. DR was successful in reducing inappropriate behavior, just as DRL was effective in reducing the frequency of Lloyd's perseverative speech.

Another study that used DRL in isolation was done by Austin and Bevan (2010) to reduce requests for attention with typically developing students. Though requests for attention are different from perseverative speech, this study showed how effective DRL can be in reducing a problem behavior. The researchers saw an immediate decrease in the frequency of requests, similar to the immediate results seen with Lloyd. Though there was no reversal phase in the present study, the lower rates of perseverative speech over an extended period of time showed

some experimental control. A reduction in perseverative speech increases the likelihood of this student having more appropriate social interactions. Results from the social validity questionnaire showed that the intervention also improved school functioning.

**Limitations and Direction for Future Research**

Although there was a decrease in the frequency of perseverative speech for two participants, the research shows less reliability because control was not able to be shown with the third participant. Another limitation to the research study is the fact that David was absent during one day of his intervention and Ingrid was absent for two days during baseline. This caused a break in the data and created the possibility for confounding variables to influence the participants in this study. Multiple confounding variables occurred during the baseline phase for Ingrid. On day five of the study, she developed a cold sore on the inside of her mouth, causing a decrease in her perseverative speech, as well as her other communicative statements, due to the discomfort. The cold sore was in her mouth for three days during baseline. During the weekend prior to the 14$^{th}$ day of the research study, a medication change occurred and she also had a seizure. Known side effects of her seizures are drowsiness, which could have contributed to the decreased frequency on the day after.

Other limitations include the use of convenience sampling, rather than the use of random sampling. For future studies, the researcher suggests using random sampling and an extended period of time for research. Due to the lack of literature in this area, continued research on the use of DRL with more participants would strengthen the reliability of this intervention. Next steps in researching DRL would be to decrease the frequency of allowed perseverative speech after seeing a stable trend during intervention. A second intervention should begin in which the

student is allowed to engage in a slightly lower frequency of perseverative speech. Due to time constraints, implementing further interventions was beyond the scope of this study.

In conclusion, in this study, the use of DRL demonstrated a reduction in perseverative speech, though more research is needed in the area. As shown, individuals with ASD have difficulty communicating and interacting with others in socially appropriate ways. With decreased rates of perseverative speech, individuals with ASD can more easily communicate and do so in an appropriate manner.

## References

American Psychiatric Association. (2013). *Diagnostic and statistical manual of mental disorders: DSM-5*. Washington, DC: Author.

Arora, T. (2012). Understanding the perseveration displayed by students with autism spectrum disorder. *Education*, *132*, 799-808.

Austin, J.L., & Bevan, D. (2010). Using differential reinforcement of low rates to reduce children's requests for teacher attention. *Journal of Applied Behavior Analysis, 44*, 451-461. doi: 10.1901/jaba.2011.44-451

Berger, N. I., Manston, L., & Ingersoll, B. (2016). Establishing a scale for assessing social validity of skill building interventions for young children with autism spectrum disorder. *Journal of Autism and Developmental Disorders, 46*, 3258-3269. doi: 10.1007/s10803-016-2863-9

Chowdhury, M. & Benson, B. (2011). Use of differential reinforcement to reduce behavior problems in adults with intellectual disabilities: A methodological review. *Research in Developmental Disabilities*, *32*, 383-394. doi: 10.1016/j.ridd.2010.11.015

Fisher, Wayne W., Rodriguez, Nicole M., & Owen, Todd M. (2013). Functional assessment and treatment of perseverative speech about restricted topics in an adolescent with asperger syndrome. *Journal of Applied Behavior Analysis*, *46*, 307-311. doi:10.1002/jaba.19

Kennedy, C. H. (2005). *Single-case designs for educational research.* Boston, MA: Allyn and Bacon.

Kostinas, G., Scandlen, A., & Luiselli, J. (2001). Effects of DRL and DRL combined with response cost on perseverative verbal behavior of an adult with mental retardation and obsessive compulsive disorder. *Behavioral Interventions*, *16*, 27-37. doi: 10.1002/bin.70

Luci, J. (2003). *The effects of sensory motor therapy on the stereotypic movements of children with disorders on the autistic spectrum.* (Doctoral Dissertation) Retrieved from ProQuest Digital Dissertations.

Matson, J., Kiely, S. & Bamburg, J. (1997). The effect of stereotypies on adaptive skills as assessed with the dash-ii and vineland adaptive behavior scales. *Research in Developmental Disabilities*, *18*, 471-476. doi: 10.1016/s0891-4222(97)00023-1

McMillan, J. H. (2016). *Fundamentals of Educational Research* (7th Ed.) Boston, MA: Pearson.

Prizant, B. (1996). Brief report: Communication, language, social, and emotional development. *Journal of Autism and Developmental Disorders*, *26*, 173-178. doi: 10.1007/bf02172007

Rehfeldt, R.A. & Chambers, M. R. (2003). Functional analysis and treatment of verbal perseverations displayed by an adult with autism. *Journal of Applied Behavior Analysis, 36*, 259-261. doi: 10.1901/jaba.2003.36-259

U.S. Department of Health & Human Services. (2014). *Autism spectrum disorder.* Bethesda, MD: U.S. NIDCD Information Clearinghouse.

## Appendix A

Perseverative Speech Data Collection Sheet

**Perseverative Speech Definition**: the repetitive use of language in which students repeat the same word, phrase, or topic (e.g., talking about dinosaurs, asking the same question, etc.) after it has already been addressed. A new occurrence will be counted after the absence of perseverative speech for 30 seconds or if the student begins a new topic within those 30 seconds.

**Baseline Instructions:** Each time the student engages in perseverative speech, engage in the topic with the student/answer the student's question and tally the occurrence in the corresponding time slot.

**Intervention Instructions:** Each time the student engages in perseverative speech, check off one box on their perseverative speech visual and tally the occurrence in the corresponding time slot. If there are only check marks below the red line, engage in the topic with the student/answer the student's question. If there are check marks above the red line on the student's visual, ignore the perseverative speech.

| **Student 1 (David)** | |
|---|---|
| Time | Frequency Tally |
| 9:00-9:30 | |

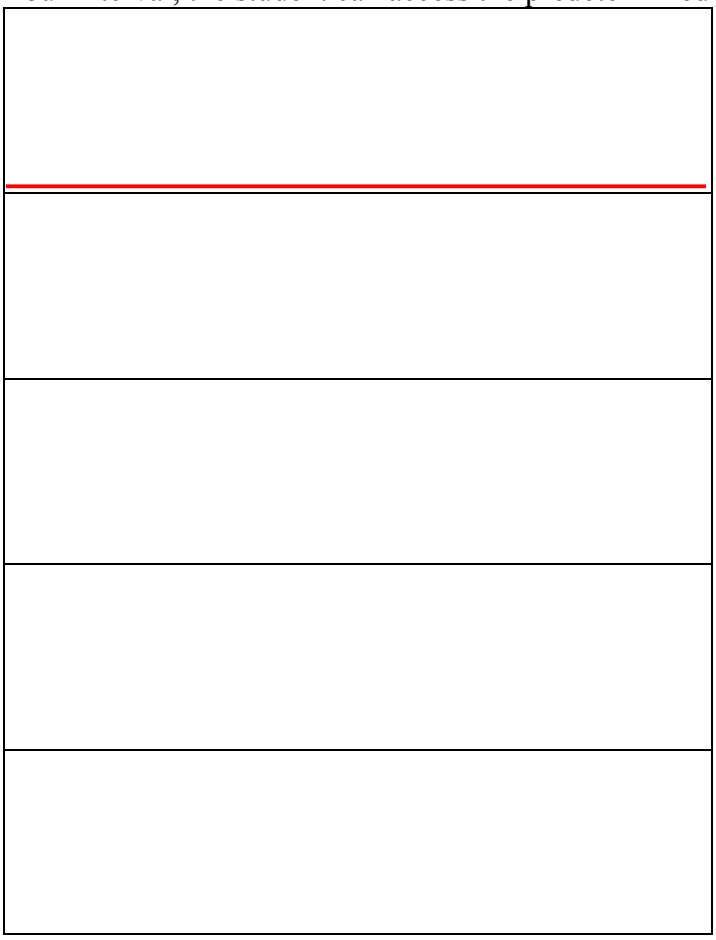
| **Student 2 (Lloyd)** | |
|---|---|
| Time | Frequency Tally |
| 1:30-2:00 | |

| **Student 3 (Ingrid)** | |
|---|---|
| Time | Frequency Tally |
| 9:00-9:30 | |

## Appendix B

Perseverative Speech Visual

During a half hour, _____ can engage in perseverative speech __ times. Upon each occurrence of perseverative speech, a checkmark will be placed in a box. If there are any spaces remaining at the end of the half hour interval, the student can access the predetermined reinforcer, _____.



## Appendix C

Fidelity Checklist

| Date | Time | Student | Signature |
|---|---|---|---|
| | | | |

| Question | Yes | No |
|---|---|---|
| Did they reinforce the student when the frequency was less than the specified number? | | |
| Was reinforcement provided? | | |
| Was the visual in view of the student? | | |
| Did the instructor check off a box each time the student engaged in the behavior? | | |
| Did the instructor acknowledge the behavior each time there were still empty boxes? | | |
| Did the instructor ignore the behavior once the student went over the specified number? | | |

## Appendix D

Social Validity Questionnaire

| Questions: | | 1 Strongly disagree | 2 Disagree | 3 Agree | 4 Strongly Agree |
|---|---|---|---|---|---|
| 1 | This treatment was effective | | | | |
| 2 | I found this treatment acceptable for increasing the student's skills | | | | |
| 3 | Using the treatment improved skills across multiple contexts (home, classroom, community) | | | | |
| 4 | I think the student's skills would remain at an improved level even after the treatment ends | | | | |
| 5 | This treatment improved school functioning | | | | |
| 6 | This treatment quickly improved the student's skills | | | | |
| 7 | I would be willing to carry out this treatment myself if I wanted to increase the student's skills | | | | |
| 8 | I would suggest the use of this treatment to other individuals | | | | |
| 9 | This treatment decreased the level of stress experienced by the student's instructors | | | | |