EFFECTIVE STUTTERING TREATMENT FOR PERSONS WITH AUTISM SPECTRUM DISORDERS: A SINGLE-SUBJECT DESIGN STUDY

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Abstract

Effective Stuttering Treatment in Persons with Autism Spectrum Disorders: A Single-Subject Design Study

This study investigated the efficacy of treating stuttering in an adult with an Autism Spectrum Disorder (ASD) who stutters. Past studies have reported a high prevalence of fluency disorders in persons on the autism spectrum. Even though a large percentage of persons with ASD stutter, there have been no published studies examining stuttering treatment efficacy in this population. There is a need in the field of speech language pathology for evidence based stuttering treatment programs for persons with ASDs. This study was a single-subject design with an adult male diagnosed with an ASD and severe stuttering who had been undergoing social-pragmatic language therapy for several years. Baseline data collection was completed for the affective, behavioral, and cognitive components of stuttering. Once stable baselines were established, a rule-based fluency treatment program that targeted the behavioral component of stuttering was implemented. Treatment progressed from the word-level to the sentence-level to conversational speech. Conversational speech samples were collected and analyzed for percent stuttered words (%SW) in and outside the clinic with the clinician, unfamiliar listeners, parents, and friends. Throughout stuttering treatment, the participant reduced his %SW significantly and was able to maintain a high level of fluency during the withdrawal and second treatment phases. As expected, affective and cognitive measures of stuttering remained relatively unchanged throughout treatment. These results suggest that a rule-based fluency program holds promise at reducing %SW in persons with ASD who stutter. Future directions include replicating our findings with additional participants and identifying participant variables critical to treatment success.

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Chapter 1: Introduction

A wide range of disorders can impair communication in both children and adults. Speech-language pathologists (SLPs) are responsible for the evaluation, diagnosis, and treatment of communication disorders in a variety of settings including school systems, hospitals, and private practices (American Speech-Language-Hearing Association, 2007). Speech and language disorders can affect a person's ability to understand or produce spoken, written, and nonverbal language, to produce sounds accurately, and/or to attend to tasks for an extended period of time. These communication disorders manifest themselves differently in different people. For example, persons with Autism have specific impairments in communication that differ from people who have fluency disorders.

Unfortunately, it is possible for people to exhibit more than one communication disorder. When this happens, SLPs rely on their clinical expertise, the needs of the client, and supporting research to diagnose and provide treatment (ASHA, 2004). Although there is much research available about the treatment of communication impairments related to autism and the treatment of stuttering when they occur singularly (Ozonoff & Miller, 1995; Crooke, Hendrix, & Rachman, 2008; Garcia Winner, 2005; Gray, 1994; Runyan, & Runyan, 2007; Bloodstein & Bernstein-Rater, 2008), there is limited published research regarding the assessment and treatment of stuttering in persons who also have an Autism Spectrum Disorder (ASD).

There is minimal research published regarding the prevalence of these two conditions occurring simultaneously. About 1% of adults stutter (Guitar, 2006) and 1 in 110 children are diagnosed with an ASD every year (Rice, 2009). There is some indication that the co-occurrence of these two disorders is quite high. In a study conducted by Shriberg, Paul, McSweeny, Klin, Cohen, & Volkmar (2001), it was found that two thirds of persons with Asperger Syndrome and 40% of speakers with high functioning autism produce disfluent speech on more than 20% of utterances. The most common types of disfluencies were sound, syllable, and word repetitions. Disfluencies occurred more frequently in sentences of greater grammatical complexity (Shriberg et al, 2001). Shriberg and colleagues did not speculate as to the underlying cause of these disfluencies; disfluencies could be due to motor sequencing difficulties and/or linguistic planning deficits. Despite such a large percentage of persons on the autism spectrum who exhibit some type of stuttering behavior, SLPs currently have little evidence-based research to support stuttering intervention in this specific population. In order to understand the relationship between autism and stuttering and how to go about treating the two disorders, it is important to have a basic understanding of each individual condition. The follow sections provide information on each disorder's definition, associated communication impairments, and treatment considerations.

Chapter 2: Literature Review

Autism Spectrum Disorders

According to the Diagnostic and Statistical Manual of Mental Disorders – IV Text Revision (DSM-IV-TR), Autistic Disorder (AD) is characterized by impairments in social interactions and communication skills along with the presence of restricted and repetitive behaviors or interests (American Psychiatric Association, 2000). This paper will use the term Autism Spectrum Disorder (ASD) to refer to the conditions similar to AD (Autism, Asperger Syndrome, Pervasive Developmental Disorder, Not Otherwise Specified). Specific communication impairments associated with ASD include the delay in or lack of development of spoken language, poor topic initiation and maintenance skills, stereotyped and repetitive use of language (i.e. repeating utterances spoken aloud by others or only talking about one specific topic), and the lack of spontaneous social play (American Psychiatric Association, 2000). In addition to delayed language development, persons with ASD have a variety of other communication impairments. Children and adults on the autism spectrum often exhibit: incorrect use and interpretation of the suprasegmental aspects of speech, difficulties with language comprehension (especially in conversational situations), and poor pragmatic language skills (Tager-Flusberg, Pauls, & Lord, 2005).

Along with the above impairments, persons with ASD typically present with poor theory of mind skills (Solomon, Ozonoff, Carter, Caplan, 2008; Baron-Cohen, Leslie, Frith, 1985), which can be defined as the ability to take the perspective of others (Toth and King, 2008). In a study conducted by Baron-Cohen et al, researchers found that 80%

of autistic children presented with poor theory of mind skills (Baron-Cohen, Leslie, Frith, 1985). Because so many of the children with autism in this study failed to take the perspective of someone else during a controlled test, Baron-Cohen and colleagues concluded that poor theory of mind in autistic children represents an impairment specific to that population, a finding since replicated by others (Baron-Cohen, Leslie, Frith, 1985; Frith & Happe, 1999).

Language is important for development and maintenance of theory of mind (Tager-Flusberg, 2007; Astington & Baird, 2005). Many children with autism rely on their knowledge of syntax and semantics when using theory of mind skills (Tager-Flusberg, 2007). Theory of mind deficits will impair a person's ability to make inferences about abstract concepts underlying appropriate language use across varying contexts. For example, Baron-Cohen, Leslie, and Frith (1986) studied picture description tasks in which children with high-functioning autism had to infer the mental states of people in the pictures and then describe what was happening. They found that the children on the autism spectrum used fewer mental-state terms than control groups when describing these types of pictures. However, when describing pictures that required no theory of mind skills, the children with ASD performed better than controls. This impairment in using language to describe mental states can have implications in adult-like communication events. For example, if someone applying for a job is unable to infer what qualities the employer is looking for, he would probably fail to describe those qualities in an interview. Or, in any type of social relationship, someone without theory of mind would find it difficult to sympathize or empathize with his or her partner; these

are important skills for any successful relationship. This is why it is beneficial for SLPs to provide treatment for social-pragmatic language for persons on the autism spectrum.

Speech and language interventions for persons with ASD typically focus on improving social-pragmatic skills such as understanding emotions and perspective taking (Attwood, 2000; Solomon, Goodlin-Jones, & Anders, 2004). This involves increasing the person with ASD's awareness of the appropriate way to communicate in a given situation and developing his theory of mind skills so that he is able to take the perspective of and interpret the feelings of others (Ozonoff & Miller, 1995). It is crucial that SLPs address perspective taking in therapy; improving a person with ASD's theory of mind skills will not only improve social-pragmatic skills, but may also increase overall social competence (Garcia Winner, 2005).

Social-pragmatic intervention refers to treating a person's ability to use language across a variety of settings and social situations, with different communication partners and communicative intents. Increasing awareness of social communication skills is an important strategy when treating social-pragmatics in persons with ASD. This involves being able to use, recognize, interpret, and react to different body language and facial expressions as well as appropriate turn-taking, topic initiation, and eye contact. Without first establishing the client's awareness of the difference between appropriate and inappropriate communication skills, it will be difficult to teach him how to act appropriately in different social situations. Intervention aimed at improving social-pragmatic language will yield little or no generalization to real-world situations without first establishing awareness of social cues and developing the cognitive skills required to use and interpret them (Crooke, Hendrix, Rachman, 2008).

Increasing awareness of appropriate pragmatic language, as well as improving theory of mind skills, are steps involved in social-pragmatic intervention of persons with ASD. But what is the best method of administering such treatment? Very often, persons on the autism spectrum have trouble understanding social norms and altering their communicative behavior to adapt to different contexts (Crooke, Hendrix, & Rachman, 2008). In other words, persons with ASD do not posses social-pragmatic skills such as knowing how to introduce appropriate topics based on a specific context and using nonverbal communication. Treatment should play to the strengths of persons with ASD in order to obtain maximum results. One such strength is an ability to succeed when attempting rule-based tasks (Minshew, Goldstein, Muenz, & Payton, 1992). In theory, persons with ASD can be taught the rules of social communication in a literal, structured manner. This would lead one to believe that using a rule-based intervention program would yield clinical and functional results.

A rule-based treatment program involves defining specific skills that the person with ASD can apply to different communicative situations and teaching him to use those rules when interacting with others (Crooke, Hendrix, & Rachman, 2008). Social Stories (Gray, 1998) are an example of an intervention program for persons with ASD that utilizes both their preference for visual stimuli but also their ability to learn concrete "rules" of interactions. Social Stories are visual representations of social situations in which an individual on the autism spectrum does not know how to react or communicate. The SLP and person with ASD determine a topic (i.e. playing on the playground, eating lunch with friends, meeting new people). They work through the situation together writing down thoughts, ideas, and solutions to any problems that arise. Once the stories

are created, the scripts are then used in real-life situations to facilitate appropriate social pragmatic interactions (Gray, 1998).

Rule-based intervention programs for persons on the autism spectrum can be effective in other areas beyond social skills. Ozonoff and Miller (1995) used group therapy focused on teaching specific communication and social skills (e.g., rules for topic maintenance, appropriate methods of giving compliments, and expressing nonverbal signals appropriately) as well as theory of mind tasks (e.g., leading a blindfolded partner through a maze, role-playing different perspective-taking scenarios). Results showed that using a systematic, rule-based approach in teaching theory of mind skills to young adults with autism improved their performance on several perspective-taking tasks (Ozonoff & Miller, 1995).

In addition to difficulties in theory of mind skills, anxiety can also contribute to poor social skills in persons with ASD. Leyfer et al (2006) noted that some symptoms of anxiety, such as negative reactions to changes in environment, are so similar to core ASD symptoms that some professionals confuse them for characteristics of ASD. The authors found that anxiety in children with ASD is usually focused on something specific (e.g., transitions between activities or loud noises). Bellini (2004) conducted a study to determine whether or not different types of anxiety are more common in adolescents with ASD than those without ASD. The researchers used the *Social Anxiety Scale for Adolescents* (SAS-A), which is a self-report measure that assesses three factors of anxiety: Fear of Negative Evaluation, Social Avoidance and Distress -New Situations, and Social Avoidance and Distress-General. They found that adolescents with ASD exhibited high levels of social anxiety. When compared to community samples from

adolescents without ASD, half of the ASD sample scored above the cutoff score for high social anxiety (Bellini, 2004).

Social anxiety can make it difficult for individuals to communicate, whether or not they are on the autism spectrum. It occurs in some persons with ASD and is also present in some persons who stutter (Iverach, Jones, O'Brian, Block, Lincoln, Harrison, Hewat, et al, 2009). Treatment for ASD and for stuttering can address social anxiety as it relates to communication. Therefore, it is important for SLPs to consider how the symptoms of these disorders interact in order to address treating them simultaneously.

Clearly, Autism Spectrum Disorders are complex in nature and require communication treatment across several domains. The presence of an ASD can severely impact an individual's ability to communicate effectively. ASDs present themselves differently in different persons. Similarly, stuttering is a complex disorder that presents itself differently from person to person. Stuttering also makes communicating difficult across contexts and should be examined from a multidimensional point of view.

Stuttering

The American Speech and Hearing Association (ASHA) states that the evaluation and treatment of fluency disorders fall within the scope of practice of licensed SLPs (American Speech and Hearing Association, 2007). It is important for SLPs to be knowledgeable about stuttering characteristics so that they can provide the most effective treatment.

Stuttering has been defined as not only an impairment of the fluency of speech, but also in the "rate, pitch, loudness, inflectional patterns, articulation, facial expression,

and postural adjustments of the speaker" (Bloodstein & Bernstein-Ratner, 2008, p. 1). It is important to note the difference between stuttered disfluencies and non-stuttered disfluencies, since everyone produces some amount of disfluent speech. For the purposes of this paper, the term *stuttering* will be used to describe stuttering events such as part word repetitions, sound prolongations and blockages in airflow. These types of disfluencies are contrasted with non-stuttered disfluencies which include repeating whole words or phrases, revisions, and interjections. Like stuttering, these non-stuttered disfluencies can significantly interfere with a person's communication if they occur frequently. When they are coupled with tension in the neck or articulators, they are considered to be stuttering events. Part word repetitions (c-c-car), prolongations (i.e. ssssay), and blocks (a large burst of air preceding or in the middle of a word), are examples of true stuttering events and are often accompanied by some type of tension (American Psychiatric Association, 2000).

Stuttering symptoms and treatment can be characterized into three distinct components: affective, behavioral, and cognitive. The affective component of stuttering focuses on how the person who stutters (PWS) feels about his stuttering and the emotions associated with talking (e.g., anxiety, fear, and shame). If a PWS has negative feelings about his speech, he could become frustrated over time, embarrassed about his speech, and may speak less frequently due to the expectancy and fear of stuttering (Guitar, 2006; Yaruss, 2001).

The behavioral component narrows in on the actual act of stuttering. Examples of stuttering behaviors include the number of stuttered words in a sentence, the type of

stutter, and severity of the stuttering event, and behavioral avoidance of words and/or speaking situations (Guitar, 2006).

The cognitive component of stuttering refers to the PWS's awareness of his stuttering. This includes the PWS's negative evaluation of his speech as well as accepting himself as a PWS (Yaruss, 2001). Treatment of stuttering can focus on just one of the above components or all three. It is up to the SLP and client to determine which approach would be most beneficial for the person who stutters.

One popular stuttering intervention approach is stuttering modification, which is aimed at changing the way in which a PWS stutters to eventually lead to more fluent speech (Manning, 2001). Stuttering modification works to increase fluency by either changing how the PWS feels about his speech or by altering the way he stutters. During stuttering modification treatment, the PWS first goes through an identification phase – pointing to places of physical tension when speaking and talking about feelings associated with stuttering. Then, the PWS moves on to practicing stuttering in different, less tense ways. For example, during stuttering modification therapy, the PWS would be taught to release tension during moments of stuttering by lengthening sounds in words. Immediate awareness of stuttering events in one's own speech while speaking, therefore, is a critical factor in the success of a stuttering modification treatment program.

The cognitive and affective components of stuttering are targeted through this process of identifying stuttering events and reflecting on the associated feelings. Awareness of one's own feelings and attitudes towards his speech, therefore, is a critical factor in the success of a stuttering modification treatment program. Without an awareness of how stuttering makes one feel when speaking with his friend compared to

when speaking with his employer, the PWS would have extreme difficulty overcoming feelings associated with stuttering. Stuttering modification is similar to behavior modification and includes techniques such as systematic desensitization of the fear of stuttering, operant conditioning to provide either punishment for stuttering or reward for fluent speech, and altering the person who stutter's speech to increase fluency (Bloodstein & Bernstein-Ratner, 2008).

An alternative approach to stuttering intervention is fluency shaping, which attempts to modify the PWS's total speech pattern to achieve fluency (Hillis, 1997). The overall goal of fluency shaping approaches is to teach a new way of speaking that is incompatible with stuttering. One type of fluency shaping treatment is the Fluency Rules Program (FRP), developed by Runyan and Runyan in 1981 and subsequently updated (Runyan & Runyan, 2007). Developed for school-aged children who stutter, the FRP consists of a set of well-defined rules addressing speech production to decrease stuttering. Runyan and Runyan (1986) found that the FRP was effective at reducing the percentage of syllables stuttered (%SS) in children in a public school, without ultimately reducing the children's rates of speech or amount of words spoken. The universal rules, which are used for every FRP client, include: *Speak slowly, Say each word only once, and Say it short* (Runyan & Runyan, 2007). These rules attempt to make it easy for the child to adapt his manner of speaking to reduce stuttering. If the universal rules do not decrease stuttering, the FRP has a series of more specific rules for the SLP and child to use.

Determining which type of stuttering intervention to implement is highly dependent on characteristics of the PWS. For example, if the PWS has an extremely negative attitude about his speech or has anxiety during speaking situations, a therapy

approach that targets the affective component of stuttering could be beneficial. However, targeting emotions associated with stuttering would be close to impossible for a client who is highly unaware of those emotions. With the different approaches to stuttering treatment requiring different levels of attention, awareness, and cognitive skills from the client, it is important to consider strengths and weaknesses of the PWS when choosing a stuttering treatment program. For persons on the autism spectrum, this task can become extremely difficult due to their lack of awareness of their stuttering behaviors and their difficulties in identifying their own emotions.

Treating Stuttering in Persons with Autism Spectrum Disorders

Often times in therapy, when multiple communication domains are impaired and would benefit from treatment, one approach is to address the area of impairment that is in most need of intervention (Brookshire, 2007). For a person with ASD who stutters, this could often mean ignoring his stuttering and focusing on improving social language skills. Other times, however, it might be possible to treat both conditions simultaneously. As SLPs rely more and more on evidence-based practice, it is crucial that they look to the published research to determine the best way to treat stuttering in persons with ASD. Unfortunately, no published research studies exist that describe treatments for persons who exhibit both ASD and stuttering.

Scaler Scott and Sisskin (2007) stated that due to limited research on this topic, questions about prevalence of stuttering and ASD occurring simultaneously and prognosis for improvement remain unanswered. Sisskin (2006), presented two case studies of persons, ages 7 and 17, each with an ASD and disfluent speech. She noted that

the disfluencies observed in these two cases were not similar to those of developmental stuttering. Instead, she noted final part-word repetitions and mid-syllable insertions as common disfluencies in both cases (Sisskin, 2006).The lack of published research about persons with ASD who stutter is unfortunate because, as stated before, it appears that the two disorders may co-occur fairly frequently (Shriberg et al, 2001). While Shriberg et al (2001) were able to report that a high percentage of persons with ASD stutter, it is important to consider the fact that they did not set out to study the prevalence of stuttering in persons with ASD. Instead, these researchers' primary goal was to profile the speech and prosody characteristics using standardized assessment tools in this population. Their participants were 30 males with either High-Functioning Autism or Asperger Syndrome with relatively high functioning levels compared to many individuals on the autism spectrum. In addition to the speech disfluencies noted above, many of these participants exhibited significant prosodic abnormalities. This is important when considering speech treatment outcomes, particularly in the area of speech naturalness (Martin, Haroldson, & Triden, 1984). For example, one may be fluent but aprosodic, which will impact ratings of speech naturalness.

Another important consideration when determining the best stuttering treatment in persons with ASD is whether or not they are aware of their disfluencies. As with social-pragmatic treatment, awareness again becomes a critical factor in the planning and executing of treatment (Scaler-Scott, Grossman, Abendroth, Tetnowski, & Damico, 2007). When planning treatment of stuttering in persons with ASD, it seems reasonable to first attempt to establish consistent awareness of the affective, behavioral and cognitive components of their stuttering problem. However, this is not always possible for persons

with ASD due to their lack of theory of mind skills and difficulties with emotional processing. Fortunately, there is a stuttering treatment program – the Fluency Rules Program – that does not require the PWS to develop an advanced awareness of his stuttering. Also, treatment tasks in the FRP play to the rule-based learning techniques described earlier in persons with ASD. Although some awareness is required (e.g., being able to self-monitor speaking rate and identify moments of disfluency), a deeper awareness of emotions and feelings towards stuttering is not required in the FRP.

As mentioned earlier, the treatment of social-pragmatic skills in persons with ASD should focus heavily on the rules of communication. The purpose of this paper is to determine if applying a rule-based fluency intervention program – such as the FRP – to a pre-existing social-pragmatic intervention program will result in a decrease in percentage of stuttered words in an adult with ASD. It is hypothesized that applying such a program will reduce the frequency and severity of stuttering present in an adult with ASD who stutters.

Chapter 3: Method

Design

This is a single-subject ABAB design in which: A1is a baseline data collection phase for stuttering behaviors and continued social pragmatic treatment; B1is a stuttering treatment phase using the Fluency Rules Program (FRP) with ongoing social pragmatic treatment; A2 is a withdrawal phase with no stuttering treatment and no social pragmatic treatment; and B2 is a stuttering treatment phase with FRP and social pragmatic treatment.

This research study was conducted over the course of 27 weeks – nine weeks of baseline data collection (A1), ten weeks of treatment (B1), five weeks of withdrawal (A2), and three weeks of additional treatment (B2). On average, the participant attended two, 50-minute therapy sessions per week during the baseline and treatment phases. In total, the participant attended 45 sessions.

Participant

The participant was a 21-year-old male with a diagnosis on the Autism Spectrum and severe stuttering who was taking Prozac and Wellbutrin during this study. When this study began, he had been receiving social-pragmatic services for three years focused on improving his social-pragmatic skills – specifically his ability to use appropriate greetings, topic maintenance, identification of emotions, and perspective-taking. The participant had not received any documented stuttering therapy. One year prior to the initiation of this study, the participant had received a stuttering evaluation at our clinic, in which he stuttered on 15.75% of spoken syllables. The decision was made at that time to

focus on social-pragmatic deficits and not on stuttering. The current study began a year later after the participant's family noted that his stuttering was interfering more with communication and they asked if it could be addressed in treatment. . The participant expressed an interest in receiving therapy focused on reducing his stuttering and signed a contract outlining the details of the study in which he agreed to participate.

Social-Pragmatic Skill Level

In order to develop a complete understanding of the participant's speech and language skills as well as his adaptive behavior skills prior to this study, the *Clinical Evaluation of Language Fundamentals – Fourth Edition* (CELF-4) and the *Vineland Adaptive Behavior Scale – Second Edition* (Vineland-II) were administered. The CELF-4 was administered to obtain data on the participant's overall receptive, expressive, and pragmatic language skills. The CELF-4 is standardized for ages 5-21 and consists of subtests that examine formulation of sentences, knowledge of word definitions, understanding spoken paragraphs, and phonological awareness, among others. The researcher, the participant's parents, and a third party who knows the participant well independently completed the Pragmatic Profile of the CELF-4 to compare judgments about the participant's current pragmatic language skills. This profile provided the researcher with valuable information about the participant's pragmatic language skills outside of the clinical setting.

The CELF-4 has been normed on a population of 2650 children ages 5-21 and is representative of the US population (Semel, Wiig, & Secord, 2003). The CELF-4 is a reliable and valid measure of a person's overall language skills (Semel, Wiig, & Secord,

2003). This standardized measure was chosen because of its comprehensive nature. The CELF has been considered one of the top three standardized tests used by SLPs when testing both expressive and receptive language skills (Wilson, Blackmon, Hall, & Elcholtz, 1991). Results from this assessment can be found in Table 2 and Table 3.

The *Vineland Adaptive Behavior Scales – 2* (Vineland – II) was administered to the participant to further evaluate his current skill level across a variety of domains. The Vineland-II is normed for ages birth through 90 years. It has a standard score of 100 with a standard deviation of 15 (Sparrow, Cicchetti, and Balla, 2005) The Vineland-II expanded interview was used to assess the participant's daily functioning skills in domains such as communication, socialization, and daily living skills. Results from this assessment can be found in Table 4.

Based on the results of the CELF-4 and Vineland-II, the participant presented with weaknesses in receptive, expressive, and pragmatic language. Also, based on results of the Vineland-II, the participant presented with weaknesses in socialization skills including interpersonal relationships and coping skills. These results are consistent with the participant's diagnosis of an Autism Spectrum Disorder.

Treatment for Social-Pragmatic Language

During the course of this experiment, the participant continued to undergo therapy focused on improving his social-pragmatic language skills per the course of his treatment program at our clinic. This was done in part to ensure that the rule-based fluency program was responsible for any decrease in %SW, and not a change in social-pragmatic treatment causing that decrease. It was also to ensure that the participant received the

treatment that he wanted and needed in relation to his diagnosis of an Autism Spectrum Disorder.

Specifically, treatment was modeled after Michelle Garcia Winner's Think Social! model (Garcia Winner, 2005). The first step of this treatment was to increase the participant's awareness of nonverbal communication in himself and others. This included identifying the meaning of gestures and body language as well as developing an understanding of nonverbal communication. The next step was to teach the participant to connect that awareness to an emotion. Therapy focused on using facial expressions, body language and environmental cues to make judgments about people's emotions. For example, once the participant was able to look at a picture and accurately identify the emotions of the people in the picture, he would use thought bubbles (written representations of person's thoughts) to connect those emotions to a personal experience or activity. This was aimed at increasing his ability to empathize with others. The final aspect of this treatment program was taking perspective of how other people think. Carol Gray's (1994) Social Stories and thought bubbles were used to teach perspective taking to the participant. After the participant was able to identify how he would feel in a certain situation, he would use thought bubbles to identify how others would react in the same situation.

Treatment of social-pragmatic language skills also involved the creation of a "communication binder" by the participant and the researcher. This binder was divided into different sections for emotions, making friends, body language, etc. The researcher would create visual aids for the participant to use throughout the session and everything

was kept in this binder. The participant frequently would use the binder during therapy tasks, even when not prompted to do so.

Baseline Data for Stuttering

Baseline data collection was conducted for nine weeks, until consistent baselines were obtained in all stuttering-related measures. In order to collect baseline data for stuttering behaviors, the researcher collected data on the three components of stuttering – affective, behavioral, and cognitive. The *State-Trait Anxiety Index* (STAI) (Speilberger, n.d.) and the *Modified Erickson Scale of Communication Attitudes* (S-24) (Andrews & Cutler, 1974) were used to assess the participant's anxiety and his feelings towards his stuttering.

Although no causal relationship between anxiety and stuttering has been empirically established, research suggests that anxiety is related to stuttering (Craig, 1990; Miller & Watson, 1992) and that social anxiety and stuttering co-occur (Iverach, et al, 2009). Therefore, data were taken to establish the participant's level of anxiety before the administration of treatment. The STAI is one of the most frequently used measures of both state and trait anxiety (Bieling, Antony, & Swinson, 1998). It is composed of twenty statements describing how a person feels in a specific situation (state anxiety) and in general (trait anxiety). The PWS ranks each feeling as "almost never, sometimes, often, or almost always." The STAI has been normed for working adults as well as high school students (Speilberger, n.d.).

The S-24 was used to collect baseline data on the participant's attitude towards his stuttering. Manning (2001) describes the S-24 as a "popular and easy-to-administer

scale" which is often used in the clinical setting. It is composed of twenty-four true/false questions related to the PWS's feelings towards stuttering and communication.

The *Perceptions of Stuttering Inventory* (PSI) (Woolf, 1967) was used to assess the participant's awareness of his disfluencies. Researchers consider the PSI to be a cognitive measure, as it assesses the participant's awareness of his stuttering behaviors. The PSI is comprised of sixty statements regarding stuttering characteristics; the PWS checks off the behaviors that are characteristic of his own stuttering. The statements are broken down into *struggling* with speaking, *avoiding* speaking situations, and *expectancy* of stuttering. Results from these measures can be found in Table 5.

A series of conversational samples between the participant and clinician were used to collect data regarding the behavioral aspect of stuttering over a period of several weeks. On average, speech samples contained 450 words of the participant's speech. These samples were transcribed by the researcher using CHAT software (Bernstein-Ratner, Rooney, MacWhinney, 1996). The *Stuttering Severity Instrument – 3* (SSI-3) suggests that %SS be calculated based on samples of at least 200 syllables (Riley, 1994). The researcher used samples of at least 450 words in order to obtain more reliable baseline data for %SW.

Guitar (2006) stated that because stuttering can be difficult to measure and quantify, multiple measures of stuttering should be used when determining whether or not a person's speech consists of non-stuttered disfluencies or stuttering events. Fortunately, clinicians and researchers have developed reliable methods of counting and classifying stuttering events. Yaruss et al (1998) found that both on-line measurement and transcript-based measurement (i.e. recording the person who stutters' speech and

then counting disfluencies) both resulted in similar measurement of quantity and types of disfluencies. By utilizing either a real-time measurement approach or a transcript-based approach (Bernstein Ratner, MacWhinney, 1996), clinicians are able to accurately measure frequency and severity of stuttering.

Treatment for Stuttering

A modified version of The Fluency Rules Program (Runyan and Runyan, 2007) was used as the foundation of stuttering treatment. Treatment began by teaching the participant the three universal rules – *speak slowly, say each word only once, and make each sound short*. The participant was taught the rules and was then asked to write them down until he was able to do so independently across two consecutive treatment sessions.

Once the participant memorized the rules, the researcher and the participant "practiced" fluent speech. This began at the word level (1 word, 2 words, 3 words, 4 words, 5 words) and proceeded to the sentence level. In order to progress from one level to the next, the participant had to produce fluent speech with 90% accuracy in 50 trials across two consecutive sessions. In other words, when speaking at the 2-word level, the participant had to produce at least 45, 2-word utterances without disfluencies two sessions in a row.

These tasks were completed by having the participant repeat words spoken by the clinician and by having him describe pictures. Once the participant reached criteria at the word and sentence level, he was asked to speak fluently in time intervals (30-seconds, 1-minute, 3-minute). Criteria for time intervals were different than above. The participant reached criteria at this level by producing fewer than 5% SW across two consecutive sessions. Refer to Appendix A for the FRP treatment plan used in this study.

Treatment for stuttering was conducted over a period of 10 weeks. The FRP was fully explained to the participant. Rules were presented both verbally and visually and visual cues were used until the participant demonstrated complete understanding of the rules. Conversational probes were taken on the behavioral aspect of stuttering (%SW) during every step of the FRP (word-level, sentence-level, conversation).

Treatment Progression

The treatment period began once baseline data for the behavioral, affective, and cognitive components of stuttering were stable. Treatment for social-pragmatic language was continued throughout the study. Generally, therapy sessions were broken down into an average of 25 minutes of stuttering therapy and 25 minutes of social-pragmatic therapy. Sometimes, however, it was necessary to spend the majority of the session focusing on either stuttering or social language. This meant that some sessions focused solely on stuttering and some focused solely on social-pragmatics.

A five-week withdrawal period of no treatment began when our clinic closed for semester break. During this time, speech samples were obtained outside the clinic by the participant's family, friends, and employers. After this period of no treatment, the participant returned to our clinic and conversational probes were collected to determine if there was a change in %SW during the period of no treatment. Data for %SW were collected in the first session, and the FRP was re-introduced at the conversational level. The second phase of the FRP continued for three weeks until he met criteria.

Within Clinic Measures with Clinician

Throughout the study, conversational speech samples were collected whenever the participant came to individual therapy sessions. During the baseline data collection phase, speech samples were taken during the first 15-20 minutes of the session. When stuttering treatment began, speech sample calculations for %SW was taken at random times throughout the session.

Within Clinic Measures with Unfamiliar Listeners

Once the participant had reached criteria for FRP at the conversational level, random and unfamiliar listeners were brought into the therapy sessions to converse with the participant. This was done in order to determine whether or not the participant could maintain fluency in the presence of unfamiliar listeners. Because the clinician may have acted as an inadvertent cue for fluent speech, he was not always present during the conversations with unfamiliar listeners (Venkatagiri, 2004). The participant's %SW was calculated from these conversational samples.

Out of Clinic Measures with Clinician

Finn (2003) stated that treatment generalization is more likely to occur when treatment is incorporated into the client's real life. In order to analyze the participant's fluency both in the clinical setting and the real world, some sessions were conducted outside of the clinic. The clinician and participant would go out to lunch or go for coffee. Conversations were recorded and data for %SW were calculated from these speech samples.

Out of Clinic Measures with Different Communication Partners

Throughout the course of this study, recordings were taken by a variety of outside listeners including the participant's friends, employers, and parents. These recordings were collected in an attempt to determine whether or not the participant was maintaining fluency out of the presence of the clinic and the clinician. Data for %SW were calculated from speech samples collected from friends and parents. We gave his friends, employers, and parents written instructions about length of speech samples to be collected. Samples from friends and family adhered to written instructions. Unfortunately, speech samples collected in his employment setting were very short (30-45 seconds) and contained mostly employer speech. Therefore, we deemed these samples to be not representative of the participant's speech and we did not analyze them.

Transcription and Coding

Speech samples of an average length of 450 words were recorded using an Olympus Digital Voice recorder outside the clinic and a Marantz CD recorder inside the clinic. Audio files were then uploaded onto a computer and converted to WAV files using FreeRip, a file conversion program. Using the CHAT and CLAN programs contained in the Child Language Data Exchange System (CHILDES; MacWhinney, 2010), researchers transcribed and coded all speech samples obtained. Sonic CHAT mode links audio files to the transcription program (CHAT) and allows transcribers to segment conversational samples as they occur naturally. Thus, the CHAT transcription process begins by dividing the large conversational sample into smaller units. These smaller samples can then be played back and transcribed line-by-line, thus improving

transcription reliability (Bernstein-Ratner, Rooney, MacWhinney 1996). Stuttering events (blocks, prolongations, and part-word repetitions) and non-stuttered disfluencies (whole-word repetitions, phrase repetitions, and revisions) were then coded using CLAN conventions (Bernstein-Ratner, Rooney, MacWhinney 1996). This transcript-based measurement of stuttering was chosen to add to the reliability of the researcher's counting of stuttering events (Bernstein-Ratner, Rooney, MacWhinney 1996).

Reliability

We calculated reliability for transcription accuracy, presence of stuttering events, and presence of non-stuttered disfluencies. For transcription reliability of the 20,000 words spoken by the participant, transcribers agreed on all but one. This disagreement was resolved by a third judge. Once speech samples were transcribed and checked for transcription accuracy, the samples were coded for stuttering events and non-stuttered disfluencies. Each transcript was then printed out and coding of stuttering events and non-stuttered disfluencies were checked by a second listener. The first author was the primary transcriber and coder, transcribing and coding the majority of samples. His transcriptions and coding were checked by a certified SLP (second author). Two additional speech and hearing students transcribed and coded samples. They received training in how to transcribe and code disfluencies. The samples transcribed and coded by these two students were checked for accuracy by either the first or second author.

A minimum of two listeners verified the presence of stuttering events in each transcript. If the first and second listeners disagreed with the original coding of a stuttering event or coding of a non-stuttered disfluency, a third party listened to the

sample and made the final judgment. There were a total of 1,052 stuttering events across all samples. The first and second listeners agreed on 1,049 stuttering events and disagreed on three, resulting in point-to-point reliability of 99%. There were a total of 830 non-stuttered disfluencies across all samples. The first and second listeners agreed upon 828 non-stuttered disfluencies and disagreed on two, resulting in 99% point-to-point reliability.

Chapter 4: Results

Our research question was: will a rule-based fluency treatment program reduce the percent stuttered words in persons with an Autism Spectrum Disorder who stutter? The following sections report visual inspection of the data. It was hypothesized that applying such a program would reduce the frequency and severity of stuttering present in the conversational speech of an adult with ASD who stutters.

Stuttering Behaviors

Data regarding stuttering behaviors are in Tables 6 and 7 and Figures 1 and 3. During the baseline data collection phase, the participant averaged 14.57% SW with a standard deviation of 3.73 in conversational speech, which is considered severe stuttering (Manning, 2001). Typical speech contains less than 2%SW (Van Riper, 1982). Upon initiation of the FRP at the one-word level, the participant's fluency improved during conversational probes to 8.82 %SW. As treatment progressed to the sentence and conversational levels, the participant averaged 3.95% stuttered words with a standard deviation of 2.60 in conversational speech within the clinic. The participant maintained a high level of fluency during the withdrawal period (2.07%SW; standard deviation of 0.27) and during the second treatment phase (2.34%SW; standard deviation of 1.51).

Figure 3 presents celeration lines calculated using Satake, Jagaroo, and Maxwell's (2008) methods for determining clinical significance in single subject designs. A celeration line is a graphic representation of the rate of change in behavior. These lines can represent increase, decrease, or no change in a targeted behavior. We calculated

trend lines for %SW in A1, B1, and B2. This process for calculating trend lines is based on the calculation of medians for each half of the data in a given phase; once determined, these two medians are connected to form a trend line to show the nature of change in behavior within a given phase.

During baseline, the participant had an accelerating line for %SW, indicating that %SW was increasing during this phase. During treatment, the participant had a decelerating line for %SW, indicating that %SW decreased during treatment. During the second treatment phase, the participant's line of celeration was also in decline. This indicates that the trend was for decreasing %SW.

Satake, Jagaroo, and Maxwell (2008) also discuss the methods to determine the magnitude of change due to treatment by examining the standard deviation of baseline data and comparing it to the amount of change seen during treatment. They claim that any data point in the treatment phase that is two standard deviations away from baseline mean is considered a clinically significant change (Satake, Jagaroo, & Maxwell, 2008). Every data point for %SW in the B1, A2, and B2 phase of this study is at least two standard deviations away from the mean during baseline (14.57%SW). This indicates that the FRP treatment was effective at reducing the %SW in the participant's conversational speech.

Non-stuttered Disfluencies

Data regarding non-stuttered disfluencies can be found in Tables 8 and 9 and Figures 2 and 4. When non-stuttered disfluencies (e.g., whole word repetitions, phrase repetitions, and revisions) occur frequently, they can significantly impede successful

communication. During the baseline phase, the participant averaged 10.9% non-stuttered disfluencies with a standard deviation of 4.31 in conversational speech. Percentage of non-stuttered disfluencies in conversational speech dropped to 7.06% upon initiation of the FRP at word-level. Throughout the first treatment phase, the participant averaged 3.18% non-stuttered disfluencies with a standard deviation of 2.99 at the conversational level within the clinic. The participant maintained a low average level of non-stuttered disfluencies during the withdrawal (2.70% with a standard deviation of 1.43) and second treatment phase (1.88% with a standard deviation of 1.24). These data suggest that the participant generalized his rules for fluent speech to the non-stuttered disfluencies that were not targeted in treatment.

Using the same methods described above (Satake, Jagaroo, and Maxwell, 2008), celeration lines were calculated for %non-stuttered disfluencies. During baseline, the %non-stuttered disfluencies had a flat line of celeration, indicating that no change was occurring to the participant's %non-stuttered disfluencies. During both the first treatment phase and the second treatment phase, the participant displayed a deceleration line for %non-stuttered disfluencies, indicating that the FRP was decreasing the percent of non-stuttered disfluencies in the participant's speech.

By examining data points in B1 in relation to the standard deviation from the mean during the A1, researchers could determine the magnitude of change of %non-stuttered disfluencies during the treatment phase (Satake, Jagaroo, & Maxwell, 2008). During treatment, ten out of thirteen speech samples (77%) analyzed were considered to be a clinically significant decrease in %non-stuttered disfluencies from the baseline phase. In other words, ten of thirteen data points in B1 fell below two standard deviations of the

mean during baseline. This indicates that even though the FRP did not target non-stuttered disfluencies, the participant was able to use his rules for disfluencies other than stuttering.

Statistical Analyses of the Data

Due to the number of data points for %SW available in the A1 and B1 phases, we calculated a t-test to see if there were differences between the means of these two treatment phases. The two means were significantly different ($t - 5.73$; $df = 9$, $p = .000$). The %SW was significantly less in the treatment (B1) phase than during baseline (A1).

Qualitative Results

Qualitative reports of increased fluency were also received from the participant's employers and family. The researchers received unsolicited emails from the participant's parents during the first treatment phase in which they stated that he "hardly stutters anymore." The participant's employers, unaware of the current study, also commented that he does not stutter often anymore at work.

Affective and Cognitive Measures

Data regarding the affective and anxiety measures can be found in Table 4. Throughout this study, affective components of stuttering as well as measures related to speaking anxiety remained relatively stable. Data regarding the cognitive component of awareness of stuttering are more difficult to interpret. During the first treatment phase, the participant's score on the PSI decreased slightly. There was a slight increase in the

participant's awareness of his stuttering during the second treatment phase. At maintenance, his score on the PSI returned to baseline level.

Chapter 5: Discussion

Current Study

This was the first controlled study of stuttering treatment in persons on the Autism Spectrum. Previous research on this topic indicates that a high percentage of persons with ASD stutter (Shriberg et al, 2001) and that we currently do not know the best methods of treating both conditions simultaneously (Scaler-Scott & Sisskin, 2007). The current study found similar results to Shriberg et al (2001) in terms of the types of disfluencies seen in persons on the spectrum. Like Shriberg et al (2001), the participant in this study presented with disfluencies found in neurotypical PWS (blocks, sound prolongations, and part-word repetitions usually at the beginnings of words) as well as non-stuttered disfluencies found in neurotypical PWS(whole-word repetitions, phrase repetitions, and revisions). Shriberg et al (2001) reported similar behaviors in their sample of persons with ASD. In contrast, final part-word repetitions and mid-syllable insertions, disfluencies found in two cases reported by Sisskin (2006), were not present in our participant. It is not known if treating the disfluencies found by Sisskin in 2006 using a rule-based fluency program might yield clinical results similar to ours. This merits further consideration, however, because the FRP focuses on how to produce words fluently regardless of the type of disfluencies.

Clinical Implications

The results of the current study indicate that a rule-based fluency program holds promise for reducing stuttering behaviors in persons with ASD who stutter. When the

fluency rules were introduced and taught to the participant in a systematic manner, his %SW decreased significantly and he maintained a high level of fluency during withdrawal and the second treatment phase. Also, this study found that targeting stuttering behaviors using the FRP resulted in a decrease in non-stuttered disfluencies. Because the participant had such a high percentage of non-stuttered disfluencies (10.9% average during baseline), the reduction of these behaviors resulted in much more fluent speech.

An important feature of this treatment study was the relatively simple manner in which the fluency rules were taught to the participant. By dedicating a portion of each treatment session to remind the participant of his fluency rules, he was able to internalize them and use them without much further cueing. This is valuable information for speech-language pathologists in schools, private practices, and university clinics because it tells them that they can implement a stuttering treatment program for persons with ASD that will not interfere with their ongoing social-pragmatic treatment.

The results of this study suggest that persons on the autism spectrum with language impairments can benefit from this stuttering treatment. In contrast to the participants in the Shriberg et al study (2001), the participant in this study presented with language impairments and low adaptive levels based on the Vineland-II. This piece of information is important for clinicians working with persons with ASD who stutter and who also have language impairments because it suggests that strong language skills are not a requirement for successful completion of the Fluency Rules Program.

Awareness can play a significant role in maximizing a client's learning about his stuttering and how to change it (Van Riper, 1973). Our participant had a limited

awareness of social norms and pragmatic language use as well as a limited awareness of his stuttering behaviors. This reduced awareness, however, did not prevent him from succeeding with the FRP. This suggests that although persons with ASDs often struggle with awareness of abstract concepts (e.g. how stuttering makes one feel, predicting when stuttering might occur, knowledge of avoidance behaviors), they have the potential to develop an awareness of their own speech. Level of awareness is different for everyone, whether or not they have an ASD. Therefore, it is important for clinicians to determine if their clients with an ASD have the level of awareness necessary to undergo a rule-based fluency treatment program. We were unsure about what level of awareness would be needed to reduce stuttering behaviors using the FRP. On the one hand, some level of awareness of stuttering is needed in order to change it (Manning, 2001). On the other hand, the research literature is not forthcoming on just how much awareness is enough. This is perhaps due to a lack of reliable and valid measurable tools to quantify amount of awareness. In this study, we used the PSI, a self-report questionnaire of the participant's knowledge of his own stuttering, his avoidance of stuttering events, and his ability to anticipate a stuttering event to measure his awareness. However, the PSI does not provide information about what scores correlate with high, medium, and low levels of awareness. This is unfortunate because without a valid measure of a person's awareness, it is impossible to quantify the relative importance of this variable on treatment success.

Awareness of behaviors other than stuttering has been shown to be a crucial factor in the treatment of social-pragmatic deficits in ASD (Crooke et al, 2008). Perhaps, one could develop tools to measure awareness of stuttering that are similar to those developed for ASD. Of course, this would require a large-scale study with many PWS. One

possible solution, would be to have PWS self-evaluate their speech naturalness pre and post treatment. Although this differs slightly from awareness of stuttering behaviors, naturalness is a variable that can be rated reliability by listeners (Martin, Haroldson, & Triden, 1984).

Future Directions

Clearly, there is a need for more research on how to best treat stuttering in persons with ASD and on the prevalence of these two disorders occurring simultaneously. Although prevalence studies have been conducted (Shriberg et al, 2001), a large-scale investigation on the nature, frequency, and severity of stuttering occurring in persons on all different levels of the Autism Spectrum would assist in developing appropriate treatments. The goal of the Shriberg et al (2001) study was not to document the prevalence of stuttering in persons with ASD. Therefore, a study with this specific purpose is warranted.

Similarly, studies regarding the effectiveness of FRP with persons with ASD should be conducted on a larger scale, with multiple participants on different levels of the Autism Spectrum. By repeating the FRP treatment protocol with more persons with ASD, we will be able to see if it can work for persons with different levels of autism severity. Our participant's strengths in written language and his strong rote memory likely contributed to his success in the use of FRP. His verbal output made it possible for researchers to accurately measure his stuttering behaviors and his ability to internalize and follow rules made it possible for him to comprehend and use the fluency rules. Clearly, it is not relevant for persons who are nonverbal, but it could be effective with

those on the spectrum that have different levels of verbal output. Additionally, identifying other patterns of skill and deficit not present in our participant that could affect treatment outcomes is a worthwhile endeavor.

One aspect of fluency not examined in this study was speech naturalness. Speech naturalness is multidimensional and is largely determined by a person's rate, fluency, and prosody (Ingham & Packman, 1978; Johnson, 1987). Martin, Haroldson, and Triden (1994) created a 9-point speech naturalness scale in which they did not define "speech naturalness" for their raters. A future consideration for this study would be to have listeners rate speech samples for naturalness taken before, during, and after stuttering treatment. It would also be interesting to compare the results of speech naturalness scores of persons with ASD who do not stutter. Because persons with ASD have been known to have abnormal prosodic features in their speech (Shriberg et al, 2001; Paul, Augustyn, Klin, & Volkmar, 2005; McCann & Peppe, 2003) it may be difficult for them to achieve high scores on a naturalness rating scale, even with more fluent speech. However, once a person with ASD who stutters achieves some level of fluent speech, his speech naturalness scores should improve.

This study set out to determine an effective method for treating stuttering in a person with an autism spectrum disorder. The Fluency Rules Program was used in a systematic fashion, resulting in a significant reduction in stuttering behaviors and non-stuttered disfluencies in conversational speech. The results of this study suggest that a rule-based stuttering treatment program may be effective at reducing stuttering in persons with ASD.

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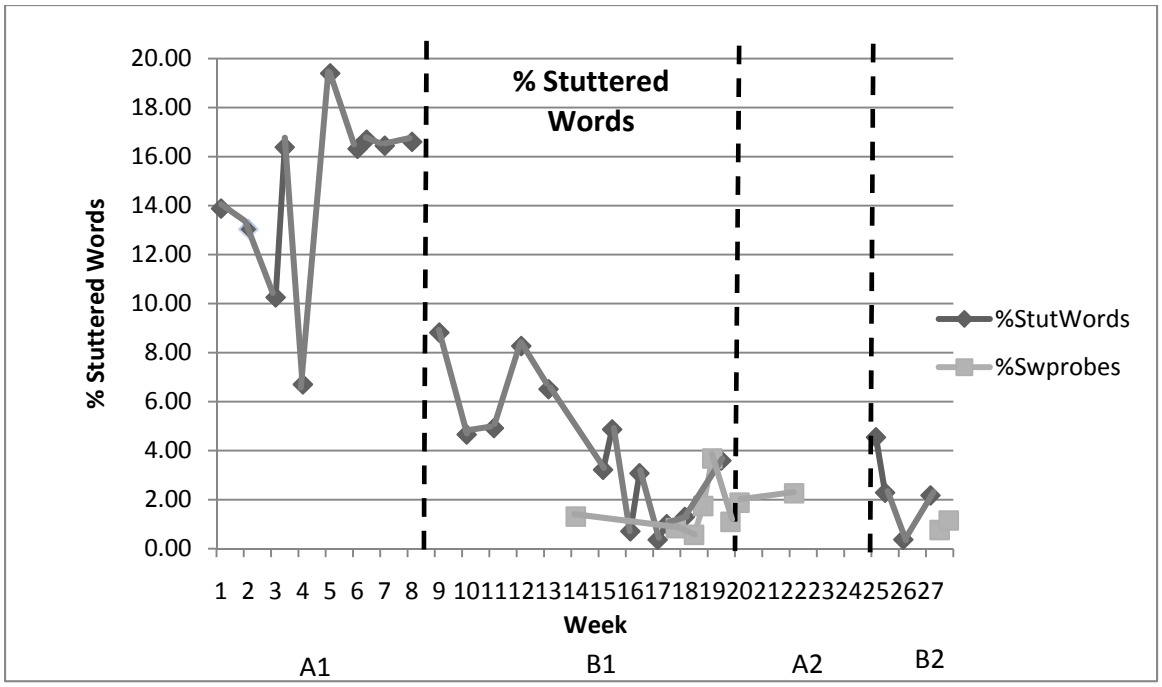

Figure 1. Percentage of stuttered words (%SW) in conversational samples across all phases of the study

Note. Stuttering behaviors include part-word repetitions, blocks, and prolongations.

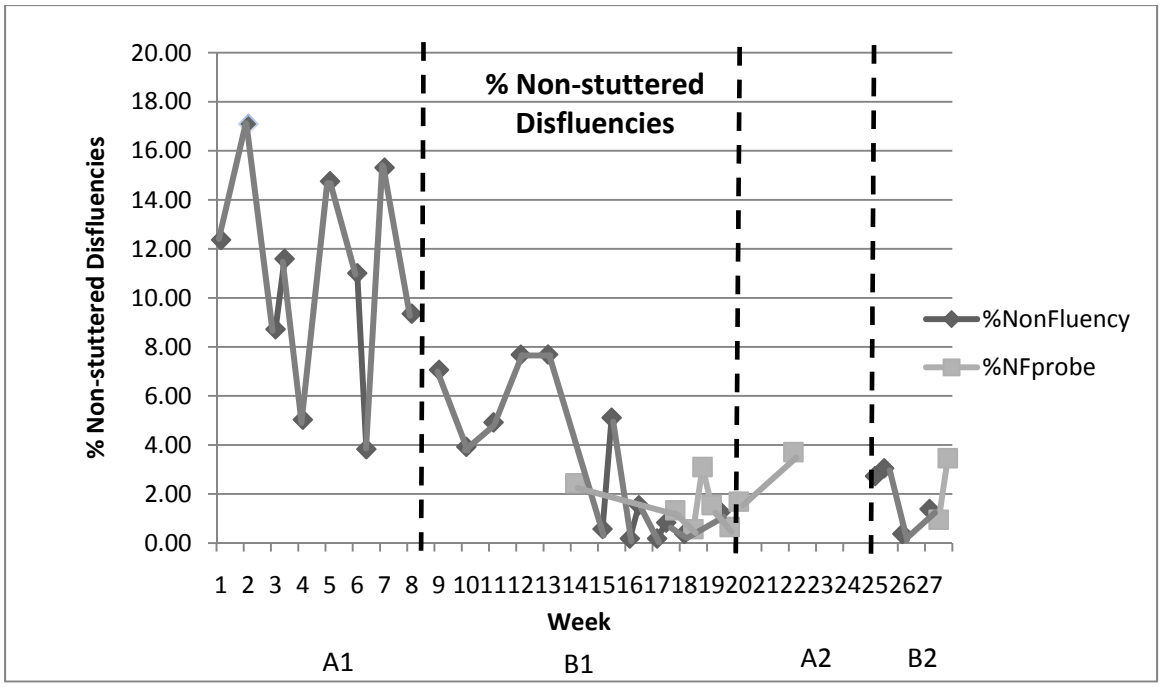

Figure 2. Percentage of non-stuttered disfluencies in conversational samples across all phases of the study.

Note. Non-stuttered disfluencies include whole-word repetitions, phrase repetitions, and revisions.

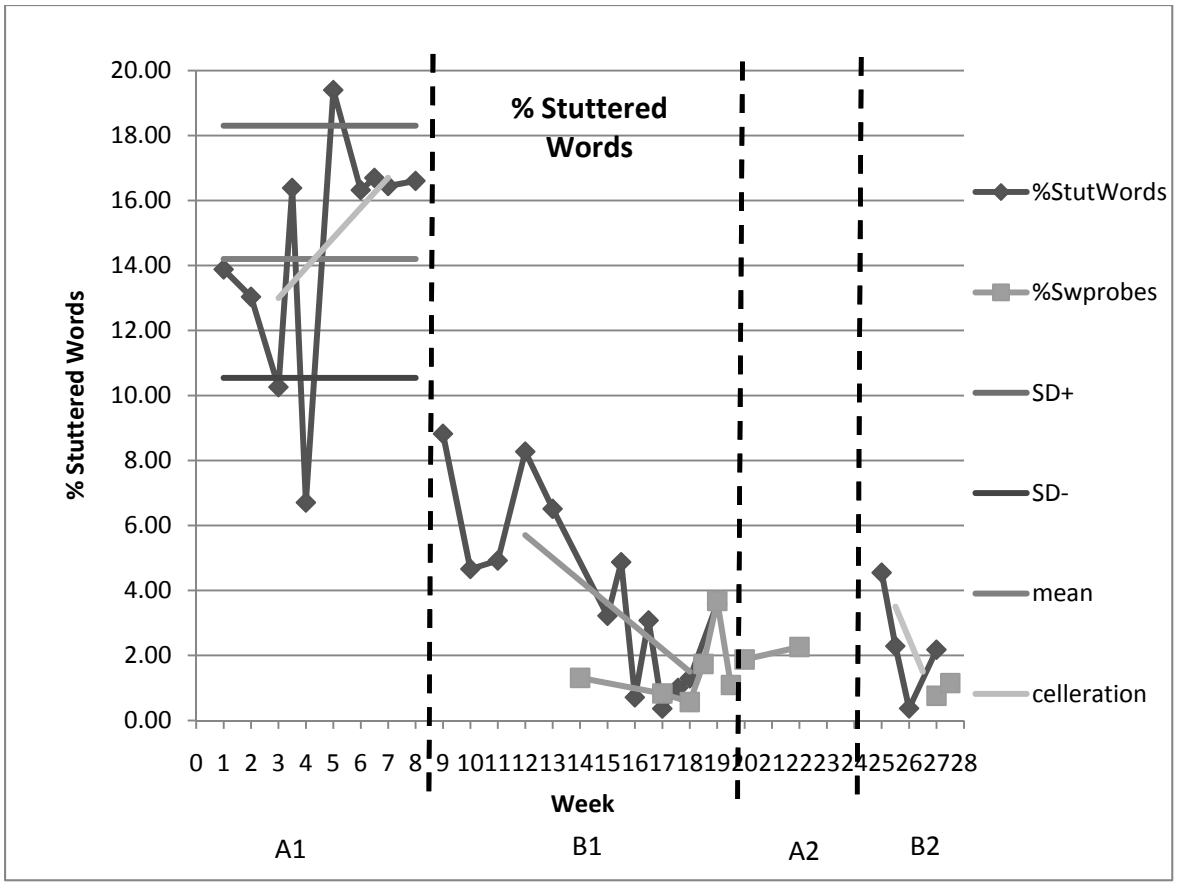

Figure 3. Celeration lines and two Standard Deviations (SD) lines for stuttering behaviors in conversational speech samples during all phases of the study.

Note. Stuttering behaviors include part-word repetitions, blocks, and prolongations

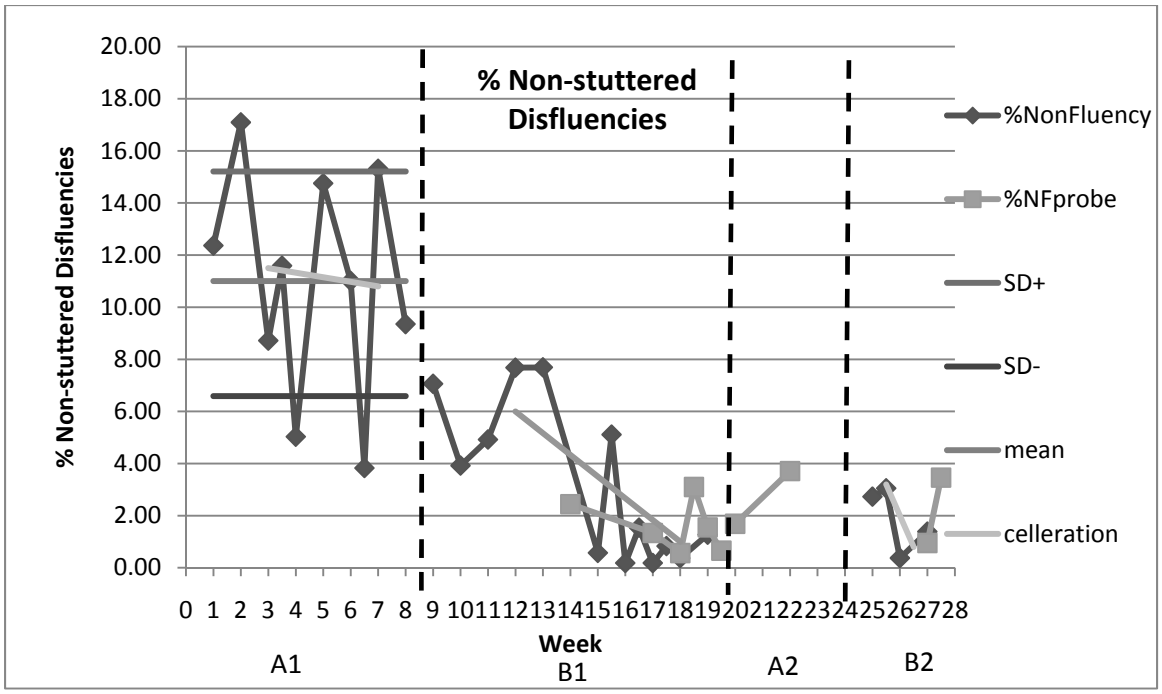

Figure 4. Celeration lines and two Standard Deviation (SD) lines for non-stuttered disfluencies in conversational samples across all phases of the study.

Note. Non-stuttered disfluencies include whole-word repetitions, phrase repetitions, and revisions.

Table 1

Areas of impairment in persons with Autism Spectrum Disorders (ASD), description of deficits, and citations

Area of Impairment for Persons with ASD	Description of Impaired Skill	Citations
Theory-of-Mind	The ability to take perspective of what other people are thinking and distinguish those thoughts from one's own	Solomon, Orzonoff, Carter, Caplan, 2008; Baron-Cohen, Leslie, Frith, 1985; Toth and King, 2008; Tager-Flusburg, 2007.
Pragmatic Language	The ability to appropriately use and comprehend language in different contexts	Tager-Flusberg, Pauls, & Lord, 2005; Young, Diehl, Morris, Hyman, & Bennetto, 2005; Philofsky, Fidler, & Hepburn, 2007
Social Cognitive Skills	Interpreting nonverbal actions, recognizing and responding to social cues,	Garcia Winner, 2005; Attwood, 2000; Solomon, Goodlin-Jones, & Anders, 2004; Crooke, Hendrix, & Rachman, 2008

Table 2

Participant's Clinical Evaluation of Language Fundamentals – 4th Ed. (CELF-4) results

CELF-4 Language Index	Standard Score	Percentile Rank	Interpretation
Core Language Index	79	8	BNL*
Receptive Language	72	3	BNL
Expressive Language	108	70	WNL*
Language Content	100	50	WNL
Language Memory	99	47	WNL
Working Memory	94	34	WNL

*Note. BNL= Below Normal Limits. WNL = Within Normal Limits

Table 3

Participant's Clinical Evaluation of Language Fundamentals – 4th Ed. (CELF-4) results from the Pragmatics Profile

Score from SLP	Score from Mother	Score from Father	Interpretation
88	91	89	Impaired

Table 4

Participant's Vineland Adaptive Behavior Scale – 2nd Ed. (Vineland-II) results

Domain	Standard Score	Sub-Domain	v-Scale Score	Adaptive Level
Communication	36	Receptive	5	Low
		Expressive	9	Low
		Written	11	Mod-Low
Daily Living Skills	67	Personal	9	Low
		Domestic	9	Low
		Community	11	Mod-Low
Socialization	40	Interpersonal Relationships	5	Low
		Play and Leisure Time	7	Low
		Coping Skills	9	Low

Table 5

Scores for affective and cognitive measures of stuttering during the four phases of this study

Test Used	A1	B1	B2	Maintenance
STAI	48, 52, 54, 55, 56	55, 55	57	46
S-24	16, 14, 11, 9, 10	8, 11	9	7
PSI	11, 5, 8	12, 6	16	5

Note. STAI = State-Trait Anxiety Index. Scores range from 20 to 80 with a higher score indicating more anxiety.
S-24 = Modified Erickson Scale of Communication Attitudes. Scores range from 1-21 for persons who do not stutter and 9-24 for persons who stutter.
PSI = Perceptions of Stuttering Inventory. Scores range from 0-60 and are categorized in terms of struggle, avoidance, and expectancy behaviors.

Table 6

Mean and Standard Deviation of %Stuttered words (%SW) for within-clinic conversations during baseline, treatment phase 1, and treatment phase 2

Treatment Phase	Mean %SW	Standard Deviation
Baseline (A1)	14.57	3.73
Treatment (B1)	3.95	2.60
Treatment (B2)	2.34	1.51

Table 7

Mean and Standard Deviation of %Stuttered words (%SW) for out-of-clinic conversational probes during treatment phase 1, withdrawal phase, and treatment phase 2

Treatment Phase	Mean %SW	Standard Deviation
Treatment (B1)	1.54	1.12
Withdrawal (A2)	2.07	0.27
Treatment (B2)	2.34	1.51

Table 8

Mean and Standard Deviation of %non-stuttered disfluencies for within-clinic conversations during baseline, treatment phase 1, and treatment phase 2

Treatment Phase	Mean %non-stuttered disfluencies	Standard Deviation
Baseline (A1)	10.90	4.31
Treatment (B1)	3.18	2.99
Treatment (B2)	1.88	1.24

Table 8

Mean and Standard Deviation of %non-stuttered disfluencies for out-of-clinic conversations during treatment phase 1, withdrawal phase, and treatment phase 2

Treatment Phase	Mean %non-stuttered disfluencies	Standard Deviation
Treatment (B1)	1.61	1.00
Withdrawal (A2)	2.70	1.43
Treatment (B2)	2.21	1.77

Appendix A

Fluency Rules Program Treatment Plan

Cuing Hierarchy

1. Independently
2. Verbal Reminder
3. Visual Cue
4. Full Model

Long Term Goal 1: Client will reduce his %SW to less than 5%SW across all communicative contexts.

Short Term Goal 1.1: The client will produce fluent speech at the single word level in 50 trials with 90% accuracy across two consecutive sessions.

Short Term Goal 1.2: The client will produce fluent speech at the two-word level in 50 trials with 90% accuracy across two consecutive sessions.

Short Term Goal 1.3: The client will produce fluent speech at the three-word level in 50 trials with 90% accuracy across two consecutive sessions.

Short Term Goal 1.4: The client will produce fluent speech at the four-word level in 50 trials with 90% accuracy across two consecutive sessions.

Short Term Goal 1.5: The client will produce fluent speech at the five-word level in 50 trials with 90% accuracy across two consecutive sessions.

Short Term Goal 1.6: The client will produce fluent speech at the sentence level in 50 trials with 90% accuracy across two consecutive sessions.

Short Term Goal 1.7: The client will produce fluent speech in a 30-second period of connected speech with clinician in 50 trials with 90% accuracy across two consecutive sessions.

Behavioral Objective 1.7a: The client will produce fluent speech in a 30-second period of connected speech while discussing a topic likely to increase disfluencies with clinician in 50 trials with 90% accuracy across two consecutive sessions.

Behavioral Objective 1.7b: The client will produce fluent speech in a 30-second period of connected speech while discussing an emotionally neutral topic with clinician in 50 trials with 90% accuracy across two consecutive sessions.

Behavioral Objective 1.7c: The client will produce fluent speech in a 30-second period of connected speech while discussing a topic likely to increase fluency with clinician in 50 trials with 90% accuracy across two consecutive sessions.

Short Term Goal 1.8: The client will produce fluent speech in a 30-second period of connected speech with unfamiliar listener in the therapy setting with 90% accuracy across two consecutive sessions.

Short Term Goal 1.9: The client will produce fluent speech in a 1-minute period of connected speech with unfamiliar listener in the therapy setting with 90% accuracy across two consecutive sessions.

Short Term Goal 1.10: The client will produce fluent speech in a 3-minute period of connected speech with unfamiliar listener in the therapy setting with 90% accuracy across two consecutive sessions.