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Using syllable-timed speech to treat preschool children who stutter: A multiple baseline experiment

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Abstract

This report presents the results of an experimental investigation of the effects of a syllable-timed speech treatment on three stuttering preschool children. Syllable-timed speech involves speaking with minimal differentiation in linguistic stress across syllables. Three children were studied in a multiple baseline across participants design, with percent syllables stuttered (%SS) as the dependent variable. In the week following the initial clinic visit, each child decreased their beyond-clinic stuttering by 40%, 49% and 32%, respectively. These reductions are only evident in the time series after the introduction of the syllable-timed speech treatment procedure. Participants required a mean of six clinic visits, of approximately 30–60 min in duration, to reach and sustain a beyond-clinic %SS below 1.0. The results suggest that clinical trials of the treatment are warranted.

Educational objectives: The reader will be able to summarize, discuss and evaluate: (1) The nature, impact and treatment options available for early stuttering. (2) The syllable-timed speech treatment protocol administered. (3) The advantages of syllable-timed speech treatment for early stuttering. (4) The questions that further research needs to answer about the syllable-timed speech treatment.

Keywords: Stuttering; Syllable-timed speech

1. Introduction

Stuttering usually begins after a period of apparently normal speech development between the second and third years of life (Bloodstein, 1995), as children start to put words together into short sentences. In most cases, the first sign of stuttering is the child repeating syllables (Packman & Attanasio, 2004); however, as stuttering develops the child may start to adopt fixed postures of the speech mechanism and may even show signs of effort and struggle while speaking. The incidence of stuttering, that is the percentage of the population that have stuttered at some point, is around 2.8% (Craig, Hancock, Tran, Craig, & Peters, 2002). On the other hand, the prevalence of stuttering, that is the percentage of the population who stutter now, is around 1% (Bloodstein, 1995). This discrepancy demonstrates that a considerable proportion of children recover naturally from stuttering before they reach adulthood. It is frequently reported that

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between 74% and 85% of children grow out of stuttering (Mansson, 2000; Yairi & Ambrose, 1999); however, these figures needs to be interpreted with caution as they account for the broad stuttering population. Recovery rates in the clinical population are likely to be much lower as children who present to clinics have generally been stuttering for a long period of time with no sustained improvement. A recovery rate closer to 50% of the clinical population (Onslow, Harrison, & Jones, 1993) is more indicative of the actual percentage of children who naturally resolve. At present, it is not possible to predict whether an individual child will grow out of stuttering or will require treatment. Nevertheless, at a population level, the three factors that may predict natural recovery include gender, family history of recovery and age since onset. It seems that more girls grow out of stuttering than boys, and that having a family history of recovery from stuttering may increase a child's chance of recovering naturally (Yairi & Ambrose, 1999). The chances of recovery seem to be best shortly after the onset of the condition, with the odds for recovery progressively lessening the longer the child has been stuttering (Mansson, 2000).

For this reason, the general consensus is for treatment during the preschool years. This is particularly important given that information is available to suggest that chronic stuttering can have adverse effects in young children. Preschoolers have been observed to withdraw, abort utterances and use avoidance strategies to circumvent stuttering which, as a result, may limit their ability to resolve conflicts, lead peers, discuss problems and explain events (Langevin, Packman, Thompson, & Onslow, unpublished results). The overall quality of play for stuttering preschoolers may also be hindered, with children as young as 3 years experiencing negative peer reactions to their stuttering such as teasing and being ignored (Langevin et al., unpublished results). These consequences in the preschool years may foreshadow difficulties in kindergarten and primary school if stuttering does not diminish. During the school-age years, stuttering places children at risk of being bullied (Blood & Blood, 2004), being perceived negatively (Langevin & Hagler, 2004) and being less accepted (Davis, Howell, & Cooke, 2002) than their non-stuttering peers. The long-term negative consequences associated with these reactions to stuttering include low self-esteem, depression, anxiety, psychosomatic symptoms, mistrust of others and truancy (Hawker & Boulton, 2000). Infact, reports have suggested that the majority of stuttering children have been bullied about their stuttering at school (Hugh-Jones & Smith, 1999), and as a result develop negative attitudes towards their speech such as fear and resentment. With such an increased risk of being bullied, it would be expected that school-age children who stutter might experience difficulties transitioning into adolescence and adulthood. In fact, adults who stutter are more likely to present with clinically significant levels of social anxiety (Kraaimaat, Vanryckeghem, & Van Dam Baggen, 2002) and social phobia (Stein, Baird & Walker, 1996) and have greater fear of negative evaluation and trait anxiety than controls (Messenger, Onslow, Packman, & Menzies, 2004). It is also the case that adults who stutter fail to attain occupational potential (e.g., Klein & Hood, 2004) because the majority of occupations in modern Western society are white collar and require communication skills (Ruben, 2000). Consequently, there is a need to search for efficacious stuttering treatments for the early period of a child's life in order to minimize, and possibly prevent, these adverse effects.

Stuttering during the preschool years is potentially amenable to a range of intervention strategies. These intervention strategies can be classified according to whether the treatment is indirect, direct or mixed. Indirect treatments do not specifically target stuttering related speech behaviours. Rather, they aim to modify aspects of the child's environment in order to identify and alleviate stressors that are thought to impact on stuttering. Indirect treatments for early stuttering include: Group Play Therapy (Wakaba, 1983), Teaching and Facilitating Mother–Child Interaction Therapy (Wyatt, 1969), Parent Focused Treatment (Yaruss, Coleman, & Hammer, 2005), The Demands and Capacities Model (Franken, Kielstra-Van der Schalk, & Boelens, 2005) and Parent–Child Interaction Therapy (Millard, Nicholas, & Cook, 2008). Direct treatments do specifically target stuttering related speech behaviours by providing children with strategies to deal productively with stuttering. Direct treatments for early stuttering include: Regulated Breathing (Azrin & Nunn, 1974; Elliot, Miltenberger, Rapp, Long, & McDonald, 1998), Rhythmic Speech Training (Coppola & Yairi, 1982), Speech Restructuring (Shine, 1984) The Comprehensive Stuttering Program (Kully & Boberg, 1991), The Fluency Rules Program (Runyan & Runyan, 1986), and The Lidcombe Program (Jones et al., 2005). Mixed treatments combine elements of both approaches and include the Preschool Fluency Development Program (Culp, 1984), The Intensive Stuttering Therapy Program (Hasbrouck et al., 1987), The Stuttering Intervention Program (Pindzola, 1999) and Fluency Facilitation (Jones-Prus, 1980). Despite the array of treatment options available for early stuttering intervention, it is impossible for clinicians to single out any one particular treatment approach that will work for all children who stutter. Furthermore, few treatments for early stuttering have undergone convincing clinical trials testing (Onslow, Jones, O'Brian, Menzies, & Packman, 2008), making it difficult for clinicians to form educated clinical decisions regarding treatment options. It is crucial, therefore, to add to the inventory of clinical trials evidence for alternative

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treatment approaches, so as to equip clinicians with viable options to address their individual, clinical and institutional needs.

The present paper contributes to the development of a direct style of treatment for early stuttering that is simpler and easier to administer than those described above. It is based on the well-known stuttering suppressor, syllable-timed speech. Syllable-timed speech (STS) involves speaking with minimal differentiation in linguistic stress across syllables and is achieved by saying each syllable in time to a rhythmic beat. This procedure has been known for centuries as being the most powerful agent for the control of stuttering (Ingham, 1984); however, the reason for its effectiveness remains the source of much debate (Andrews, Howie. Dosza, & Guitar, 1982; Fransella & Beech, 1965; Harrington, 1987; Wingate, 1969). One theory, The Syllable Initiation Model (Packman, Code, & Onslow, 2007) proposes that STS is associated with reduced levels of linguistic stress which is thought to be a stuttering "trigger" in those with a vulnerable speech motor system. This theory is directly supported by data linking reduction of speech motor variability with reduced stuttering in adults who stutter (Packman, Onslow, & van Doorn, 1994), and with preschoolers (Packman, van Doorn, & Onslow, 1992). Regardless of the reason, the ameliorative effects of STS are only temporary in adults, presumably because at that time the neural pathways for speech have already become established and are intractable to change. In children however, neural pathways for speech are still being laid down. It is reasonable to predict, therefore, that STS may induce long-term amelioration of stuttering in children before the neural pathways for speech are established.

Despite its promise, research into the use of STS to treat stuttering children has been limited. Andrews and Harris (1964) found that STS, trained in an intensive format using programmed instruction, was an effective inhibitor of stuttering for five children aged 11 years. At 9 months post-treatment however, all children had experienced an increase in stuttering to varying degrees, presumably because their neural pathways for speech were intractable to change. Alford and Ingham (1969) combined a token reward system with STS training and negative practice to treat nine stuttering children, aged between 7 and 10 years. In this study, the group that had received the treatment combination demonstrated a more significant reduction in stuttering than the group that had received the token reward system alone. However, the effect of training STS alone was not examined. Coppola and Yairi (1982) used programmed instruction to train three stuttering preschool children to produce syllables of equal duration in time to a metronome beat. Stuttering decreased in two of the three children after 6 weeks of treatment. However, stuttering was only measured within the clinic.

More recently, Trajkovski, Andrews O'Brian, Onslow, and Packman (2006) reported the use of a STS procedure to treat stuttering in a 3-year-old boy with a 2-year history of stuttering. To address the shortcomings of past research, STS was used in this study at near normal speech rate, with normal intonation, and without the use of programmed instruction. Programmed instruction is a predetermined set of progressive clinical steps. Its use during the clinical methods above involved initially slow rates below 100 syllables per minute and progression to a final rate of around 200 syllables per minute without stuttering. Programmed instruction was not used in the Trajkovski et al. report because there is evidence to suggest that STS can be trained without it (Greenburg, 1970), and also because a non-programmed approach appears to be more suitable for preschool children because of its simplicity. After 7 weeks, speech beyond the clinic showed stuttering frequency below 1.0% syllables stuttered.

The purpose of the present study was to continue the development of the Trajkovski et al. STS treatment. The former study was a non-experimental case study. The present study used an experimental design to demonstrate that the clinical procedure is able provide functional control of stuttered speech in everyday childhood speaking situations.

2. Method

2.1. Participants

Participants were three stuttering preschool children, aged 3 years 5 months, 3 years 11 months and 3 years 8 months. All children were identified as stuttering by the first two authors, who are qualified speech-language pathologists, during assessments conducted at the Australian Stuttering Research Centre. Stuttering was diagnosed with standard methods. Participants were required to meet the following criteria before being accepted into the study: (1) stuttering for at least 12 months prior to the study, (2) age up to 4 years 5 months, and (3) no stuttering treatment for 12 months prior to the study.

Participant SP was a 3 year 5 month old girl. Her parents reported that the onset of stuttering was gradual, starting at around 30 months. They reported that SP's language development was rapid but that some of her speech sounds were unclear. A positive family history of stuttering was reported. At the end of the baseline phase, SP's mean pre-treatment % syllables stuttered (SS) was 2.0. At this point she had been stuttering for around 12 months. SP's stuttering severity

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was monitored by her parents under the guidance of the first author for 6 months prior to the commencement of the study. SP had not received any treatment for her stuttering.

Participant ME was a 3 year 11 month old boy with a reported sudden onset of stuttering at around 27 months of age. He had a repaired cleft lip and palate which occurred independently of a syndrome and mildly affected his articulation and intelligibility. A strong family history of stuttering was reported in ME's mother and sister. At the end of the baseline phase, ME's mean pre-treatment %SS was 6.3. At this time he had been stuttering reportedly for around 20 months, and had not received any treatment for his stuttering.

Participant AH was a 3 year 8 month old boy. His parents reported gradual onset of stuttering at around 30 months of age. No family history of stuttering was identified and no other speech or language problems were identified. At the end of the baseline phase, AH's mean pre-treatment %SS was 10.0. AH's parents reported that, at this time, AH had been stuttering for around 14 months. AH had been treated with the Lidcombe Program; however, his parents reported that his stuttering subsequently worsened and treatment was ceased after 2 months. When the baseline phase began, AH had not received treatment for 12 months.

2.2. Procedure

The three children were studied with a multiple baseline design across participants, with STS treatment for stuttering as the independent variable. The A Phase was baseline and the B Phase was treatment. The decision to introduce the treatment phase was based on stable baselines of increasing duration across the participants. The treatment program was conducted in two Stages. The aim of Stage 1 was to establish stutter-free speech and consisted of two parts, Stage 1a and 1b. The child then progressed to Stage 2 when his or her stuttering reached a very low level (see Table 1).

During Stage 1a, the participants attend the clinic once a week for between half an hour and 1 h to master the STS technique. At the beginning of treatment, the SLP (speech language pathologist) instructed the parent and child in the use of STS through demonstration, imitation and practice at near normal speech rate and with normal intonation. The parent was then required to model STS to the child at home and to encourage the child to use STS during natural everyday conversations (e.g., playing board games, looking at picture books, unpacking the shopping, and driving in the car). Practice occurred four to six times per day for 5–10 min each time. During these practice sessions, the child was allowed to slip into and out of STS. Praise was given occasionally when the child used STS after being presented with the model. The intervention did not incorporate contingencies for stuttering or stutter-free speech or any instruction to change daily routine, family environment or parental communication style.

At the start of each clinic visit, the SLP measured %SS using a dual-button electronic counter. One button is pressed for each syllable associated with unambiguous stuttering and another pressed for every other syllable in order to generate a %SS measure (see Kingston, Huber, Onslow, Jones, & Packman, 2003; Onslow & Packman, 1999). This measure was

Table 1
Treatment protocol administered.

Stage	Procedure
1a	*Goals*: Child and parent learn to use STS. *Progression criteria*: Child and parent practice the STS technique four to six times per day for 5–10 min. Parent prompts brief STS use frequently between practice sessions.
1b	*Goals*: The frequency of clinic visits is reduced. Child and parent continue practicing STS technique four to six times per day for 5–10 min. Parent continues prompting the child to use STS between practice sessions. *Progression criteria*: Within-clinic <1 %SS over 3 weeks. Beyond-clinic mean severity rating <2 over 3 weeks.
2	*Goals*: Parent gradually withdraws STS practice with the child. Parent prompts STS if a stutter is heard.

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based on a conversational speech sample that was a minimum of 300 syllables. The SLP also trained the parent to measure the children's average stuttering severity each day, in everyday speaking situations. This was done with a 10 point severity rating (SR) scale where 1 = "no stuttering" 2 = "extremely mild stuttering" and 10 = "extremely severe stuttering" (Onslow, Packman & Harrison, 2003). Each day the parent assigned a SR score from 1 to 10 for average stuttering severity for that day. These measurements were used as an indicator for progression through the treatment program.

During Stage 1b STS practice was maintained as in Stage 1a; however, attendance decreased to fortnightly clinic visits once the SLP was satisfied that the parents and child were implementing the procedure correctly and consistently. When stuttering reached criterion level, the parent and child moved to Stage 2. The criteria for movement into Stage 2 were: (a) less than 1% syllables stuttered within the clinic over 3 consecutive weeks, and (b) average SR <2 for each of the previous 3 weeks.

The aim of Stage 2 was to maintain these low levels of stuttering while the child and parent attended the clinic less frequently for 1 year. During Stage 2 of the Program the parent gradually withdrew the STS practice sessions, over a period of months. In the event of criterion speech performance not being met at any scheduled visit during Stage 2, the speech pathologist had the option of either stalling progress through Stage 2 or returning the child to Stage 1.

2.3. Data collection

During every week of the baseline and treatment phases, two 10-min conversational speech samples were audio recorded by the parent in the child's home environment using a Sony TCM-939 cassette recorder. The parents were instructed to keep the level of background noise during recording at a minimum to ensure that the child's speech could be clearly understood by an observer. The treating SLP measured %SS from these audio recordings using a dual-button electronic counter. The total number of syllables required to calculate a reliable %SS score was set at a minimum 300 syllables.

2.4. Reliability

To determine interobserver agreement on the beyond-clinic %SS measures, 20% of each participant's baseline and treatment speech samples were selected randomly and scored by a blinded independent observer. The observer was blinded to whether the speech samples were from the baseline or treatment phase of the study. The observer did not know about the treatment being conducted. The Pearson correlation between the %SS scores for the treating clinician and independent observer was .90. For the treating clinician and independent observer, the mean %SS scores were a follows: SP, 7.9, 6.2; ME, 3.0, 2.9; AH, 0.8, 0.7. The discrepancy between the mean scores for participant SP was because of a systematic effect, for 9 of the 10 samples, where the independent observer scored below the original observer. Seven of these samples were from SP's intervention phase, and the mean %SS scores for those seven samples were 6.6 and 6.2, showing little difference.

3. Results

Fig. 1 presents the mean weekly beyond-clinic %SS scores for each child, with each data point representing the mean of two recordings. The results have been presented upon visual inspection of the data, rather than undertaking statistical analysis, as the "eyeball" test is the standard in single subject designs (Hurlburt, 2003; Mc Reynolds & Kearns, 1983). In the week following the initial clinic visit, each child decreased their beyond-clinic %SS score by 0.8%SS, 3.1%SS and 3.2%SS, respectively. As can be seen in Fig. 1, all three children reached and sustained a beyond-clinic %SS below their pre-treatment baseline levels. These reductions are only evident in the time series after the introduction of the STS treatment procedure. Participants required a mean of three clinic visits in Stage 1a and 5.6 clinic visits in Stage 1b of treatment. Clinic visits were between 30 and 60 min in duration. For all the children, %SS reduced to below 1.0%SS. In the case of Participant AH, this constituted a reduction from particularly severe pre-treatment stuttering severity.

Participant SP attended the clinic with her mother on nine occasions. Of these, two clinic visits were required during Phase 1a and seven clinic visits were required during Phase 1b of the treatment program. The duration of clinic visits ranged from 30 to 60 min. SP's mother reported that practice of STS occurred three to five times per day for 5–10 min intervals, or for longer periods if SP requested that practice continue. SP's mother reported that SP would sometimes not want to use STS. However, by combining treatment with a motivating game, SP's resistance to treatment could be

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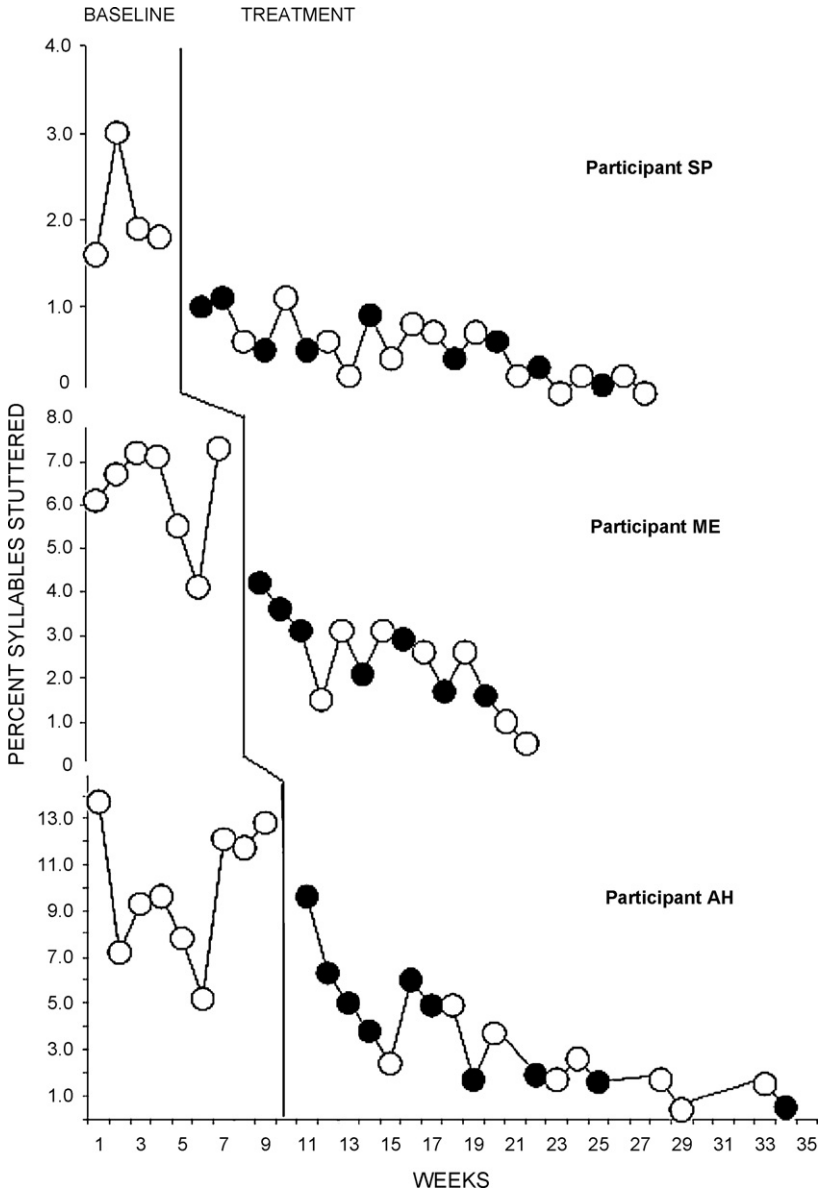

Fig. 1. Mean weekly beyond-clinic %SS for participants. Each data point is a mean of two 10-min beyond-clinic recordings. The closed circles represent clinic visits.

reduced until a routine was established. The SLP noted that during the initial clinic visit SP required a parental model to imitate before she could use STS on her own. However, after the second clinic visit SP could use STS spontaneously without having to imitate a model. Unbeknown to the SLP, SP's mother withdrew therapy for personal reasons on the ninth and tenth week of treatment. No immediate effect on SP's %SS was noted; however, during the 2 weeks following treatment withdrawal SP's %SS beyond the clinic increased. Once treatment was re-instated, SP's %SS returned to a downward trend. SP's mean pre-treatment %SS was 2.0. After the first clinic visit, SP was able to reach and sustain a beyond-clinic %SS below 1.0.

Participant ME attended the clinic with his mother on seven occasions. Of these, three clinic visits were required during Phase 1a and four clinic visits were required during Phase 1b of the treatment program. The duration of clinic visits ranged from 30 to 60 min. ME's mother reported that practice of STS occurred two to four times per day for 5–10 min intervals, in and around the home. Even though ME was willing to use STS, ME's mother commented that

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scheduling practice proved difficult at the beginning of treatment. The consistency with which treatment was being delivered increased after ME's father and siblings participated in treatment. The SLP noted that during the initial clinic visit ME could spontaneously use STS without having to imitate an adult model. The SLP also observed ME subtly using STS in conversation after the initial treatment session. ME decreased the use of STS apparently in proportion to the time elapsed after the practice session. On the fourth week of treatment ME had surgery to insert tympanostomy tubes for a recurrent middle ear infection. ME's mother reported that during this time the frequency of treatment delivery was reduced but treatment was not ceased altogether. No immediate effect on ME's %SS was noted after the surgery; however, in the week following the surgery and associated treatment reduction, ME's %SS beyond the clinic increased significantly. Once treatment was re-instated, ME's %SS followed a downward trend. ME's mean pre-treatment %SS was 6.3. After the seventh clinic visit, ME was able to reach and sustain a beyond-clinic %SS of below 1.0.

Subject AH attended the clinic with his mother on 10 occasions. Of these, four clinic visits were required during Phase 1a and six clinic visits were required during Phase 1b of the treatment program. The duration of clinic visits ranged from 30 to 60 min. AH's mother reported that practice of STS occurred three to four times per day for 5–10 min intervals, in and around the home. During the initial clinic visit, the SLP noted that AH's stuttering involved frequent fixed articulatory postures, which, when combined with his talkative nature, prevented him from using STS spontaneously. As a result, for the first 2 weeks of treatment AH had to imitate an adult model to increase his compliance before he could use STS. With practice and presumably because of a reduced stuttering severity, AH was able to use STS without imitating an adult model after the third clinic visit. AH's mother reported that she would occasionally provide AH with small rewards in order to motivate him to use STS at the onset of treatment. These rewards were eventually withdrawn once treatment routine was established. During the fifth week of treatment AH's mother reported reducing the frequency of practice sessions during a family holiday. As with the other two participants, no immediate effect on %SS was noted. However, in the week following the holiday and associated treatment reduction, AH's %SS beyond the clinic increased significantly. Once treatment was re-instated, AH's %SS followed a downward trend. AH's mean pre-treatment %SS was 10.0. After the tenth clinic visit, AH was able to reach a beyond-clinic %SS below 1.0.

4. Discussion

The results of this study provide experimental evidence for the potential efficacy of an early intervention for stuttering using STS. All three participants maintained a reduction in their beyond-clinic stuttering, which was associated with the introduction of the treatment. It is unlikely that the reductions in stuttering were due to natural recovery. All three children had been stuttering for at least 12 months and two of the three children, SP and ME, had a strong family history of non-recovery from the disorder. Furthermore, two of the three children, ME and AH were boys. Despite this, all children showed an immediate reduction in stuttering, after varying baseline periods, to below baseline levels, within 3 weeks of treatment being introduced.

Along with the reductions in stuttering, at the end of the treatment phase the speech of all participants was judged perceptually by the SLP as sounding natural on the non-treatment beyond-clinic recordings. The parents reported that this was also the case for the participants' everyday speech. This is of interest because it suggests that the ameliorative effects of STS may generalize in preschool children. In other words, the reductions in stuttering that occur during STS may persist, even when the children are no longer speaking rhythmically. This is in contrast to previous studies with adults (see Ingham, 1984). Nevertheless, future studies need incorporate independent naturalness ratings of beyond-clinic speech in order to confirm the perceived naturalness reported in this study.

In terms of treatment viability, all three parents reported that the treatment involved little effort apart from providing a STS model to their child four to six times per day for 5–10 min intervals. In contrast to other treatments for early stuttering that have been recommended and clinically researched, there was no need to change the dynamics of the child's family interactions (Millard et al., 2008), to provide verbal contingencies for stuttering moments during the day (Jones et al., 2005), or to specifically instruct the child in detailed speech pattern changes (Boberg & Kully, 1994).

With regard to treatment efficiency, participants required a mean of 8.6 clinic visits (9, 7 and 10 visits, respectively) to attain 1.0 %SS in beyond clinic speaking situations. However, this was a clinical experiment, the aim of which was to establish that effects were due to the treatment. For this reason, the sample size was kept relatively small and there was no long-term follow up to determine how long treatment effects were maintained. Nonetheless, the results suggest that clinical trials of the treatment are warranted. Currently, we are conducting a Phase II trial of the treatment with a larger group of children for the purposes of establishing the number of preschool children who respond, the treatment

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times required, and whether any predictors of treatment responsiveness can be established. If these trials indicate that the STS treatment is safe, viable and efficacious for many cases of early stuttering, it could prove to be a more efficient alternative to current treatment approaches.

CONTINUING EDUCATION

Using syllable-timed speech to treat preschool children who stutter: A multiple baseline experiment

QUESTIONS

1. The following factors are associated with recovery in children who stutter:
   (a) Gender, family history of stuttering and language acquisition.
   (b) Family history of recovery, previous treatment and age.
   (c) Gender, family history of stuttering and communication environment.
   (d) Gender, family history of recovery and age since onset.
2. The following statement is true of treatments for children who stutter:
   (a) There have been no treatments developed.
   (b) There have been many treatments developed.
   (c) Treatment development has been sparse.
   (d) Many treatments have been developed but few have undergone sufficient scientific testing.
3. The Syllable-Initiation Model proposed that syllable-timed speech suppresses stuttering by:
   (a) Slowing speech rate.
   (b) Reducing linguistic stress contrasts.
   (c) Altering neural connections.
   (d) None of the above.
4. The methods used in the report were:
   (a) A mix of quantitative and qualitative.
   (b) Purely qualitative.
   (c) Purely quantitative.
   (d) Mostly reductionist.
5. The major finding was that:
   (a) Syllable-timed speech is the best treatment for early stuttering.
   (b) Further clinical trials of syllable-timed speech treatment are justifiable.
   (c) Syllable-timed speech is not effective in the treatment of early stuttering.
   (d) None of the above.

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