

Evidence-based practice in the treatment of adolescent and adult stuttering: what do we know and what works?

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Abstract

Depending upon severity and its nature, stuttering can result in psychological and social difficulties if left untreated into adolescence and adulthood. There is therefore an urgent need for providing best evidence regarding its epidemiology, nature and treatment. This workshop will explore clinical research that has provided best evidence for treatment efficacy in adolescents/adults, and provide detail on strategies are actually known to be effective (eg. reduce stuttering and related anxiety), and what strategies are known to maintain fluency gains, thus preventing relapse. Description of how cognitive behaviour therapy is integrated into treatment will also be explored

Introduction and epidemiology

Stuttering is characterized by “interruptions to the fluency and flow of speech, where the person knows what he or she wishes to say, but is unable to because they are experiencing either: (a) involuntary repetitions of syllables, especially when starting words, (b) involuntary prolonging of sounds and (c) unintentional blocking of their speech” (Craig, et al., 1996). Stuttering is classified in the DSM IV as a childhood disorder (American Psychiatric Association, 1994), though it is found across all age levels (Craig et al., 2002a). Most children will begin to stutter before adolescence, most commonly between 2 and 5 years of age, with the highest peak at around four years (Craig et al., 2002a). In latest research on the epidemiology of stuttering, the prevalence of stuttering over the entire lifespan (from two years to older age) was found to be 0.72% with at least a 50% higher prevalence rate of stuttering in males (Craig, et al., 2002a). While the risk of stuttering is higher (2 to 4% depending on age), a 0.72% prevalence rate is expected given that many children naturally recover from stuttering (Bloodstein, 1995). A higher prevalence rate of up to 1.4% was found in children and adolescents (2 to 19 years), with males having a fourfold higher prevalence (Craig et al., 2002a). Table 1 shows a breakdown of prevalence and risk by age.

Table 1: Shows epidemiological data for people who stutter by age breakdown (Craig et al., 2002a; 2003a)

| Factor | Children 2-10 years | Adolescents 11-20 years | Adults 21-49 years | Older adults 50 + years |
|---------------------------|------------------------|----------------------------|-----------------------|----------------------------|
| Prevalence | about 1.4% | about 0.5% | about .8% | about 0.4% |
| Cumulative Incidence | 3-5% | about 2% | about 2% | < 2% |
| M:F ratio | 2-3:1 | 4:1 | 2:1 | 1.4:1 |
| Spontaneous Recovery rate | 50 to 75% | < 50% | < 25% | < 25% |
| Anxiety levels | normal | slightly above normal | abnormal | abnormal |
| Communication fears | slightly raised | abnormal | abnormal | abnormal |

Stuttering and arousal/anxiety

We know that:

1. Stuttering is increased when the person who stutters (PWS) is exposed to threatening and demanding stimuli
2. Stuttering is decreased when they are exposed to less threatening stimuli.
3. People who stutter show increased physiological arousal in the moment of stuttering
4. Higher levels of 'state' anxiety have been found to be associated with the stuttering moment (Craig et al., 2003a)

Stuttering and chronic anxiety

The risk of developing an anxiety disorder may be increased in PWS. Longitudinal research following speech/language disordered children (including children who stutter) aged five years old has consistently found that these children have increased rates of anxiety disorder (anxiety disorders consisted mostly of social phobia) in early adulthood compared to other psychiatric diseases like schizophrenia or eating disorder (Beitchman, et al., 2001). By age of about 10 years, negative perceptions and concerns about stuttering are beginning to develop (Hancock, et al., 1998). By adulthood, PWS have been shown to have pervasive negative stereotypes (Craig, et al., 2003b). For example, PWS hold negative perceptions of themselves (eg. they believe they are more anxious), and non-stuttering persons in the community, regardless of whether they know a PWS, believe that adult PWS are shy, self-conscious, anxious people who lack confidence (Craig et al., 2003b).

The majority of studies are suggesting that adult PWS are more at risk of developing chronic levels of anxiety. A systematic literature search found 18 studies that investigated levels of chronic and/ or social anxiety in people who stutter. These studies are summarised in Tables 2 and 3. Seven studies found no differences in anxiety (Table 2) while 11 studies found significant differences in anxiety (Table 3).

Implications for treatment

Preliminary research has shown that a proportion of PWS develop a level of social anxiety comparable to people with a primary diagnosis of social anxiety disorder and that treatment with therapies suitable for social anxiety disorder are beneficial (Schneier et al., 1997; Stein et al., 1996). Given that research findings support a salient role of anxiety (both state and chronic social based anxiety) in stuttering, it seems appropriate that anxiety be considered a diagnostic feature of the disorder, especially for adult people who stutter. It is important that DSM IV diagnostic features for stuttering not preclude anxiety symptoms, as this may have negative implications concerning its management. For example, a person who seeks treatment for their stuttering may not be assessed for their level of anxiety in relation to their stuttering and consequently, they may not be offered anti-anxiety treatment, simply because anxiety is not viewed as an important component of stuttering.

A strategic approach to the treatment of stuttering is now needed. Based on the above evidence, a proportion of PWS (perhaps up to 40%) will present with abnormal levels of chronic anxiety, and traditional stuttering therapies primarily directed at reducing stuttering behaviour may have limited impact on this anxiety component. A suggested approach to the management of stuttering for adolescents and adults is outlined in Table 4. Based upon best evidence in adolescent and adults, it is my view that

specialized stuttering treatment should be delivered in a cognitive behavioural therapy regimen (Craig et al., 1996). Goals of treatment (depending on the person's needs of course) would at very least be to (i) gain control over stuttering behaviours (such as involuntary repetitions and blocking on syllables and words, along with high levels of muscle tension while the person struggles to speak); (ii) gain control of any social and speech related fears and anxieties; and (iii) enhance social skills related to speaking and interacting with others.

Table 2 shows a summary of studies that have found no differences in trait anxiety between people who stutter (PWS) and non-stuttering controls (NSC)

| Authors (listed by date) | Participants | | Anxiety (Trait or social) | Significant Differences |
|-----------------------------|-----------------|-----------------|------------------------------|----------------------------|
| | PWS | NSC | | |
| Molt & Guilford, 1979 | 15 | 15 | Trait | No |
| Zenner & Shepherd, 1980 | Not known | Not known | Not known | No |
| Oliver, 1981 | 6 | 6 | Not known | No |
| Cox et al., 1984 | 21 | 30 | trait | No |
| Peter & Hulstijn, 1984 | 24 | 24 | Trait | No |
| Miller & Watson, 1992 | 38(males) | 38(males) | Trait | No |
| Miller & Watson, 1992 | 14 (females) | 14 (females) | Trait | No |
| Blood et al., 1994 | 11 | 11 | Trait | No |

Relapse and stuttering treatment

A significant minority of PWS who have been treated for their stuttering have a risk of relapse (Craig, 1998; Craig et al., 2003a). PWS who have difficulties with relapse may well be those who have a high risk of developing generalized or social anxiety. Therefore, anti-relapse treatments should be developed including fluency re-treatment, self-control and anxiety reduction therapies and possibly, the use of anxiolytic agents for people for which the psychological therapies have not been successful (Craig, Hancock & Cobbin, 2002; Craig & Tran, 2006). See Craig et al., (2002) for an example of an effective anti-relapse protocol.

Table 3 shows a summary of studies that found differences in trait anxiety between PWS and non-stuttering controls (NSC).

| Authors (Listed by date) | Participants | | Anxiety Measure (Trait or social) | Significant Differences |
|---------------------------------|--------------|-----|--------------------------------------|----------------------------|
| | PWS | NS | | |
| Bonifacio, 1974 | 35 | 35 | Trait | Yes |
| Greiner et al., 1985 | 41 | 41 | Social | Yes |
| Craig, 1990 | 102 | 102 | Trait | Yes |
| Kraamaat et al., 1991 | 110 | 110 | social | Yes |
| Fitzgerald et al., 1992 | 27 | 41 | social | Yes |
| Mahr & Torosian, 1999 | 22 | 100 | Trait | Yes |
| Mahr & Torosian, 1999 | 22 | 297 | Social | Yes |
| Kraamaat et al., 2002 | 89 | 131 | social | Yes |
| Craig et al., 2003a | 63 | 102 | trait | Yes |
| Ezrati-Vinacour & Levin 2004 | 47 | 47 | trait | Yes |
| Messenger et al., 2004 | 34 | 34 | social | Yes |
| Blomgren et al., 2005 | 19 | - | Trait | Yes |

Table 4 Recommended management of stuttering in adolescents and adults

Assessment

- Assessment of the severity of stuttering in various social contexts
- Diagnosis of the psychological impact of stuttering, including social anxiety assessment
- Assessment of social skills repertoire specifically in relation to speech

Treatment

- Specialised treatment that reduces stuttering symptoms by altering speech patterns (e.g. airflow, fluency shaping, speech muscle tension feedback and delayed auditory feedback techniques)
- Stuttering modification treatments that can reduce dysfluency by altering stuttering responses (including self-control techniques, rewards for fluency and response cost techniques for stuttering)
- Cognitive-behavioural therapies for social related anxieties (e.g. relaxation, social skills and thought-control techniques)
- Pharmacological anti-anxiety therapies for those who have difficulty controlling anxiety using cognitive-behavioural techniques

Levels of evidence

Clinicians have an obligation to provide services that have been shown to have an evidence base in achieving therapeutic goals. This emphasis on demonstrating treatment efficacy in a scientific and rigorous manner is a major goal of evidence based medicine or health care (EBHC) described elsewhere (Sackett, Rosenberg, Gray, Haynes, & Richardson, 1996). EBHC is believed to be a necessary approach when determining the efficacy of therapies for persons with particular diseases, such as spinal cord injury (Craig et al., 1997), psychological disorders such as depression (Lett et al., 2005), cardiovascular disease (Cook et al., 1995; Truswell, 2001), and stuttering (Craig et al., 1996). However, if one is to determine which treatments are efficacious for any particular disease or disorder, then the problem of what criteria should be applied to identify these treatments arises. This has led to the development of specific and standardized criteria that can be applied to treatment outcome studies in order to determine the quality of the data (Lett et al., 2005). This issue is currently being debated, for instance, when I conducted a Google Scholar search on “levels of evidence” in mid 2007, 3,370,000 hits for levels of evidence was found. The central issue being debated is, given the findings of a treatment study, how confident can we be that the treatment is really beneficial? By way of example, Lett et al., (2005) used the American Psychological Association taskforce levels of evidence for psychological treatments. Lett et al., (2005) applied this level of evidence criteria to various non-pharmacological treatments of depression for people with coronary heart disease (CHD). The criteria used consisted of three categories:

Category 1: strongest evidence, that is, treatments have been shown to be superior to a placebo or to another plausible treatment in at least two studies.

Category 2: treatments supported by at least one controlled study.

Category 3: treatments that have less rigorous support such as case-control studies (eg correlation or cross sectional studies), and non-controlled studies (eg. pre and post treatment of one group only, case study data, and widely practised traditional methods not yet been investigated in a controlled trial).

They found treatments with the best evidence for depression consisted of cognitive behavior therapy and interpersonal therapies. These type of treatments had numerous robust controlled trials showing efficacy and so were believed to be beneficial treatments of depression for people with CHD. Based on the quality of the evidence, they also concluded that exercise programs were beneficial as was treatment involving medicating with the herb St John’s Wort. However, they found little evidence that therapies like acupuncture, fatty acids therapy, and other complimentary therapies were beneficial for people with CHD who were also depressed.

Truswell (2001) described levels of evidence criteria developed by the National Health and Medical Research Committee (NHMRC) in Australia and applied this system to treatment research in the nutrition area for diseases like CHD. The system consists of seven grades where Grade 1 is the highest level of evidence and Grade 7 the lowest.

- (1) **Grade 1:** consisted of evidence that arises from a systematic review (SR) of randomized controlled trials (RCT).
- (2) **Grade 2:** consisted of evidence arising from a well designed RCT study.
- (3) **Grade 3:** consisted of evidence arising from a well controlled cohort study (eg. non-randomized controlled longitudinal treatment study).
- (4) **Grade 4:** consisted of evidence arising from case-control studies (eg. cross sectional data) or single-case experimental studies.

- (5) **Grade 5:** consisted of evidence arising from studies with an historical control (eg. retrospective data).
- (6) **Grade 6:** consisted of evidence arising from case study outcomes (eg. uncontrolled description of a treatment with a single person).
- (7) **Grade 7:** evidence consisted of data from reports say from an expert committee or clinical and traditional opinion.

Levels of evidence similar to that developed by the NHMRC have been applied to determine efficacious therapies in surgery (Meakins, 2002), nutrition and dietary related disorders such as CHD (Truswell, 2001), back pain (Ferreira et al., 2002), and anti-thrombotic therapy (Cook et al., 1995). However, it must be understood that there are problems with the use of levels of evidence. Criteria used to judge evidence has not been standardized, that is, for instance, different weights may be used to describe the quality of studies. This problem can lead to different conclusions to be drawn from the same set of studies (Ferreira et al., 2002). For instance, Ferreira et al., (2002) found low agreement in levels of evidence conclusions using four different criteria for low back pain. Levels can also be too stringent for the area being studied, for example, in health nutrition and dietary research (Truswell, 2001). Using the NHMRC levels of evidence he concluded that due to difficulties in running RCTs in dietary research (eg. problem of controlling people's diets), evidence of treatment efficacy is often based on data arising from lower levels of evidence such as cohort studies (Grade 3 evidence). This point is crucial as most of the health claims allowed by the US FDA have not been supported by evidence from RCTs (Truswell, 2001). Similarly, evidence in surgery is just as likely to come from a surgeon performing new procedures in a case study approach (Meakins, 2002). In an effort to overcome some of these standardization problems between levels of evidence criteria, a system called the Strength of Recommendation Taxonomy (SORT), has been developed in order to be applied in family practice medicine (Ebell, et al., 2004). SORT is a system that addresses the quality, quantity and consistency of evidence (Ebell, et al., 2004). The strength of recommendation consists of three levels. These are:

- (a) **Level A evidence** which is based on consistent and good quality data and a conclusion on this level strongly suggests that a particular treatment is beneficial.
- (b) **Level B evidence** is based on inconsistent or limited quality evidence, and Level B can only offer weak support that a treatment may be effective.
- (c) **Level C evidence** is based on data arising from clinical consensus, traditional practice, case study evidence and so on. Level C evidence can offer no confidence that a treatment is beneficial.

SORT then offers criteria to determine the quality of the data. To achieve this, it provides three grades of quality.

- (i) **Level 1** consists of high quality data and evidence arising from sources such as systematic review or meta analyses, or from a high quality RCT. A treatment will be considered beneficial if a systematic review/ meta analysis provides consistent findings of efficacy, or if high quality RCT evidence demonstrates beneficial outcomes.
- (ii) **Level 2** consists of data with limited quality: Level 2 evidence is concluded based on data from lower quality clinical trials (eg. non-standardized) with inconsistent findings, or on evidence from cohort studies, or weaker still, from case-control studies.
- (iii) **Level 3** consists of data from traditional opinion, case studies, etc.

Consistency is then defined. A conclusion of “consistent” assumes that most studies conducted found similar findings. “Inconsistent” assumes considerable variation among study findings or the conclusions of systematic reviews/ meta analyses do not find consistent evidence of efficacy.

Components of an RCT

Before we apply the levels of evidence criteria to treatment outcome studies in stuttering, a brief description of an RCT is warranted. The following are the major components of an RCT that are believed to result in high quality evidence for the efficacy of a particular treatment.

1. Participants are targeted and then randomized into groups in order to equally distribute selection bias between the experimental and control groups.
2. The RCT design consists of at least a treatment group and a control group, which can be either a passive control (time control only) or an active placebo (time and therapy input). The RCT should have sufficient subject numbers to ensure 80% power to produce a finding. Power is defined as the probability of correctly rejecting the null hypothesis. This means that subject numbers should be calculated before the trial is conducted.
3. Objective measurement of outcome should be conducted across a variety of contexts.
4. Both groups are followed up over time, for at least two years after treatment in order to monitor relapse.
5. A gold standard RCT requires a double blind procedure, that is, neither subjects nor the clinicians know which group receives the control. However, in many interventions involving psychological treatments such as stuttering therapy, a double blind technique will not be possible. To help control bias, a single blind procedure can be used. This involves the researcher/clinician who assesses outcome not being aware of which group the subjects being assessed were from, or at what time the subjects were measured (eg. pre or post treatment).
6. Treatment protocols are standardized for the treatment group with manuals written and used, and the clinicians trained in the treatment protocol.
7. The Control group should be offered treatment as soon as their participation in the control is complete.

Evidence levels for stuttering treatment efficacy

High quality evidence now exists for the benefits of treatment of stuttering, though a negative is that there are few high quality controlled studies that provide this evidence. For instance, Grade 2 or Level 1 evidence exists for the treatment of children who stutter (Jones et al., 2005). Using the SORT criteria, one would conclude that a Level A recommendation should occur, though this conclusion is tempered by the fact that only one RCT has so far been conducted. However, Franken et al., (2005) has provided Grade 3 and Level 2 evidence (controlled cohort study) for the beneficial effects of treatment for children who stutter.

Good quality longitudinal cohort clinical trial evidence exists for the benefits of adolescents who stutter (Boberg & Kully, 1994; Craig et al., 1996; Hancock et al., 1998). This data allows a Grade 3 and Level 2 evidence conclusion, and a Level B SORT conclusion. Unfortunately, the majority of research with people who stutter is

uncontrolled, and this only allows Grade 4 to 7/ Level 3 evidence conclusions leading to a Level C recommendation.

Clinical trial evidence for adolescents and adults who stutter

Grade 2 and 3 evidence exists for the efficacy regulated-breathing techniques (Azrin & Nunn, 1974). Regulated breathing requires participants to breathe smoothly and deeply, with regular pauses, while relaxing speech and chest muscles. It has also been integrated into a CBT regimen that includes relaxation techniques, self-correction and self control strategies, social support and encourages long-term maintenance by employing transfer and generalization techniques. Controlled studies with adults who stutter have found significant reductions in stuttering compared to an active placebo control (Azrin, Nunn, & Frantz, 1979; Saint-Laurent & Ladouceur, 1987). However, regulated breathing by itself, however, was not found to be effective as a treatment for stuttering (Andrews & Tanner, 1982).

Evesham and Fransella (1985) provided Grade 4 evidence for the efficacy of a fluency shaping technique for adults similar to Smooth Speech. Smooth Speech within a CBT regimen conducted in an intensive structured format has also been found to be very effective (Grade 4 evidence) for adults (Craig, et al., 1987). In what is known as the Prince Henry Hospital program the first week is dedicated to learning smooth speech beginning at slow speeds and increasing the speed gradually, in structured rating sessions of groups of six. Regular audiovisual feedback sessions were conducted every day and the goal was to speak at normal rates using socially acceptable conversation skills by the end of the week (for instance, not speaking in a monologue style). Transfer of the skills occurred in the second week. Participants began transfer by completing two home conversations on the weekend, and then a graded hierarchy of conversations was followed beginning with the easiest (home conversations) to the hardest conversation (speaking in front of a group or speaking on the telephone to strangers). The third week consisted of generalization and maintenance strategies with a meeting with family members at the end of the week to discuss ways they can help participants maintain their fluency. Small financial rewards were made contingent on success throughout the three weeks, and brief rating sessions were held every day of the second and third weeks to reinforce smooth speech skills. Each participant was encouraged to spend time discussing barriers to fluency with a clinician throughout the second and third weeks.

Other Grade 4 evidence exists. Boberg and Kully (1994) studied 17 adults and 25 adolescents and found that 69% maintained a “satisfactory” level of post-treatment fluency after 12 to 24 months (determined by performance on a telephone call). The Fluency Rules Program developed by Runyan and Runyan (1986) used similar skills to those used in the Smooth Speech fluency shaping program and reported that 9 of 12 (75%) school-age children significantly improved their fluency after 12 months (Runyan & Runyan, 1999). Kully and Boberg (1991) combined fluency shaping and stuttering modification (pullouts; easy versus hard stuttering) approaches in 10 young subjects and found that 8 of the 10 children who stuttered had significantly reduced stuttering immediately after treatment. A follow-up of 8 children showed improvements after 8-18 months.

Perhaps the most persuasive evidence to date (Grade 3) comes from controlled trial research conducted by Craig, Hancock and colleagues (Craig et al., 1996; Hancock et al., 1998). We conducted a two-city controlled clinical trial with 97 older children and young adolescents who stuttered and investigated the efficacy of three treatments in

comparison to a no-treatment control. The purpose of the clinical trial was to evaluate the effectiveness of an intensive Smooth Speech program integrated within a CBT regimen. A second aim was to determine the efficacy of a less intensive Smooth Speech and CBT treatment on effectiveness, and a third aim, not relevant for this talk, was to determine whether a speech muscle feedback treatment would be successful in reducing stuttering.

The mean age of the children before treatment was 10.8 years of age (range of 9 to 14 years) and most of the children were boys (82%). Both Smooth Speech groups involved participants being treated in groups of four or five by the clinicians who were trained in the therapy protocols. The clinician-to-client ratio was similar for both groups. The first treatment (n=27) consisted of an intensive therapy format in which Smooth Speech was taught over five consecutive days in structured speech rating sessions beginning from slow speeds on the first day (one quarter the average speech rate) and gradually increasing the speed to normal rates by the fourth day. The children were required to interact in fluent conversation for at least 5 minutes in each session. Non-socially acceptable conversation styles (such as a monologue) were discouraged by the clinician. Video self-assessments of performance (for fluency, speech naturalness and conversational skills) occurred at regular intervals throughout the week and a graded exposure approach from simple to more difficult social interactions was used for speech assignments to transfer fluency skills outside the clinic. Generalization of fluency skills and discussions with parents about maintenance occurred on the last day of the week. Success throughout each phase of the program was financially rewarded.

The second program (n=25) involved teaching Smooth Speech in a less intensive format and was labeled “home based” in the trial (Craig et al., 1996). It was considered important to determine whether Smooth Speech could be applied in a non-intensive format as it is difficult for clinicians to arrange up to five or six straight days that are wholly dedicated to a particular therapy and group of clients. This program placed more emphasis on practice in the home environment and less emphasis on structured rating sessions in the clinic. Consequently it required one day a week for five weeks, not including follow-up sessions. Smooth Speech was taught on the first day beginning with slow speech rates, though the goal was for the children to talk using Smooth Speech at normal speech rates by the end of the first day. Parents learned how to use and teach Smooth Speech. When the clinician believed the parent was able to use Smooth Speech, identify stuttering, reliably time speech assignments, and reliably monitor the child’s use of Smooth Speech, the parents were encouraged to take the role of clinician for their child. Smooth Speech was reinforced on the second day of the program (that is, the second week) within the context of group games involving conversations followed by suitable rewards for successful completion of speech assignments. Additional cognitive behavioral strategies were used. These consisted of discussion of related problems and fluency barriers, self-monitoring skills such as maintaining speech diaries that measured fluency/stuttering as well as attitudes, and transfer and maintenance procedures. Homework activities were given each week of the program over the five weeks. They were assessed by the clinicians and the parents.

The third treatment (n=25), which is of minimal interest here, consisted of a speech muscle biofeedback program (Craig et al., 1996). All three programs were integrated within a CBT regimen. A no-treatment control (n=20) consisting of older children who stuttered was also evaluated. Subjects were conscripted over a period of two years and were allocated to groups when they first attended the clinic. While they were not randomly allocated into groups, there is no compelling reason to suspect that the resulting groups were biased in a way that would have confounded outcomes. As shown

in Craig et al. (1996), all four groups were similar in age, gender makeup and stuttering history (i.e., similar rates of stuttering and treatment history).

Most children who participated in the study had begun to stutter early (mean age of 4.7 years, with a range from 2 to 11 years) and had stuttered most of their lives (average of 6 years). About two-thirds of the children had received some form of therapy prior to the study, though in most cases the intervention had been carried out several years before. No children had received therapy in the three months prior to the Smooth Speech treatment. To control for language ability, only those who were progressing normally in their speech for their age were included in the program. For ethical reasons, the no-treatment control children were offered therapy after waiting three months. Participants were assessed immediately before treatment, immediately after treatment, and at 3 and 12 months after treatment. A long-term follow-up occurred after 2-6 years (a mean of 5 years after treatment).

Severity of stuttering was assessed by the percentage of syllables stuttered (%SS) and rate of speech or syllables per minute (SPM). Children were assessed in three contexts: (a) having a conversation with the clinician in the clinic; (b) talking to a family member or friend on a telephone from the clinic, and (c) talking to a family member or friend in the home environment. Speech naturalness was assessed using a Likert scale (ranging from 1: poor naturalness to 5: very good naturalness) by the clinician, the parent and the child. Anxiety was assessed by the State-Trait Inventory for Children (STAIC) (Spielberger, et al., 1972), a measure that assesses both state anxiety (how anxious they feel at the time of testing) and trait anxiety (how anxious they feel generally). Attitudes towards speech were assessed only at the five year long-term follow-up; this was done using the Communication Attitude Test-Revised (CAT-R; De Nil & Brutten, 1991). Children were assessed for their anxiety and attitudes towards their speech in a relaxed environment, that is, in the clinic when the child was comfortable and feeling at ease, without any pressures to complete from the parent or clinician.

Both the intensive and the home-based Smooth Speech programs were found to be very effective for reducing stuttering in older children and adolescents (Craig et al. 1996; Hancock et al., 1998). Results over time and as a function of treatment for the two programs are found in Table 5 in the form of percent improvement (%Imp) scores and effect sizes. %Imp was determined by the following formula: $[(\text{pre-treatment \%SS} - \text{post-treatment \%SS}) / \text{pre-treatment \%SS}] \times 100$. Effect sizes were determined by: $(\text{pre \%SS} - \text{post \%SS}) / \text{SD pre \%SS}$. Inspection of Table 5 shows that stuttering was substantially reduced in the short term (that is, immediately after treatment) as shown by the very large effect sizes, from 1.6 to more than 2 for the clinic conversation and telephone conversation, respectively. At the 12 months and mean 5 years post-therapy sessions, the reductions in stuttering were maintained with large effect sizes ranging from 1.3 to 1.8. This is impressive considering that a large effect size is considered to be 0.8 or over (Cohen, 1988). Though not presented here, stuttering frequency levels were similarly reduced in the home conversation measures (Craig et al., 1996; Hancock et al., 1998).

Table 5 Mean % improvement scores (%Imp) and effect sizes (ES) for frequency of stuttering (%SS) for the two Smooth Speech treatments for the clinic and telephone conversations

| Time Intervals and Contexts | Intensive Smooth Speech | | Home Based Smooth Speech Treatment | |
|---|-------------------------|-----|------------------------------------|-----|
| | %Imp | ES | %Imp | ES |
| Pre-treatment to immediate post treatment | | | | |
| Clinic conversation | 95% | 2.2 | 90% | 2.1 |
| Telephone conversation | 94% | 2.1 | 83% | 1.6 |
| Pre-treatment to 1 year post treatment | | | | |
| Clinic conversation | 72% | 1.7 | 76% | 1.7 |
| Telephone conversation | 72% | 1.7 | 61% | 1.3 |
| Pre treatment to a mean 5 years post treatment | | | | |
| Clinic conversation | 76% | 1.8 | 80% | 1.8 |
| Telephone conversation | 76% | 1.8 | 71% | 1.4 |

Figure 1 shows the short and long-term fluency outcomes (%SS) for clinic conversation of the two Smooth Speech groups as well as for the stuttering control group (only up to 3 months). As can be seen, substantial and very significant reductions in stuttering occurred in the two Smooth Speech groups compared to the control group. Whereas the Control Group worsened over a period of 3 months (having slightly negative effect sizes), as shown in Figure 1, the Smooth Speech Groups were found to have a large reductions in stuttering over this period. After a mean of five years, both treatment groups were found to have maintained an improvement of around 75% or more, and this is regarded as a very desirable goal for therapy by the author. Although stuttering severity scores increased slightly at the 3-month, one-year and a mean of five years after treatment, these increases were not substantial. In contrast, the stuttering severity for the age-matched control children remained elevated for the three months in which they participated in the study. In the absence of effective treatment, it would be unlikely that the control group would improve after the three-month period.

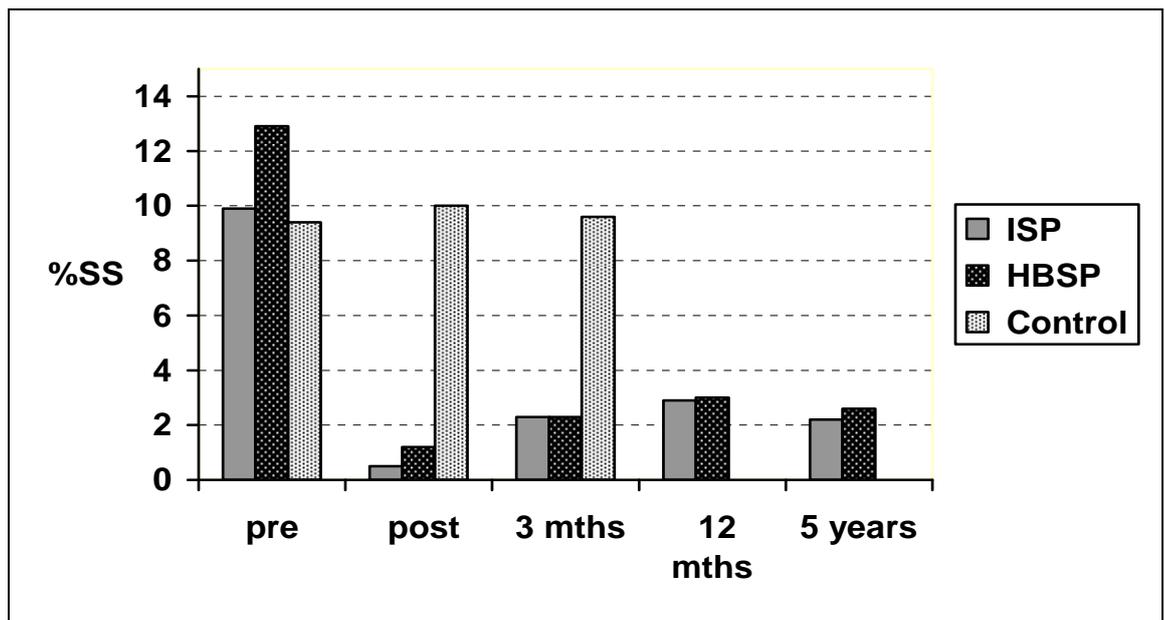


Figure 1 Mean frequency of stuttering (%SS) during a conversation for the two Smooth Speech groups and the control group. ISP is the Intensive Smooth Speech group and HBSP is the home based Smooth Speech group (adapted from Craig et al., 1996 and Hancock et al., 1998)

The children who received the two Smooth Speech treatments within a CBT regimen significantly increased their rate of speech in comparison to the controls (up to 3 months). Speech rate continued to increase for the two treatment groups up to the 5 year follow-up (Hancock et al., 1998). A proportion of this increase could be due to increased maturation after five years (subjects ages mostly ranging from 16 to 18 years). However, there is no question that in the long-term the participants in the Smooth Speech programs were speaking faster with less stuttering in comparison to their pre-treatment performance, and at rates typically expected in society. This decreased stuttering and increased speech rate demonstrate that a fluency shaping treatment that utilizes CBT techniques can be very successful in reducing stuttering severity in the long-term.

The children who received Smooth Speech were speaking naturally after treatment. This was found in the perceived naturalness scores as rated by the clinician, the parents and the children themselves (Craig et al., 1996; Hancock et al., 1998). This is an important result because of a common misconception among clinicians that people who are treated with Smooth Speech will speak in an unnatural style after treatment (Hancock et al., 1998). This may be true if the fluency shaping strategy being used emphasizes continuous vocalization (as in some forms of prolonged speech treatments) rather than continuous airflow (as taught in Smooth Speech). It also demonstrates the importance of including CBT aspects alongside the fluency shaping treatment. For example, it is imperative that participants have the opportunity of correcting their speech styles using audiovisual feedback sessions in which the group provides comments on naturalness and social skills aspects of their conversation. In these sessions, negative attitudes towards speech can be challenged and adapted.

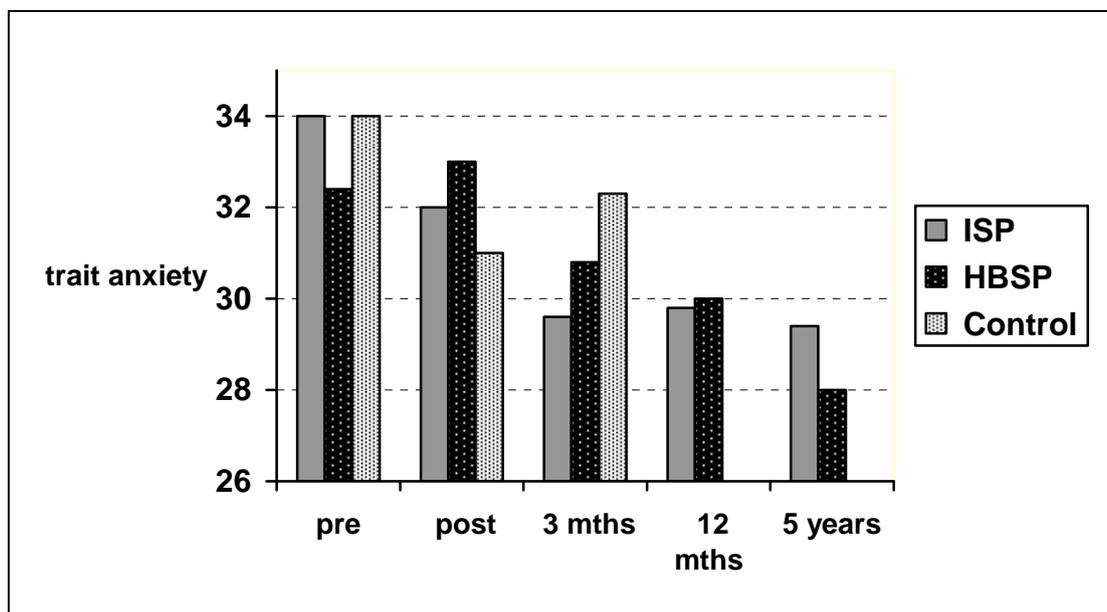


Figure 2. Mean trait anxiety scores for the two Smooth Speech groups and the control group. ISP is the Intensive Smooth Speech group and HBSP is the home based Smooth Speech group (adapted from Craig et al., 1996 and Hancock et al., 1998)

Figure 2 shows that trait anxiety levels of the older children receiving the Smooth Speech programs actually decreased over time to levels expected to be seen in norm populations, whereas anxiety levels in the control group did not substantially change (Hancock et al., 1998). This suggests that the treated group worried less about their speech and social interactions than those who were not treated. Additionally, negative

attitudes towards communication were also found to reduce to low levels for both the intensive Smooth Speech (Mean = 11.8, SD = 7.7) and the less intensive Smooth Speech groups (Mean = 13, SD = 8.3). These levels are lower than those that might be expected in older children who stutter (De Nil & Brutten, 1991). This suggests that the treated children were more willing to communicate verbally, providing further evidence of their enhanced psychological well-being.

Relapse

A criterion of less than 1%SS represents minimal stuttering (Craig et al., 1996) and less than 2%SS has been used as a cut off point for treatment (for example, stuttering below 2%SS may well suggest the person does not need an intensive treatment program) as well as a criterion for relapse, that is, stuttering above 2%SS has been considered to indicate significant stuttering (Craig 1998). Therefore, it is useful to determine the proportion of subjects who were stuttering at or below these levels after treatment. A large majority of children who received the intensive Smooth Speech format were stuttering less than 2%SS immediately after treatment, while over 80% were stuttering negligibly (that is, less than 1%SS). However, by 12 months, fewer were stuttering at these very low levels (only 4% stuttering less than 1%SS and fewer than 50% were stuttering less than 2%SS). Interestingly, after five years, the proportion with low amounts of stuttering increased substantially (over 40% were stuttering less than 1%SS while 80% were stuttering less than 2%SS). A similar trend occurred in the less intensive Smooth Speech program. Just over 75% were stuttering less than 2%SS immediately after the intervention (60% of those less than 1%SS), with a decrease after 12 months (60% less than 2%SS and 36% less than 1%SS). Once again, the children and adolescents had improved at the five-year follow-up, with 50% stuttering minimally and 64% stuttering less than 2%SS.

If one used the 2%SS relapse criterion, one could suggest that relapse rates hover around 20% for the intensive form of Smooth Speech and around 36% for the less intensive program. We also used a parent rating of whether their child had relapsed to pre-treatment levels, their child still stuttered but not as high as pre-treatment levels, or their child had never relapsed (no significant stuttering). Only 13% of the parents believed their child had relapsed back to pre-treatment levels. This is a lower estimate of relapse than predicted by the use of the 2%SS criterion. However, 53% of parents believed their child had exhibited some stuttering after five years post treatment. It is possible that some of these parents underestimated their child's stuttering. Even so, these rates of relapse are pleasing. As discussed elsewhere (Craig, 1998), such relapse rates are not as large as seen in many other disorders such as obesity, schizophrenia and drug addictions. Having said this, it is important to reduce relapse rates and lower the risk of relapse for older children (and adults) once they have received Smooth Speech treatment. In fact, we have shown that providing additional anti-relapse treatments are effective at lowering relapse risks in older children (Craig et al., 2002; Hancock & Craig, 2002).

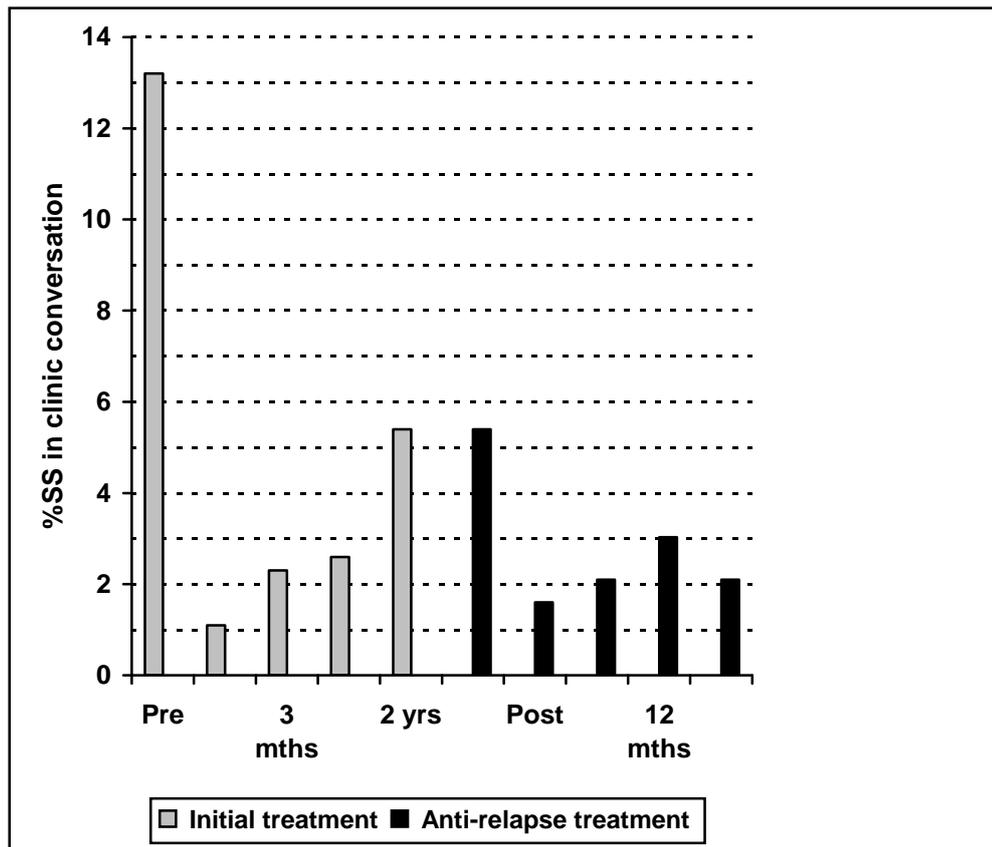


Figure 3 showing mean %SS for the clinic conversation up to two to six years for Initial treatment and up to two years following the anti-relapse treatment (adapted from Hancock & Craig, 2002)

Figure 3 provides evidence that additional anti-relapse treatment can benefit adolescents who had relapsed or were having problems with maintaining their fluency. This study (Hancock & Craig, 2002) investigated the effectiveness of an anti-relapse treatment for 12 adolescents who had participated in the initial treatment programs reported above, and who were experiencing difficulties maintaining treatment gains. Groups consisted of up to four children and parents (i.e., at least eight persons per group) and the anti-relapse programme was conducted two days a week over two weeks, with a fifth day option in the third week if treatment skills had not been adequately transferred and generalised outside the clinic environment. An experienced clinician led the group. The anti-relapse program was successful in producing significant reductions in stuttering as well as increasing speech rate and speech naturalness two years after the additional booster treatment. The anti-relapse treatment program had a stronger emphasis on CBT components (for instance, attitude change therapy, self-management therapy, relaxation therapy) compared with the initial Smooth Speech programs. Hancock and Craig (2002) also provided evidence that showed participants' speech rate increased over the period of time following the anti-relapse program in comparison to their speech rate following the initial program.

In summary, the results of this controlled trial and anti-relapse study provided evidence that suggests:

- the majority of older children who participated in the Smooth Speech and CBT program resulted in a significant reduction in stuttering

- the majority of older children who participated in the Smooth Speech and CBT program resulted in a significant reduction in anxiety levels.
- speech production was natural.
- children were speaking at speeds typical of their peers (that is, ranging from 180 to 200 SPM).
- the majority of those who experienced relapse were improved long-term following an anti-relapse program the long-term.
- a less intensive home based Smooth Speech format was found to be efficacious.

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