TRAINING FLUENCY AS A MOTOR SKILL IN THE TREATMENT OF DYSFLUENT CHILDREN

by

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ABSTRACT

This paper deals with fluency training programs designed for five young children ranging in age from four to eight years. The young abnormally dysfluent child, who is demonstrating considerable fragmentation and only a beginning awareness of his speech difficulties, presents a problem in treatment. Recent research has indicated that fluency involves the coordination of respiration, phonation and articulation (Perkins et al., 1976), and this information may be helpful in treating the young dysfluent child. The programs involved in this paper have been designed to train fluency as a motor skill, rather than focusing on controlling the stuttering. Two degrees of directness were employed. Less direct approaches involved the use of conditions which facilitate fluency skills (including the use of rhythm, a slow prolonged speech model, choral speaking, singing and overlearned tasks), gradually increasing the length and complexity of utterances used as recommended by Ryan (1972) and increasing the child's resistance to listener disturbances. More direct approaches involved the use of passive airflow and improving breath control for speech purposes. Good improvements in fluency skills were noted, and follow-up measures indicated that all but one child maintained their fluency skills, while the one child demonstrated a mild regression of fluency skills.

There has been a reluctance on the part of speech-language pathologists to work with the young abnormally dysfluent child. Typical approaches have included parent counselling while ignoring the treatment of the disorder, improving the parent-child relationship (Andronico et al., 1971; Egolf et al., 1972) or delaying treatment until the dysfluent child matures and exhibits a more engrained dysfluent speaking pattern. Recent approaches to the treatment of dysfluent children, however, have successfully used operant procedures to decrease stuttering (Ryan, 1972; Martin et al., 1972).

Traditional approaches toward the treatment of stuttering, in its more advanced form, have included attempts to "control" the stuttering, thus involving the study of stuttering, rather than the "total process of talking" (Williams, 1957). Since the child stutterer does not have the fears, shames, embarrassment, and avoidance behaviours of the adult, such traditional direct therapy has been considered inappropriate for the young child stutterer (Williams, 1971).

Stuttering, however, is a childhood disorder, and as such the onset is usually before the age of six, while it rarely begins in adults (Bloodstein, 1975). Certain behaviours may differentiate normal dysfluency in children and more deviant patterns. Normally dysfluent children may fragment their speech as the result of various "communicative pressures" (Bloodstein, 1975). Early dysfluencies include phrase repetitions, interjections and pauses, while more deviant patterns include greater fragmentation of speech such as syllable repetitions, sound prolongations, and tension (Johnson et al., 1959, cited in Bloodstein, 1975). Bloodstein's (1975) Phase I/Phase II distinction emphasizes that in the latter stage, the dysfluencies become more chronic, more fragmentation occurs, while some awareness, but little concern is evident.

Williams (1957) has suggested that stuttering treatment for children should focus not on "controlling" the stuttering, but rather on the "total process of talking". Bar (1971) also

recommended that treatment tor children focus on fluency so that fluency becomes "self-reinforcing". If one supports a learning hypothesis, then reinforced fluency skills, provided some awareness is present, should lead to increased fluency and a reduction in its incompatible behavior, stuttering. (Bar, 1971).

Recent research has indicated that "fluency" involves the coordination of respiration, phonation, and articulation (Adams, 1974; Perkins et al., 1976). A breakdown in any one of these areas may, thus, result in a stuttering block.

The stutterer appears to experience physiological and aerodynamic difficulties with speech. Wingate in (1969) discussed stuttering as a "phonetic transition defect", involving difficulties joining syllables together and in initiating and maintaining continuous airflow and voicing during speech production.

Stuttering, therefore, may be related to motor planning difficulties (Adams, 1974). Recent evidence has indicated that the adult stutterer is slower than the nonstutterer in initiating (Adams and Hayden, 1976; Starkweather et al., 1976), as well as in terminating phonation (Adams and Hayden, 1976). However, if voice onset is delayed, then there may be no difference in initiating vocalization between the stutterer and nonstutterer (Starkweather et al., 1976), while the practice effect may reduce difficulties the stutterer has in initiating and terminating phonation (Adams and Hayden, 1976). Perhaps fluency treatment should be directed toward delaying voice onset and/or practicing coordinating respiration, phonation, and articulation.

In comparing children and adult stutterers and nonstutterers, Cross and Luper (1979) have found that stutterers demonstrated significantly slower voice reaction times at each age level. The experimenters have suggested that difficulties controlling the laryngeal mechanism may be related to the dysfluent child's early fluency difficulties. Perhaps then clinicians need to deal with the motor planning difficulties of the child and train him in the usage of existing fluency skills. Further solidification of the fluency disorder might, therefore, be arrested or prevented.

Characteristics of Beginning Stutterers Selected for Treatment;

A Rationale

In this study the five general characteristics of beginning stutterers selected for treatment included: (1) the greater frequency of dysfluencies as compared to normally dysfluent children (Yairi, 1972; Adams, 1977); (2) the degree of fragmentation of speech (Bloodstein, 1975); (3) physiological and aerodynamic difficulties during speech production (Adams and Reis, 1971; Agnello, 1971; Perkins et al., 1976; Adams, 1977); (4) beginning awareness of fluency difficulties and (5) the ineffectiveness of parental counselling in reducing the severity of the fluency disorder.

Firstly: In reference to the greater frequency of dysfluencies in the speech of the beginning stutterer, data provided by Yairi (1972) and Adams (1977) suggest that the child who is less than 5 percent dysfluent is less likely to be a stutterer, while the child who is generally more than 10 percent dysfluent is more likely to develop stuttering. Obviously, there's some uncertainty between 5 and 10 percent; therefore, other factors need to be considered.

Secondly: Early stutterings include greater fragmentation such as syllable repetitions and sound prolongations (Bloodstein, 1975). Bloodstein's Phase I/II distinction emphasizes that in the latter stage, the dysfluencies become more chronic, while more fragmentation occurs.

Panelli and McFarlane (1978) indicated that the more types and instances of dysfluencies, the poorer the prognosis for recovery without treatment intervention.

Thirdly: Tension and fragmentation, which Bloodstein (1975) uses to explain the "integral features of stuttering behaviour", may be reflected in the aerodynamic and physiological difficulties in stuttered speech. Fluent speech depends on the integration of the respiratory, laryngeal, and articulatory systems, while stuttered speech results from an incoordination among these systems (Perkins et al., 1976.) This incoordination may be reflected in various behavioural indicators as represented in Table 1. For instance, during stuttered speech, stoppage of airflow from the respiratory system may be indicated by fixation of respiratory or laryngeal musculatures or articulators (as in silent articulatory postures).

TABLE 1

AERODYNAMIC AND PHYSIOLOGICAL ASPECTS OF STUTTERED SPEECH
(Behavioral Observations)

A. RESPIRATORY PROBLEMS
- — Excessive Tension — Breathing Type
- — Inadequate or Inappropriate Inhalation or Exhalation
- — Stoppage of Airflow

B. PHONATORY PROBLEMS
- — Excessive Tension —Stoppage of Phonation
- — Difficulties Initiating Phonation
- — Difficulties with Voiced/Voiceless Transitions

C. ARTICULATORY PROBLEMS
- — Excessive Tension
- — Difficulties with Voiced/Voiceless Transitions

Breathing and vocal abnormalities during stuttered speech have long been noted (Van Riper, 1971; Bloodstein, 1975). During a voice evaluation, Boone (1977) has recommended that the type of breathing, mode of breathing, and breath control for speech purposes be assessed. Problems at the respiratory level may be indicated by the breathing type used such as clavicular breathing, which is inefficient for speech production (Boone, 1977), as well as inadequate or inappropriate inhalation or exhalation, which may include inhalation in the middle of a word, speaking on inhalation or exhalatory reserve, choppy speech, and difficulties with phrasing.

Abnormalities of pitch, loudness, and quality should be observed. Difficulties initiating phonation may be indicated by the use of vocal fry initiation, abrupt initiation, and the use of silent articulatory postures. Difficulties with voiced-voiceless transitions occur in stuttered speech (Agnello, 1971) and may be indicated by the use of the schwa vowel for another vowel, sound repetitions, and prolongations (Adams and Reis, 1971). Stoppage of airflow or voicing may be indicated by the use of effortful repetitions, glottal stops, explosive blocks, silent articulatory postures as well as part-word repetitions, sound prolongations and the use of the schwa vowel as suggested by Adams (1977).

Excessive tension at the articulatory level may be indicated by the presence of tremors, hard articulatory contacts, and silent or audible articulatory postures. Difficulties with voiced-voiceless transitions, as previously discussed, may also have an articulatory component. Again inappropriate use of the schwa vowel, sound repetitions, and prolongations may be observed.

While motor planning difficulties in stuttering have been reported, Riley and Riley (1979) have stated that 69% of their sample of stuttering children also demonstrated motor planning dysfunctions.

The fourth factor considered was the beginning awareness of fluency difficulties assumed from behavioural observations. These included a lack of eye contact, a reluctance to speak, the child's demonstration of frustration such as stopping talking following a dysfluency, and the child's indication of a belief in the difficulty of speech by the excessive use of such statements as: "I can't say that"; "I talk funny"; "I don't know"; "It's hard". Culatta and Sloan (1977) have indicated that children as young as first graders (and perhaps younger) are able to discriminate between stuttered and nonstuttered speech, although they may not have the label "stuttering"; this suggests that a modelling approach might be quite appropriate with this age group. As Bar (1973) indicates, once there is an awareness of stuttering then treatment should be initiated.

The fifth factor considered was the lack of success of traditional parental counselling in reducing the severity of the fluency disorder. Following a Johnsonian approach, clinicians generally have been quite reluctant to treat the dysfluent child, in the belief that increased attention to the problem might increase awareness, resulting in a further deterioration of fluency skills. Culatta and Sloan's research, however, indicated that young children do have good discrimination abilities.

METHOD

Subjects

In addition to the criteria for subject selection just discussed, individual subject information has been summarized in Table 2. The five children selected for treatment ranged in age from 4 years 2 months to 8 years 8 months with a mean of 6 years 2 months at the initiation of fluency treatment. All children had experienced abnormal fluency difficulties in terms of frequency of dysfluencies, tension, and fragmentation from a minimum of 8 months to a maximum of 4 years, with a mean of 2 years 2 months.

TABLE 2

INDIVIDUAL SUBJECT INFORMATION

SUBJECT	SN	JP	MC	DB	SK
AGE WHEN FIRST TREATED	4-2	5-4	6-3	6-6	8-8
AGE FLUENCY PROBLEM NOTED	3-6	3-6	4-6	2-6	6-1
OTHER COMMUNICATION DIFFICULTIES	ARTIC.	NONE	ARTIC. (RESOLVED)	ARTIC.	ARTIC. (RESOLVED)
PRIOR PARENTAL COUNSELLING	YES	YES	YES	YES	YES
PREVIOUS FLUENCY TREATMENT	NO	NO	NO	BRIEFLY	NO
FLUENCY PROGRAM	A	A	AB	AB	AB
TRANSFER PROGRAM	NO	NO	NO	YES	YES
DURATION OF TREATMENT	2 MOS.	3 MOS.	6 MOS.	9 MOS.	2½ MOS.
# OF ½ HR. SESSIONS	33	16	24	49	14

As Bloodstein (1975) has discussed, many abnormally dysfluent children may have a history of other communication disorders. Interestingly, four out of five of the selected children had a history of articulation difficulties as noted by previous speech/language assessment reports. Half of those with a history of articulation problems had resolved these problems (one spontaneously and one by direct treatment) prior to the beginning of fluency treatment.

All children were seen individually for treatment; four children were seen in a Health Clinic setting, while subject SN was seen in a hospital setting. Most children were seen twice weekly for half-hour sessions during the school year, while subject SN was seen daily during a summer treatment period. Duration of treatment ranged from 2 to 9 months with a mean of 4.5 months, while the number of sessions ranged from 14 to 49 with a mean of 27 sessions.

Treatment was terminated once the child had achieved and maintained his conversational fluency level at 98% for a minimum of six to eight sessions and when the child's duration and physical concomitant scores on the *Stuttering Severity Instrument* had been reduced to 1 or 0. The exception was client SN, whose treatment was terminated as a result of family problems. SN reached a fluency level of 94% before treatment was terminated.

Parental Involvement

As previously reported, all parents of the subjects had received traditional counselling, emphasizing a "hands-off" approach. Since all parents indicated frustration with the idea of ignoring the presence of their children's abnormal speaking patterns, parental counselling, combined with demonstrations, was provided when possible. Parents were counselled to: (a) reduce fluency disruptors in the home, (b) give the child attention while he was attempting to communicate, rather than focusing on disruptions in communication, (c) encourage talking under relaxed conditions, (d) model a relaxed speaking pattern without instructing the child to change his speaking pattern, and (e) avoid the use of "helpful hints" to change the child's speaking pattern.

All parents, with the exception of MC's parents, were available inconsistently to observe treatment sessions. Home assignments were only given out after the parent had observed three sessions and had also practiced the task following the clinician's demonstration within the treatment setting. "SN's, SK's, and JP's parents were the most consistent about carrying out home assignments, while MC's parents were only available for phone contacts.

Less Direct Treatment Approach

A less direct treatment approach, program A, emphasized modelling rather than correction and was used with all children in the initial stages of treatment. Dysfluent utterances were not corrected, although the clinician did slow down her own speaking rate and rephrase the child's dysfluent utterances. The child, however, was not instructed to change his speaking pattern. Rather, the child tended to respond to the modelling approach by expanding or commenting on the clinician's remarks in a more fluent manner.

Areas of treatment emphasis included: (1) establishing fluent speech with the use of fluency facilitators; (2) maintaining fluent speech, while the use of fluency facilitators was faded out; (3) reinforcing fluent utterances of gradually increasing length and complexity (Ryan, 1972), and (4) desensitizing the child to fluency disruptors associated with communicative stress (Emerick, 1965).

Overlearned materials and novel stimuli, conditions which result in changes in vocalization, were used to strengthen the child's expectation of and use of a fluent motor

pattern. The use of overlearned materials may aid in practicing coordinating respiration, phonation and articulation involved in fluent speech production, known as the "practice effect" (Healey et al., 1976; Frank and Bloodstein, 1971). Overlearned materials used in this fluency program involved the use of counting, singing, fingerplays, and nursery rhymes. The effect of novel stimuli may be to aid in simplifying the motor planning involved in fluent speech production (Perkins et al., 1976) by increasing the voicing, vowel or syllable duration. The novel stimuli used in this program included choral speaking, singing, rhythm, a metronome and/or the use of a slow, prolonged speech model.

Generally a shaping procedure was used in establishing fluent speech with the use of fluency facilitators and when fading out these facilitators.

Overlearned materials such as nursery rhymes, fingerplays, and songs as well as rhythm games were modelled one phrase at a time with the use of a slow, prolonged speech model and a rhythm. One clap was used per syllable during these fluency games. The child could thus organize his speech output around a beat, resulting in increased vowel duration and a decreased speaking rate without calling attention to his speech. Similarly, a metronome was used with one child who demonstrated difficulties following a slow, prolonged speech model without specific instruction. This particular child, gradually increased his rate from 80 to 120 words per minute with the use of the metronome and while maintaining a 98% fluency rate.

The rhythm provided by clapping or the use of a metronome was gradually faded out at each response level once a fluency rate of 98% was achieved. For instance, the "rhythm" might be provided for most of the sentence with the exception of the last word and then gradually the use of the "rhythm" would be reduced and eliminated for the entire utterance.

The hierarchy of responses used proceeded from choral to imitative to sentence completion, to structured carrier responses, to question cued responses, to more spontaneous responses. As suggested by Ryan's (1972) "gradual increase in length of utterance" program, fluent utterances progressed from words to phrases to longer phrases to sentences to longer sentences and to several sentences.

Once a fluency success rate of 98% was established with the above fluency facilitating activities without the use of a beat or a metronome, then more spontaneous speaking tasks were gradually introduced. Objects and pictures were introduced with carrier sentences and presented with a slow prolonged speech model. Responses gradually followed the previous outline from choral to imitative to completing a sentence to spontaneous. The child gradually uttered a greater number of fluent utterances in succession until he was able to tell a story fluently using pictures. In a systematic way, the motor planning for each response proceeded from a simplified to a more complex level in view of Tormik and Bloodstein's (1976) findings that stuttering and thus motor planning difficulties increase as linguistic complexity increases.

Finally, since greater fragmentation of speech may result from various communicative pressures, the child was desensitized to listener disturbances. The frequency of non-verbal fluency disruptions (such as tapping a foot impatiently) and later verbal fluency disruptors (such as "no", "stop", "hurry up") was gradually increased. The child was instructed to continue talking and not to interrupt his message. Both the clinician and client took turns during this activity, while gradually increasing the length of their fluent utterances.

Parents who attended treatment sessions followed home programs and continued to facilitate the child's fluency skills during a maintenance phase, where the frequency of sessions was gradually decreased.

More Direct Treatment Approach

Program B, also emphasized the use of modelling in addition to instruction (regarding respiration training) rather than correction. This program was generally used with the older children who were more aware of their fluency difficulties and who, generally, with the exception of one child, demonstrated more severe fluency difficulties. Dysfluent utterances were not corrected, although the clinician did slow down her own speaking rate, used breathy phonation, and rephrased the child's dysfluent utterances. The child was not instructed to change his speaking pattern.

Program B, which followed the use of Program A, was generally used when respiratory problems during speech production, as outlined in Table I, were noted. When such difficulties as speaking on residual air or on inhalation, using clavicular breathing, using choppy speech, or difficulties with phrasing, the use of excessive tension and/or stoppage of airflow continued to be present following the use of novel stimuli and overlearned materials outlined in Program A, then a somewhat more direct program was incorporated into the more spontaneous tasks involved in Program A.

The gradual increase in length and complexity program (Ryan, 1972) used in Program A continued to be used in Program B, in conjunction with (1) respiration training and (2) the use of passive airflow or breathy phonation. The hierarchy of responses continued to progress from choral to imitative to completing a sentence to spontaneous responses to the use of longer units of fluent speech.

The use of an abdominal-diaphragmatic breathing pattern or "tummy breathing" was trained in order to reduce tension at the level of the larynx. Aspects of Azrin's and Nunn's (1974) "regulated breathing approach" were used. Regular pausing and use of "tummy breathing" were coordinated with phrasing work, although the child was not instructed to correct dysfluent utterances using "regular breathing"as Azrin and Nunn suggest. Respiration training was the most direct aspect of the program and the only instance where the child was given specific instructions, in this case to use an appropriate breathing pattern and speak in groups of phrases in order to promote the use of "easy talking".

In addition, the clinician modelled the use of passive airflow, or continuous airflow prior to and during phonation as described by Perkins (1973), in order to train smooth, uninterrupted easy initiation of phonation. The child however was not instructed to change his manner of phonation. Respiration training was used in conjunction with continuous airflow while gradually increasing the length of phrases used.

Desensitizing the child to listener disturbances, as discussed previously, was also incorporated into this program, although "easy talking" and communicating one's message were associated with the use of "tummy breathing". In this manner, attention was directed toward aspects of fluent speech rather than stuttered speech.

Since spontaneous transfer occurred with many of the young children, an occurrence also noted by Ryan (1972), specific transfer situations were used with only two of the children. Transfer situations generally included show and tell topics, role-playing situations, and actual situations. Where good parental involvement occurred, home programs were used and parents also assisted in maintenance as the frequency of sessions was gradually decreased over a one month period.

RESULTS

Riley's (1971) *Stuttering Severity Instrument*, which measures severity in terms of frequency of dysfluencies, duration of blocks, and the use of physical concomitants was administered before and following treatment and at the time of each follow-up visit.

Table 3 represents individual severity measures taken at the initiation and termination of treatment in addition to mean scores. Prior to treatment the children's fluency difficulties ranged from mild-moderate to severe, and very mild to mild following treatment. All children reduced the frequency of their dysfluencies as well as the duration of their blocks, while clients SN, MC, DB reduced their usage of physical concomitants.

TABLE 3

Severity as measured by THE STUTTERING SEVERITY INSTRUMENT at the initation and termination of treatment.

	SUBJECTS											
	SN		JP		MC		DB		SK		Means	
Scores	S1	S2	S1	S2	S1	S2	S1	S2	S1	S2	S1	S2
Frequency	16	6	14	4	16	6	18	6	11	2	15.0	4.8
Duration	3	1	1	0	3	1	4	1	2	1	2.6	.8
Physical concomitants	1	0	0	0	3	1	7	0	0	0	2.2	.2
Total	20	7	15	4	22	8	29	7	13	3	19.8	5.8

S1 = SSI score at the initiation of treatment
S2 = SSI score at the termination of treatment

Characteristics of the children's dysfluency patterns have been presented in Table 4. At the initiation of treatment, all the children demonstrated tension and fragmentation in their speech to varying degrees. Following treatment all children decreased the number of dysfluency types used from a range of 5 to 7 (out of 7 listed) to a range of 1 to 3 different types used. By the termination of treatment, all children used predominantly easy whole word repetitions, thus fragmenting their speech to a lesser degree. In addition, clients MC and SN used some easy syllable repetitions at the termination of treatment. Client DB, however, who later demonstrated a mild regression, also used some tense syllable and word repetitions and demonstrated some usage of abrupt initiation of phonation.

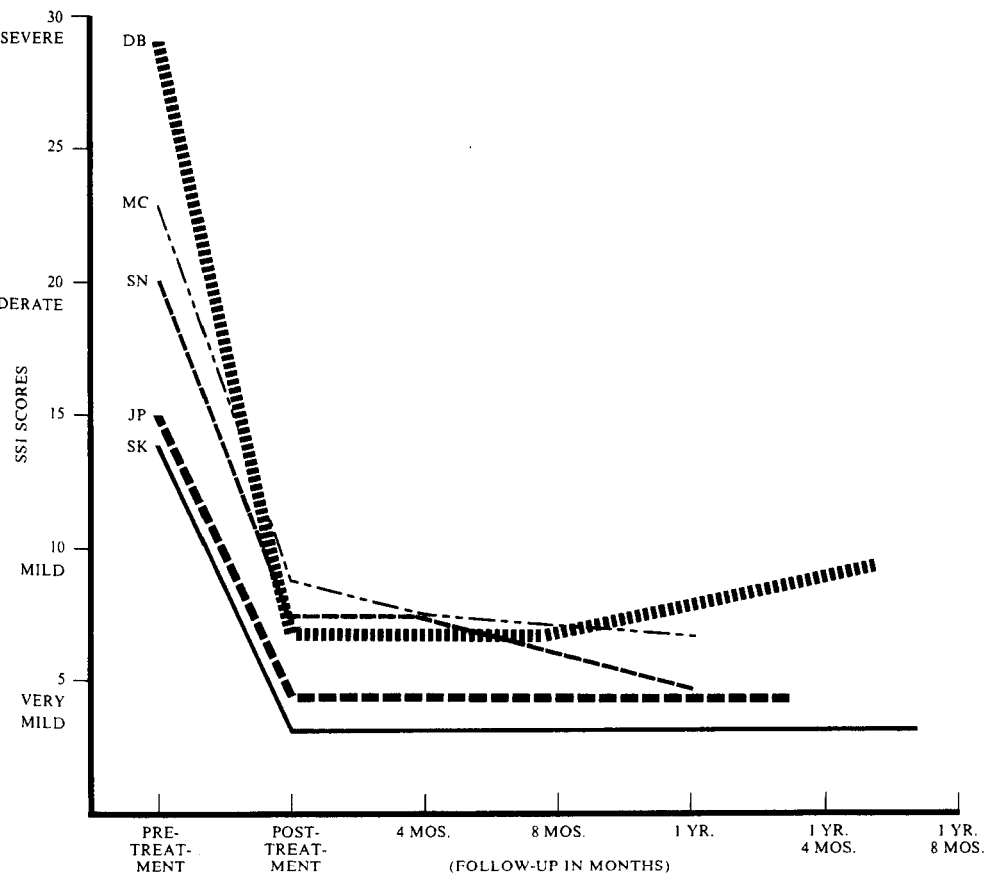
TABLE 4: PROFILE OF DYSFLUENCY PATTERNS PRE- AND POST-TREATMENT

	SUBJECTS									
	SN		JP		MC		DB		SK	
Dysfluency Types	T1	T2	T1	T2	T1	T2	T1	T2	T1	T2
Silent articulatory postures	+				+		+			
Abrupt phonatory onsets			+		+		+	+	+	
Sound prolongations	+	+	+		+		+		+	
Sound repetitions	+		+		+	+				
Part-word repetitions	+				+		+		+	
Syllable repetitions	+		+		+		+	+	+	
Word repetitions	+	+	+	+	+	+	+	+	+	+

T1 = characteristic at the beginning of treatment
T2 = characteristic at the termination of treatment
+ = dysfluency type present

Treatment results and follow-up measures taken two to three times after the termination of treatment, as represented in Figure 1, indicated that four out of five children maintained their fluency skills or improved slightly. The first follow-up measures were taken 4-7 months following treatment with a mean of 5.4 months. The second follow-up measures were taken 7 months to 18 months following treatment with a mean of 12.8 months. Follow-up measures were taken for a third time for clients SN and JP from 12 to 14 months following treatment (mean = 13 months). Only one child demonstrated a mild regression of fluency skills, although this child (DB) demonstrated the most severe fluency disorder at the initiation of treatment and had demonstrated difficulties at the youngest age (two and a half years) and for the longest period of time (four years) prior to the initiation of fluency treatment.

FIGURE 1: TREATMENT RESULTS AND FOLLOW-UP MEASURES
(FOR SUBJECTS SK, JP, SN, DB AND MC)



DISCUSSION

Since the abnormally dysfluent child has not "practiced" his dysfluent speaking pattern as long as the adult stutterer, it may be easier to improve the speech pattern of the child who is demonstrating considerable fragmentation and tension in his speech and a growing awareness of his fluency difficulties.

In view of Riley's and Riley's (1979) findings that a very high percentage of early stuttering children (69% of their sample) demonstrated motor planning dysfunctions, it seems reasonable to train fluency as a motor skill for these types of children. Further support for the presence of motor planning difficulties in stuttering can be found in Tornik and Bloodstein's (1976) findings that stuttering increases as linguistic complexity increases. In addition, the reports of articulation difficulties in many stuttering children causes one to seriously consider the presence of motor planning difficulties in the treatment of abnormally dysfluent children.

Strengthening the child's expectation of and use of a fluent motor pattern through the use of fluency facilitating conditions (overlearned materials and novel stimuli), and where necessary, through the use of respiration training and passive airflow have been effective in increasing the fluency skills of several dysfluent children. The children presented in this paper were able to reduce the frequency and different types of dysfluencies as well as the duration of their blocks and the use of physical concomitants. The initial results of the above fluency training programs appear quite promising. Increasing fluency skills resulted in a reduction if its incompatible behavior, stuttering.

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