LANGUAGE AND SPEECH MOTOR INTERFERENCE IN STUTTERING CHILDREN

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DEDICATED

TO

AMMA & APPA

CERTIFICATE

This is to certify that the dissertation entitled : LANGUGAGE AND SPEECH MOTOR INTERFERENCE IN STUTTERING CHILDREN is the bonafide work in part fulfilment for the degree of Master of Science (Speech and Hearing), of the student with Register No.M9202.

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This is to certify that this dissertation entitled LANGUGAGE AND SPEECH MOTOR INTERFERENCE IN STUTTERING CHILDREN has been prepared under my supervision and guidance.

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DECLARATION

This dissertation entitled LANGUGAGE AND SPEECH MOTOR INTERFERENCE IN STUTTERING CHILDREN is the result of my own study under the guidance of Dr. Savithri, S.R., Lecturer, Department of Speech Sciences, All India Institute of Speech and Hearing, Mysore, and has not been submitted earlier at any University for any other Diploma or Degree.

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CHAPTER-I

INTRODUCTION

Stuttering is defined as -

(i) (a) disruption in the fluency ot verbal expression, which is (b) characterized by involuntary, audible or silent repetitions in the utterance of short speech elements, namely: sounds, syllables and words of one syllable. These disruptions (c) usually occur frequently or are marked in character and (d) are not readily controllable.

(11) Sometimes the disruptions are (e) accompanied by accessory activities involving the speech apparatus, related or unrelated body structures, or stereotyped speech utterances. These activities give the appearance of being speech related struggle.

(iii) Also there are not infreguently (f) indications or report of the presence of an emotional state, ranging from a general condition of "excitement" or "tension" to more specific emotions of a negative nature such as fear, embarrassment, irritation, or the like,(q) the immediate source of stuttering is some incoordination expressed in the peripheral speech mechanism and the ultimate cause is presently unknown and may be complex or compound (Wingate, 1964).

The ultimate cause' still remains unknown. The state of the field is perhaps best reflected in Van Riper's personal experience.

"When 1 was a youth of 16 1 swore an oath to a birch sampling that I would devote my life to finding the cause and cure for stuttering. Decade after decade 1 returned to that tree and confessed I had found neither. That birch tree died a long time ago but if it were still living I would have to say the same thing today"... "Have 1 anything more to say? Yes, that I still hope that sooner or later others will fulfill the vow I made to that birch tree" (Van Riper, 199O).

Earlier trends were to approch stuttering as a pathogonomic monolith inspite of diversity in stuttering manifestations. Increasingly, this trend has changed and stuttering is no longer viewed as a unitary disorder. If stuttering is not a unitary disorder, there exists a need to identify components that affect a child's/adult's threshold for fluency. In recent years as the promises of behvioural and other explanations has become less attractive, interest in the motoric and linguistic phenomenon has reawakened.

Research on stutterers has demonstrated that both the fluent and dysfluent speech of sutterer; is aberrant vis-a-

vis normals. Irregularities may be found in the individual motor system involved in speech-respiration, phonation and articulation as well as in the co-ordination between them. Review by Adams (1984) and Peters (1987) unequivocally demonstrated slower speech reaction times in stutterers. These slower reaction times could be due to slower preparation or programming of speech utterances as well as slower initiation of the speech movements themselves (Meters, Hulstjin and Starkweather, 1989). The coordination between laryngeal and respiratory systems also seems to be diminished in stutterers. The perceptually fluent speech pattern of stutterers contains unusual patterns of air pressure build up. Electromyographic and electroglottographic studies have shown abnormal laryngeal behaviour even in the perceptually fluent speech of stutterers (Freeman and Ushijima, 1978; Shapiro, 1980; Van Lieshout, Peter, Hulstin and Startweaker, 1980). In terms of articulatory behaviour, stutterers show longer delay in onset of movement (Laruso, Gracco and Abbs, 1987; Peters, et al. 1989), longer transition times (Caruso et al. 1987; Zimmerman, 1980 a, b) and longer steady state postures (Zimmerman, 1980 a, b). Stuttering children are slightly but significantly delayed in the development of language skills (Kline and Starkweather, 1979; Wall, 1977). Stuttering is often seen in chidlren with delayed language development just as their language emerges (Merits-Patterson

and Reed, 1981). However, with findings like these, the chicken/egg' question remains unresolved. Is the language delay a consequent of stuttering or vice—versa. Why does one find children with language skills beyond their age stuttering? Points at which stuttering occurs can be linguistically defined. Words close to/the beginning of the sentence (Wingate, 1976), on longer compared to shorter sentences (Jayaram, 1984) and major clause boundaries (Wall, Starkweather and Cairns, 1981). The effort required to formulate sentences reduces fluency in normal young speakers. When syntactic formulation preceeds production, normal non-fluencies are seen in syntactically more complex sentences (Gordon, Luper and Peterson, 1986).

Recently, Peters and Starkweather (1990), have formulated hypotheses and suggested lines of research to account for these findings. Three hypotheses have been suggested. These are (1) "There are sub-groups of stutterers such that one develops primarily out of motoric deficit while another develops it primarily out of a linguistic deficit". (2) "Language and speech motor processes may interfere with one another during the act of talking, at least in children who are beginning to stutter. This interference hypothesis' is based on research in non-stutterers, which suggests that the simultaneous performance of language formulation and

motor programming may result in deterioration of performance in one or both areas (kinsbourne and Hicks, 1978). Such a hypothesis is suggestive for a number of reasons one of which is the explanation it offers for the location of stuttering between sentences. The locations that have the most power in eliciting stuttering are those that are both linguistically and motorically demanding. For example the beginning of a sentence or clause, where movement is fast and where formulation activity is most likely to occur is the most probable location for stuttering. Also, a longer sentence is more likely to be stuttered than a shorter one (Bloodstein and Gantwek, 1967; Jayaram 1984) and longer sentences might be expected to be motorically more complex and, therefore, reguire more formulation effort as well as effort of motor programming". (3) "Competence and performance have different effects on fluency. Higher levels of language competence (knowledge) could hinder fluency by creating a large lexicon and a greater available pool of syntactic forms from which to choose words and formulate sentences. Higher level performance skills such as word finding and sentence construction, can only improve fluency by increasing the rate at whiqh language performance is executed. In this way, the child whose language is delayed although he or she is not hindered by a large vocabulary or syntactic variation, might find it difficult to find words even from a small lexicon or

to construct even simple sentneces and perform motor activities at the same time".

Peters and Starkweather (1990) have suqqeted several lines of research to test the above hypothesis. The first hypothesis can be tested by administering various tests for language skills, oral motor behaviour and tests of general motor behaviour and motor co-ordination. If thieve are subtypes with purely motoric/purely linguistic, the stutterers should produce low scores on either of the two variables. An investigation of the speech motor/language interference hypothesis requires two comparisons (1) comparison of the interference effect of a language task on a simultaneous motor task with interference effect of a non-language cognitive task on simultaneous motor performance, and (2) comparison of the interference effect of a non-speech motor task on simultaneous language performance. The third hypothesis can be tested by investigating relationship between stuttering and cluttering in more detail".

Investigations of such a nature can have several implications for diagnosis and therapy. Instead of limiting assessment to description of perceptually observable types of dysfluencies; more reaction time measures may be conducted. Observable articulatory behaviour may also be assessed using

measures like oral motor scale (Riley and Riley, 1986). Detailed language assessment is also called for in order to obtain a wholistic picture.

"Development of therapeutic techniques designed to remediate linguistic or motoric deficits should wait for more direction from research" (Peters and Starkweather, 1990). The "chicken/egg" issue needs to be resolved. Nevertheless, there are indications that linguistic and motoric deficits may play an etiologic role.

In spite of such indications,the lines of research suggested by Peters and Starkweather (1990) have not been pursued to date. It is in this context that the second hypothesis "Language and speech motor processes may interfere with one another during the act of talking, at least in childrn who are beginning to stutter" proposed by Peters and Starkweather (1990; is being investigated. The interference of language task and speech motor task will be investigated in stuttering children in the age range of 6-9 years, and their scores would be compared with that of normal children.

CHAPTER II

REVIEW OF LITERATURE

"Why do individuals stutter?" Several approaches have been made to answer this question, while the solution remains elusive, our understandinq of the problem has increased many-fold. Stuttering has been viewed as a motor defect (MacKay, 1970% Van Riper, 1971; Adams, 1974, 1975b; Schwartz, 1976 and Zimmerman, 1980), and as a linguistic deficit (Bloodstein, 1958) (Wingate, 1980). Brief descriptions of the concept of these authors have been provided in the section following:

I. STUTTERING AS A MOTOR DEFECT:

a. Stuttering as a defect in phonetic and syllabic contextual programming (MacKay, 1970):

MacKay (197O) proposed a normal speech production model at the phonetic level which can account for pathological stuttering. According to him the model contains the following levels:

Buffer Display

Individual Phoneme Level

Contextual Integration

Motor Units

The Buffer level has two functions:

1) it stores the word to be produced in abstract form,

2) generates a set of programs to modify the phonemes (reguired in the production of the target word) according to the context.

The buffer feeds into the individual phoneme level where the phonemes in the target word gets partially primed. From here the partially primed units are sent to the motbr unit level. A scanner passes over these giving an additional boost of excitation. This brings the primed units to the threshold and a series of motor commands are sent to the appropriate speech musculature.

MacKay (1970 a) and Mackay and Soderberg (1970 c) suggest that the contextual programming model can also account for pathological stuttering in three ways:

Model-1 : Postulates that the motor unit threshold may be lowered in stutterers vis-a-vis normals.

Model-2 : Hypothesizes greater levels of hyperexcitability than normals.

Model-3 : Postulates greater prepriming for stressed units.

b) Stuttering as a defect in coarticuiatory timing:

Van Riper (1971) defined stuttering behaviour as a "word improperly patterned in time and the speaker's reaction there to". He hypothesizes that there is a breakdown in the timing of coarticuiatory events in the production of the syllable. This breakdown has been attributed to the following:

a) Stutterer's inability to monitor speech appropriately through tactile - kinesthetic - proprioceptive feedback

b) Deficient ability to integrate long motor seguences.

c) Organic deficiencies in speech related functions viz. breathing, voicing, articulation etc.

The combined result of these short coming is the core of stuttering behaviours - syllabic repetitions, sound prolongations, silent articulatory postures and phonatory arrests.

Evaluated in the light of research on the motor abilities of stutterers, Van Riper's model stands in good stead. A defect in timing may explain some of the problems stutterers may have in maintaining rhythmic repetitions of various speech and non-speech tasks. While it is consistent with almost all of research on respiratory, phonatory and

articulatory abilities of stutterers, its major flaw is its lack of specificity.

c) Stuttering as a defect in airflow and vocalization:

Adams (1974, 1975 b) described stuttering as a defect in airflow and vocalization. In this model, irregularities in respiration and phonation are viewed as primary stuttering events while articulatory irregularities are seen as secondary coping strategies. Stuttering is seen as a breakdown in the timing, smooth initiation and maintenance of exhalation and voicing. When such breakdowns occur, the speaker either repeats the same articulatory gesture or prolongs the articulatory gesture being attempted. In order for voicing to occur, subglottal air pressure must exceed supraglottal air pressure and be able to overcome the glottal resistance.

Excessive supraglottal air pressure in stutterers is usually caused by the secondary coping strategies in the upper articulators. When this happens, compensatory activity in the expiratory musculature is called for. Without this, constrictions or blockages of the airflow by the tongue or lips raise the supraglottal air pressure above the level of subglottal air pressure and cause cessation of phonation.

Excessive glottal resistance is attributed either to excessive stiffness within the vocal folds or to completely abducted folds prior to phonation.

Adams' model accounts for the fact that supraqlottal air pressure is excessive during stuttering (Hutchinson, 1975; Hutchinson and Navarre, 1975); and fluent speech of stutterers (Agnello and Wingate, 1971).

It seems reasonable to speculate that the delayed voice onset and difficulty in shifting from voiceless to voiced sounds in stutterers is due to excessive glottal stiffness. Thus, the model is consistent with the data on phonatory abilities of stutterers.

Adams' model in general is not inconsistent with articulatory data. However, there is no definitive evidence yet to conclude that articulatory disturbances are secondary to respiratory and phonatory breakdown.

d) Stuttering as a learned excitatory response to a laryngeal abductor reflex:

Schwartz (1976) stated that the core of the stuttering block is, "the tendency, under conditions of psychological stress, for the loss of supra medullar inhibition of the PLA during speech".

Central to his model is the "airway dilatation reflex" (ADR), whenever there is a blockage of the airway or a need for greater than normal volume of air, the ADR comes into play during which the nostrils flare, the body of the tonque moves forward, the pharynx dilates and the vocal folds abduct. According to Schwartz ADR is mediated by the medulla. During normal speech subglottal pressure is elevated, but the ADR is not elicited because of inhibition of medullary centers by higher centers. During periods of psychological stress, however, this inhibition breaks down and the ADR is elicited. This causes the PCA to contract, thus rendering phonation impossible.

Faced with such a situation, a speaker may try to "do battle supraglottaly" (Schwartz, 1974). He may tense the lips, tongue or jaw. Overt stuttering thus consists of learned excitatory behaviours.

The model has been criticized on its scientific accuracy, logic and explanatory power (Freeman, Ushijima and Hirose, 1975; Zimmerman and Allen, 1975). It does not account for the linguistic findings of stuttering. It does not predict any general motor co-ordination deficit in stutterers;

e) A broad theoretical notion about stuttering was presented by Zimmerman (1980).

For the first time, Zimmerman gave a physiological rather than psychological explanation for the phenomenon. He explained the problem at the level of the motor neurons, where a number of impulses from diverse sources were integrated and the sum of these inputs determine the background tonus and triggering threshold for co-ordinated structures.

f) Stuttering as Tension and Fragmentation.

Bloodstein has explained stuttering in terms of an anticipatory struggle reaction (Bloodstein, 1958). However, in recent years he has considered two additional notions of tension and fragmentation (Bloodstein, 1969, 1974, 1975 a,b).

Tension typically produces prolongations of continuant sounds or hard attacks of stop consonants. In the latter case, the stop phase of the consonant is prolonged, presumably with a high degree of intraoral air pressure followed by a greater than normal explosion of air and onset of voicing. This combination of factors results in a

notably hard glottal attack. Tension can also result in complete stoppage of the air Stream from an excessively tensed and prolonged stop phase of a consonant. An attempt to vocalize with a tightly closed glottis are probably typical only of severe stutterers 'Van Riper, 1971.

The result of fragmentation depends upon the speaker's conception of the locus of difficulty in speech. Early or mild stutterers probably are only vaguely aware of where their difficulties lie, therefore, they tend to fragment natural synthetic units such as phrases, clauses or sentences. The result is repetition of the first word of the syntactic unit. Rarely do these repetitions occur in the middle or end of a syntactic unit.

The model of stuttering as tension or fragmentation elucidates a number of research findings rather well particularly those with children. It predicts that the "word bound" factors influencing the loci of stuttering, such as consonants, vowels, word freguency, word length, information load and grammatical class will not be present in the stuttering of preschoolers. There is some empirical evidence to support this hypothesis (Bloodstein, 1974; Bloodstein and Gantwerk, 1967; Harvey-Fisher and Brutten, 1977).

The tension aspect of the model appears consistent with much of the research using electromyography. The data consistently indicates higher levels of muscle activity during stuttering than fluency.

The major weakness of this model is that it does not satisfactorily explain why speech becomes fragmented. The only support given for this hypothesis that "getting started" in speech involves a more complex motor plan than continuing or finishing an utterance,is the observation that people seem to have the greatest difficulty in getting started in several fine motor skills. While Bloodstein is probably correct in this supposition, an explanation of why getting started is difficult is not provided.

II. STUTTERING AS A LINGUISTIC DISORDER:

a) Stuttering as a defect in Prosodic Transition to stressed syllables (Wingate, 1980).

Wingate's view of stuttering might be termed a defect in prosodic transition to stressed syllables. "Prosodic" refers to various suprasegmental features such as juncture, intonation patterns and stress lor accent) changes which cut across typical phonetic segments. "Transition" defect

implies that stuttering is a problem of movement between sounds rather than stuttering "on" a sound. "to" means that the problem in stuttering occurs in transitions towards - not away from -the next sound. "Stressed syllable" refers to the fact that stuttering is most inevitably associated with syllable production, notably in production of the vowel in each syllable. Vowels carry considerably more acoustic energy than consonants, and the primary source of that acoustic energy is phonation. Furthermore, the effort required for vowel production is magnified in stressed syllables, and these syllables are most likely to be stuttered.

Stuttering results from both linGuistic and motoric difficulties, both of which interact to produce the stutterer's intermittent inability to "actualize" the vowels of stressed syllables. Observable stuttering symptoms are audible or silent prolongations of segments of one syllable or less in length.

The equivocal fact that most stuttering occurs on the initial syllable of words is seen as an artifact of the distribution of syllabic stress in sentences.

By looking at general patterns, and disregarding selected contradictory findings, Wingate has generated a potentially powerful model of stuttering.

Wingate's prosodic transition model of stuttering is not inconsistent with most of the data on voice onset and voicing irregularities of stutterers.

One finding in coarticulation literature is not entirely consistent with the model's prediction of stuttering on vowels. Montgomery and Cooke (1976) found that stuttered CV syllables appear to be abnormal during the consonant segment but normal in the following vowel. Otherwise, the model is quite consistent with articulatory data on stutterers. Further more, it is not inconsistent with most of the data on the motor abilities of stutterers. Nonetheless a few of his generalizations are not consistent with research results.

Wingate states that the factors of initial word position and the consonant vowel effects are artifacts of (1; the frequency of occurrence of stressed syllables in the initial word position and (2) of the frequency with which English words begin with consonants. Assuming that his figures of 80% are accurate for both cases, then about 80% of stuttering should occur on initial word syllables and about 80% of those should be on consonants. The evidence however suggests

higher values in both cases (Hahn, 1942 b; Johnson and Brown, 1935; Taylor, 1966).

b) Stuttering as a disorder in language systems and processing (Hamre, 1976).

According to Hamre (1976) stuttering is a problem of speech programming and production. This also indicates that stuttering is a problem at two levels, a linguistic level termed "language systems" and a psychophysiological level termed "language processing".

Because of the phonological problem involving segments and prosody, stutterers show impairment in using both context-sensitive rules and context-free rules. Here, "context-sensitive" is intended to indicate that the rules contain inter-dependencies among the variables, as in the case of later occurring sounds influencing the production of earlier sounds. "Context-Free" rules contain no inter-dependcies among the variables, and here stutterer may stutter on words beginning with any particular sound, but, by itself.

He also states that, if stuttering increases in severity, it begins to influence, or be influenced by,

variables at other levels. For example, an usually severe instance of stuttering may affect the speaker's ability to generate appropriate syntax and/or his ability to perceive sensory stimuli. It also predicts that the most significant linguistic problems in stuttering wil1 be found in the area of phonology rather than morphology or syntax.

Numerous other studies also explain stuttering as a language disorder. Ratner and Sih (1969) studied the effects of utterance length and task complexity in normal and stuttering children. Both groups showed fluency breakdown as they imitated sentences with gradual increase in syntactic complexity and length. Ratner and Sih proposed that nonfluencies occur when children are pressed to produce utterance beyond their linguistic capacity. Stockes and Usprich (1983) studied learning aspects of stuttering and reported that stuttering children stuttered more freguently and had increase in disfluencies as the level of language demand increased.

Kathryn (1989) evaluated receptive and expressive langugage age eguivalency scores for sixteen stutterers 5-9 years to determine if differences exist between these skills of young stutterers. The finding that young stutterers were not delayed in their receptive language

skills were delayed in their expressive langugage skills, was interpreted as support for the hypothesis that langugage deficits observed in stuttering children result from their attempts to specify verbal responses as a means of coping with their stuttering.

The most recent explanation based upon the langugage aspects for the etiology of stuttering has been the demand and capacity model by Adams (1991). According to Adams, fluency breaks down when environment and self imposed demands exceed the speakers cognitive, linguistic motoric and or emotional capacities for responding. The idea for organizing the data into two major categories - demands for fluency and capacities for fluency - developed as the solution to a puzzling combination of facts about the role of language in the development of stuttering.

According to Adams (1990) this demands for langugage performance strain the child's learning capacity, but more importantly they also strain the childs motor capacity in two different ways. First, language and motor performance occur at the same time during speech production, so central nervous system processing for learning may detract from motor performance (kinsbourne, 1971/.

Second, the longer words and sentences that are inherent in more complex learning reguire a more complex motor plan (Peters, Hulstjein and Starkweather, 1989; and are also executed more quickly than the words and sentences of simpler learning (Amster, 1984). So asking for more complex learning ability, as in langugage therapy, or at the high end of learning ability, as with the superior child, is motorically, as well as linguistically demanding. In both cases the descrepancy between the demand and the capacity for performance is similar and may cause disfluency in speech.

Converging evidence support that stuttering is associated with deficits in the planning and execution of speech. And the evidence also suggests that the onset, development and occurrence of stuttering may be related to demands that learning places on speech motor planning and execution.

Recently, Peters and Starkweather (1990) have explored the relationship between motoric and linguistic function in stutterers in order to derive suggestions Tor developing new research hypothesis. These attempt to account for the various findings regarding motoric and linguistic variables. Three hypothesis have been put-forth.

(i) "There are sub-qroups of stutterers such that one develops primarily out of a linguistic deficit while another develops primarily of a motoric deficit".

(ii) "The second hypothesis is that language and speech may interfere with one another during the act of talking at least in children who are beginning to stutter. This interference' hypothesis is based on research in non-stutterers which suggests that simultaneous performance of language formulation and motor programming may result in a determination in one or both areas (Kisbourne and Hicks, 1978). Such a hypothesis is suggestive for a number of reasons, one of which is the explanation it offers for the location of stuttering behaviour in sentences. The locations that have the most power in eliciting stuttering are those that are both linguistically and motorically demanding. For example, the beginning of a sentence or clause where movement is both fast and accurate and where formulation activity is more likely to occur is the most probable location for stuttering. Also, a longer sentence is more likely to be stuttered than a shorter one (Bloodstein and Gantwerk, 1967; Jayaram, 1984) and longer sentences might be expected to be syntactically more complex and therefore to require

more formulation effort as well as more effort of motor programming.

(iii) Competence and performance have different effects on fluency. Higher levels of language competence (knowledge) could hinder fluency by creating a large lexicon and a greater availability of syntactic forms from which to choose words and formulate sentences. Higher levels of performance skill, however such as word finding and sentence construction can only improve fluency by increasing the rate at which language performance is executed. In this way, the child with advanced linguistic knowledge may run an increased risk of stuttering because he or she lacks the motor skill to execute fluently the sentences but she knows how to construct, while the child whose language is delayed, although not hindered by a larqe vocabulary or syntactic variation, might find it difficult to find words even from a small lexicon or to construct even simple sentences and perform motor activity at the same time.

In the present study the second hypothesis is verified by examining the interference of language and speech motor tasks in stuttering and normal children in the age range of 6 to 9 years.

CHAPTER III

MEIHODOLOGY

Subjects:

15 child stutterers (five each in the age range of 6-7, 7-8 and 8-9 years) and 15 normal children (five each in the age range of 6-7, 7-8, and 8-9 years) served as subjects. The child stutterers had normal intelligence as assessed by a psychologist and were diagnosed to have stuttering and had normal language level as assessed by a speech-language pathologist (using Speech-Ease-K-Screeninq Test). They did not have any history of misarticulations or any other speech and hearing problems.

The normal children were matched for age and sex of stuttering children. Table 1 depicts the subject details.

Age range (in years)	Stuttering			Normal		
	Male	Female	Total	Male	Female	Total
6 - 7	2	3	5	2	3	5
7 - 8	4	1	5	4	1	5
8 - 9	4	1	5	4	1	5

TABLE-I : Subject details.

Material:

Three tasks;- interference between lanquaqe and speech motor task, interference between language and non-speech motor task, interference between cognitive and non-speech motor task;- were selected. for tasks 1 and 11, sixteen picturable meaningful kannada words which were appropriate to the age of the children were selected based on a pilot study done on normal children in the same age group. These sixteen words were categorized under: a) four nouns, (b) four adjectives, (c) four transitive verbs, (d) four intransitive verbs.

Iable-11: provides the material.

Nouns	Adjectives	Transitive verbs	Intransitive verbs
1. Moustache*	white	writinq	dancing
2. Knife	yellow*	brushing	running
3. Vessel	red	reading*	coughing
4. Leg	brown	washing	crying*

Table-II: Material for task 1 and 11 (*) key words.

* Key stimulus.

Four words (mustache, yellow, reading crying) as uttered by a normal adult female were audio-recorded in a cassette with an interstimulus interval of five seconds in Kannada which formed the material. Four sets of pictures were made. Each set consisted of one noun, one adjective, one transitive verb and one intransitive verb. For Task III, a puzzle was used which the child had to arrange depending on the model given (Fig.l).

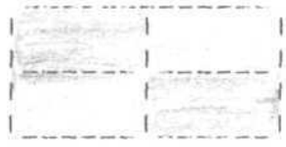

Figure-1 : Puzzle for Task III

Method:

The subjects were tested individually. They were seated comfortably in a quiet place and the audio material was presented through the headphones. The subjects were instructed to listen to the words through the headphones and were to point to the appropriate picture representing the word in the set of four pictures placed ir front of them. While doing this they were instructed to simultaneously and continuously say papu papu papu' for Task-I. In Fask-II the same method was followed but here the subjects had to simultaneously and continuously tap his/her right foot.

In Task-lII the subject was provided with a puzzle and he was instructed to complete the puzzle by referring to the model. While doing so, he was to simultaneously and continuously tap his right foot.

Scoring:

These responses were recorded on a response sheet (Appendix-I) by the experimenter and a scoring system was adapted. A score of 1' was given if the subject was able to perform the task and a score of 0' was given when the subject was unable to perform the task (unable to point to appropriate picture, unable to repeat papu ... continuously or interrupting the task by either stopping, repeating initial syllable or prolonging it). The total score for each task was computed for each subject and Wilcoxin matched pair test was administered to find out the significance of difference between tasks and between normals and stutterers.

CHAPTER IV

RESULTS AND DISCUSSION

I. Performance of the subjects on all the three tasks.

1) Stuttering vs. normal children: In general the difference in the performance of stuttering vs. normal children was significant only for Task-1. However, the performance of stutterers and normals differed on the other tasks also (Fig.2) while normal children obtained scores above 95% on Task-I, stuttering children obtained scores below 58%. On Task-I ten normal subjects scored 100% and five had 87.5%. Among the stutterers, one scored 100%, eleven had 5O%, two had 37.% and one had 62.5% scores. On Task-Il while eleven stuttering subjects scored 1OO%, Two of them had 87.5% and three had 75% scores, among normals, fourteen had 100% scores and one scored 87.5%. In Task-III, fourteen stuttering subjects had 100% scores and one had 50% score. The normal subjects also showed similar performance.

2) Comparison of stuttering subjects on Task-I vs. Task-II vs. Task III and across age groups: The results of Wilcoxin matched pair test indicated significant

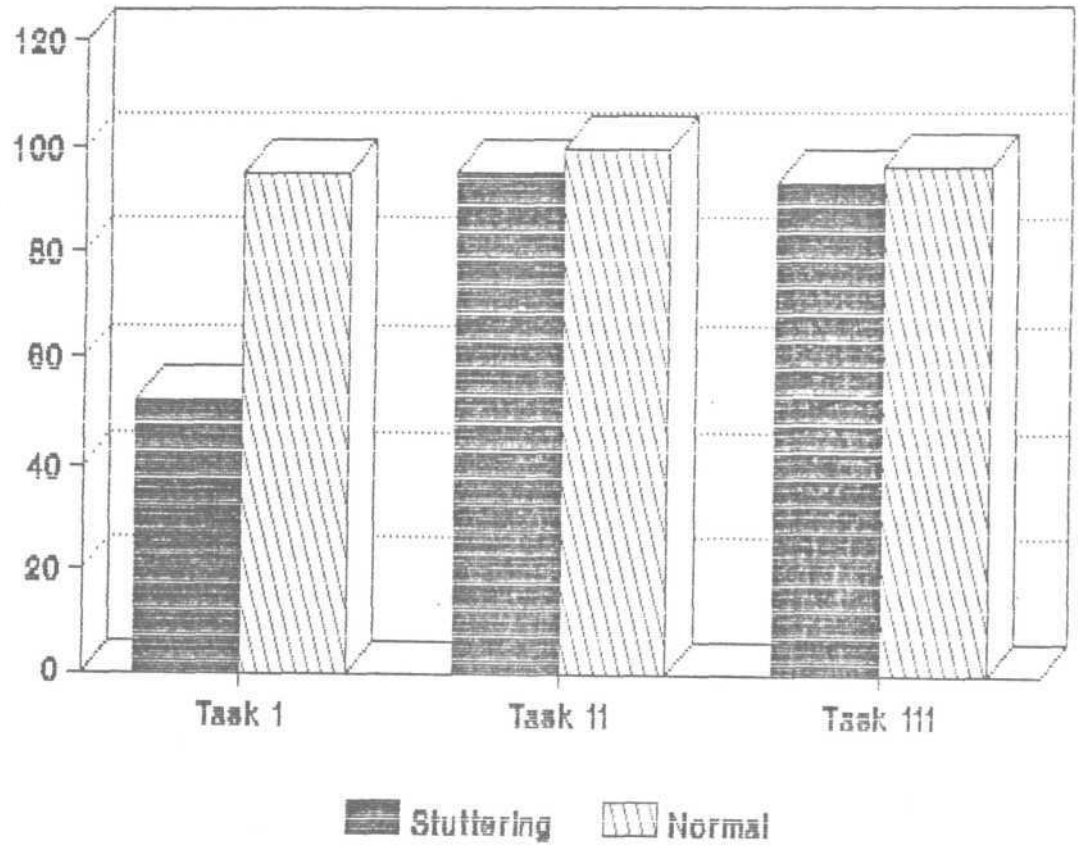

Fig 2 Inter Task Comparison between stuttering and normal children.

difference between the scores of Task-I and II of stuttering children (p < . 05). Figure 3 shows the percent scores stuttering children across age groups on all the tasks. Generally, the performance of stuttering children was good on Task-I 11 followed by Task II and Task-I. On Task-1, the subjects in the age range of 6-7 years performed poorer than subjects in the higher age groups. On the same task, subjects in the age range of 7-8 years had the highest score. On Task-II and Task-III, subjects in the age range of 8-9 years had the highest scores. However, on Task-II, there was not much difference in the performance of stuttering children across the three age groups.

II. Performance of male and female subjects:

Figure 4 shows the percentage scores of males and females. The results are interesting in that the male subjects performed better than the females though not significantly. The S' score (category separation score) between males and females was high in Task-II and Task-II I but low for Task-1.

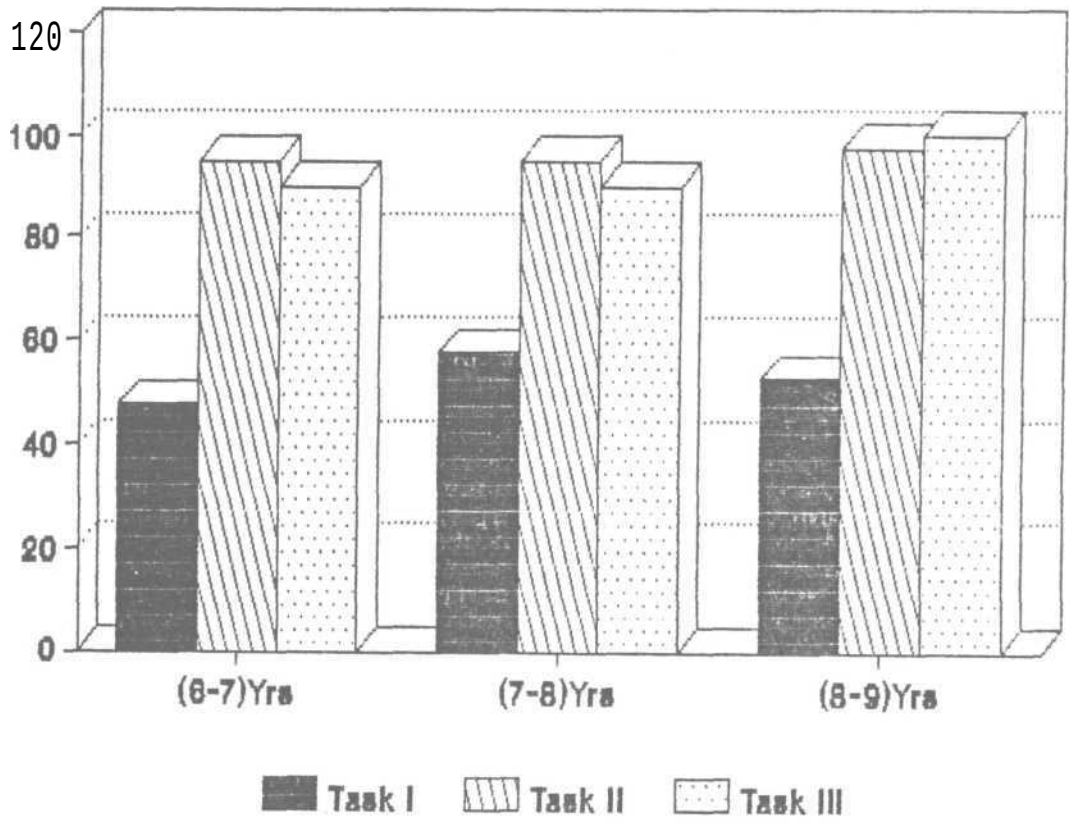

Fig.3: Percent scores of stuttering children across the age groups.

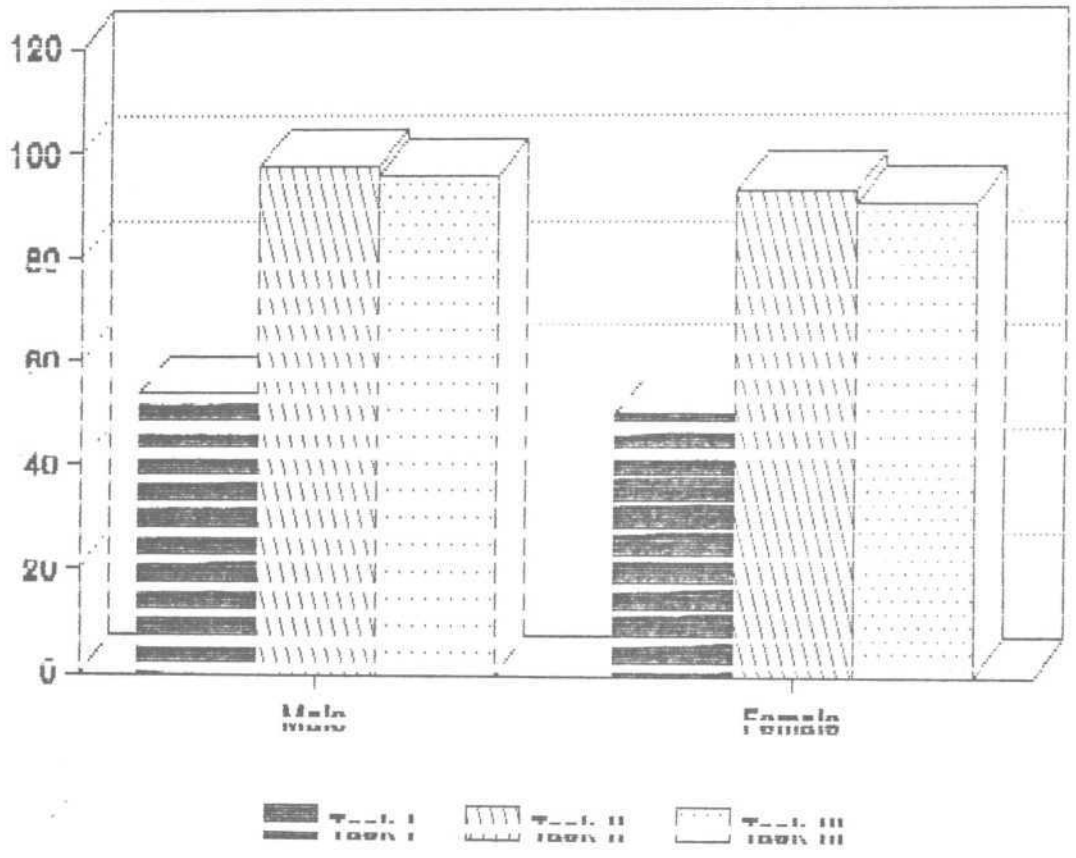

Fig.4: Percent scores of males and females.

III. Performance on various tests of the tasks:

The difference in scores was significant for the speech motor task and language task. Among all the variables, both stutterers and normals scored lowest on the speech motor variable. Normals scored 100% on all variables except on the motor (both speech motor and non—speech motor).

The performance of stuttering subjects was poorer than that of normals on all variables except on the language task in Task-II and cognition in Task-Ill. On these two, both groups showed similar performance. Figure 5 shows the percentage scores on various tests,

Discussion:

The results reveal several points of interest. First of all stutterer's performance was poor on Task-I and there were no significant difference between the scores of stuttering and normal children on Task II and task III. While the percent scores of stutterers on Task-I was 53, that in normals was 96. These suggest that stutterers have difficulty performing speech motor and language tasks simultaneously and thus there is an interference between speech motor and language tasks in stutterers. Also, no

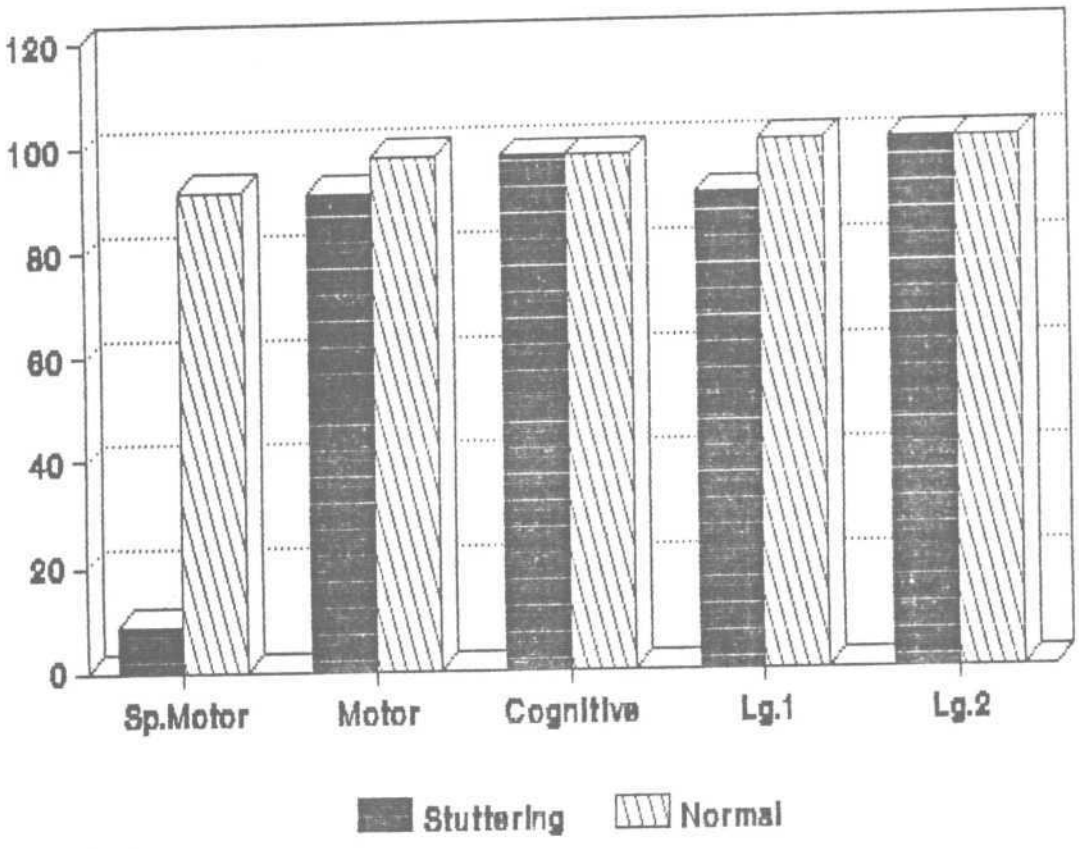

Fig.5: Percent scores on various tasks.

interference was found between non-speech motor and lanquaqe and language and cognitive tasks. The results of this study support the hypothesis of Starkweather that, "lanquaqe and speech motor processes may interfere with one another during the act of talkinq at least in children who are beginninq to stutter" (Starkweather, 199O).

Second, males performed better than females. This might be because the number of males was more than that of females in the present study. Hence the average scores might be better for males.

Third, it appears that the performance of stutterers improved on Task-I as the age progresses. When the results of this study was compared with that of Nandakumar (1994), it was found that there was an increase in the score of stuttering children cm Task-1. This could be attributed to physiological maturation. Figure 6 shows the performance of normal and stuttering children from 6-13 years on 7ask-l.

Also, the scores on speech motor task and language task (Task I) indicate that while the children obtained very low scores on speech motor tasks, it was not so on language task. This was observed among all the stuttering children in the present study. This finding indicates that the possibility

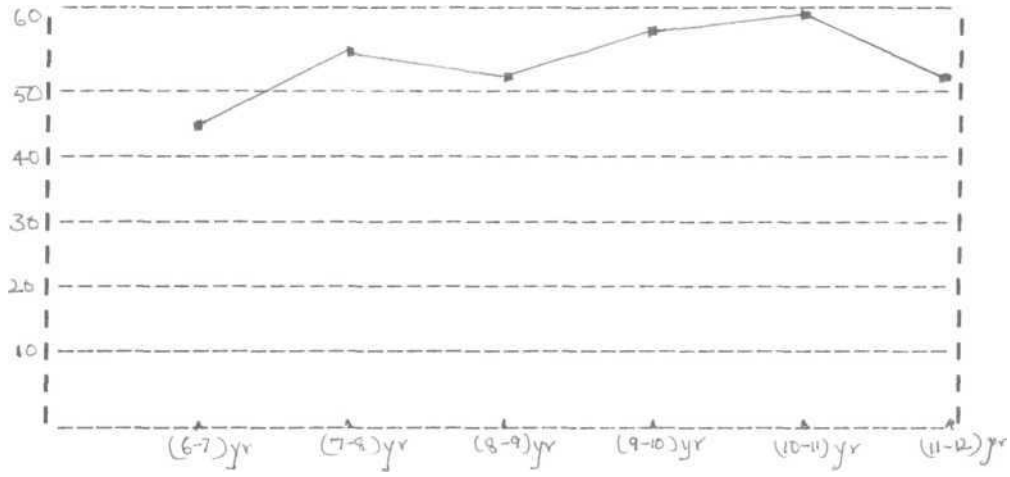

Fig.6: Performance of stuttering and normal children in the age range of (6-13) years.

of occurrence of the sub-groups of stutterers with motoric deficit may be more than the other sub-groups. It would be possible to use these tasks as a test to find out the interference between speech motor and languaqe tasks in stutterers. While the test can retain Task-I and Task-II, Task-III can be deleted out as performance of stutterers on the cognitive task was similar to that of normals.

The test could be administered to stuttering children to find out the interference along with purely language tasks and purely speech motor tasks. If found poor on language task language could be improved and if found poor cm speech motor task speech motor task could be worked on.

As the time available for the study was very short only fifteen stuttering children were tested. It would be interesting to learn as to how the various sub-groups of stutterers would perform on this task.

CHAPTER V

SUMMARY AND CONCLUSIONS

This investigation was aimed at studying the hypothesis that "Language and speech motor processes may interfere with one another during the act OT talking at least in children who are beginning to stutter" (Starkweather, 1990). Fifteen child stutterers and fifteen normal children in the age range of 6-9 years were investigated cm three tasks specifically designed to test the following:

(i) Language and speech motor processes interference,
(ii) Language and non-speech motor process interference,
(iii) Non-speech motor and cognitive process interference.

For Task-I, and the stimulus word was presented through headphones. the subjects were reguired to point to the appropriate picture from a set of four presented before them. While listening for the stimulus word and pointing to the appropriate picture, the subjects had to continuously say papu'. For Task-II, the pointing response remained the same but instead of saying papu', the subjects had to continuously tap their right foot. For Task-III, the subjects had to complete a puzzle while continuously tapping their right foot.

The subjects were given a score of 1' if they could point to the right picture and O' indicated failure. Also the subjects scored 1' if they said papu' continuously and '0' if there was any repetition prolongation etc. while saying papu'. Task-II was scored similarly. For Task-III completion of puzzle earned the subjects a score of 1 and failure 0'. For foot-tapping, any stoppage earned a score of 0' and continuity 1'.

The results were analyzed using Wilcoxin matched pair test. The percentage of scores obtained by subjects on each task was calculated and was analyzed.

The results indicated that while there was significant interference of language and speech motor processes in stutterers, it was not so in normals. On comparing the present study with that of Nandakumar (1994) it was observed that the score in Task-I improved in stuttering childrenas age

Also, the scores on speech motor task and language task (Task-I) indicate that while the children obtained very less scores on speech motor tasks, it was not so on language task. This was observed among all the stuttering children in the present study. This finding indicates that the possibility of occurrence of the sub-group OT stuttering with motoric deficit may be more than the other sub-groups.

The test could be administered to stuttering children to find out the interference alonq with purely lanquage tasks and purely speech motor tasks. If found poor on lanquaqe task lanquaqe could be improved and it tound poor on speech motor task speech motor task could be worked on.

As the time available for the study was very short only 15 stuttering children were tested. It would be interesting to learn as to how the various sub-groups of stutterers would perform on this task.

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APPENDIX

NAME: AGE: SEX:

DIAGNOSIS: IQ:

LANGUAGE LEVEL:

Sl. No.	Language Task	Speech Motor Task
1.		
2.		
3.		
4.		

Sl. No.	Language Task	Non-Speech Motor Task
1.		
2.		
3.		
4.		

Sl. No.	Cognitive Task	Non-Speech Motor Task
1.		
2.		
3.		
4.		

Sample of Score Sheet use for data collection.