FRENCHAY DYSARTHRIA ASSESSMENT IN CEREBRAL PALSIED

Hemalatha (B)

REGISTER ***NO*****.M9203**

A DISSERTATION SUBMITTED AS PART FULFILLMENT OF M.SC. (SPEECH AND HEARING) TO THE UNIVERSITY OF MYSORE

ALL INDIA INSTITUTE OF SPEECH AND HEARING, MYSORE - 570 006

1994

DEDICATED

TO

TO MY

AMMA, APPA AND AKKA

FOR THEIR LOVE, INSPIRATION

AND CONST ANT SUPPORT

CERTIFICATE

This is to certify that the dissertation entitled : FRENCHAY DYSARTHRIA ASSESSMENT IN CEREBRAL PALSIED is the bonafide work in part fulfilment for the degree of Master of Science (Speech and Hearing), of the student with Register No.M9E03.

Director,
All India Institute of
Speech and Hearing
Mysore 570 006.

CERTIFICATE

This is to certify that this dissertation entitled FRENCHAY DYSARTHRIA ASSESSMENT IN CEREBRAL PALSIED has been prepared under my supervision and guidance.

Guide
Mrs. Manjula R
Clinical Lecturer
Dept. of Speech Pathology
All India Institute of
Speech and Hearing
Mysore 570 006.

DECLARATION

This dissertation entitled FRENCHAY DYSARTHRIA ASSESSMENT IN CEREBRAL PALSIED is the result of my own study under the guidance of Smt. Manjula, R. Clinical Lecturer, Department of Speech Pathology, All India Institute of Speech and Hearing, Mysore, and has not been submitted earlier at any University for any other Diploma or Degree.

Mysore–6
Date: MAY, 1994 Reg. No.9203

ACKNOWLEDGMENTS

I would like to extend my deepest gratitude, reverences and heartfelt thanks to Mrs.Manjula, R, Clinical Lecturer, Department of Speech Pathology, for her excellent guidance. Thanks a lot Mam, for your art of simplicity, splended help, and above all to have put up with me patiently. 1 certainly consider it an honour that you consented to guide me

Thanks to Dr. (Miss) S.Nikam, Director, All India Institute of Speech and Hearing, Mysore, for having given me the permission and opportunity to undertake this dissertation.

I express by due thanks to Mr. C.S.Venkatesh, Lecturer, Department of Speech Sciences, All India Institute of Speech and Hearing, Mysore, for his help during statistical analysis.

Thanks to all those little kids from the Spastic Society of India, Bangalore and Dada Amar Society for Cerebral Palsied, Bangalore, for being such solvely and co-operative subjects for the study.

Thanks for the Library staff for helping me in searching the references.

Anith and Rasi - friends, thanks for your genuinity, trueness, warmth, move and affection, that you'll have showered on me. I won't forget those yesterday's of fun, joy, laughter and above all your FRIENDSHIP.

A special thanks to Bala - for his kind nature to help unflinchingly even till the very last moment and Pushpa, for being me with during the data collection.

Raji, Sangeetha and Mahes for being there? with me, when I needed your help.

Jayanthi and Yasmeen for their timely help and Rakhee for her artistic touch in my study.

Last, but not the least, my gratitude goes to Mrs.Rajalakshmi Akka,for a neat work with a short notice.

TABLE OF CONTENTS

LIST OF TABLES

LIST OF GRAPHS

INTRODUCTION

"Only the feet that move in order, dance
Only the words that more in order sing"

-Alfred Noyes.

It has been said, "Everytime you say a word, you perform a miracle", yet those of us who use words so freely and so easily take them far granted, forgeting that cral communication probably is the most important and most compliete of all human behaviours.

Human neuromotor system involves a couple": and For only motor act to take place a co-ordinator. *I*n terms of muscle strength, speed of movement , app*r* appropriate ranqe of EXCURSION accuracy of movement, motor steadiness and muscle tone is required. Damage that impairs one or more of these neuromuscu1ar functions may affect motor production (Netsell. 1984).

Speech is a highly integrated physiological motor act

characterised by a series of complex motions executed by kinetic change (Fletcher, 1972). Dyserthiia is one such speech disorder resulting from the impairment of the neural mechanisms that regulate the movement of speech. The incidence of dysarthria among children is :\ I e'J *la* ':.'..•

l-2/1000 (ASHA, 1980). One of the etiology of dyserrthria children is cerebral palsy (Brown, 1985).

Cerebral palsy, is motor dysfunction secondary to CNS damage before, during, or shortly after birth (Boone, 1978).

Cerebral palsied (CP) children have sensory, motor, perceptual, behavioural and emotional problems. Speech abnormalities are often seen in them as all the subsystems of speech production, respiration, phonation, resonance, articulation and prosody are affected (Barnes, 1983).

Speech motor control may be affected to a different extent and in different manner from that observed in the limbs and trunk in children diagnosed as spastics and athetoids. Children with mild cerebral palsy may have severe dysarthria and similarly, speech may be relatively unaffected and generally intelligible even to strangers in children with severe spastics quadriplegia (Brown, 1984).

It is seem that, both adult dysarthrias and cerebral palsied children share in common more *or* less similar speech characteristics. So a similar assessment procedure for both the groups is feasible. Darley, Aronson and Brown (1969) reports that 1) respiration 2) resonation 3) phonation 4) articulation and 5) prosody are impaired in adult dysarthria.

A similar pattern was found by Boone (l978) in CP children According to Boone, dysarthria and poor intelligibility are the marked features of CP children's speech and dysarthria includes problems of respiration, phonation, resonance, articulation and prosody.

The traditional methods of speech evaluation of the cerebral palsied population by neurologists and speech pathologists in the early days inclined towards usage of materials such as tongue twisters. Since then, the evaluation strategies have become more scientific, organized and informative. There are 2 major assessment procedures:

1) Those involving the perceptual measures which are subjective (Dale, 1950; Bloomer, 1963; Buck and Cooper, 1956).

S) Measures involving the instrumental analysis, such as physical, acoustical and physiological techniques, which *are* objective (Kent and Netsell, 1975; Farmer, 1977).

Perceptual analysis requires that a trained speech pathologist listen to selected speech samples of a patient and make judgements about the type and distribution of abnormalities. It does not involve elaborate instruments. They have been found to be more feasible and convenient.

Instrumental analysis requires that a trained speech pathologist make similar interpretations from the recordings obtained from the instruments. The perceptual and instrumental analysis have both advantages and disadvantages.

A thorough clinical understanding will come from individual and integrated assessments of the mulct" systems that subserve speech motor control (Netsell, 1986). Inspite of the advantages of abjective analysis, perceptual analysis are mostly used because of their high content validity, time economy and inability in ordinary clinical settings. There are however, some disputes (Schiavetti, Sitter, 1980; Kent and Ansel, 1992) regarding the value of using such measures in dysarthria. These measures depend on how well clinicians can agree on scale values and make reliable judgements. Therefore continued research into their effective use is indicated (Enderby, 1983; Bassich and Ludlow, 1986; kearns and Simmons, 1988; Zyski and Uleisiger, 1987).

Since adult dysarthrias and cerebral palsied children have similar speech characteristics, as evidenced by the studies carries out by Rutherford (1944), Eisenson (1962), Darley (1969) and Murdoch(1992) the efficacy of "Frenchay Dysarthria Assessment" (FDA) which is used with adult dysarthria is tested with cerebral palsied children.

As of now, no reports of a single comprehensive test for cerebral palsied children are reported the present study aimed at evaluating the different functions (reflex, respiration, lips, jaw, palate, laryngeal, tongue and intelligibility) in cerebral palsied population (spastic and athetoid) using FDA.

OBJECTIVES OF THE STUDY;

1) To compare the performance of the spastic and athetoid cerebral palsied children on FDA.

E) To compare the performance of the adult dysarthric's and the cerebral palsied children on FDA.

BRIEF PLAN OF THE STUDY:

1) Modifying the speech tasks in FDA to suit the younger age group.

2) Administration of the tasks on the test groups (Spastic and athetoid).

3) Scoring and analyzing the responses obtained.

4) Intrepretation and Discussion.

REVIEW OF LITERATURE

Human neuromotor system involves a complex act. For any motor act to take place, coordination in terms of muscle strength, speed of movement, appropriate range of excursion, accuracy of movement, motor steadiness and muscle tone is required. Damage that impairs one or more of the muscular functions may affect motor production (Netsell, 1986).

Damage to different portions of the central and/or peripheral nervous system results in a speech disorder called dysarthria both in adults and in children (Lindblom, 1981).

Dysarthria in children may range from complete anarthria, or lack of speech, to a disorder so mild that it may readily be confused with a resolving developmental articulation disorder. Developmental forms of dysarthria in children may show amelioration with age at least up to adolescence. In the case of degenerative disorders, it may increase in severity with age. It is difficult to ascribe dysarthrias in children to a particular etiology or etiologic pattern. But in case of adult dysarthrics, the etiology is known to certain extent (Darley, 1975).

The most common cause of the impairment of motor speech in children is cerebral palsy (CP) and in adults,

Parkinsonism (Darby, 1905). CP is a motor dysfunction secondary to CMS damage, before, during or shortly often birth. CP refers to non…progress i.e, central nervous system deficit (Boone, 1972).

The neuromuscular manifestation;; may be regarded as the most obvious symptom of CP. This problem affecting sensory, perceptual conceptual and behavioural system, either delay or arrest speech and language development . The speech and language problems may vary from mild to severe degree depending on the neuromusculare and neurosensory impairments.

The activity of speech is realised by the articulator movements of the speech organs. The speech apparatus is f unctionally divided into respiration, phonation, resonance, articulation and prosody . These are exclusively under the neuromuscular control. Thus even the simplest peripheral motor pattern should reflect the co-ordinated function of the CNS (Boone, 1972 and Darby, 1985). Since a CP child's CNS is affected, he has problem in any or combination of all of these sub-systems depending upon the severity of the impairment.

Although CP population is a heterogenous one, a common characteristic is dysarthric speech. There is a clear

evidence of reduced speech intelligibility (which is the significant characteristic of dysarthria) in CP children (Tikofsky and Tikofsky, 1964).

Darley, Aronson and Brown (1969) reported deviant dimensions in adult dysarthrics in the following areas of speech production (1) respiration (2) resonation (3) phonation (4) articulation and (5) prosody.

Dysarthrias in children are less well studied than those found in adults (Stark, 1985). However, there are few studies conducted on CP children and adult dysarthrics which on careful observation shows similar areas of involvement (Darby, 1985). These studies are discussed briefly in the next section.

SPEECH CHARACTERISTICS OF ADULT DYSRTHRIA AND CEREBRAL PALSIED CHILDREN:

Studies reporting the speech characteristics of adult dysarthria and CP children in general may be categorized under the following function:- (1) respiration (2) resonation (3) phonation (4) articulation and (5) prosody.

Respiration:

Respiratory dysfunction is a common characteristic of dysarthria and CP children. Murdoch and Ingram (1992) found reduced breath support for speech in spastic dysarthrics especially in pseudobulbar palsy. Rutherford (1944), Clement and Twitch ell (1959), Berry and Eisenson (1962) and Boone (1972) reported shallow inspiration and forced expiration in spastics, while in athetoids it was shallow uncontrolled inspiration, forced uncontrolled expiration and noisy breathing.

Resonation:

Darley (1975), Darley, Aronson and Brown (1989), Murdoch and Ingram (1992) examined the resonatory characteristics in flaccid dysarthria especially that of amyotrophic lateral scelrosis and bulbar palsy. They were found to have hypernasality, nasal emission and imprecise consonants.

In CP children, Clement and Twitchell (1959) reported abnormal nasal resonance in spastics and pharyngeal resonance in athetoids.

Phonation:

Few significant phonatory insufficiencies seen in flaccid dysarthrias of amyotrophic lateral scelrosis and bulbarpalsy are breathy voice, harsh voice, audible inspiration, short phrases, strained-strangled phonation and glottal fry (Darley, Aronson and Brown, 1989).

Rutherford (1944, Clement and Twitchell (1959), Berry and Eisenson (1962) and Boone (1972) reported that in the case of spastics, voice was high pitched and monotonous, weak in intensity, gettural or breathy in quality and lacked vocal inflection. On the other hand, in athetoids it was low pitched, whispered hoarse voice with throaty, quality and excess of loudness.

Articulatory difficulties:

Imprecise consonant articulations, vowel distortion, irregular articulatory breakdown, slow rate and short phrases were reported in ataxia, especially that of cerebellar ataxia, chorea and dystonia, by Darley, Aronson and Brown (1969) and Murdoch and Ingram (1992).

The chief articulatory impairment in both spastics and athetoids were impairment of linguadental sounds. In spastics it was due to spasticity, stiffness of peripheral speech musculature and inability to form fine synchronous movements by tongue, lips, palate, and jaw. In athetoids, due to uncontrolled movements of speech musculature more errors were found on word final consonants (Clement and Twitchell, 1959; and Boons, 1972).

Andrews, Platt and Young (1977) evaluated the articulatory impairment and intelligibility of CP speakers. They found high correlation between articulatory errors and speech intelligibility. They reported that performance of spastics was superior than athetoids.

This was further supported by Laing (1979), Platt (1980 a,1980 b), Platt, Andrews, Howie (1980) and Kent et al. (1990).

Prosodic errors:

Darley, Aronson and Brown (1969); Darley (1975); Murdoch and Ingram (1992) reported the nature of prosodic errors (excess and insufficiency) in ataxia, dystonia, spasticity and rigidity. Monopitch, monoloudness, excess/equal stress

phoneme prolongetion, interval prolangstion, and inappropriate silences, were reported in the speech of this group.

Rutherford (1944) Clement and Twitchell (1962) in particular reported that rate and rhythm were impaired in CP speakers. Spastics had slow rate, laboured production, spasmodic and broken rhythm. Athetoid also had slow rate of speech but rhythm was jerky and uncontrolled.

Enderby (1986) using the Frenchay Dysarthria Assessment with spastics, reported poor movement of the tongue and lips, poor phonation, inappropriate intonation, poor intelligibility in conversation and description, reduced alternating movements of the tongue, reduced maintenance of palatal elevation, hypernasality and lack of volume control.

Thus from the above studies, it is quite evident, that both adult dysarthrics and CP children share in common, more or less similar speech characteristics.

ASSESSMENT TECHNIQUES FOR DYSARTHRIA:

Broadly, the assessment procedures can be divided into two:

-> Objective analysis or measurements provided by the instruments (i) physiological and (ii) acoustic measurements.

—> Perceptual analysis or measurements which are subjective.

The dysarthric adult exhibits disturbance of the automatized skills due to complex movement control disorder. Since the movement control is disturbed, the integrity of the oral mechanism, its structure and muscular components ar*e* not predictive of the patients speech production impairment (Netsell, 1981). For these reason's many have used perceptual judgements for assessing dysarthria (Darley, Aronson and Brown, 1969).

It is well known that perceptual system's *are* subjective, and have limited power for determining which aspects of speech motor patterning are affected. Further, perceptual judgements are difficult to standardize over time and across different settings, preventing the maintenance of adequate inter-rater and intra-rater reliability. It is also difficult to replicate, limiting the comparability of different investigators results. So some of these problems can be avoided by using the objective analysis of speech (Canter, 1963; Lehiste, 1965).

Few abjective measures used to investigate presence, type and severity of dysarthria, are speech articulator movements *are* measured by electromyography (Neilson and O'Dwyer, 1981) or by electromyography and other quantitative measures such as aerodynamic (Barlow et al, 1983) as indices of dysarthria. Use of imaging techniques (Hirose, et al. 1982), acoustic measures, such as relative speech timing (Fennel, 1985) and formant patterns (Gerratt, 1983) motion rates (Dworkin, 1980) and patterns of phonemic errors (Platt, et al, 1980) *are* all reported as non-perceptual methods to analyse dysarthria.

Also the use of respirometers and face masks (Hardy and Arkebaner, 1966) have proved useful in assessing velopharyngeal function which often contributes to the speech production of dysarthria.

Ideally, the pressure-flow technique and cineflurography *are* used simultaneously for complete assessment of velopharyngeal function (Netsell, 1971) and also for the articulatory mobility in dysarthric patients (Netsell, 1975). Instrumental assessment, ie. spirometric assessment of the respiratory abilities with pseudobulbar patients showed reduced vital capacities (Murdoch, et al. 1989).

Instrumental measures for the assessment of CP are also reported in the literature. Recordings of aerodynamic variables, cinefluorographic analyses of speech movements (Hardy, 1961) have reported articulatory abnormali tigs in CP.

The velopharyngeal competency as evaluated on an oral manometer in the cerebral palsy cases indicated palatal malfunction and respiratory musculature weakness (Hardy, 1961). The eleetromyographic recordings (EMG) of lip, tongue, jaw and mandibular muscles in cerebral palsy revealed, higher amplitudes of activity during the performance of non-speech gestures (O'Dwyer and Neilson, 1983, 1984).

SUBJECTIVE ASSESSMENT METHODS:

Since there is no, one comprehensive testing, available to assess the dysarthric speech several perceptual techniques are suggested to assess the different areas of involvement in dysarthric speech.

One such area which needs to be assessed is speech intelligibility. It has been measured by basically two kinds of listener techniques:

- staling procedures, where listener assigns ratings,
- identification tasks where listener transcribes what the speakers says (Platt, Andrews, Young and Quinn, 1980).

Platt et al, (1980); Yorkston and Beukelman (1981) have computed intelligibility of single words and sentences to reflect the percentage of correctly transcribed utterances or words within utterances.

Similarly transcription tasks provide the opportunity for phonemic or word analysis of the listener's misidentification of the speaker's intended words that may contribute to the intelligibility deficit. It also has greater face validity than scaling procedures (Yorkston and Beukelman, 1980).

Intelligibility was also assessed in cerebral palsied, both spastics and athetoid by Platt and Young (1978). Three measures of intelligibility, ie. single word intelligibility, prose intelligibility and visual scale of speech handicapped. They found single word intelligibility as an excellent and simple measure of speech competence. Also the athetoid subjects were more difficult to understand, and consistently inferior in all speech measures than spastics.

Articulatory impairment is a common characteristic feature which is affected in dysarthrics and CP. Irwin (1985) developed a phonetic equipment to analyse the speech in terms of vowel types, consonant types, vowel frequencies and consonant frequencies in 3 groups of CP, ie. spastics, athetoid and tension athetosis. It was found that the phonetic differences did not exist among these 3 groups based on these four factors. Irwin (1956) devised an instrument ie. a short test of articulation with 5 consonants (p, b, m, d and t). These sounds were incorporated in a list of 15 words to test the CP population. The test was standardized on CP.

Articulation errors and diadochokinetic rates were assessed in 200 CP by Platt and Young (1988). They found that athetoids were inferior the spastics ie. there were more phonemic error.

In contrast to the above selective assessments, Wolfe (1950) did a comprehensive examination of the peripheral speech mechanism of 50 CP children. The evaluation consisted of examination of tongue, lips, mandible, velum, larynx and respiration. The subjects were asked to perform the standard movements for each part and a rating was made as to the extent of movement and the degree of control the subject had

on each structure examined. The examination of respiratory system, consisted of observation of deep inhalation, deep exhalation and controlled breathing. The function affected were arranged in the order of involvement from the most often affected to the least affected. They were respiration, tongue, larynx, velum, lips and mandible. The understandability, articulation and rate of speech were also evaluated. Respiration and rate of speech were found to be more affected in athetoids.

Love et al, (1980) evaluated the adequacy of biting, sucking, swallowing and chewing activities as well as the presence of absence of nine infantile oral reflexes against speech proficiency in 60 CP speakers. The subjects with adequate feeding skills were found to have better levels of speech and articulatory proficiency. It was also felt that the presence of dysphagic symptoms and abnormal oral reflexes were not particularly predictive of lack of speech or dysathria.

Comparative studies on subjective vs. objective methods are reported in the literature. One such study by Ludlow and Bassich (1983) attempted to find whether acoustic measures differentiated speech of two groups of patients (Shydrager syndrome and parkinson's disease) in the same way as

perceptual ratings. Perceptual assessment consisted of 19 different attributes reported by Darley, Aronson and Brown (1975) such as rate control, voice quality etc. Acoustic measures consisted of measures such as jitter ratio, Fo and mean SPL. The results indicated that both acoustic and perceptual assessment systems were capable of discriminating accurately the 2 types of dysarthria.

POPULAR PERCEPTUAL SYSTEMS FOR APPRAISING THE DYSARTHRIA:

Darley, Aronson and Brown (1975) employed a seven point scale to rate 38 dimensions in a patient's speech. The dimensions were grouped into 7 categories - pitch, loudness, voice quality, respiration, prosody, articulation and overall or general impressions that comprise intelligibility and bizarreness. The system popularly known as the Mayo system does not rate a patient on each of the 38 dimensions. The presence or absence of specific dimensions on listening is used to classify the disorder; for example the presence of monopitch, monoloudness and reduced loudness signifies hypokinetic dysarthria.

Yorkston and Beukelman (1988) administered an articulatory inventory to 19 adult dysarthrics and compared them on two forms of testing viz. traditional testing and

phoneme identification in terms of overall scores and interjudge reliability. Results indicated that the samples judged using the traditional testing method where the subjects knew the target phoneme, were scored more accurately than those judged using a phoneme identification format, where the judges did not know target phoneme.

OBJECTIVE VS. PERCEPTUAL JUDGEMENT:

Many studies have been conducted to find the correlation between perceptual and instrumental analysis in evaluating dysarthric speech adequacy.

Though perceptual judgements have been considered 'subjective' it has its advantages. Moll (1964), argued that the ultimate test of speech acceptability is based on its acceptability to listeners. Deviations detected by instruments are of no consequence to communication unless listeners judge the speech to be deviant. Thus, speech is ultimately defined by listeners perception Metsell, (1984) and McNeil (1986) supported the above view. They stated that the perceptual measures had more "face validity" than the instrumental measures.

Gentile (1990) studied speech characteristics using perceptual and acoustic analysis and found acoustic analysis supports the perceptual observations of speech in dysarthric.

There are also investigators who refute this (Rosenbek and LaPointe, 1978; Ludlow and Bassich, 1984). They identified dysarthric types based on the perceptual analysis and concluded that the use of perceptual analysis in conjunction with physiologic measurements was essential.

Supporting this view, Rosenbek, 1984; Weismer, 1984; and Netsell, 1984; comment that the ".... physiological studies in isolation (that is without concomitant measures of the perceptual or acoustic correlates) are uninterpretable. In short the physiological data must be "tied" to their acoustic - perceptual consequences".

However, Kent and Ansel (1992), said that perceptual analysis could still be used in judging the dysarthric speech adequacy for many reasons.

1. Perceptual ratings have high content validity because they are able to measure the multiple facets of speech.

S. It is less time consuming, and

3. Can be used in ordinary clinical settings.

So, it is needless to say that perceptual judgements are clinically significant and helpful for diagnostic purposes. The test used in this study, The Frenchay Dysarthria Assessment' is also perceptually based.

FRENCHAY DYSARTHRIA ASSESSMENT (FDA):

The Frenchay Dysarthria Assessment developed by Enderby (1983) is a short easy standardized assessment that can be used by speech pathologists to categorically diagnose adult dyarthria.

The aim of FDA is to establish a reliable assessment for dysarthria and to promote greater interest in developing and evaluating treatment methods for this population.

It employs a 9 point rating scale containing nine increments to rate eight behaviours or structures, reflex, respiration, lips, jaw, palate, laryngeal, and intelligibility from "no function" to "normal function" and also rate, sensation and associated factors. A patient's performance profile places him or her in one of the five groups that are said to differ in their localisation of neurological involvement - UMN, LMN, extrapyramidal cerebellar and mixed types.

Each section assesses, the function of that particular structure in speech and also in non-speech activities. For example, respiration is assessed at rest and in speech.

Reflex -> Cough, Swallow, Dribble.
Respiration -> At rest, In speech.
Lips -> At rest, Spread, Seal, Alternate, In speech.
Jaw -> At rest, In speech.
Palate -> Fluids, Maintenance, In speech.
Laryngeal -> Time, Pitch, Volume and In speech.
Tongue —> At rest, Protrusion, Elevation, Lateral, Alternate and In speech.
Intelligibility -> Words, Sentences and Conversation.

This test attempted to differentially diagnose 5 groups of adult dysarthrias - spastic, mixed, extrapyramidal, cerebellar and flaccid types.

The nine items of the test were useful in differentiating a dysarthric subject from a normal subject (Enderby, 1986). However, they were not reliable in differentiating different dysarthric groups. For example, the cerebellar group of dysarthrias overlapped with the spastic and extrapyramidal group of dysarthria.

One of the most important dimensions of an assessment is assurance that different judges will be able to describe the same type and degree of a disorder in the same way. Inter judge reliability on FDA was measured using both trained and untrained therapists. The product moment correlation on each item between judges yielded high inter judge reliabiity (= .86) . The test was also proved to be valid.

Wallace (1991) used FDA to investigate the integrity of oral motor structure and function in normal aging individuals. Five females and five male subjects ranging from 50—90 years were taken. Two individuals trained in the use of FDA, administered this test to 40 subjects. Findings from this study suggested that aging individuals had mildly reduced oral motor performance which was reflected in their FDA scores. The greatest reductions was noted for the tongue and laryngeal sections.

The main strengths of FDA over other assessment procedures, according to Enderby (1986) are that:

-> It is developed in a normal clinical situation and hence more reality oriented.
-> It is sensitive to changes in speech.
—> It requires little training to administer reliably.

-> The test results are easy to communicate.

-> Its also proved useful in identifying the different types of dysarthria.

As evidenced through the studies conducted by Rutherford (1944), Clement (1959), Berry and Eisenson (1962), Boone (1972), Platt (1977), Canter (1963), Darley (1969), and Murdoch (199S), both adult dysarthrics and cerebral palsied children share in common more or less similar speech characteristics. On the assumption that no one single comprehensive assessment is available for cerebral palsied, FDA which is used in the assessment of adult dysarthrias, was chosen to assess the CP , in this study.

So far no reports of studies related to the assessment of CP using FDA is available. Hence the present study aimed at examining the CP using FDA.

NEED FOR THE STUDY:

Till date, there are no reports of one single comprehensive test for developmental dysarthrics especially for CP children (spastics and athetoids). Based on the fact, that adult dysarthrics and developmental dysarthrics have few common areas of involvement, as evidenced through the studies

in the literature a test, the FDH Which i= used with adult dysarthrias is chosen.

The present study aims to find out the feasibility of this test with CP children (spastics and athetoids). Here an attempt is made to test or assess the speech and non-speech skills in CP children (spastic and athetoid) using FDA.

The performance of the CP on FDA will be analyzed. It would also be interesting to note whether this test can differentiate spastics from athetoids. This assessment procedure would then perhaps help the clinician, in planning the therapeutic activities for the cerebral palsied children.

METHODOLOGY

The aims of the present study was as fallows:

1. To compare the performance of two age groups of spastics on FDA.
S. To compare the performance of two age groups of athetoids on FDA.
3. To compare the overall performance of spastics vs. athetoids cerebral palsied children on FDA.
4. To compare the performance of adult dysarthrias as against the cerebral palsied population on FDA.

Subjects:

Sample - The test was administered on 2 groups of cerebral palsied children. The first group (Group-A) consisted of 42 spastic cerebral palsied children ranging from 4-18 years. The second group (Group B) consisted of 9 athetoids ranging from 9—22 years. These subjects were chosen from special schools; "Spastic Society", Bangalore, "Dada Amar Society for cerebral Palsied", Bangalore and from All India Institute of Speech and Hearing, Mysore.

Age range - The age range of subjects selected fell within 4-22 years for both groups.

For the purpose of statistical analysis Group A was divided into sub-groups, ie Group-1 and Group-2. Group-B was divided into sub-groups Group-3 and Group-4 (refer Table-1).

Table-1: AGE GROUPS OF SPASTICS AND ATHETOIDS.

Groups	Age groups	Age range in years	Number of subjects
Group-A	Group 1	- 12	25
	Group 2	13 - 18	17
Group B	Group 3	9 - 12	5
	Group 4	13 - 22	4

The subjects were divided into sub-groups, to find if any differences in performance existed between the age groups.

Educational status: The subjects selected for the study were receiving formal education, and speech therapy. The medium of instruction was in English and for few it was in Kannada language.

Subject selection criteria:

The subjects selected fulfilled the following criteria:

1) They were of average intelligence or borderline to mild mental retardation.

2) They had good expressive and comprehensive skills and all of them used verbal mode for their communication.

3) They were formally educated and hence were able to read simple sentences except for the lower age-group (4-6 years).

The test manual used:

The test selected was the "Frenchay Dysarthria Assessment" (Enderby, 1980) which is a standardized test that is used by Speech pathologists to categorically diagnose dysarthria in adults.

Test items:

The FDA (Frenchay Dysarthria Assessment) is divided into 11 sections. The first 8 sections contain subtests, which have definite set of tasks, which are as follows:

Section	Sub tests
RFFLEX (a)	i) Cough ii) Swallow iii) Dribble
RESPIRATION (b)	i) At rest ii) Spread
LIPS (c)	i) At rest ii) Spread iii) Seal iv) Alternats v) In speech
JAW (d)	i) At rest ii) In speech
PALATE (e)	i) Fluids ii) Maintenance iii) In speech
LARYNGEAL (f)	i) T ime ii) Pitch iii) Volume iv) In speech
TONGUE (g)	i) At rest ii) Protrusion iii) Elevat ion iv) Lateral v) Alternate vi) In speech
INTELLIGIBILITY (h)	i) Words ii) Sentences iii)Conversation
RATE	
SENSATION	
ASSOCIATED OR INFLUENCING FACTORS	Hearing, Pasture, Sight, Teeth, Language and Mood.

The last section enables the examiner to comment on the associated factors that may influence the speech disorder.

Every subject tested was graded according to the grades (a, b, c, d, e) given in the FDA battery. The grades ranged from 'normal function' (a) to 'no function' (e). If the subject's response did not exactly fit into a particular grade, then the response was scored "in between" the grades. As given in the FDA battery, once the score was determined a bold line was drawn on top in that, position on the graph. Then, the graph was shaded to reflect the severity. The shaded areas are the ones which *are* affected and unshaded are not affected. The scoring graph used in the FDA manual is given in Appendix-I.

Test materials:

The test materials used in FDA battery is as fallows:

1) Test manual
2) Scoring graph
3) Tongue depressor
4) Stop watch
5) Tape recorder
6) Glass of water
7) Words and sentence cards.

Modifications:

There are reports of FDA being used in other populations apart from adult dysarthrics. In a study conducted by Wallace (1991), FDA was used to investigate the integrity of oral motor structure in normal aging individuals. The findings suggested that aging individuals had mildly reduced oral motor performance which was reflected in their FDA scores.

In the present study attempts were made to find out the feasibility of using FDA with cerebral palsied children (spastics and athetoids). Certain modifications were however made in the few tasks used in FDA, to suit the needs of the present study. The tasks used in the FDA manual were standardized on the western population and on adult dysarthrics. So certain modifications were required to meet the needs of Indian population and the childhood dysarthrics (cerebral palsied) chosen for this study.

Since the selected subjects were exposed to Indian English and Kannada language, hence modifications of Frenchay Dysarthria Assessment subtests on intelligibility section had to be carried out. Some of the items (words and sentences) in this subtest were not familiar to the subjects

who spoke English because of the cultural unfamiliarity in the item. Such items were substituted with the words and sentences found to be more familiar in the Indian context. For Kannada speaking subjects the item was selected from the study by Sreedevi (1985). These items matched with the original items listed in English in the FDA, in terms of its complexity.

The lists of words and sentences in English and Kannada are given in Appendix II, and III respectively.

Item 3 (conversation) *on* the subtest of intelligibility of FDA and all the speech tasks on the subtest of lips, soft palate, laryngeal and tongue had to be modified. This modification was in terms of further simplification of task keeping in view the language delay in the cerebral palsied, children of the study. This was carried out by adapting the picture description, recitation of rhymes, narration of stories and conversation tasks from the studies of Indu (1989), Yamini(1989) and Nagapoornima (1989)*

*These were the tasks used in the study to elicit spontaneous responses from normal children in order to study the disfluencies in the normal children.

Adminlstration:

Test environment:

The subjects were tested with minimum distractions. They were seated in a comfortable sitting pasture during testing. Each subject was tested individually by the examiner.

Scoring of the results:

The subjects responses were immediately scored as specified in the FDA manual by identifying the grade, which best described the subjects response. The tasks were first demonstrated by the examiner. Then grade was ascribed based on the behaviour demonstrated by the subject on second attempt of the specified task as followed in the FDA manual. The first attempt was for the practice purpose

Recording the response:

For the purpose of recording, a 9 point rating scale (in 5 section, ie. from a to e)as described in the FDA manual was used. The ratings were a,b,c,d, e, where 'a' depicted the normal function and 'e' 'no function'.

Raw score:

For purpose of statistical calculation, the alphabetical grades of FDA were converted into numerical scale, as follows:

a -> 4
b -> 3
c -> 2
d -> 1
e -> 0

The results were charted on the bargraph, with the 9 point scale on the vertical axis and eight tests on the horizontal axis as given in Appendix-I.

Reliability check:

The test was administered by another trained speech pathologist on £ randomly chosen subjects to check for inter-judge reliability. Intra judge reliability was checked by the investigators repeating the test on 2 subjects after a period of a week. Intrajudge reliability was found to be 99%. The inter judge reliability was found to be 97%.

The raw data obtained, was further tabulated and subjected to a suitable statistical analysis.

RESULTS AND DISCUSSION

The raw data obtained for two groups of spastics and two groups of athetoids using FDA were tabulated and subjected to suitable statistical analysis.

All the patients in Group-A were spastics, ranging from 4-22 years and were divided into sub-groups Group-1 and Group-2. Group-B were athetoids ranging from 9-22 years and were divided into sub-groups, Group-3 and Group-4.

Groups	Sub-groups	Age range	Number of subjects
Group—A	Group-1	4-12 years	25
	Group-2	13-18 years	17
Group-B	Group-3	9-12 years	5
	Group-4	13-22 years	

The subjects were divided into subgroups, to find if any differences in performance existed between the age groups.

The results of the experimental tasks were analysed.

1. To compare the performance of Group-1 and Group-2 on FDA.
2. To compare the performance of Group-3 and Group-4 on FDA.
3. To compare the overall performance of Group-A vs. Group-B, ie. spastics vs. athetoids on FDA.
4. To compare the performance of adult dysarthrias as against the cerebral palsied population on FDA.

The tabulated data was subjected to discriminant function analysis. It was carried out with the help of an AT computer using NCSS software package. The individual means, combined means and standard deviations were obtained for all the four groups. T—test was carried out to analyse the overall performance of spastics vs. athetoids on FDA.

SECTION-1:

Performance of Group—1 spastics and Group-B spastics on FDA:

Table-2 depicts the individual and combined means and standard deviation scores of spastics (Group-1) ranging from 4-12 years on different sections (a_1 to h_1) of FDA.

Table-4 depicts the individual and combined means and standard deviation scores of spastics ranging from 13-18 years on different sections (a_2 to h_2) on FDA.

Table-3 depicts the mean scores for speech vs. non-speech activities of spastics (Group-1) ranging from 4-12 years on different sections (b_1 to g_1) on FDA.

	b_1	C_1	d_1	f_1	ft	g_1
Non speech activities	2.6	3.22	3.7	3.71	2.3	2.36
Speech activities	2.2	2.6	3.6	3.02	2.2	1.8

Table-3: Means for Speech vs. non-speech activities of Group—1 spastics.

Table-2: Means and Standard deviations of Group-1 Spastics (4-12yrs)
N = 25

		Individual means	S.D.	Combined means	S.D.
al	i	3.66	.62		
	ii	3.06	.60	3.27	.8
	iii	3.1	.98		
bl	i	2.6	.6	2.43	.73
	ii	2.2	.80		
cl	i	3.88	.44		
	ii	3.7	.46		
	iii	2.5	.68	3.10	.83
	iv	2.8	.72		
	v	2.6	.65		
dl	i	3.7	.56	3.66	.55
	ii	3.6	.54		
el	i	3.86	.34		
	ii	3.56	.46	3.48	.58
	iii	3.02	.57		
f1	i	2.2	.71		
	ii	2.3	.83	2.31	.83
	iii	2.5	1.01		
	iv	2.2	.79		
gl	i	3.3	.66		
	ii	2.5	.82		
	iii	1.8	.989	2.28	1.04
	iv	1.9	1.21		
	v	2.3	.85		
	vi	1.8	.86		
hi	i	2.8	.81		
	ii	2.34	1.03	2.47	.9
	iii	2.24	.78		

al-Reflex
i=Cough
ii=Swallow
iii=Dribble

bl-Resp
i=At rest
ii=In speech

cl-Lips
i=At rest
ii=Spread
iii=Seal
iv=Alternate
v=Speech

dl-Jaw
i=Rest
ii=Speech

el-Palate
i=Fluids
ii=Mainte
iii=Speec

gl=Tongue
i=At rest
ii=Protrusion
iii=Elevation
iv=Lateral
v=Alternate
vi=Speech

f1-Laryngeal
i=Time
ii=Pitch
iii=Volume
iv=Speech

hl-Intelligibility
i=Words
ii=Sentence
iii=Conversation

Mean rate = 34 words per minute

Table-4: Means and Standard deviations cf Group-2 Spastics (13-10 years). N=17.

		Individual means	5.D.	Cc.-bin-d m"•ans	S.D.
a2		3.79	.2[p]		
	ii	3.53	.5°	2.34	.72
	iii 3.35		.9°		
b2	i	2.5	1.0	2.24	1.1
	ii	2.2	1.2		
c2	i	3.7			
	ii	3.4	.44 .0		
	iii 2.9		.96	2.12	.85
	iv 2.9		.74		
	V **2.7**		.69		
d2	i	3.0			.47
	ii	3.7			
e2	i	3.9			
	ii	3.3		3.66	.55
	iii	3.3			
f2	i	2.2	.89		
	ii	2.5	.89	2.55	.28
	iii	3	.79		
	iv	2.5	.05		
g2	i	3.5	1 06		
	ii	3.9	.77		
	iii	2.17	1.20	2.62	1.1
	iv	2.26	1.20		
	v	.9	.70		
	vi	2.4	.28		
h2	i	3.2	1.11		
	ii	3.1	1.22	2.02	1.1
	iii	2.82	1.0		

Mean rate=38 words per minute.

T = =i n - for Epccc •s . ni'i activities of Group-2 spastics

d..

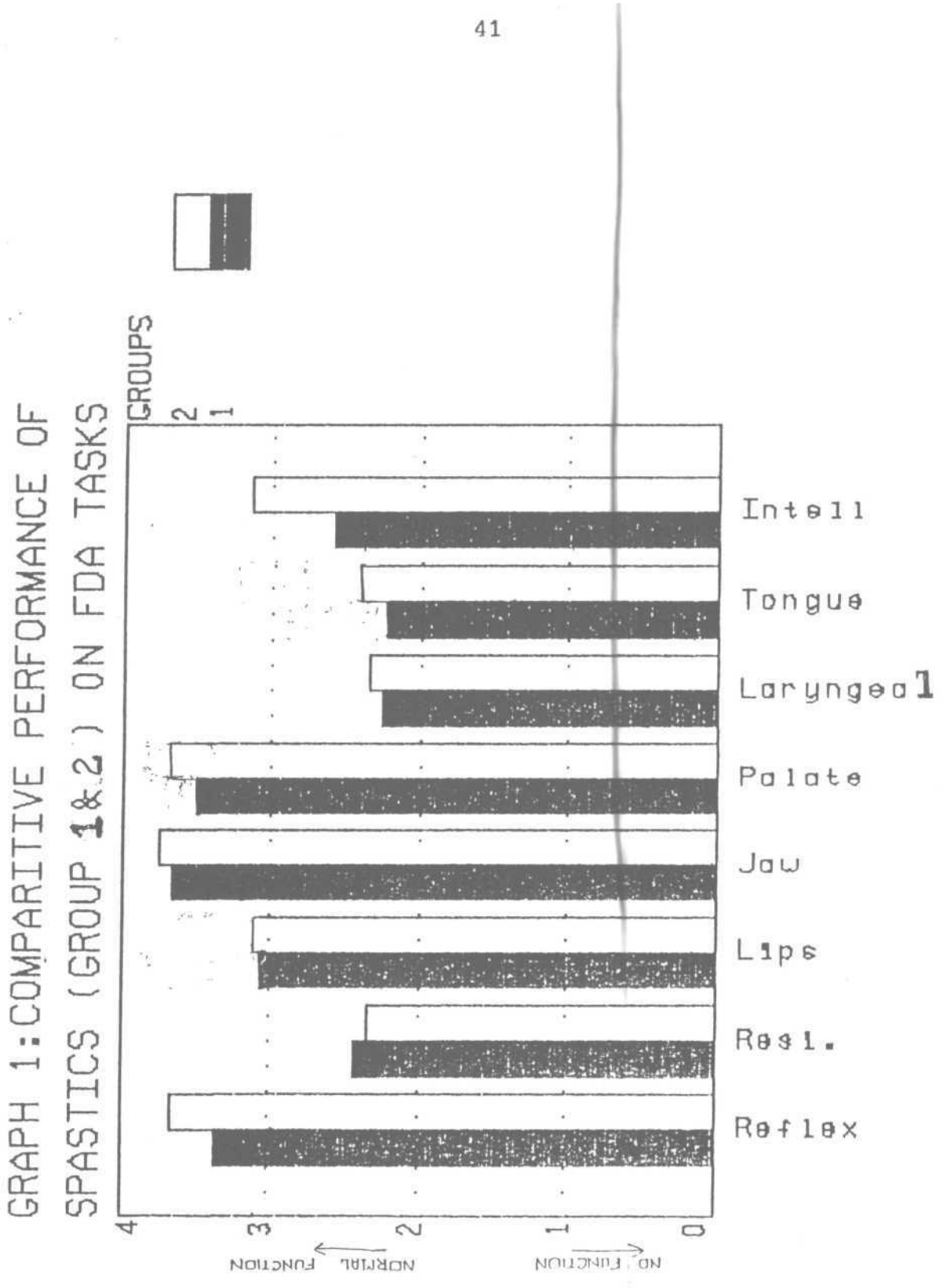
Man i-posch activities	2.5	q	o	.7	
'.peech activitisE					

Table-5 -hews the mc-an scares of nor •zp=r:h vs. speech actiities for spasti:= (Gri-jp 2) rangir.g from 13- 19 years on different sections of PDA 'b..-. tc g.,.) .

Table- 6a: Comparisian cf rr.r-ans and SD c:f Croup 1 vs. Group-2

Group 1	2 . P 7 i? . H 2 2 ri .0 ."-P. .02			2.I1J 2.20 .Qj	2.<4- i.'l'H .9
Group		12			2.AG 3.03
GD	1.1	.05		1.1	1.1

Tram the observations mads- frcif: T;':-!3-. _» J, -+ and 5 tf'.2 Graph-1 the? following inferences at '~ d^ av;n *'or the Group-1 a.id Gr-up 2 spastics, thess are taDa1..;13cj i,-, > ;\b 1£.--tt .


GRAPH 1: COMPARITIVE PERFORMANCE OF SPASTICS (GROUP 1&2) ON FDA TASKS
GROUPS
2
1
Intell
Tongue
Laryngeal
Palate
Jaw
Lips
Resl.
Reflex
4
3
2
1
0
NORMAL FUNCTION
NO FUNCTION

Table—6b: Comparison of Group—1 and Group-2 spastics of FDA

FDA		Comparative degree of invo1vement Spastics	
Task	Activities	Group-1	Group-E
Reflex (a)	Cough	More	Less
	Swallow	More	Less
	Dribble	More	Less
Respiration (b)	At rest	More	Less
	In speech	Equal	Equal
Lips (c)	At rest	More	Less
	Spread	More	Less
	Seal	More	Less
	A1ternate	More	Less
	Speech	More	Less
Jaw (d)	Rest	More	Less
	Speech	More	Less
Palate (e)	Fluids	More	Less
	Maintenance	More	Less
	Speech	More	Less
Laryngeal (f)	Time	More	Less
	Pitch	More	Less
	Volume	More	Less
	Speech	More	Less
Tongue (g)	At rest	More	Less
	Protrusion	More	Less
	E1evatior\	More	Less
	Lateral	More	Less
	Alternate	More	Less
	Speech	More	Less
Inte11igibility (h)	Words	More	Less
	Sentences	More	Less
	Intelligibility	More	Less
Rate		More	Less

From the Graph-1 and the Table-6b we can infer that Group-2 spastics performed better than Group-1 spastics in

all the tssks of FDA, the following is the hierarchical order of tasks of FDA from least affected to the most affected.

- Reflex
- Jaw
- Palate
- Laryngeal
- Tongue, and
- Intelligibility.

Here reflex is the least affected task and intelligibility the most affected task.

When the overall pattern is considered, both the groups of spastics show a similar pattern in terms of their performance on various tasks of FDA. However, when individual scores *are* considered, the performance of older age group (12–18 years) of spastics is found to be better than younger age group of spastics. This finding supports the view which states that with increase in the age, the neuromotor development also matures following a developmental trend even in disordered population (Netsell, 1984).

It is also evident from Table 3 and 5 that the speech activities *are* more affected than non-speech activities inboth the groups of spastics. This could be because speech tasks demand for high coordinated muscular adjustment which is difficult in spastics (Kent, 1980; Hardy, 1976).

It is found that intelligibility of words are better than that of sentences and converstion in both the groups. This is in agreement with Platt and Young's (1978) study, where they found single word intelligibility as an excellent measure of speech competence in cerebral palsied.

The rate of speech in words per minute is more in Group-2 than Group-1 spastics. It may also be noted that oral reflexes are better in Group—2 than Group-1 spastics. The oral reflexes may have influenced the rate of speech which in turn was demonstrated by better performance on words for spastics. This is in accordance with Love et al. (1980) study, where it is reported that cerebral palsied children with adequate oral reflexes are found to have better levels of speech proficiency.

From the above results we can conclude that both the groups of spastics matched on the pattern of performance. However, the older age group (13-18 years) performed better than younger age groups (4—12 years) based on the degree of performance. Thus both the groups of spastics performed differently on the tasks in FDA.

SECTION-1l

Performance of Group-3 athetoids and Group-4 athetoids on FDA.

Table-7 depicts the individual and combined means and standard deviation scores of athetoids (Group-3) ranging from 9-1E years on different sections (a_3 to h_3) on FDA.

Table-8 depicts the individual and combined means and standard deviation scores of athetoids (Group-4) ranging from 13-22 years on different section (a_4 to h_4) on FDA.

Table-9 shows the mean scores for speech vs. non-speech activities of athetoids (Group-3) ranging from 9-12 years on different sections (b_3 to g_3) on FDA.

Table-9: Means for speech vs. non-speech activities of Group-3 spastics.

	b_3	c_3	da	e_3	fa	
Non-speech activities	1.4	2.4	3.6	3.35	1.06	1.4
Speech activities	1.2	1.2	2.7	3.1	.5	1

Table-7: means and Standard deviations of Group-3 athetoids (9-12 years) N=5.

		Individual means	S.D.	Combined means	S.D.
a3	i	3.5	.61		
	ii	2.7	.71	2.83	.88
	iii	2.3	.97		
b3	i	1.4	.74	1.33	.78
	ii	1.2	.91		
c3	i	3	1		
	ii	2.5	1.41		
	iii	1.7	.57	2	1.24
	iv	1.6	.65		
	v	1.2	.57		
d3	i	3.5	.89	3.1	.88
	ii	2.7	.67		
e3	i	3.5	.5		
	ii	3.2	.45	3.27	.42
	iii	3.1	.22		
f3	i	1.5	1.22		
	ii	1	.61	.93	.89
	iii	.7	.84		
	iv	.5	.71		
g3	i	2.3	.97		
	ii	1.9	.55		
	iii	1	.55		
	iv	1.5	1.12	1.52	.8
	v	1.4	.42		
	vi	1	.61		
h3	i	1.9	.55		
	ii	1.2	.76	1.5	.67
	iii	1.3	.57		

Mean Rate=22 words per minute

Table-8: Means and Standard deviations of Group-4 athetoids (13-22 years) N=4 .

		Individual means	S.D.	Combined means	S.D.
a4	i	3.5	.58		
	ii	2.88	.85	3.13	.86
	iii	3	1.15		
b4	i	1.5	.58	1.44	.94
	ii	1.38	1.38		
c4	i	3.25	1.5		
	ii	3	1 . 15		
	iii	1.75	.29	2.4	1.11
	iv	2.25	.29		
	V	1.75	.5		
d4	i	3.6	1 .5	3.2	1.12
	ii	2.8	1 .75		
e4	i	4	0		
	ii	3.5	.41	3.56	.83
	iii	3.2	1.03		
f4	i	1.88	.63		
	ii	2	1.15	1.75	.93
	iii	2.38	.75		
	iv	.75	.29		
g4	i	3.13	1.03		
	ii	1.63	.25		
	iii	1.4	.82	1.74	1.04
	iv	2	1.22		
	v	1	1.16		
	vi	1.25	2.89		
h4	i	1.88	1.89	1.54	1.6
	ii	1.75	2.02		
	iii	1	1.16		

Mean rate=30 words per minute.

Table-10: Shows the mean scores of non-speech vs. speech activities for athetoids (Group-4) ranging from 13-22 years on different sections of FDA (b_4 to g_4).

Table—10: Means for speech vs. non-speech activities of Group-4 spastics.

	b_4	c_4	d_4	e_4	f_4	g_4
Non-speech activities	1.5	2.43	2.75	3.75	2.08	1.95
Speech activities	1.38	1.75	2.38	2.63	.75	1.25

Table-11a: Comparison of means and Standard deviation of Group-3 Vs. Group-4 athetoids.

	a	b	c	d	e	f	g	h
Group-1								
Mean	2.83	1.3	2	3.1	3.27	.925	1.52	1.5
SD	3.13	1.44	2.4	3.2	3.56	.75	1.74	1.54
Group-2								
Mean	.88	.78	1.24	.88	.42	.89	.8	.67
SD	.86	.94	1.11	1.12	.83	.93	1.04	1.6

From the observations made from Tables 7, 8, 9, 10 and the Graph-2 the fallowing inferences are drawn for the Group-3 and Group-4 athetoids. These are tabulated in Table-l1b.

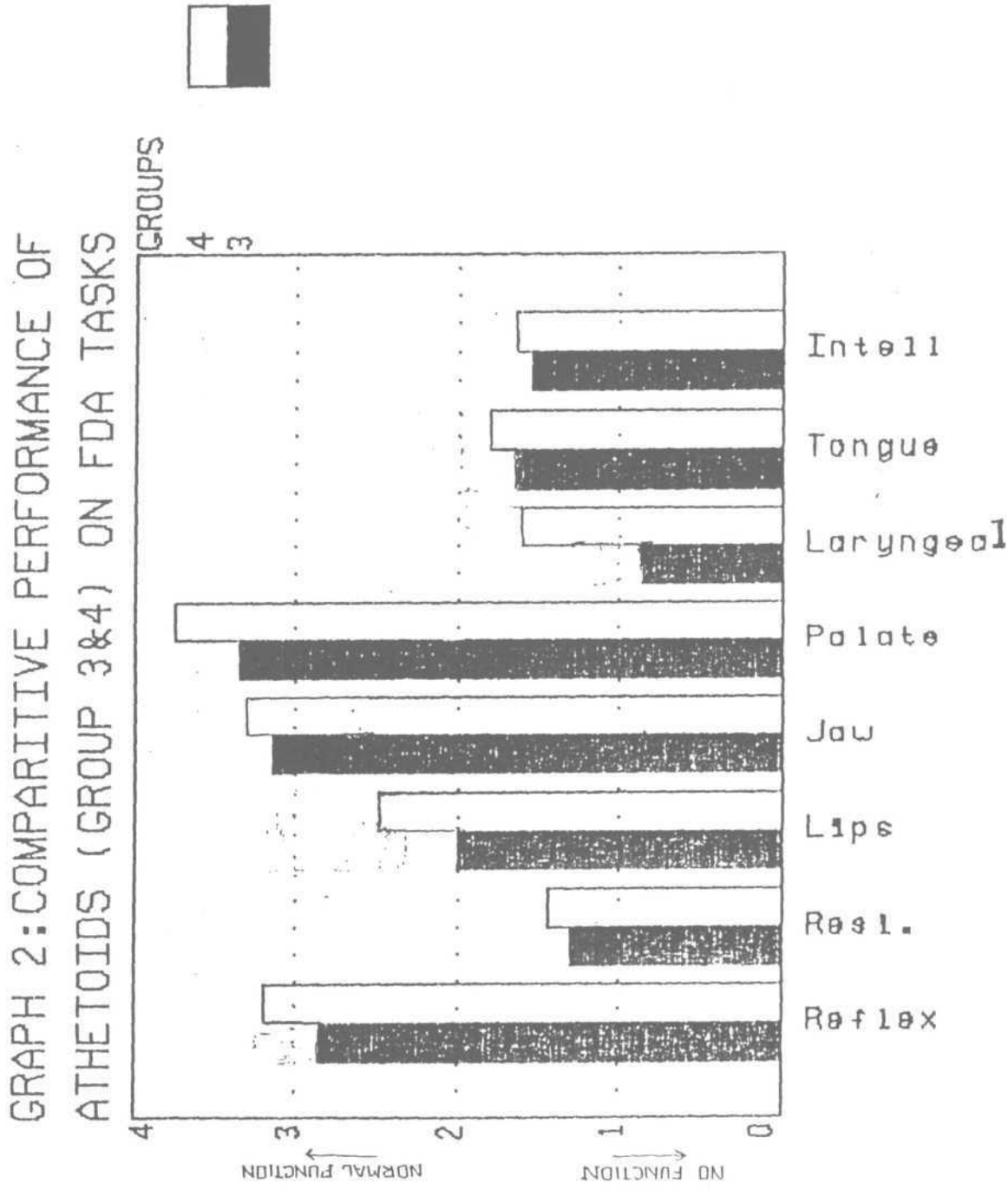

GRAPH 2:COMPARITIVE PERFORMANCE OF ATHETOIDS (GROUP 3&4) ON FDA TASKS
GROUPS
4
3
Intell
Tongue
Laryngeal
Palate
Jaw
Lips
Resl.
Reflex
4
3
2
1
0
NORMAL FUNCTION
NO FUNCTION

Table-11b: Comparison of Group-3 and Group-4 athetoids on FDH

FDA		Comparative degree of involvement Spastics	
Task	Activities	Group—3	Group-4
Reflex (a)	Cough	Equal	Equal
	Swallow	More	Less
	Dribble	More	Less
Respiration (b)	At rest	More	Less
	In speech	More	Less
Lips (c)	At rest	More	Less
	Spread	More	Less
	Seal	More	Less
	Alternate	More	Less
	Speech	More	Less
Jaw (d)	Rest	More	Less
	Speech	More	Less
Palate (e)	Fluids	More	Less
	Maintenance	More	Less
	Speech	More	Less
Laryngeal (f)	Time	More	Less
	Pitch	More	Less
	Volume	More	Less
	Speech	More	Less
Tongue (g)	At rest	More	Less
	Protrusion	More	Less
	Elevation	More	Less
	Lateral	More	Less
	Alternate	More	Less
	Speech	More	Less
Intelligibility (h)	Words	More	Less
	Sentences	More	Less
	Intelligibility	More	Less
Rate		More	Less

From Graph-2 and Table-l1b we can infer that Group-4 athetoids performed better than Group-3 athetoids in all the tasks of FDA.

The following is the hierarchical order of tasks of FDA from least affected to the most affected.

- Reflex
- Respiration
- Lips
- Palate
- Laryngeal
- Tongue and
- Intelligibility

Here reflex is the least affected task and intelligibility the most affected.

When the overall pattern is considered both the groups of athetoids show a similar pattern in terms of their performance on various tasks of FDA. However, when individual scores are considered, the performance of older age group (12-22 years) of athetoids is found to be better than younger age group of athetoids. This finding is supported by Netsell's (1984) view which states that with increase in the age, the neuromotor development also matures following a developmental trend even in disordered population. We can also infer from tables 9 and 10 that speech activities are affected more than non-speech activities in both the group of athetoids. It is also noticed that speech activity of the laryngeal tasks is the most, affected than other speech tasks in both the groups of athetoids. From the results, it is clear that rate of

speech in words per minute is more in Group-4 ie. in the older age Group (13—2S years) than in younger age group (9-12 years) of athetoids.

From, the above results we can conclude that both the groups of athetoids matched on the pattern of performance. However, the older age group (13-22 years) performed better than younger age group (9—12 years) based on the degree of performance. Thus both the groups of athetoids performed differently on tasks of FDA.

SECTION-III

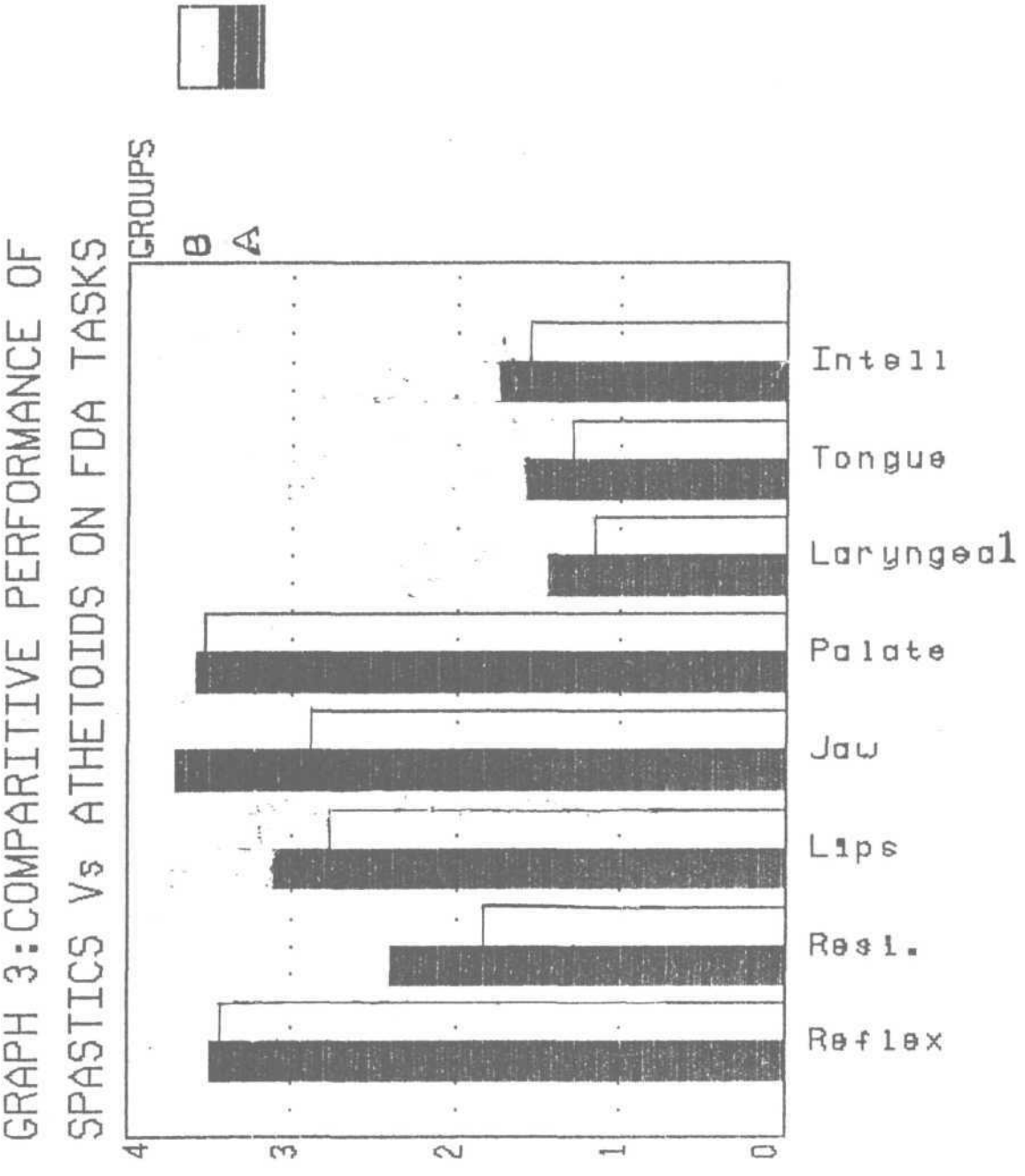
Comparison of Spastics (Group-A) Vs. Athetoids (Group-B):

Table-12 depicts the means and standard deviations scores of spastics (Group-A) and athetoids (Group-B) ranging from 4-18 years and 9-22 years respectively.

Table-12 : Comparison of means and SD of spastics (Group-A) Vs. athetoids (Group-B).

	a	b	c	d	e	f	g	h
Group-A								
Mean	3.39	2.4	3.11	3.7	3.55	2.41	2.44	2.7
SD	3.37	1.97	2.81	3.45	3.54	2.12	2.34	2.5
Group-B								
Mean	.78	.89	.83	.52	.57	.86	1.07	1.03
SD	.81	1.12	1.05	.81	.6	1.1	1.12	1.34

The Graph-3 represents the performance of spastics and athetoids on FDA.


GRAPH 3:COMPARITIVE PERFORMANCE OF
SPASTICS Vs ATHETOIDS ON FDA TASKS
GROUPS
B
A
4
3
2
1
0
Intell
Tongue
Laryngeal
Palate
Jaw
Lips
Resi.
Reflex

From the Table-12 and Graph-3 We can inter that there is an overall similarity in their performance for activities on FDA between the spastics and athetoids, but spastics have performed better than athetoids in all the sections of FDA. Although there is a similarity between spastics and athetoids the scores on the different activities of FDA, suggests that spastics seem to perform better than athetoids, in all the sections of FDA. The section which *ar&* most affected in spastics (Refer Table 6b) *are* respiration, laryngeal, tongue and intelligibility. This is also true for the athetoids (Refer Table—lib), but the degree of involvement is more in athetoids this observation seem to correspond with Wolfe (1950) study, where he found a hierarchy of involvement of the structures involved from the most affected to the least affected in a comprehensive examination on cerebral palsied children. The hierarchy was as follows - respiration, tongue, larynx, velum, lips and mandible. He also found that rate of speech was more affected in athetoids which agrees with the finding in this study. Also there are others in the literature who support that athetoids *are* more affected than spastics (Platt and Young, 1978; Platt and Young, 1988). The poor performance of athetoids can be attributed to the anatomical lesion and the physiological pattern of the movement disorder. Neuromuscular limitations imposed on the speech production mechanism in cerebral palsied are more

severe in athetoids than in spastics. The results were found to be significant at 0.01 level for respiration, lips, jaw, larynx, tongue and intelligibility, and significant at 0.05 level. But no significant difference between spastics and athetoids for the palatal tasks. (Refer Table-13).

Table-13 : T scores and probability values for the tasks on FDA.

Parameters	T scores	Probability values
Reflex	2.064	.046
Respiration	5.04	0
Lips	4.71	0
Jaw	3.31	.0037
Palate	1.8	.077
Larynx	6.29	.00
Tongue	5.26	0
Intelligibility	4.97	0

The discriminant analysis was performed on the data obtained for four groups of cerebral palsied children. * Predictions were correct for 92% of Group-1, 100% of Group-2, 100% of Group-3 and 100% of Group-4.

---

*This statistical technique produces a series of linear combinations called factors of original variables in a manner that members belonging to one diagnostic group have significantly different values from those belonging to other groups.

Table-14 shows the results of predicted and actual group of the cerebral palsied children.

Table-14 : Discriminant analysis of Group 1, 2, 3 and 4.

Actual group	Predicted group			
	Group-1 N=25	Group-2 N=17	Group-3 N=5	Group-4
Group-1	92%	4%	0'%	4%
Group-2	0%	100%	0'%	0%
Group-3	0%	0%	100%	0%
Group-4	0%	0%	0%	100

When spastics and athetoids as a whole was considered athetoids showed better prediction than spastics. Predictions were correct for 95% of spastics and 100% of athetoids. These results are given in Table-15.

Table-15 : Discriminant analysis of Group-A and Group-B.

Actual group	Predicted group	
	Group-A N=42	Group-B N=9
Group-A	95.2%	4.8%
Group-B	0	100%

Discriminant analysis also indicated that the following tasks of FDA were the significant factors which differentiated spastics from athetoids.

They were:

1) Speech tasks of respiratory section
2) Lip seal
3) At rest and speech tasks of jaw section
4) Volume and speech tasks of laryngeal section
5) Sentences and conversation.

There are few studies in the literature which support the above findings. Hardy (1961) suggested that respiratory musculature weakness is indicated while assessing the velopharyngeal competency, in cerebral palsied population. Yorkston and Beukelman (1980) stated that sentence intelligibility scores provided a valid measure of speech intelligibility.

From the above discussion we can conclude that, the predictive data of the cases shows that FDA can be used as an effective and accurate tool in classifying or differentiating spastics and athetoids.

SECTION-IV

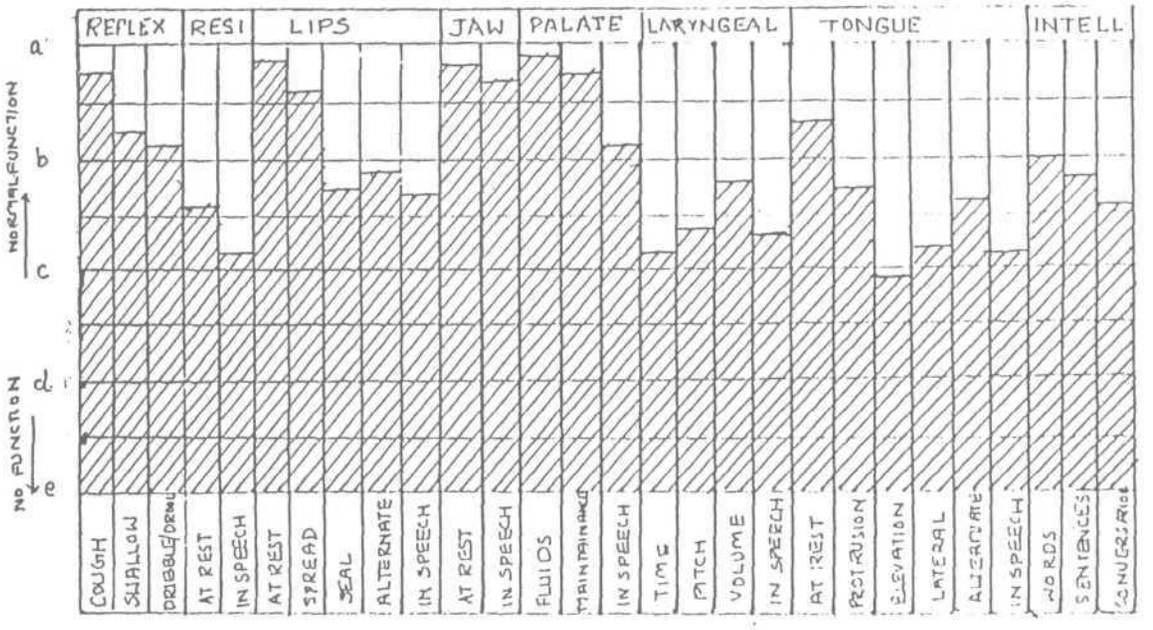
Comparison of Childhood dysarthria against adult dysarthria:

Table—16 gives the overall means of two groups of spastics (Group-A) and two groups of athetoids (Group B) for the activities on FDA. The mean scores of Group-A and Group-B *are* plotted on respective scoring sheets in order to visualize the pattern of involvement, of both the groups (Graph 4 and 5 respectively).

By comparing the Graph 4 of Group-A (spastics) against the graph of UMN lesion in adult dysarthria cited from the FDA manual,Refer Graph-6 it is found that, in general, spastic children are affected more than adult dysarthrics of UMN type on the different sections of FDA. The order of involvement from most affected to the least affected in spastic children are as fallows: Tongue, laryngeal, intelligibility, respiration, lips, palate, reflex and jaw.

The order of involvement from the most affected to the least affected in adult dysarthria with UMN lesion is as follows: Tongue, intelligibility, laryngeal, reflex, lips, palate and respiration.

GRAPH-4 : PERFORMANCE OF SPASTICS ON FDA



GRAPH-5 : PERFORMANCE OF ATHETOIDS ON FDA.

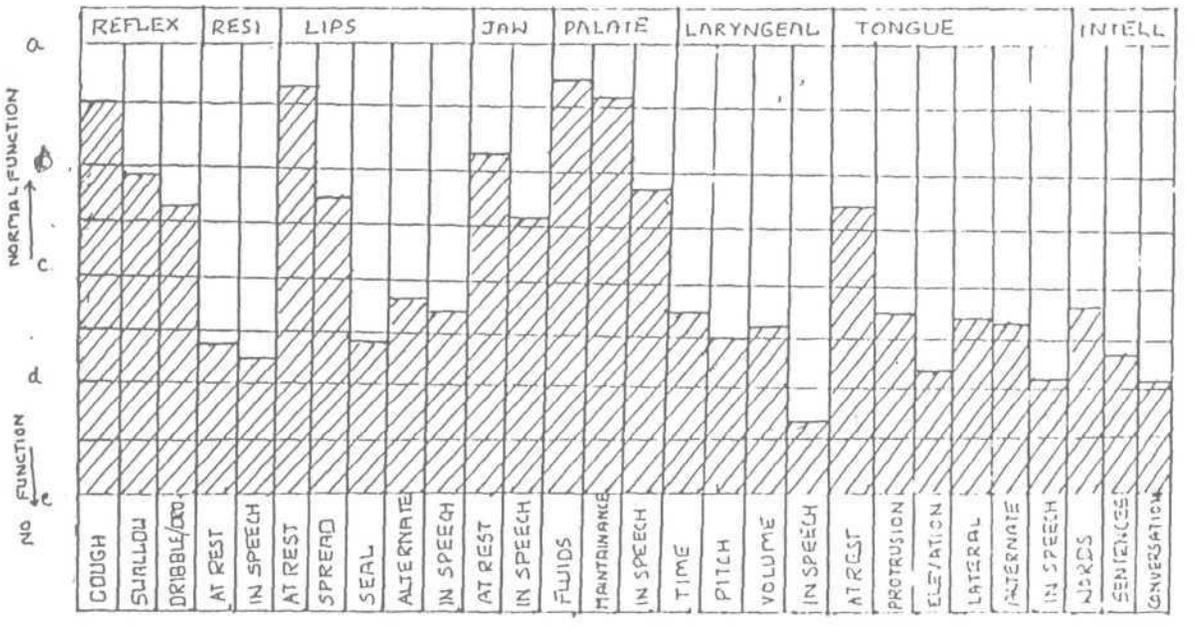


Table-16: Overall means of Group-A and Graup-B

		Means	
		Group-A	Group-B
a	i	3.72	3.5
	ii	3.29	2.94
	iii	3.22	2.65
b	i	2.55	1.45
	ii	2.2	1.29
c	i	3.79	3.6
	ii	3.55	2.75
	iii	2.7	1.47
	iv	2.85	1.92
	V	2.65	1.72
d	i	3.75	3.17
	ii	3.65	2.54
e	i	3.88	3.75
	ii	3.68	3.35
	iii	3.16	2.86
f	i	2.2	1.69
	ii	2.4	1.5
	iii	2.75	1.54
	iv	2.35	0.62
g	i	3.4	2.71
	ii	2.7	1.76
	iii	1.98	1.2
	iv	2.28	1.75
	V	2.6	1.7
	vi	2.1	1.13
h	i	3.0	1.89
	ii	2.72	1.47
	i i i	2.52	1.15

From the above discussion, we can infer that spastic children exhibited more or less similar pattern of involvement as that of adult UMN dysarthria. This view is

supported from the studies done by Rutherford, (1944); Clement and Twitchell, (1959); Darley, (1975); Darley, Aronson and Brown, (1989); and Murdoch and Ingram, (1992).

It is also found that based on the pattern of involvement from most affected to least affected on various subtasks of FDA, certain similarities and dissimilarities are found in both the groups and this is depicted in Table-17.

Table-17 : Similarities and Dissimilarities between spastic children and adult UMN dysarthria on FDA.

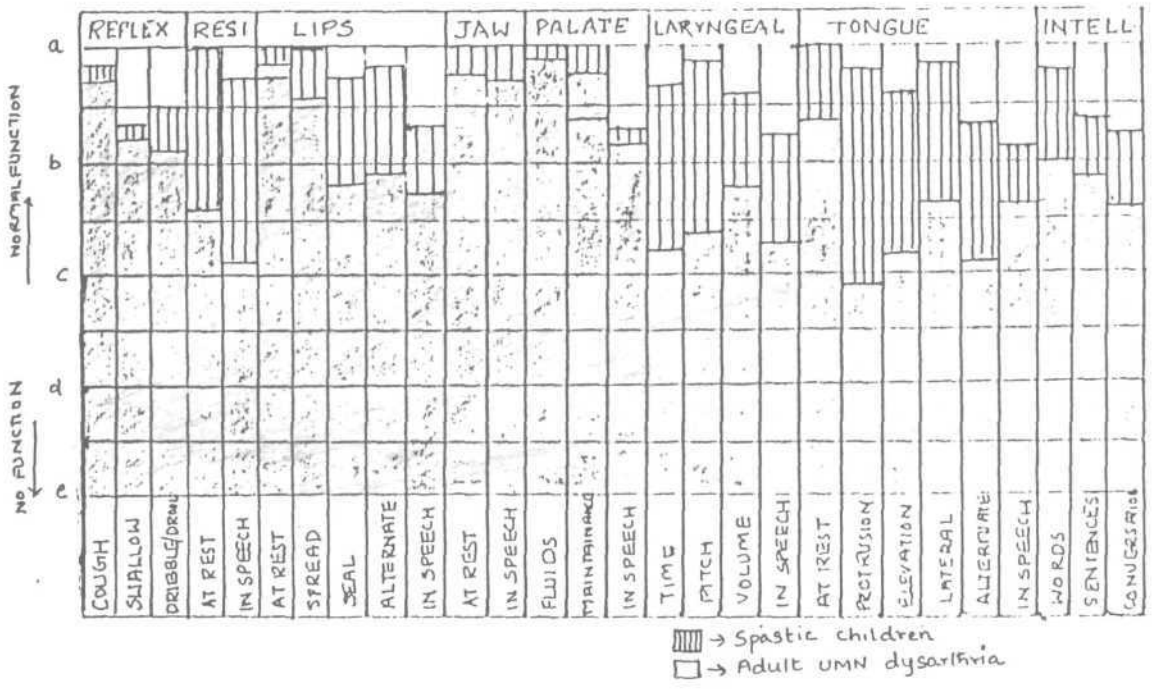
Section	Groups	Similarities	Dissimilarities
Reflex	Spastic Children		Dribble,Swallow Cough.
	Adult Dysarthrics		Swallow,Dribble Cough.
Respiration	Spastic Children	In speech, At rest	
	Adult Dysarthrics	In speech At rest	
Lips	Spastic Children	Speech, Seal Alternate Spread At rest	
	Adult Dysarthrics	Speech, Seal,Alternate,At rest Spread	
Jaw	Spastic Children		At rest, Jaw
	Adult Dysarthrics		Unaffected

Palate	Spastic Children	In speech, Maintenance, Fluids.	
	Adult Dysarthrics	In speech, Maintenance, Fluids.	
Laryngeal	Spastic Children		Time, Speech, Pitch, Volume
	Adult Dysarthrics		In speech, Volume, Time Pitch
Tongue	Spastic Children		E1evation, Speech, Lateral Alternate, Protrution At rest
	Adult Dysarthrics		Speech, Alternate, Elevation, Lateral, Protrusion, Rest
Intelligibility	Spastic Children	Conversation, Sentence, Words	
	Adult Dysarthrics	Conversation, Sentence, Words	

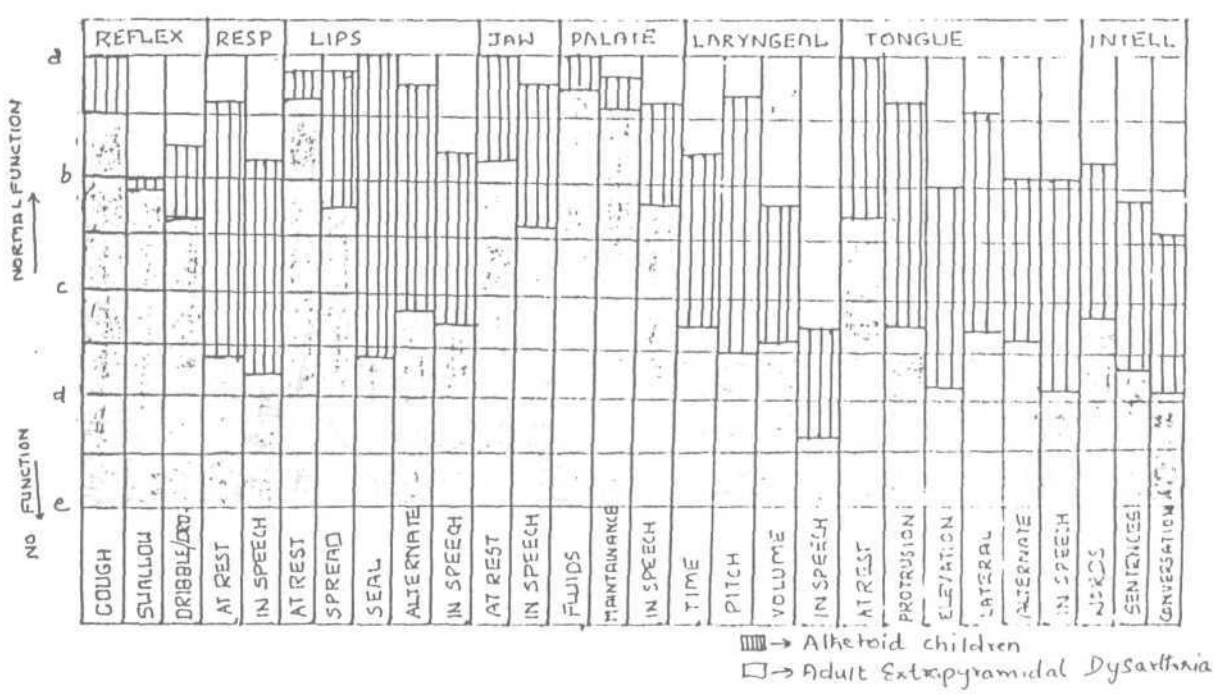
From Table-17, it is clear, that in most of the sections, the pattern of involvement is same for both spastic children and adult UMN dysarthrics. Hence, this test is more feasible with spastics of younger age group.

Graph-5 of Group-B (athetoids) is compared with the graph of extra pyramidal lesion in adult dysarthria (given in the FDA manual). Refer Graph-7 In general, it is found that, performance of athetoid children are poorer than that of adults with extrapyramidal lesion on the different sections of FDA. The

GRAPH-6 : PERFORMANCE OF SPASTIC CHILDREN & ADULT UMN DYSARTHRIA ON FDA
(CITED FROM FDA MANUAL, ENDERBY: 1980)



GRAPH-7 : PERFORMANCE OF ATHETOID CHILDREN & ADULT EXTRAPYRAMIDAL DYSARTHRIA ON FDA (CITED FROM FDA MANUAL, ENDERBY: 1980)



order of involvement from the most effetted to least effected in the athetoid children are as follows: -> Larynx, tongue, intelligibility, respiration, lips, reflex, jaw and palate. But in adult with extra pyramidal lesion the order noted as follows: -> Larynx, tongue, intelligibility, reflex respiration, lips, palate and jaw.

Thus, from Graph—5 and the above results we can infer that athetoid children also exhibit, more or less similar pattern of involvement as that of adults with extrapyramida1 lesion. There *are* many reports in the literature, which support the view that childhood dysarthria and adult dysarthrias share similar speech characteristics (Rutherford, 1944 Clement and Twitchell, 1959; Darley, 1975; Darley, Aronson and Brown, 1989; and Murdoch and Ingram, 1992).

When the pattern of involvement from most affected to the least affected in terms of each skill is considered certain similarities and dissimilarities *are* found between these 2 groups. They are depicted in Table-1B.

Table-18: Similarities and Dissimilarities between spastic children and adult extrapyramidal dysarthria on FDA.

Section	Groups	Similarities	DissimilaritieS
Reflex	Athetoid Children		Drool,Swallow Cough.

	Adult dysarthr ics		Swa11ow, Drool Cough.
Respira tion	Athetoid dysarthrics	In speech,At rest	
	Adult Dysarthrics	In speech,At rest	
Lips	Athetoid Children		Seal, Speech, Alternate, Spread, At rest
	Adult Dysarthrics		Speech, Alter- nate, Spread At rest & Seal
Jaw	Athetoid Children	In Speech, At rest	
	Adult Dysarthrics	In Speech, At rest	
Palate	Athetoid Children	In speech, Mainte- nance, Fluids.	
	Adult Dysarthr ics	In speech, Mainte- nance, Fluids.	
Laryn geal	Athetoid Ch ildren		Speech, Pitch, Vo1ume, Time
	Adult Dysarthrics		Speech, Volume Time, Pitch
Tongue	Athetoid Children	Speech, Elevation Alternate, Lateral Protrusion, At rest	
	Adult Dysarthrics	Elevation, In speech Alternate, Lateral Protrusion, At rest	
Intell gibi- lity	Athetoid Children	Conversat ion, Sentence, Words	
	Adult Dysarthrics	Conversat ion, Sentence, Words	

However, there are only few dissimilarities between the groups, and since more of similarities are found, we can infer that athetoid children also showed more *or* less similar involvement like the adult dysarthrics with extrapyramidal lesion.

From Tables - 17 and 18, it is evident that there are more similarities in the performance of childhood dysarthrics and adult dysarthrics in terms of type and degree of performance on each task in FDA. It is also seen that adult dysarthric performed superiorly on all the tasks of FDA compared to cerebral palsied dysarthria. We can also infer that FDA as an assessment scale can be used effectively with the childhood dysarthric population.

SUMMARY AND CONCLUSION

The present study aimed at finding out the feasibility of using Frenchay Dysarthria Assessment (FDA) as an assessment tool with the cerebral palsied (Spastic and athetoid). The study also aimed at comparing

—> The performance of two different age groups (4-12 and 13-22) of spastics on FDA.

-> Performance of two different age groups (9-12 and 13-22) of athetoids on FDA.

-> Performance of spastics VS athetoids on FDA, and

-> Performance of adult dysarthrias as against the cerebral palsied population on FDA.

The subjects selected for this study were 42 spastics ranging from 4-18 years and 9 athetoids ranging from 9-22 years.

Frenchay Dysarthria Assessment by Enderby (1980) which is used for testing adult dysarthrias was used to assess the performance of spastics and athetoids selected for this study. The performance of spastics and athetoids on the different functions listed in 8 sections of FDA was assessed perceptually using the 9 point rating scale suggested in the manual (Enderby, 1980). The 8 sections were (1) Reflex (2)

Respiration (3) Lips, (4) Jaw,(5) Palate (6) Laryngeal (7) Tongue and (8) Intelligibility.

The performance of the selected subjects on the tasks (in the x-axis) of FDA was recorded as per the instruction in the FDA manual. The subjects responses were graded on the 9 point rating scale (in 5 section ie. from 'a' to 'e') and the results were recorded on the score sheet used on the y-axis) in FDA. The raw scores obtained were then subjected to suitable statistical analysis. The fallowing, summarises the findings of the study.

1) The performance of the older age groups were better than the younger age groups of spastics and athetoids on FDA.

2) Patterns of performance by spastics and athetoids on FDA were qualitatively the same for the tasks in FDA. However, when individual scores were considered spastics performed superiorly than athetoids.

3) More similarities were seen in the pattern of performance in developmental dysarthrics and adult dysarthrias on FDA. But, developmental dysarthrics performance was poorer than the adult dysarthrics.

Implications of the study:

1. The results of the study indicated many similarities between the performance of adult dysarthrics and developmental dysarthrics on FDA. Hence, this test could be used as a common assessment tool for both developmental dysarthrics and adult dysarthrics.

2. FDA can also be used to establish baseline and grade the progress during speech-therapeutic intervention in cerebral palsied dysarthria.

Limitation of the study:

In this study, the sample size of spastics and athetoids could not be equalized, because of the non-availability of subjects.

Suggestions for further research:

1. To conduct the study on the other sub-groups of cerebral palsied, like ataxia and mixed.

2. To standardize the modified tasks used in this study to suit the sample being tested.

3. To conduct the study on a large sample of cerebral palsied population and standardize this as a diagnostic tool for the cerebral palsied and other dysarthric conditions of childhood.

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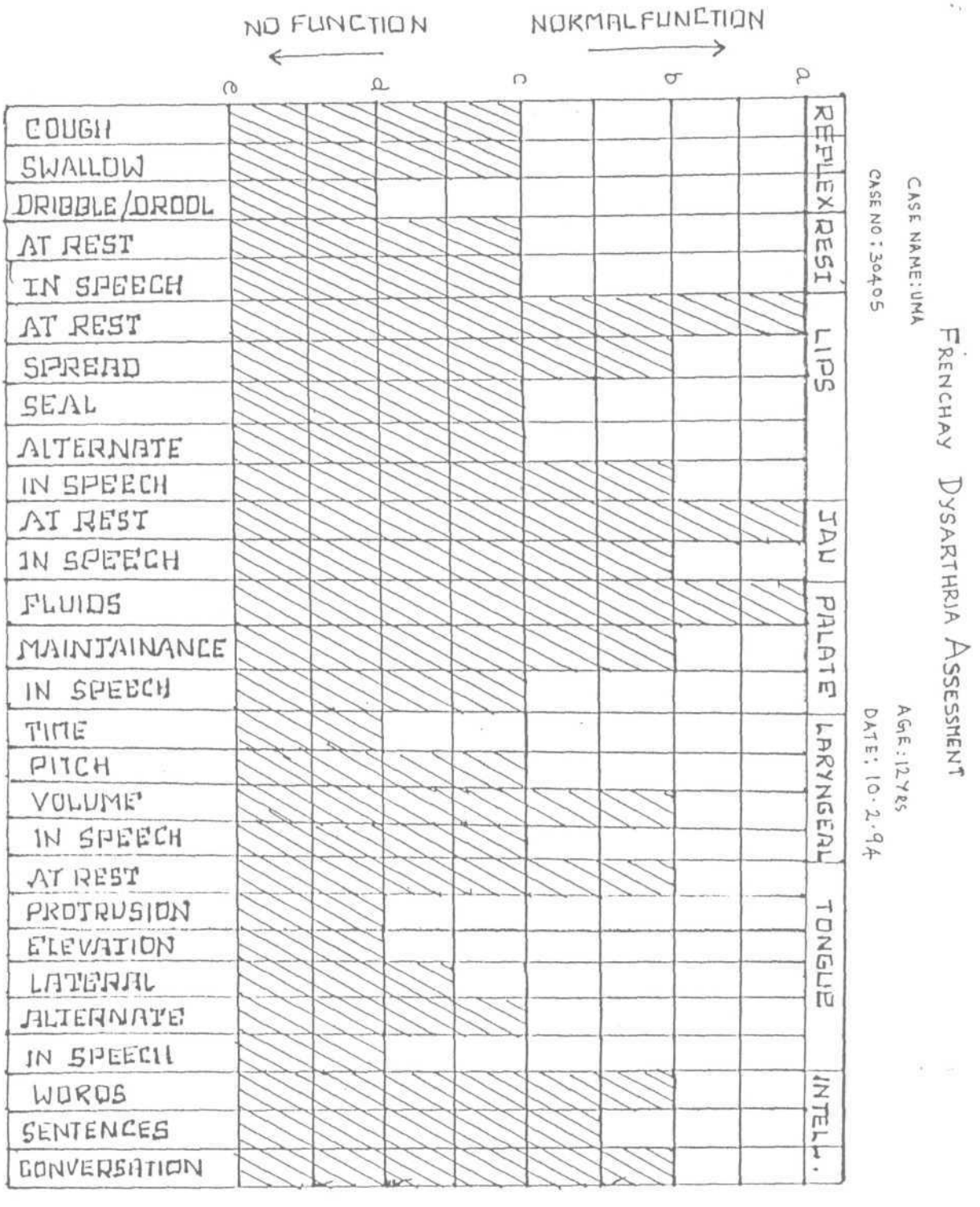
APPENDIX - I



FRENCHAY DYSARTHRIA ASSESSMENT

CASE NAME: UMA

CASE NO: 30405

AGE: 12 YRS

DATE: 10.2.94

APPENDIX - II

	Modified word list	Borrowed word list in Kannada	Word list in FD FDA manual
1.	white	bili	farm
2.	park	udyanarana	warm
3.	dark	katle	swarm
4.	go	hogu	storm
5.	grow	bele	spark
6.	goat	kuri	park
7.	trouble	tondre	dark
8.	double	erdarashtu	dagger
9.	car	karu	gadget
10.	here	i1li	jacket
11.	air	gali	jagged
12.	single	onti	glow
13.	cycle	saikal	go
14.	play	ata	grow
15.	floor	nela	goat
16.	though	adaru	bubb1e
17.	know	kivi	stuffle
18.	scissors	kattari	troub1e
19.	thought	yocane	doub1e
20.	fat	dappa	car
21.	brought	balu	here
22.	thin	sanna	error
23.	hot	bisi	air

24.	bus	bassU	single
25.	mouth	bayi	jungle
26.	chair	kurci	cyc1e
27.	mother	tayi	sprinkle
SB.	doctor	vaidyaru	sway
29.	plate	tatte	slay
30.	rose	qulabi	play
31.	leaf	ele	payar
32.	gold	canna	briar
33.	knife	katti(caku)	prior
34.	doork	bagilu	arear
35.	bangle	bale	floor
36.	bread	breddu	galore
37.	black	kappu	explore
38.	hen	koli	though
39.	god	devaru	known
40.	king	raja	urgent
41.	sun	surya	sergeant
42.	house	mane	brought
43.	cold	tannage	thought
44.	shop	angadi	brown
45.	head	tale	thorn
46.	father	hale	spain
47.	old	pustaka	loyal
48.	book	candra	lair
49.	moon	tande	vat
50.	light	dipa	fat

APPENDIX III

Modified Sentence list	Borrowed sentence list in Kannada	Sentence list in t-DA manual
I. The man is coming	manushya baruttidine	Tne inan is clocking
E. The man is repeating	manushya punahahelutj;idd$_1$3nc	The man is plotting
3. The man is sending	manushya kaluhisuttiddane	The mar is leaping
k. The manis fighting	manushya hBraduttiddane	The man is creeping
5. The roan is teaching	manushya kalisuttiddans	The iTisn is cashing
6. The manis sleeping	manushya malagitijjane	Tne man is patching
7. The man is cathing	manushya hediyuttiddane	Tns man is coir.ing
8. The man is receiving	manushya tegedukolluttiddane	The man is swimming
9. The man is naming	manushya hesarlluttiddane	The man is spinmriq
10. The man is drinking	manushya kudiyuttid^ane	The roan is sinning
II. The man is bending	manushya baggidcjsne	The man is refeating
IS. The man is biting	manushya kaccuttiddane	Tn= dan is receding
13. The man is dancing	mam.; shya nart i su11 idine	*Tr*~ iu;i is r£t5rinq
14. The man is picking	manushya ettikollutiiddane	The man i= twikermg
15. The man is standing	manushya ninttiddane	Ins man is daanrg
16. The man is hearing	manushya keluttiddane	The msn is sending
17. The man is finding	manushya hudukuttiddlne	The man is proving
IS. The man is bringing	icanushya tarutti^dane	The raan is fighting
19. The man is sitting	fnanushya kulijjtiddlne	Tne man is spitting
20. The man is walking	manushya nadeyuj^id^ane	The man is prancing
21. The man is running	manushya odu^id^ane	Tha man i= teachirq
22. The man is leaving	manushya horadirjjiddans	*Ir*\s man IE ta;cjirg

23. The man is reaching manushya taluputtiddane TIE xa;: IS ti:H'-.g

24. The man is building manushya kattuttiddane The iran is la::inj

25. The man is using manushya upayc"gisut;iddliis The .T.=.I :• ;:rr.-g

26. The roan is making itianushya laaduttiddine The T.?.: IS b::c-ir.3

27. The man is stopping ma^j.Hr.ya rnllisiitticdane Th= ITS- is :!c":":

28. The man ia staying mafiushya ulidukolluttiddsr.e The r.ar. i= i!~?:: .a

29. The man is doing manushya maduttiddlne The T.ir is rr?pi.-.q

30. The man is arriving ciafTushya agarciiuttiddane Ths .T.an is ca'zr.ir.:

31. The man is thinking manushya yociauttidJanc- The ii.a" is pitihirg

32. The min is flawing msiTushya udjt^iddjne "h= .nar, is nur.cir.g

33. The man is falling nanushya biluttiddaris Ths ,rar :F tr:-,cir.q

3^. The man is watching rcanushya gsiTiSr.isuttidJi.ie The *R3*\-< IS sinriir.g

25. The man is railing manushya uruluttiddans The *T*\3\; is fir.dir.]

36. The man is standing mafiushya nintiddine The *str.* is ;;:••: >.~.*i*

37. The man is folding inanushys madacutticdanE The *ir:>* is n?:arg

38. The man is waiting manushya !-.?v.'.tiddlr= Th= .Tan is :ri"!:iVig

39. The man is wearing manus-hya hakikolluttiddar.s Ins r.an i= samara

W. The man is turning naiiushya suduttiddaiie Ths man is star.dir.g

M. The man is shouting manushya kirucikoliutt^iddane The aian is bending

42. The man is planting iTianushya neduttidd?.ne The nan is i:ringing

43. The man is tapping raanushya tattuUiddlne Ths- man is citing

W. The man is helping manushya sahayim?dutti{jdane Ths ;T:jn is dancing

45. The man is selling manushya maruttidjane The aian is tugging

46. The man is buying mafiushya kandukcllittiddlne. Ths ;«an is tucking

47. The man is praying manushya prarthisuttiddane Tr.s man is picking

48. The man is finishing	manushya	mugisuttiddane	The man is gagging
49. The man is starting	manushya	arambhisuttiddane	The man is hearing