

ARTICULATION PROFICIENCY IN THE MENTALLY RETARDED

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MYSORE - 570 006
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to whom I owe everything

MY SISTERS

to whom I am proud to possess

MY TEACHER

Dr.N.P.NATARAJA

A source of inspiration

CERTIFICATE

*This is to certify that the dissertation entitled "**ARTICULATION PROFICIENCY IN THE MENTALLY RETARDED**" is the bonafide work in part fulfilment for the degree of Master of Science (Speech & Hearing), of the student with Register No. M8913.*



Director

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CERTIFICATE

This is to certify that the dissertation entitled
"ARTICULATION PROFICIENCY IN THE MENTALLY RETARDED"
has been prepared under my supervision and guidance.

May 1991


DR.N.P.NATARAJA 13/6/91
Guide

DECLARATION

This dissertation is the result of my own study undertaken under the guidance of Dr.N.P.Nataraja, Prof & HOD Speech Science, All India Institute of Speech and Hearing, Mysore, and has not been submitted earlier at any University for any other Diploma or Degree.

**MYSORE
MAY 1991**

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INTRODUCTION

Speech is used as a basic tool to convey our feelings, thoughts, ideas and attitudes. This is conveyed by means of words, phrases and sentences through a process of articulation. Articulation in the simplest form can be defined as a modification of the interrupted air-stream into different sounds by the movement of articulators such as tongue, lip, jaw, teeth, soft palate etc. It is a series of overlapping ballistic movements which places varying degrees of obstruction in the path of the outgoing air stream and simultaneously modifies the size, shape and coupling of the resonating cavities (Nicolosi, Harryman and Krescheck, 1979).

"Articulation is said to be normal as long as the speech sound produced by the speaker is conveying the meaning intended by him". If the speaker fails to convey the meaning intended by him by the use of inappropriate phonemes it is deviant or abnormal articulation (Van Riper).

Normal articulation and abnormal articulation depends on various factors such as the background and experience of the speaker and the listener, the geographic location, the age, delay in development and various other factors. The deviance in articulation may be due to factors such as poor environment, organic abnormalities, emotional conflicts, difficulties in phonetic discrimination or functional.

A person with an articulatory problem is one whose production of the phoneme varies too widely from the average values when he attempts to utter a standard phoneme, he makes it so differently that it sounds too different. This difference interferes with communication (Van Riper 1959). McDonald (1980) defines misarticulation as the "production of speech sounds which are not adequate acoustic representations of the phonological sequences of the language or dialect".

Most often misarticulation is described in terms of omissions, substitutions, additions and distortions, where omission represents omission of a particular phoneme. Most often it occurs in word final position and less frequently in word medial position. Addition, on the other hand, represents new phoneme in a word. However it is not considered as an articulation disorder since it occurs very rarely in the speech of any person.

Substitution is another form of articulation error where one phoneme is substituted in the place of another. It is one of the most common articulation errors observed in the speech of young child. This type of error is most commonly seen in the word medial position than in any other position. Distortion is characterized by the modification of the standard sound which is not accepted as a correct form.

Any of these deviations; misarticulations; persuade the person, or parents of such children to seek help of the

professional. Initially, the problem, should be identified and the nature and extent of the articulation disorder should be assessed. This requires a diagnostic tool or a battery of tests.

Articulation tests mainly serve the following purposes:

- 1) In identifying abnormal articulation
- 2) In locating possible causative factor/factors
- 3) In planning and evaluating therapy
- 4) In predicting the improvement of therapy
- 5) In finding out the effectiveness of the therapy

Various types of articulation tests are available viz; screening, diagnostic and deep tests. Screening articulation tests are used to identify the clients who are deviant in articulation and diagnostic tests are used to evaluate the deviant articulation in detail. By using deep test, clients ability to articulate a phoneme in specific phonetic environments can be evaluated.

India is a multilingual country and articulation test has to be language specific. This necessitates the development of articulation tests in various Indian languages. Currently tests of articulation are available in Kannada, Tamil, Telugu, Bengali and Malayalam. The present study aims to develop an articulation test in Oriya and to see its applicability in the mentally retarded. This would

help in identifying articulation disorders and in programming therapy for the mentally retarded.

Articulatory skill acquisition goes through a variety of stages of development with amazing ease, considering the multifactorious nature of acquisition. Several conditions can however, disrupt this smooth course of development, one of them is mental retardation.

Because of its intricate nature, testing or ascertaining the level of articulation functioning of a particular child is an involved process.

The formulation of the test items are quite complicated as they have to be graded in terms of difficulty and tasks into account the familiarity of the task. The numerous dialectal variations in India do not simplify matters. Another problem is the varying degree of urbanization of the children which further complicates selection of test items.

The situation becomes ever more problematic in the case of mentally retarded child for one, the articulation of the retarded shows a wide range, a continuum which extends from no articulation at all at one end, to near normal articulation at the other. The degree of retardation, the amount of stimulation given to the child, the training received will all contribute to acquisition of articulation and level of articulation functioning.

In addition testing the retarded child is a formidable task as they are often less forthcoming with strangers, then attention span is reduced which draws out the whole testing procedure. Test materials are often abstract representations of concrete things and the retarded child has trouble in generalization and the child would probably perform better in real life situation.

Due to the variety of speech and language disorders that can exist in a retarded child there is need to make a thorough assessment of the child's linguistic abilities. This is a must not only as an indicator of the child's general level of functioning but also as a guide to the planning of therapeutic programme. One tends to use the mental age of the child as an indicator of language age and use that as a baseline for therapy. Usually the child comes to us with an IQ score which tells us very little of his speech and language status by itself. However, combination with the language scores the IQ or cognitive score will aid in differential diagnosis and will alert to the possibility of concomitant disorders like hearing loss and C.P.

Though a positive correlation has been established between mental age and the phonology of a retarded child the relationship between the two is not clear. For example, does a five year old child with mental age of three year behave linguistically like a normal three year old? Is the

phonology merely delayed or is the whole language acquisition process is different in the mentally retarded.

There have been few studies to estimate the extent of communication disorders among mentally retarded persons in our country (Prabhu 1968; Gupta 1970; Shah 1970; Bharath Raj 1987). This present study is an attempt to say whether the phonology in mentally retarded is delayed or deviant and to see some of the sounds they frequently misarticulate.

REVIEW OF LITERATURE

Its usually taken for granted is our ability to produce and understand speech hence little thought to its nature and function, just as particular awareness of the action of our hearts, brain or other essential organs remains enigmatic. It is not surprising therefore, that many people overlook the great influence of speech on the personal adjustment as well as development and normal functioning of human society.

The question of speech being so important is that the development of human civilization is made possible to a great extent by mans ability to share experiences, to exchange ideas and to transit knowledge from one generation to another; in other words, his ability to communicate with other man. One can communicate with each other in many ways. Unquestionably, however, speech is the system that man has found to be far more efficient and convenient than any other. However all these above facts hold good for normal speech.

Articulation is an important aspect of speech production. In speech production terminology articulation refers to movements of the tongue. Pharynx, palate, lips and jaw to produce speech sounds. Abnormal articulation interferes with communication or causes maladjustment to the speaker [Van Riper (1978)]. Among the various factors that are responsible for abnormal articulation mental retardation

is a major one [Bangs, 1961; Brandfon, 1951, Donovan, 1957]. Swetlik and Brown (1977) concluded that impaired articulatory skills "constitute major impediments to social and emotional adjustment of mentally retarded children". However, the past two decades of research in the communication disorders associated with mental retardation primarily has provided descriptions of early speech development, early and later cognitive and language development and alternative communication modes and devices. Hence an attempt has been made to study the articulatory proficiency in the mentally retarded.

The majority of studies have been guided by the comparison of the delay hypothesis and the difference hypothesis. The delay hypothesis suggests that mentally retarded children develop language and communication skills in the same sequence as do normal people and that, by inference, factors underlying development are the same. However, the argument runs that the mentally retarded people develop skills more slowly and they have a lower ceiling of development than normal individuals. The difference hypothesis suggests that the sequence, and possibly the final pattern of developed skills, is different in normal and retarded children underlying mechanisms may be different and the concept of a lower 'ceiling' would not hold.

The delay difference model has been used widely in research on mentally retarded. Weisz and Zigler (1979), in reviewing the studies on examining the relationship between piagetian sequence of development in normal and retarded children. Concluded that there was general support for the delay model because similar stages of development occurred in the two populations and ceiling of development were lower. Most of the language development studies also agree with the above fact.

PHONOLOGY

Defective articulation is a common feature of the speech of mentally retarded children (Fawcus and Fawcus, 1974). Studies on the articulation of mentally retarded children include those of Irwin 1942, Bangs, 1942, Karlin and Strazzula 1952 and Schlanger 1953 a & b. In general each indicates that in mentally retarded children the articulatory development is delayed, which is consistent with delay model given by Ingram (1976).

Bangs (1942) studied 53 subjects who were residents of a Custro Dial School. He chose only subjects whose speech defects could not be attributed to factors which are known to be of etiological significance in articulatory disorders. They were tested by a naming task, using 65 cards with pictures of common objects. He analyzed in terms of (1) the number of avoidance (FQ waa TH, followed by r, S. (2) The percentage of cases avoiding the sound in each position, and

(3) a summary of the percentage of avoidances for each sound in each position. He concluded that the sounds most frequently substituted for each sound by the ament also very similar to those used by the normal child, also concluded that omissions are predominant in mentally retarded.

Karlin and Strazzula (1952) reported a study of 50 subjects from clinic ranging in age from 3 to 14 years. The children were divided into three groups according to their intelligence quotient as established by the standard. Binet, and the Kuhlman tests of mental development. He concluded that majority of children had speech defects which are similar to those found in normal children but defects were more in number and severe in nature. The most common defects were omission and substitution of sounds.

Schllanger and Gootsleben (1957) studied the mentally retarded children between the age of 8 and 10 years and found 58.7% of them to have articulatory problem. Also concluded that the development pattern was delayed and its not deviant.

Wilson (1966) used the Hejna articulation test in his study of 777 mentally retarded children whose C.A ranged from 6 to 16 years. He reported 53.4% of them to have articulatory problem.

G.G. Prabhu (1968) covered a sample of 320 mentally retarded children ranging in age from 3 to 19 years. The

children were evaluated on an appropriate test of intelligence and the I.Q obtained was the basis for classification of retardation. Secondly, the child's speech was evaluated for articulation. Out of 320 children 143 individuals i.e., 44.68% of the mentally retarded children had articulatory defects.

Gupta (1970) examined a sample of 300 mentally retarded children ranging in age from 0-10 years. Concluded that speech defect was one of the major problems in mentally retarded individual and showed a ratio of male to female as 2:1.

Shah et al (1970) studied 133 cases of the mentally retarded from a clinical population and brought out the fact that dull-mindedness and speech difficulty were the frequently mentioned complaints. Speech defects were presented by 82% of the whole group.

Dodd (1976) compared the articulatory performance of 10 normal and Down's syndrome children in a cross-sectional study. She observed that a set of 23 phonological rules accounted for all misarticulations by the normal children. The same 23 rules discribed a number of the errors produced by the Down's syndrome children, but many of the productions of those children did not appeared to be accounted for by any rules.

Stoet - Gammon (1980) showed that the phonological patterns seen in the mentally retarded were comparable to those observed in the speech of young, normally developing child. For example, unstressed syllables were deleted, initial fricatives/affricates were produced as stops, and glides were substituted for liquids.

Smith (1983) in a longitudinal study of the development of stop consonant production in normal and Down's syndrome children concluded that the Down's syndrome children evidenced several phonological processes similar to those observed in the speech of the normal children. In addition, no highly unusual phonological behaviour was detected in the stop productions and his analysis also revealed no major qualitative differences between the normal and Downs syndrome children.

J.Bharath Raj (1987) examined a sample of 300 cases of mental subnormality within the age range of one year to 25 years and classified the speech defects under heading of Delayed speech, Articulation Disorder, Aphasic speech, Voice disorder. Further he concluded that 17% of the Moderately Mentally retarded cases showed articulatory defects.

Rehabilitation includes diagnosis and treatment. For diagnosis and differential diagnosis, testing is important. Treatment also depends on the diagnosis or the assessment of the existing conditions i.e., finding and the sounds that can be articulated and those which are not articulated.

Articulation testing is a procedure using which the phonemic ability of an individual in a given language is determined.

Purpose of articulation tests:

1. Help in identifying clients with abnormal articulation.
2. Help in describing the phonemic ability of an individual.
3. Help in locating possible causative factors.
4. Are useful in studying phonological development.
5. Enable one to compare the effect of particular environment and kind of stimulation.
6. Make it possible to follow developmental schedule.
7. Help in deciding the necessity of therapy.
8. Help in evaluating and planning therapy.
9. Help in locating the sounds that should be treated first in therapy.
10. Help in predicting the improvement of therapy and
11. Help in finding out the effectiveness of the therapy.

There are various types of articulation tests and they are mainly grouped into informal and formal tests.

Informal tests:

Since conversation is the final criterion by which we judge articulation proficiency we should have some type of measure for sampling a clients articulation through his comverstion. Spontaneous connected speech provides many

different phonetic contexts and requires rapid co-articulation in its ongoing adjustment and changing tension. Ideally the diagnostician has an opportunity to hear the patient as he converses with playmates and parents if he is a child, or with peers if an adolescent or adult. The next best sample of speech, is that obtained by a conversation between clinician and client.

There are some difficulties however. The first one concerns the clinicians ability to analyze all the possible errors in the clients free speech. This can usually be overcome by use of a tape recorder. The second difficulty is that if the conversation is completely unstructured in its phonetic context the client may not use words containing all phonemes that is required to be assessed. This difficulty can be circumvented if a stimulus picture or topic is used (Hutchinson 1972). A final difficulty is that conversation may be too time consuming to be utilized for screening purposes.

Formal tests

There are five different types of articulation tests - developmental, screening, predictive, proficiency and diagrammatic, although one test may serve more than one function.

Although there are important commonalities among persons with articulation disorder and among the disorders themselves, there are also important differences that must be

considered when appropriate tests are being selected. This includes age, sex, degree of severity of the disorder, purposes of referral needs of the client, causal pattern of the disorders, concerns of the family, personality and attitude of the client, level of intellectual functioning, motor co-ordination and educational, emotional and environmental factors. The rationale underlying test selection and other procedures must always be kept in mind. These selection will be based partly on client characteristics such as

- 1) duration,
- 2) standardization
- 3) Thoroughness
- 4) Ease of administration
- 5) Appropriateness
- 6) Client appeal
- 7) Cost

Developmental tests:

The procedure examines a child's articulation of several sounds and then evaluates the developmental status of each of the individuals sounds tested. This is done by noting the age at which the child's defective sounds are mastered by the children of the normative study.

When a child has not learned to produce certain sounds that is uttered correctly by his peers, the sound is considered to be defective in articulation.

The Hejna developmental articulation test is one like this. The test contains 25 items which assess phoneme in three positions in words. Sounds are listed in developmental order according to the age when children master them.

Screening tests of articulation:

The purpose is to identify persons who may have an articulation disorders, but not to describe it or make a diagnosis. The procedures are sometimes informal though formal test are available. The aim is to detect those persons having defective articulation as quickly as possible for example, entire class rooms of school populations.

Templin Darley test has 50 items which may be used for screening.

Winitz (1969) criticized screening tests by saying that it provides only statistical normal to sort out children with deviant articulation. But Irwin (1972) points out that it is only a prelude to further testing.

McDonalds screening test is made of the most frequently misarticulated sounds, but only the voiceless ones of cognate pairs. Such a test neglects those sounds on which child may make voicing errors.

The Kannada screening articulation test was described by Rammohan Babu et al (1972). The test consists of 54 cards each carrying a picture. Each picture elicits one sound or

one blend each in one position, only selected phonemes were tasted in this test. Vowels were not tested as they are generally uttered correctly by the end of the second year.

A passage including all the phonemes of Kannada (except the aspirated ones) is included. Passage has easy readability.

Though screening tests are useful it has many limitations.

- 1) Most of the screening tests use limited sounds. The child may consistently misarticulate those which are not included and thus undetected during testing.
- 2) And some children may consistently make an error on particular sound which may be corrected by themselves later. Hence selecting the child on the basis of screening test is not much use when he may improve by himself.

Winitz (1969) suggests that the results of screening test along with the following criteria make it more meaningful.

- a) Level of developmental achievement of phoneme contrast.
- b) Level of articulatory performance necessary for beginning school.
- c) Parental concern if displayed.
- d) Knowledge as to whether the child will correct himself.

Predictive test of articulation

One function of an articulation test is prediction to determine those children who will or will not retain their early articulatory errors. The general procedure employed in studies designated to perform this function involves the selection of

- 1) Age levels and the interval over which the prediction is to be made.
- 2) Measures to be used as predictive variables.
- 3) Articulatory tests which measure improvement at the end of the test interval.

A variety of measures have been selected as potentially predictive. Included are such measures as the number of articulatory errors or when stimulated with the correct production of the sound, the ability to learn other sounds and performances on speech sound discrimination tests.

Arndt, Elbert and Shelton (1971) used the degree of improvement during the first three therapy sessions as a measure of prediction of progress over 15 therapy sessions.

Sommars at al (1961, 67) and Irwin, West (1966) found that the number of sounds misarticulated had predictive value. Farguhan (1961) discovered that the articulatory discrimination skills of nursery kids did not predict their articulation development.

Predictive screening test of articulation (PSTA) was given by Van Riper and Erickson (1973). The basic purpose of this test is to differentiate children who will master their misarticulations without speech therapy from those who, with therapy, may persist in their's even by the time they reach IIIrd grade level. PSTA is administered to children at the I grade level. A cut off score of 39 was decided for this test.

However Winitz (1975) comments that articulation tests predict and diagnose poorly. He states that the only reliable function is of assessing phonetic proficiency, the results of which are used to index incorrect sound production.

Diagnostic test of articulation:

Such a test may be used in deciding whether a child needs speech correction or not but frequently it is used with children already identified as having articulation problem to aim in prescribing the nature of speech correction. It provides detailed information about a child's ability to produce a wide range of speech sounds in a variety of positions and phonetic contexts.

Deep test of articulation given by McDonald permits evaluation of speech sounds as the audible and products of a series of overlapping, ballistic movement.

It samples representatively the phonetic context in which the sound being observed might occur and provides a test long enough to permit observation of the degree of variability present in the speakers production of sound.

A picture form (1964) a sentence form (1964) and a screening form (1964) for this test are available.

The rationale for this test was derived from Stetson (1951) who stated that the accurate possible positions for phonemes to occurs are as the releasing and arresting sounds at the beginning and ending of the breath phrases respectively.

Mc Donald (1964) devised the deep test to that each test phoneme can be assessed either proceeding or following every other possible phoneme. McDonald therapy holds that a speaker can achieve correct articulation more easily when the test phoneme is presented in a constant blend than when it is presented in isolation.

The picture form test is used with persons whose reading ability is below third grade level. For those at a above 3rd grade, the sentence deep test is used.

The record sheet provides blanks for recording types of misarticulations and correct or incorrect articulation of the sounds tested. The progression continuum for any sound from almost never correct to almost always correct permits on evaluation of therapy. This test is widely accepted.

In Kannada diagnostic articulation test (Ram Mohan Babu, Rathna et al 1972) there are 112 items in three parts. Part-1 includes items to test the vowels, diphthongs and consonants.

Part-II is same as part-I but the sounds tests is different words. Part-III tests blends.

India is a multilingual country and articulation test has to be language specific. This necessitates the development of articulation tests in various Indian languages. Currently test of articulation are available in Kannada, Tamil, Telugu, Bengali and Malayalam.

From the review of literature it is evident that articulation tests are important for assessment and moreover it give, a quantitative information which is useful for making comparisons among children being tested, as well as for pre and post treatment and within subject comparison.

Methods of eliciting response:

The methods of eliciting speech are very important. It is obvious that in any articulation test, the important thing is to get the subject to say something, and the way this is done is very important, as the technique selected may determine how much if any, speech is elicited. It may also affect to a considerable degree the quality of speech obtained.

Procedures for eliciting the speech are

- 1) Connected speech
- 2) Sound Inventories
- 3) Stimulability testing
- 4) Contextual testing

1) Connected Speech:

Since the ultimate objective of articulation remediation is correct, production of sounds in spontaneous conversation, speech sounds must be assessed in some type of connected discourse. This will give a picture of the clients over all intelligibility and the consistency of individual speech sound, as long as the client is cooperative and responsive.

Since the production of a sound may fluctuate widely the clients customary articulatory pattern cannot be measured through the production of a single stimulus item (McDonald 1964).

These inventories after use picture to elicit spontaneous responses. In administration of this the usual technique is to present a series of pictures to the subjects and ask him to name what he sees. Ordinarily there pictures are mounted directly or printed on cards so that the examiner can present them in order and rate desired for a particular subject.

Colour slides can also be used which will have greater appeal with children, or the pictures may be presented

through video, but the rate of presentation may be difficult to control.

The advantage of the picture method of presentation is that they are compact and provide a wide variety of stimuli that can be adopted to the interest and abilities of almost any child. But there are 2 major disadvantages (1) It is difficult to represent isolated sounds (2) The picture sometimes fails to elicit the particular word that is desired. For eg., Picture of lips may be elicited as teeth this difficulty may slow down the test. But by proper selection of pictures and by careful attention to the details of presentation this can be overcome.

Imitation of a modal or sentence completion can alternatively be used. Imitation generally produces more correct responses than spontaneous picture naming. However, performance- may vary with age, scoring method and nature of severity of the articulation disorders.

In summary these inventories provide an efficient and relatively easy method for obtaining a representative sample of articulatory productions.

C. Stimulability Testing:

This is another method to test the clients ability to repeat the correct form of error sounds. It consists of asking the respondent to imitate an auditory and or visual model of a sound, syllable or word containing the correct sound form.

Carter and Buck (1958) reported in a study of first grade children that stimulability testing can be used for prognostic purpose.

This testing is at best only a general guide for the identification of clients who may correct their articulation errors without formal intervention. The clinician must be aware that false positive and false negative will be a problem since stimulability testing has not been shown to be a totally accurate prediction of spontaneous improvement.

D. Contextual testing:

The identification of phonetic contexts where an error produced correct may provide the clinician with a measure of consistency.

This type of testing is primarily used to determine the direction of instruction rather than whether or not a person needs remediation. This testing is utilized to (1) measure consistency of misarticulations (2) To determine phonetic contexts in which a particular error sound may be produced correctly. This is a particular value when initiating a treatment programme.

II. Methods of recording responses:

The scoring system or transcription system used varies according to test purpose, personal preference and the transcription skills of the clinician. The type of scoring

employed, however, may determine the type of analysis the clinician is able to do with data obtained, and the treatment strategies are based on type of analysis. In the least sophisticated scoring system, responses are simply scored as correct or incorrect based on the examiners perception of whether the sound produced is within the socially acceptable phoneme boundary for a particular linguistic context.

Such a system while it may be adequate for screening is not clearly recommended for those who are attempting a complete articulation assessment.

Van Riper and Irwin (1958) suggested the results of the examination be reduced under 3 heads.

a) General impression

b) Specific sounds :

i) Defective phoneme

ii) Type of defect

iii) Test situation

iv) Position within a word

c) Variability of defective productions.

Methods of analysis:

Different types of analysis used are;

1) Pattern analysis

2) Kinetic analysis

3) Phonological analysis

4) Distinctive feature analysis

1) Pattern analysis:

The purpose of pattern analysis is to discover the organisation underlying the sound errors within the child's phonological analysis is that it offers insight into the relationship among sound segments and the interaction between speech articulation and higher levels of linguistic organisation.

The number of segment in error may influence the direction of treatment programme.

2. Kinetic analysis:

Perhaps the most basic type of pattern analysis consists of place, manner and voicing analysis. In such analysis misarticulated sounds are reviewed to determine whether similarities exist in terms of their voicing, manner of production and place of articulation. This facilitates the identification of pattern such as voiced or voiceless sound substitutions, replacement of fricatives by stops, or substitutions of lingua velar sounds by lingua alveolar sounds.

3. Phonological process analysis:

Phonological process analysis may be defined as patterns of sound usage that are modifications or simplification of the adult phonology. In terms of pattern analysis it is expected that processes will reflect similarities in what may appear to be dissimilar articulatory error.

The following common phonology processes are seen in the normal development of children's phonology (Ingram 1976).

- 1) Cluster reduction
- 2) Assimilatory processes
- 3) Syllable structure processes
- 4) Harmony processes
- 5) Feature contrast processes

Quantification of the occurrence of processes is achieved by calculating the percentage of instances of occurrence of a process of the total opportunities for its occurrence.

Natural process analysis define this as meeting the following conditions (Shriberg & Kwiat Kouski (1980)).

1) An underlying representation is simplified at the production on surface level and (2) is present in a number of language across the world. They identified 8 natural processes of speech.

- 1) Final consonant
- 2) Velar fronting
- 3) Stopping
- 4) Palatal fronting
- 5) Liquid simplification
- 6) Assimilation
- 7) Cluster reduction
- 8) Unstressed syllable deletion.

Because of the nature of the procedure for obtaining speech sample, it is more time consuming, but it can be abbreviated. A definite virtue of this process is the completeness and clarity of the instructions.

Distinctive feature analysis:

Only Fisher Logemann has incorporated a distinctive feature analysis into its test format.

distinctive feature systems are binary they describe a feature as being either present or absent. This model does not apply to articulation positioning, which has a multiplicity of points along a line. A binary system does not fit a physiologic model as complex as the movements of the mouth lips, tongue, and velum actually are. In addition the configuration of the tongue and the manner of release are critically important parameters in articulation but they are completely excluded in a binary system.

Walsh (1974) says that in some cases the distinctive feature system are not specific enough, in others, they are too specific.

Pollack (1972) feels that it provides a measure of the severity of the defect. This is true, but it can be misleading if applied uncritically.

Organizing the data is the next step. The data may be organised in terms of type of phonemes, phonetic categories, distinctive features and even nonsegmental aspects.

The Diagnostic Tests of Articulation are given in a Tabular Form (Review)

Name of the test	Constructed by	Age	Materials	Procedure	Recording and remarks
1	2	3	4	5	6
Photo Articulation test (PAT)	Pendergast Dickey, and Seiner and Sodes (1969)	-	72 colour photographs on each of 8 sheets of the PAT booklet. The first 69 items all the consonants of the English language 1 vowel & 1 diphthong Rest of the items are devoted to test vowels and diphthongs. Each photo tests only one sound. - Supplementary that word list also is provided. - A deck of individual cards is also provided for those with poor vision & those with low distractibility thresholds, as well as in therapy	The child is required he name each photo. No auditory visual stimulation is given for this section. - Then the child is asked to repeat after the examiner a list of words from the supplementary test word list (with auditory visual stimulation.	Responses are recorded on the PAT recording sheet. - It the child had made an error on a sound previously but utters the sound correctly in these items, it is circled and recorded as a pronunciation error. - The S/O/D/A are phonemic type of analysis is used for evaluating the test results. Separate scores are given to the tongue sounds, lip sounds and vowel sounds.

Name of the test	Constructed by	Age	Materials	Procedure	Recording and remarks
1	2	3	4	5	6
Templin Dentery tests of articulation	Templin & Darley 1967		141 items (diagnostic test) & 50 items (screening test). In the diagnostic part, 43 items make up the Iowa pressure articulation test, which checks on the adequacy of speech sounds requiring greater palato-pharyngeal closure.	Material were presented with no audio-visual stimulation & have to be named by the client. The phonemes in word level were elicited by having the client name colour pictures. Next, the misarticulated sounds are tested in isolation, in syllables, in words that are imitated & conversational speech.	Responses are recorded on a provided form acc. to a particular code so that the sounds can be analyzed phonemically, acc. to type of errors its consistency & stimulability.
Edinberg Articulation Test (EAT)	Bogle MC Isaac & Ingram (1971)		The rest of the items test the production of the English phonemes in words.	Tables of norms are provided in order to interpret the client's score.	Single word responses are recorded as right (R) & wrong (W). The total score is then converted into a standardized score. Phonemic analysis is done.

Name of the test	Constructed by	Age	Materials	Procedure	Recording and remarks
1	2	3	4	5	6
Test of articulation in Kannada	Ram Mohan Babu, Rathna Bettagiri (1972)	3yrs and above	Form a (screening test) uses 13 consonants in initial and medial positions except /n/, /y/ & /l/ which are tested only in the medial position. 5 blends (st, dr, xv & ks) also are included. Diagnostic articulation test has all the phonemes of Kannada grouped in terms of phonological age in picture form.	The phonemes were tested by having the child name the linedrawing on individual cards. No audio-visual stimulation is given when the stimulation is not identified correctly by the subject.	The responses are recorded on a recording sheet as correct () substitution error (The substitution phoneme is written down in phonetic transcription) error of omission (-), error of distortion (x) with descriptions, a phonetic analysis was done.
			Two passages (one containing all the consonants except the aspirated ones & the other containing all including the aspiration consonants, are also used on test materials.		

Name of the test	Constructed by	Age	Materials	Procedure	Recording and remarks
1	2	3	4	5	6
Tamil Articulation test	Usha (1986)	3 yrs & above	10 vowel & 25 consonants of Tamil in all the naturally occurring position. Test has 67 items. Balck & white line drawings were used.	No audiovisual stimulation and the pictures have to be named by the subject.	Responses are recorded as correct, substitution & distortion & analyzed phonemically. The test can be used for both diagnostic & therapeutic purposes.
Test of Articulation in Hindi	SAFA Vijaya lakshmi Kakpan Niranjini RUAS (1989)	3 yrs & above	All the Hindi speech sounds are included in all the three positions. In the test, the sounds one classified into oral vowels nasal vowels, plosives, retroflexes, affricates fricatives, nasals and laterals.	Naming of pictures.	The maximum articulation score is 100. The analysis of the obtained data is under process.
Articulation in Bengali	Arun Banik (1988)		Not available.		
Articulation in Telugu	Pudmaja (1988)		Not available.		
Articulation tests battery in	Maya (1990)		Not Available.		

METHODOLOGY OF THE PRESENT STUDY

The aim of the present study was to construct a test of articulation in Oriya Language which could serve as a test to assess the articulations in children and more specifically mentally retarded children in the present study.

The study was conducted in the following steps.

Part - I

- a) Construction of the test
- b) Establishment of norms

Part - II

- a) Assessing the articulation of mentally retarded children.

Construction of test

There are 6 vowels and 34 consonants in Oriya language (Pattnaik, 1977). The selected speech sounds are represented in Table-1

	Bilabial		Dental		Palatal		Retroflex		Velar		Glottal	
	A	B	A	B	A	B	A	B	A	B	A	B
Stops:												
voiceless	p	ph	t _h	t _h	t _ʃ	t _ʃ ^h	t _ɖ	t _ɖ ^h	k	k ^h		
Voiced	b	b ^h	d _h	d _h	j	dz	d _ɖ	d _ɖ ^h	g	g ^h		
Nasals	m		n	ɳ				n _ɳ				
Laterals			l					l _ɳ				
Flaps			r									
Ericsatives			s				ʃ					h

Note: A = Unaspirated

B = Aspirated

Table-1 showing different consonants in Oriya language which are included in the test.

	Front unrounded	Back rounded
High	i	u
Mid	e	o
Low	a)

Table-2 showing vowels in Oriya language which are included in the test.

Words with these sounds in the initial, medial and final positions were selected. 75 words in the initial positions, 80 words in the medial positions and 76 words in the final positions were selected for the present study. Total 231 words were selected on the following criterion. The words were;

- 1) Meaningful
- 2) Picturable
- 3) Unambiguous and
- 4) Easy for the younger children to identify

These words formed the overall material for the study.

Subjects:

70 literate Oriya speakers in the age range of 15-30 years were selected as subjects for the purpose of finding out familiarity.

Method:

The subjects were given the word list and were asked to rate the familiarity of words on a five point scale of familiarity as follows (List is given in Appendix-2).

1. Highly familiar (H.f) words which are very familiar and you use in everyday communication.
2. Familiar (F) words you know the meaning and use often.
3. Fairly familiar (F.f) words that you know the meaning of when given in a context and use sometimes.
4. Just familiar (J.f) that you come across but whose meaning you are not sure of.
5. Unfamiliar (U.f) words which you are not at all familiar with.

The data thus obtained was analyzed and those words which were rated as highly familiar by 75% of the subjects were considered for the test whenever two or three words for the same speech sound were rated highly familiar by 75% of the subjects the best picturable word was selected.

These words were picturized in simple line drawings. These picture formed the test material. This was chosen because of the advantages it has in eliciting responses from younger children for articulation testing (Appendix -3 for pictures).

II Establishment of norms

For establishment of norms 120 children in Bhubaneswar city in the age range of 3 to 6 years were selected (Table-3).

1. Whose mother tongue was Oriya.
2. Who belonged to middle socio-economic status.

3. Did not show any physical deformities or sensory deficits.
4. Had no history of ear discharge.
5. Were rated to have normal speech.

Age		Boys	Girls
3	3.6	10	10
3.7 -	4.0	10	10
4.1 -	4.6	10	10
4.7 -	5.0	10	10
5.1 -	5.6	10	10
5.7 -	6.0	10	10
		60	60

Table-3 showing the boys and girls in each age groups and total boys and girls.

They were divided into six groups on the basis of their age, each group representing a gap of 6 months in chronological age, from the next. Eg: 3.0-3-6, 3-7-4.0. Each group consisted of 10 boys and 10 girls. This age range was selected as it has been found that children acquire most of the sounds of a language before 7 years of age.

Test Material

The Oriya articulation test prepared consisted of 85 items which included the vowels and consonants (given in Table-1 and 2) in initial, medial and final positions. Blends were not included.

Procedure for administration of the test

The children were instructed to name pictures shown to them. Before testing, the children were shown three non test cards to get familiarized with the tester and testing condition. Approximately 25 minutes were spent for each child.

The responses were elicited by showing pictures and if the child did not know the name of the picture, he was given forced choice type questions. If there was still no response he was asked to repeat after the examiner i.e., the investigator uttered the word and then child was asked to repeat it.

The responses were audiorecorded for later qualitative and quantitative analysis. The following symbols were used in evaluation.

- a) Articulated correctly
- b) Substituted - the sound by which it was substituted was written down.
- c) Distorted (d)
- d) Omitted (o)

Scoring

Each correct articulation of the subject was given score of one and total score for each subject was computed.

The data thus obtained was grouped and statistically analysed. Mean and Percentage of scores were obtained for

both males and females separately under each group. Mann-Whitney 'U' test was used to find out the significance of difference between boys and girls in general, between boys and girls under each groups also between groups.

PART II**Methodology**

After establishing the norms the test was administered to moderately mentally retarded children in Bhubaneswar and Cuttack city. The following were the criteria for selection of subjects.

- 1) Moderate degree retardation (IQ 50-80)
- 2) Had no obvious emotional disorders.
- 3) Had hearing within normal limits.

Mental age measures were determined using a developmental schedule already standardized on an Indian population (J.Bharath Raj, 1983).

They were divided into six groups on the basis of their mental age (matched mental age group with normals) each group representing 6 month gap in mental age, from the next, eg. 3.0-3.6, 3.7-4.0 and so on. Each group consisted of 3 boys and 3 girls except 2 age ranges i.e., 3.0-3.6 and 4.7-5.0.

Mental Age	Boys	Girls
3 - 3.6	5	4
3.7 - 4.0	3	3
4.1 - 4.6	3	3
4.7 - 5.0	4	4
5.1 - 5.6	3	3
5.7 - 6.0	3	3
	21	20

Table-4, shows the number of mentally retarded boys and girls in each age group and total mentally retarded boys and girls.

Administration and scoring procedures were same as normals.

The data thus obtained was grouped and statistically analyzed. Mean and Percentage of scores were obtained for both boys and girls separately under each group. Mann-Whitney 'U' test was used to find out the significance of difference between boys and girls, in general, between boys and girls under each group and also between group.

Further Mann-Whitney 'U' test was used to find out significance of difference in articulatory proficiency between

Normal and retarded in general

Normal boys and retarded boys in each age group.

Normal girls and retarded girls in each age group.

RESULTS AND DISCUSSION

PART I

The results are discussed under the following headings.

- 1) Scores among different age groups
- 2) Order of acquisition of sounds
- 3) Scores among boys and girls
- 4) Test retest reliability.

In general, it was noticed that the articulation score was directly proportional to age in that the scores increased as the age advanced. However, even at the age of 6 years 100% score was not obtained. Scores in different age group of children are given in table-1.

There was a difference between boys and girls throughout the age groups studied. This difference increased gradually in the total score. When the total score of boys and girls were compared it was found that girls had greater scores in all age groups except at 3.7-4.0 years Graph-1 also displays the results.

The findings of Wellman (1931), Poole (1934), Templin (1957), Mecham (1962), Ram Mohan Babu et al (1972), Usha (1986), Maya (1990) indicate that 'phoneme' development is correlated with age and that some sounds are mastered, earlier than others. The results of the present study confirms those of the above in the articulation scores and thus the articulation skills increase with age.

Age	Sex	No. of subjects	Total scores	Percentage of scores (%)
3	B	10	64.1	75.4
	G	10	64.8	76.2
3.7 - 4.0	B	10	75.5	88.8
	G	10	74.3	87.4
4.1 - 4.6	B	10	77.0	90.5
	G	10	77.3	90.9
4.7 - 5.0	B	10	77.3	90.9
	G	10	77.6	91.2
5.1 - 5.6	B	10	82.3	96.8
	G	10	82.7	97.2
5.7 - 6.0	B	10	83.0	97.6
	G	10	83.3	98.0

Table-1: Showing the articulations scores for different age groups of Boys and Girls.

Among the phonemes it was generally observed that all the vowels and most of the consonant except /s/ (voiceless retroflex) /r/ (voiced alveolar flap) and aspirated stops were acquired by the age of 3 years. Table-2 shows the development of consonants in 3 to 6 years old Oriya speaking children. Articulation development for a particular sound was assumed to be completed if 90% of the children articulated them properly.

The results of the present study were compared with the studies of Templin (1957), Wellman (1931) and Poole (1934) and Mecham (1962) to see whether the order of acquisition was similar in English and Oriya.

Aspirated stops:

In the present study aspirated stop are acquired as late as 5 to 6 years. This agrees with Maya's study in Malayalam.

Pho Neme	Wellman	Poole	Templin	Mecham	Present study
m	3	3-6	3	3.5	3.0 - 3.6
n	3	4-6	3	3.5	3.0 - 3.6
n	-	-	-	-	3.0 - 3.6
h	3	3-6	3	3.5	3.6 - 4.0
p	4	3-6	3	3.5	3.6 - 3.6
p ^h	3	5-6	3	4.5	5.6 - 6.0
j	4	4-6	3-6	4.5	3.0 - 3.6
k	4	4-6	4	4.5	3.0 - 3.6
d	5	4-6	4	4.5	3.0 - 3.6
dh	-	-	-	-	5.6 - 6.0
b	3	3-6	4	3.5	3.0 - 3.6
b ^h	-	-	-	-	5.1 - 5.6
ʈ	5	4-6	6	3.5	3.0 - 3.6
e	4	7-6	4	4.5	3.0 - 3.6
s	5	7-6	4-6	5.5	3.6 - 4.0
r	5	7-6	4	5.5	3.6 - 4.0
l	4	6-6	6	5.5	3.0 - 3.6
t	5	-	7	5.5	3.0 - 3.6
t	-	-	-	-	3.0 - 3.6
d	-	-	-	-	3.0 - 3.6

Cont.,

Pho Neme	Wellman	Poole	Templin	Mecham	Present study
dz		-	-	-	5.6 - 6.0
th		-	-	-	5.6 - 6.0
t h		-	-	-	5.6 - 6.0
l		-	-	-	3.0 - 3.6
g ^h		-	-	-	5.6 - 6.0
		-	-	-	3.6 - 4.0
		-	-	-	not acquired

Pho Nema	Arlt & Good-ban	Ram Mohan babu et al (Kannada)	Usha (Tamil)	Maya (Malayalam)	Present study
m	3.0	3.0	3.0	3.0-3.6	3.0 - 3.6
n	3.0	3.0	3.0	3.0-3.6	3.0 - 3.6
ŋ	-	-	-	-	3.0 - 3.6
h	3.0	6.1	3.0	3.0-3.6	3.6 - 4.0
p	3.0	3.0	3.0	3.0-3.6	3.6 - 3.6
p ^h	3.0	3.0	-	3.0-3.6	5.6 - 6.0
j	3.0	4.0	3.0	3.0-3.6	3.0 - 3.6
k	-	3.0	3.0	3.0-3.6	3.0 - 3.6
d	3.0	3.0	3.0	3.0-3.6	3.0 - 3.6
dh	-	-	-	-	5.6 - 6.0
b	3.0	3.0	3.0	3.0-3.6	3.0 - 3.6
b ^h	-	-	-	-	5.1 - 5.6
ʈ	3.0	3.7	-	3.0-3.6	3.0 - 3.6
Sg	3.0	3.0	3.0	3.0-3.6	3.0 - 3.6

Cont.,

Pho Neme	Arlt & Good-ban	Ram Mohan babu et al (Kannada)	Usha (Tamil)	Maya (Malayalam)	Present study
s	3.0	3.0	3.0	3.6-4.0	3.6 - 4.0
r	4.0	4.0	4-0-4.6	3.6-4.0	3.6 - 4.0
l	5.0	3.0	3.0	3.0-3.6	3.0 - 3.6
t	-	-	-	-	3.0 - 3.6
t	4.0	3.0	3.0	3.0-3.6	3.0 - 3.6
d	-	-	-	-	3.0 - 3.6
dz	5.0	-	-	-	5.6 - 6.0
th	4.0	-	-	5.6-6.0	5.6 - 6.0
t	-	-	-	-	5.6 - 6.0
ʃ	-	6.6	6.0	3.0-3.6	3.0 - 3.6
gh	-	-	-	-	5.6 - 6.0
	-	-	-	-	3.6 - 4.0
	-	-	-	6.7-7.0	not acquired

Table-2: Showing the development of consonant in 3 to 6 years old Oriya Speaking Children.

Age groups (in years)	Significant difference
3.6	Not present
3.7 - 4.0	Not Present
4.1 - 4.6	Not Present
4.7 - 5.0	Not Present
5.1 - 5.6	Not Present
5.7 - 6.0	Not Present

Tabla-3 showing the significance of difference between the of boys and girls in each age group.

The analysis using Mann-Whitney 'U' test showed that there was no significant difference between boys and girls in terms of articulation scores (Confidence level .05).

These results are in agreement with that of Roe and Milisen (1942) and Sayler (1949) who found no statistically significant difference between boys and girls with respect to the correct production of consonant sounds. Harris and Winitz (1969) hypothesized that there are no real differences between boys and girls of 5 years age or older with respect to articulatory skills.

The results of the present study are similar to those of the above i.e., there was no significant difference between boys and girls of the same age group. When a comparison was made between different age groups, however, there was no significant difference between (4.1-4.6)-(4.7-5.0) : (5.1-5.6) - (5.7-6.0).

Age groups	Significant difference
3 - 3.6 & 3.7 - 4.0	Present
3 - 3.6 & 4.1 - 4.6	Present
3 - 3.6 & 4.7 - 5.0	Present
3 - 3.6 & 5.1 - 5.6	Present
3 - 3.6 & 5.7 - 6.0	Present
3.7 - 4.0 & 4.1 - 4.6	Present
3.7 - 4.0 & 4.7 - 5.0	Present
3.7 - 4.0 & 5.1 - 5.6	Present
3.7 - 4.0 & 5.7 - 6.0	Present
4.1 - 4.6 & 4.7 - 5.0	Not Present
4.1 - 4.6 & 5.1 - 5.6	Present
4.1 - 4.6 & 5.7 - 6.0	Present
4.7 - 5.0 & 5.1 - 5.6	Present
4.7 - 5.0 & 5.7 - 6.0	Present
5.1 - 5.6 & 5.7 - 6.0	Not Present

Table-4 showing the significance of difference between age groups for articulatory skills.

On the basis of the results obtained norms have been proposed for articulatory development in Oriya speaking children in the age range of 3 to 6 years.

	3.0	3.6	4.0	4.6	5.0	5.6	6.0
Vowels							
k							
e							
j							
t							
d							
t							
d							
P							
b							
Nasals							
		h					
		s					
		r					
			s				
					ph		
					bh		
							dz
							d ^h
							ts ^h

Tabla-5: Showing the development of phonemes in age groups from 3 to 6 years..

Test - Retest - Reliability

Walsh test was administered and no significant difference in articulatory skills between the two testings were observed indicating that the test is reliable. The scores of the two consecutive tests are in the following

table.

Age		Sex	No.of Subjects	First administration	Second administration
3	3.6	B	2	61	62
		O	2	64	63
3.7 -	4.0	B	2	75	74
		G	2	75	76
4.1 -	4.6	B	2	77	77
		G	2	79	78
4.7 -	5.0	B	2	76	76
		G	2	76	76
5.1 -	5.6	B	2	84	83
		G	2	81	81
5.7 -	6.0	B	2	83	83
		G	2	83	83

Table-6 showing the scores obtained on 2 consecutive tests

RESULTS AND DISCUSSION**PART II**

The results are discussed under the following headings.

1. Scores among different age groups.
2. Order of acquisition of sounds.
3. Frequency of consonant defects in order of misarticulations
4. Scores among normals and mentally retarded

In general, it was noticed that the articulation scores were directly proportional to the mental age in that the scores increased as mental age advanced. Scores in different age groups are given in table-7.

There was a difference in articulation scores between the mentally retarded boys and girls. This difference was a gradual liner increase in the total score. When the total scores of boys and girls were compared it was found that as in normals, mentally retarded girls had greater scores in all age groups except at 3.7 to 4 years than the boys. Graph-2 also displays the results.

Mental Age	Sex	Total Scores	Percentage of scores (%)
3 - 3.6	B	63.0	74.1
	G	63.4	74.5
3.7 - 4.0	B	74.0	87.0
	G	72.9	85.7
4.1 - 4.6	B	75.7	89.0
	G	76.2	89.6
4.7 - 5.0	B	76.4	89.8
	G	76.8	90.3
5.1 - 5.6	B	81.0	95.2
	G	81.5	95.8
5.7 - 6.0	B	82.0	96.4
	G	83.0	97.6

Table-7 Showing the scores in different age groups among mentally retarded boys and girls.

Order of acquisition

It was found that among the phonemes the order of acquisition was same as in normals and the articulatory defects during the course of articulatory development was also same as in normal children. But the defects were more in number in mentally retarded. It was found that the substitutions and omissions of sounds were predominant over distortions and additions in mentally retarded. It was also noted that in the group of (3.0-3.6) and (3.7-4.0) the articulation was better. The hypothetical explanation could be that they had limited vocabulary in the earlier ages (Strazulla 1952).

Frequency of consonant defects

s	32
s	27
l	24
l	21
r	21
ts	17
dz	17
t ^h	17
d ⁺	16
b ^h	16
g ^h	15
t ^s ^h	16
g	16
k	13
t	13
d	12
j	9
n	9
m	7
h	7
n	7
b	3
p	3

Table-8: Showing the frequency of consonant defects in order of misarticulations.

From the above table it is evident that they have more problem in fricatives and laterals followed by aspirated stops.

Age groups (in years)	Significant difference
3 3.6	Not present
3.7 - 4.0	Not present
4.1 - 4.6	Not present
4.7 - 5.0	Not present
5.1 - 5.6	Not present
5.7 - 6.0	Not present

Table-9 showing the significant difference between the scores of boys and girls in each age group.

Mann-whitney 'U' test showed that there was no significant differences between mentally retarded boys and girls in terms of articulatory skills (Cromer, 1974, Bodine, 1974).

Between normal boys and mentally retarded boys

Age	Sex	Total Score
3 3.6	NB	64.1
	MRB	63.0
3.7 - 4.0	NB	75.5
	MRB	74.0
4.1 - 4.6	NB	77.0
	MRB	75.7
4.7 - 5.0	NB	77.3
	MRB	76.2
5.1 - 5.6	NB	82.3
	MRB	81.0
5.7 - 6.0	NB	83.0
	MRB	82.0

Table-10 showing the scores between normals boys and mentally retarded boys.

NB = Normal boys

MRB = Mentally retarded boys

Mann-whitney 'U' test showed that (0.05 confidence level) there was no significant differences between normal boys and mentally retarded boys in terms of articulatory skills when matched in terms of mental age (Cromer, 1974, Lenneberg, Nichols and Rosenberger 1964). Graph-3 also displays the results.

Age	Sex	Total Score
3	NO	64.8
	MRG	63.9
3.7 - 4.0	NG	74.3
	MRG	73.0
4.1 - 4.6	NG	77.3
	MRG	76.2
4.7 - 5.0	NG	77.6
	MRG	76.8
5.1 - 5.6	NG	82.7
	MRG	81.5
5.7 - 6.0	NG	83.2
	MRG	83.0

Table-11 showing the scores between normal girls and mentally retarded girls.

NQ = Normal Girls, MRG = Mentally retarded Girls

Mann-whitney 'U' test showed that there was no significant difference between normal girls and mentally retarded girls in terms of articulatory skills when they were matched in terms of mental age (Cromer, 1974, Lenneberg, Nichols and Rosenberger 1964). Graph-4 also displays the results.

Mental Age	Average Chronological age in the mentally retarded	Sex	% of Scores in M.R.	X of Scores in Normals
3	3.6	B	74.1	75.4
		G	74.5	76.2
3.7 - 4.0		B	87.0	88.8
		G	85.7	87.4
4.1 - 4.6		B	89.0	90.5
		Q	89.6	90.9
4.7 - 5.0		B	89.8	90.9
		G	90.3	91.2
5.1 - 5.6		B	95.2	96.8
		G	95.8	97.2
6.7 - 6.0		B	96.4	97.6
		G	97.6	98.0

Table-12 showing the mental age, average chronological age and percentage of scores in the mentally retarded and normals.

From examination of Table-12 it is evident that even if chronological age was more than 8 years the mentally retarded population had not achieved 80% score. Where as the normals had achieved 98% of score by the age of 6 years. But when the mentally retarded were matched in terms of mental age then was no significant difference between the normals and mentally retarded population.

SUMMARY OF RESULTS

PART I

- 1) It was noticed that the articulation scores were directly proportional to the age i.e., the scores increased as the age advanced.
- 2) Vowels were the first to develop followed by unaspirated stops, laterals, fricatives and aspirated stops.
- 3) There was no statistical significant difference between boys and girls with respect to correct production of sounds.

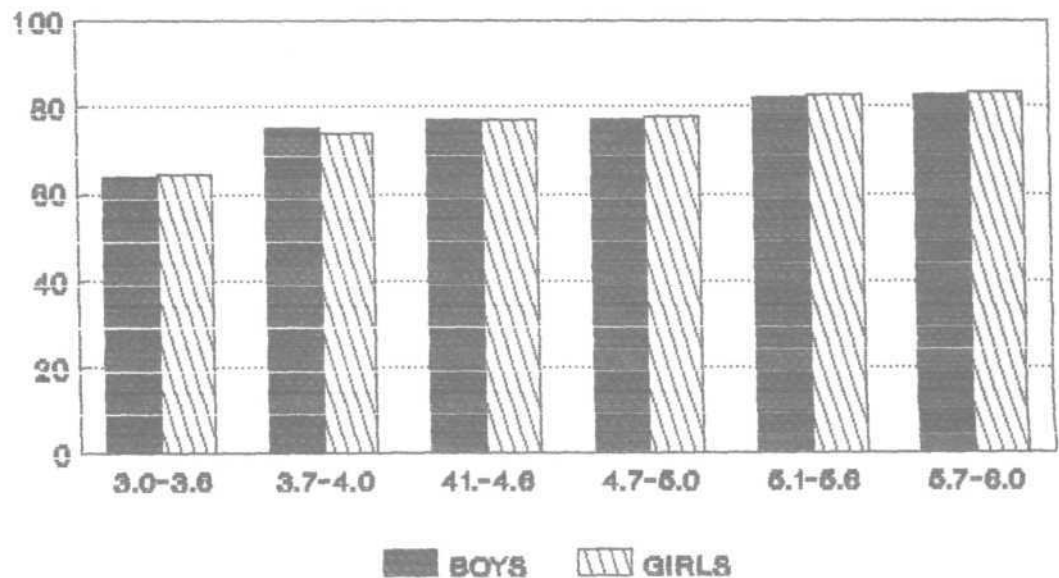
PART II

- 1) It was noticed that the articulation scores were directly proportional to the mental age i.e., the scores increased as the mental age advanced.
- 2) Order of acquisition was same as normals and misarticulation patterns they showed during the course of articulatory development was same as in normals. But

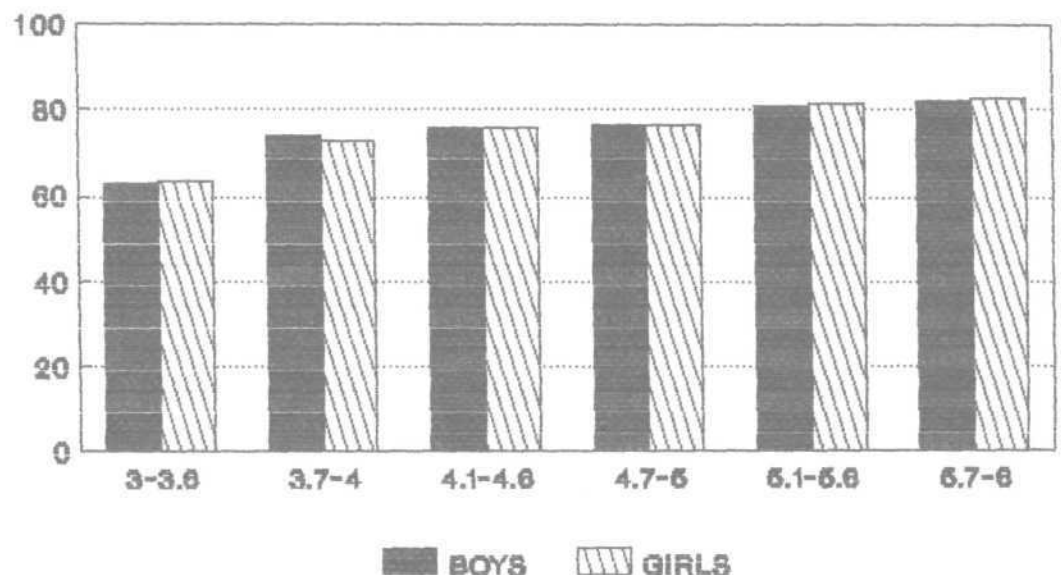
substitutions and omissions were predominant over distortions and additions.

- 3) There was no statistical significant difference between mentally retarded boys and girls with respect to correct production of sounds.
- 4) Among frequency of consonant defects fricatives were most oftenly misarticulated followed by laterals and aspirated stops.
- 5) There was no statistical significant difference between mentally retarded and normal boys when matched in terms of mental age.
- 6) There was no statistical significant difference between mentally retarded and normal girls when matched in terms of mental age.
- 7) It was observed that normals by the age of 6 years had achieved 98% scores. But mentally retarded had not achieved even 80% of scores.

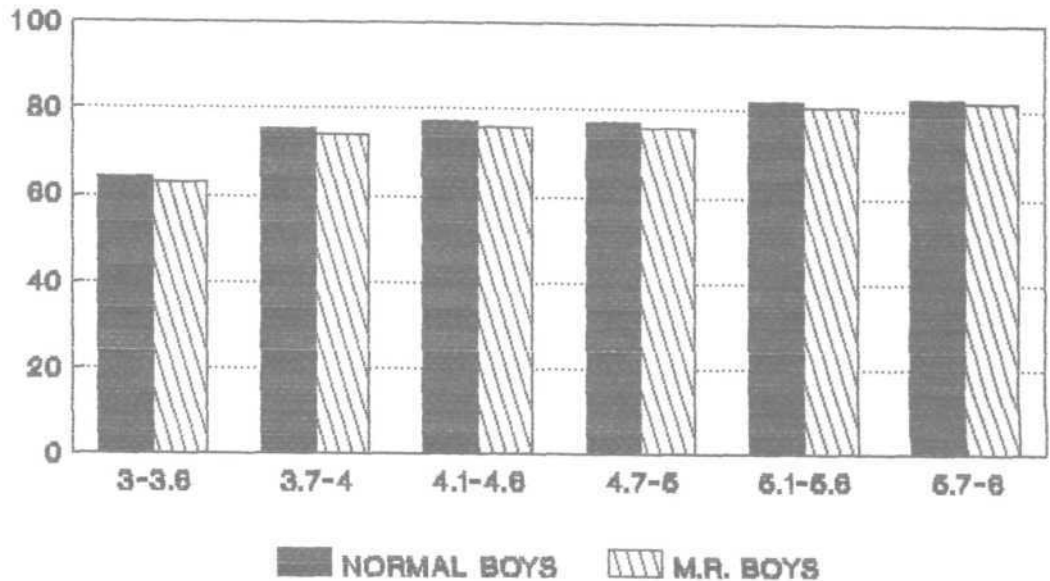
GRAPH-1 DISPLAYS SCORES OBTAINED ON NORMAL BOYS AND GIRLS IN DIFFERENT AGE GROUPS



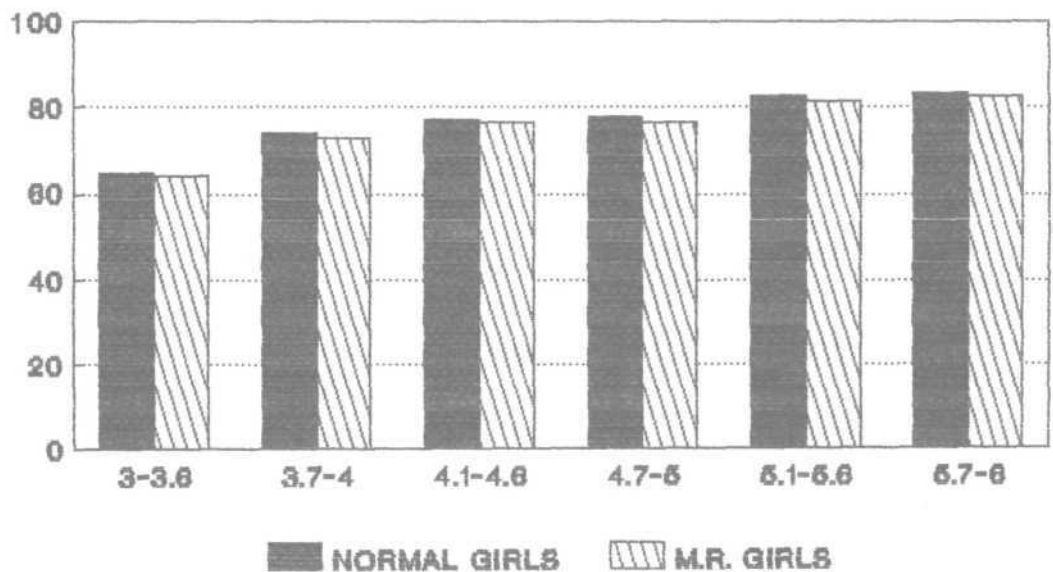
GRAPH-2 DISPLAYS SCORES FOR M.R. BOYS AND GIRLS IN DIFFERENT AGE GROUPS



GRAPH-3 DISPLAYS SCORES FOR NORMAL AND M.R. BOYS IN DIFFERENT AGE GROUPS



GRAPH-4 DISPLAYS SCORES FOR NORMAL AND M.R. GIRLS IN DIFFERENT AGE GROUPS



SUMMARY AND CONCLUSION

This study was carried out to develop an articulation test in Oriya language, since no standardized tests are available in Oriya.

6 vowels and 29 consonants of Oriya were selected for the present study. two hundred and thirtyone words with these sounds in various positions, which were picturable and unambiguous were selected and a word list was prepared. This list was administered to 70 Oriya speakers in the age range of 15 to 30 years for familiarity ratings. 5 point rating scale was used. The words which were rated most familiar by 75% of subjects were considered for the test. These words were picturized on cards of 4"x3" size to make the test.

For obtaining the normative data this test was administered to 120 normal children in the age range of 3 to 6 years in Bhubaneswar city. They were divided into six age groups of six months interval each. The cards were visually presented to elicit oral output. These responses were audio recorded.

The data for each age group was statistically analyzed. Mean and percentage of scores were obtained. Mann-Whitney "U" test was used to find out the significance of difference between the age groups and between the boys and girls of same age group.

It was found that performance varied from one age group to another. As the age increased the scores also increased. It was found that there was no significant difference between boys and girls of the same age in terms of articulatory skills. Girls exhibited superior articulatory skills when compared to boys.

It was observed that all the vowels were acquired by the age of 3 years. Most of the consonants were acquired by the age of 3 years except /s/ (voiceless retroflex) /r/ (voiced alveolar flap) and aspirated stops.

/s/ and /r/ were acquired by the age of 4 years. Aspirated stops were acquired as late as 6 years.

After the establishment of norms the test was administered to 41 moderately mentally retarded. Performance varied from one mental age group to another. As the mental age increased the scores were also increased. It was found that there was no significant difference between mentally retarded boys and girls in terms of articulatory skills. As like in normals girls exhibited superior articulatory skills when compared to boys.

Considering the order of acquisition of the phonemes it was observed that the order of acquisition was same as in normals and articulatory defects during the course of development was same as in normal children. It was also found that substitutions and omissions of sounds were

predominant in the mentally retarded over distortions and additions.

Among frequency of consonant defects fricatives are mostly affected followed by laterals and aspirated stops.

Thus it can be concluded that the test developed is useful in assessing the articulatory ability of the Oriya speaking normal and mentally retarded children.

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Sound	No	APPENDIX-I		H.f.	F	F.f	J.f	V
k -	1	କବାଟ	kabato					
	2	କୁକୁର	kukuro					
	3	କୁକୁଡ଼ା	kukuda					
	4	କାଚ	kacho					
	5	କାଫୁଲି	kafuli					
	6	କନା	kona					
k ^h	1	କାଟ	k ^h to					
	2	କାକ	k ^h ako					
	3	କାଲି	k ^h ali					
	4	କାକି	k ^h aki					
g	1	ଗାଟ	g ^h to					
	2	ଗାଈ	gai					
	3	ଗିନି	gini					
	4	ଗିରିଜା	giriya					
	5	ଗିନା	gina					
	6	ଗାଲ	gal					
g ^h	1	ଘାଣ୍ଟା	g ^h anta					
	2	ଘାଟ	g ^h ato					
	3	ଘାଈ	ghai					
	4	ଘାସ	ghasa					
ts	1	ଟାକ	tsako					
	2	ଟାମଟା	tsamto					
	3	ଟାକି	tsuki					
	4	ଟାବି	tsabi					
	5	ଟୁଲି	tsuli					
ts ^h	1	ଟାଟା	ts ^h ta					
	2	ଟାଟି	ts ^h ti					
dz	1	ଡାଟା	dzota					
	2	ଡାଟି	dzib ^h to					
	3	ଡାଟ	dzato					
	4	ଡାଙ୍ଗ	dzang ^h to					

Sound	No.		H.f.	F	F.f.	J.f.	V.f.
ɔ	1.	ɔnta ɔnta					
	2.	ɔthɔɔ ɔthɔɔ					
	3.	ɔngurɔ ɔngurɔ					
a	1.	ak ^h i ak ^h i					
	2.	ambɔ ambɔ					
	3.	athɔ athɔ					
	4.	arɔtɔ ^h arɔtɔ ^h					
i	1.	indra d ^h nu indra d ^h nu					
	2.	ilisi ilisi					
	3.	idili idili					
u	1.	uz: uz:					
	2.	ulvɔ ulvɔ					
e	1.	ekɔ ekɔ					
	2.	egaxɔ egaxɔ					
	3.						
o	1.	otɔ otɔ					
	2.	othɔ othɔ					
	3.						

APPENDIX - II

NAME:

RESPONSE SCORING SHEET

AGE:

SEX:

SOUND	WORDS	CR	S	O	D	SOUND	WORDS	CR	S	O	D
ɔ	ɔnda					dʒ	dʒoɫa				
ɔ	ɲɔ					dʒ	pradʒapɔɫi				
a	akʰi					dʒ	dʒahudʒ				
a	sua					dʒʰ	dʒʰɔɫka				
ɪ	indrɑdʰɔnu					t	tɑka				
ɪ	lɑiti					t	dʒʰɪtɪpɪtɪ				
u	uɪ:					t	lɑiti				
u	tʃɑuki					tʰ	tʰɪpɪ				
u	kau					tʰ	ɔtʰɔɫ				
e	eko					tʰ	ɑtʰ				
e	sɑtʰie					d	dɔmbɔɫu				
o	oto					d	nɔdiya				
k	kukuro					d	ghɔda				
k	kukuda					dʰ	dʰɑɫ				
k	nako					dʰ	dʰɑdʰi				
kʰ	kʰɔɫ					ɲ	bɑnɑ				
kʰ	akʰi					t	tɑlɑ				
g	gɔtʰɔ					t	pɔtʰɔkɑ				
g	egɑɫ					t	tʰɔtɑ				
g	bɔgɔ					tʰ	tʰɑɫi				
gh	ghɔntɑ					tʰ	dʒɔgɑnɑtʰɔ				
gh	bɑgʰ					d	dɑtʰ				
tʃ	tʃɑmɑtʃɔ					d	kɔdɔli				
tʃ	kɔɑɪtʃɔ					d	pɑdɔ				
tʃʰ	tʃʰɔtɑ					dʰ	dʰɔnu				
tʃʰ	mɑtʃʰɔ					dʰ	indrɑdʰɔnu				

Continued:

SOUND	WORDS	CR	S	O	D	SOUND	WORDS	CR	S	O	D
n	nədiya					m	tomato				
n	pensil					m	kələmə				
n	kano					r	rathə				
p	pə					r	kəɾɔtə				
p	chəppələ					r	anjura				
p	sapə					l	halədiya				
ph	phən					l	kələ				
ph	telip ^h ons					L	lal				
ph	səɾp ^h ə					L	bilei				
b	bələ					L	tebulu				
b	tebulu					s	ʃərə				
b	tsabi					s	surɔya				
b ^h	b ^h alu					s	bəsə				
b ^h	amrutb ^h ənku					h	həɾinə				
b ^h	dzib ^h					h	kahali				
m	mādiə					h	bəhi				

