

DEEP_TEST_OF_ARTICULATION_IN_NEPALI_PICTURE_FORM

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SAI RAM, SRI GANESHAYANAMAHA, BHUDDHAM SHARAMAM GACHYAMI

TO


BUBA (FATHER)
AND
MAA (MOTHER)
GUIDE

THOSE LOVE AND AFFECTION
ARE RESPONSIBLE FOR
WHAT I WAS
I AM
AND
I WILL BE ...

CERTIFICATE

This is to certify that the Dissertation entitled: DEEP TEST OF ARTICULATION IN NEPALI - PICTURE FORM is the bonafide work in part fulfilment for the Degree of Master in Science (speech and Hearing) of the student with Reg.No.M9304.

Mysore
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C E R T I F I C A T E

This is to certify that the Dissertation entitled: DEEP
TEST OF ARTICULATION IN NEPALI - PICTURE FORM has been
prepared under my supervision and guidance.

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DECLARATION

I hereby declare that this dissertation entitled: DEEP TEST OF ARTICULATION IN NEPALI - PICTURE FORM is the result of my own study under the guidance of Dr.S.R. SAVITHRI, Lecturer in Speech Sciences, All India Institute of Speech and Hearing, Mysore and has not been submitted earlier at any University for any other Diploma or Degree.

Mysore
May 1995

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A_C_K_N_O_W_L_E_D_G_E_M_E_N_T

" Let me touch your feet...
word can't express - my feeling toward you...
May Godbless you

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To my dearest friend Gopi: A Friend in need is
a friend in deed
I have no word to express my feeling.....

Me meet so many people, but few seem to enjoy as close a friendship.

I want to tell you too I'am very thankful to have found - A special friend like you.

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INTRODUCTION

Articulation as the word applied to speech is the production of sound with identifiable acoustic characteristic. Sound in air is transmitted from the larynx to resonators, which select certain frequency of the complex tones they receive for amplification and other frequencies for damping. The articulators (tongue, lip, teeth, velum and others) are specialized structures that alter the sizes, shapes and couplings of the oral nasal and pharyngeal resonators, and so articulation is selective resonance (Nicolosi, Harryman and Krescheck, 1978).

Articulation is defined as 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. (Nicalosi, Harryman and Krescheck, 1978).

Articulation is the movement of the articulators which serve to interrupt or modify the voiced or unvoiced air-stream, into meaningful sounds. In older sense, the term articulation refers to the intelligibility of a speech sample in relation to same variable dimension of its production such as amplification.

Misarticulation is the incorrect production of the sound with reference to adult production. It includes:

- 1) Substitution: When the sound produced by the subject is not recognized as intended but is recognizable as another sound in the phonemic inventory of the listeners.
- 2) Omission: When the intended sound is not heard by the examiner.
- 3) Distortion: When the intended sound is not recognized as a sound belonging to the phonemic inventory of the listener.
- 4) Addition: When a new sound is added to a particular word and the word is recognized in a different way.

The speech and language pathologist should be in a position to differentiate those with normal articulation from the abnormal. This can be achieved by administration of articulation tests which can be used for detection, assessment, prediction, analysis, interpretation and research.

The selection of particular test should depend on the purpose of reason for testing a specific client. Thus - the DETECTION is done to find out those who are behind developmental norms or have articulatory deviation,

- the ASSESSMENT process typically proceeds with the administration of an articulation test battery to determine misarticulations, missing rules and features, phonology processes, level, trends and inconsistencies, and
- PREDICTION involves prediction which may help in selecting the case load. This test tends to predict which children might outgrow their misarticulation.

In order to serve these purpose various typos of articulation tests have been developed such as screening, diagnostic, predictive and deep test. Screening articulation tests are used to identify the client who are deviant in articulation. Diagnostic tests are used to evaluate the deviant articulation in detail. And predictive articulation test is used to know whether the child will have deviant articulation or not in future. By using deep test clients ability to articulate phoneme in specific phonetic environment can be evaluated. This further helps in identifying the gradation of phonetic environment from easy to difficult which is helpful in therapy.

Deep test of articulation is one of the diagnostic articulation test in which each sound is tested in all

possible phonetic context ie. a sound is deep tested in a variety of phonetic context as the sound is followed and preceded by each of the other consonant.

Deep test of articulation strongly condemns positional classification. It can be screening test of articulation or diagnostic test of articulation. The deep test of articulation is available in two forms viz. The picture form and written sentence form. In picture form, two different sets of picture cards are used simultaneously to deep' test the sound in a variety of phonetic context. the sound is preceded and followed by vowels and each of the other consonants.

In the sentence test, two different sets of sentences are used, one set for the consonant preceded by a vowel and other set for the consonant immediately preceding.

The deep test has several advantages -

- 1) The sentence or picture cards of the deep test may be used following the administration of any of the conventional tests to give information on consistencies and inconsistencies of errors.
- 2) It helps to search for key words and contexts as emphasis is placed on the function of the consonant and

consistency of the consonant error in extended speech utterance of the child in many different phonetic contexts.

- 3) It provides information which may not be secured from mere conventional tests which base their results on phonemic production in isolated words.
- 4) It is useful in the exploration of phonetic environment in which consonant production may be correct.
- 5) Thus, as soon as an effective nonsense syllable combination is found, words which contain this phonetic context and related phonetic contexts are quickly utilized in therapy.
- 6) The test makes a significant contribution in the field of articulation testing and therapy because of the emphasis on consistency of phoneme production and because this is used as a basis for subsequent therapy.

Articulation is language specific. This dynamic variation calls for construction of tests specific to each language. In this regard deep tests of articulations are available in English [McDonald (1964, 1968) both picture and sentence form; Zehel and Shelton (1972) and Rcockman and

Elbert (1984), Kannada (Rohini, 1989 - sentence form), Malayalam (Maya, 1990 - Sentence form), Bengali (Animesh, 1991 - Picture form).

Deep tests of articulation in various languages are essential to be used for the population of that language. In this context the present study was planned. It aims to develop a "Deep test of articulation" Picture form in Nepali* language. This would help in identifying specific phonetic environments which are easy for the client. Also, it would help in programing therapy which would enhance the progress.

Nepali language is also called Eastern pakari, khaskura, parbatiya, or garknali language. But this Nepali language which is spoken by Nepali population is not purely Indo-Aryan language it is mixed with Tibeto-Burman language. In the central part of the Nepal, they speak mixed with Tibeto Burman and Indo-Aryan language (G.A.Grierson, 1968).

Nepali language is a language which comes under Indo-Aryan language group and spoken by Nepali population.

CHAPTER II

REVIEW OF LITERATURE

A person with an articulatory problem is one whose production of the phonemes 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).

The word "diagnosis" (Greek) means to understand thoroughly. To obtain detailed information, we need to have systematic articulation testing program. Articulation testing is a procedure, using which the phonemic ability of an individual in a language is determined.

It is well-documented that adjacent sounds influence each other during speech production (Spriesterbach and Curtis, 1953; Kozhevnikov and Chistovich, 1966) and thus, as contexts change, production variability is observed. In order to describe an individuals articulatory skills and determine the phonetic strategy, it is recommended that a systematic search be conducted for phonetic context in which a sound may be produced correctly, such testing allows for a

more representative sampling of sound production in a variety of phonetic context.

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

Articulation tests help in

- 1) identifying client with abnormal articulation,
- 5) locating possible causative factors,
- 3) describing the phonemic ability of an individual,
- 4) deciding the necessity of therapy,
- 5) planning and evaluating therapy,
- 6) locating the sounds that should be treated first in therapy,
- 7) predicting the improvement of therapy,
- 8) finding out the effectiveness of the therapy, it
- 9) enables studying phonological development, and
- 10) enables one to compare the effect of a particular environment and kind of stimulation.

The purpose of articulation appraisal is varied and hence the nature and scope of the articulation inventory varies. If the purpose is to just assess the general adequacy of articulation, in order to determine whether

child will need speech correction, screening test can be used. If a detailed description and analysis of articulation is desired, in order to determine the direction that speech correction should take, a diagnostic test is needed.

McDonald (1964) advises a much more detailed diagnostic test;- A deep test of articulation involving multiple elicitation of every sound in each of its many possible contexts. Deep test of articulation is one of the diagnostic articulation test in which each sound is tested in all possible phonetic context ie. a sound is deep tested in a variety of phonetic context as the sound is followed and preceded by each of the other consonants.

This test represents a marked departure from the conventional tests of articulation. It is based upon the premise that speech is a continuous process of movements of articulation rather than a series of static position of the structures. The function of consonants whether occurring singly or in clusters is either to release or arrest syllables. The movements of the articulators into and out of a given consonant affects the character of the consonant. In order to analyze the correctness of the phoneme, it has to be tested in many contexts in which it occurs in running speech; in other words it needs deep testing.

Deep test of articulation strongly condemns positional classification and identifies phonemes as functioning element in a syllable to either release, shape or arrest the syllable. words are made up of one or more syllables with individual sounds appearing as overlapping movements superimposed on the syllable. Sounds are studied as parts of movement sequences rather than as position in words. The dimension of consonant error inconsistency is probed very thoroughly in the test by sampling consonant production in many phonetic context in which the error sound is produced correctly.

The purposes of the deep test of articulation are - (i) to permit evaluation of speech sounds as the audible, end product of a series of overlapping, ballistic movements, and (ii) to provide a test long enough to permit observation of the degree of variability present in the speaker's production of the sound.

ADVANTAGES OF DEEP TEST:

The deep test has several advantages. The sentence or picture cards of the deep test may be used following the administration of any of the conventional tests to give information on consistencies and inconsistencies of error,

and to help search for key words and contexts. Emphasis is placed on the function of the consonant and consistency of the consonant error in extended speech utterance of the child in many different phonetic context, there by providing information which may be secured from more conventional tests which base their results on phonetic production in isolated words. Deep test can be very useful in the exploration of phonetic environments in which consonant production may be correct. Thus as soon as an effective non-sense syllable combination is found, words which contain this phonetic context and related phonetic contexts are quickly utilized in therapy. The test makes a significant contribution in the field of articulation testing and therapy because of the emphasis on consistency of phoneme production and because this is used as a base for subsequent therapy.

The deep test of articulation has two forms. The picture form and written sentence form. In the picture form two different sets of picture cards are used simultaneously to "deep" test the sound in a variety of phonetic context, as the sound is preceded and followed by vowels and as the sound is followed and preceded by each of the other consonants.

As with the picture test, in the sentence test, two different sets of sentences are used. One set for the consonant preceded by the vowel and other for consonants immediately preceding the consonant being "deep tested".

LIMITATIONS:

The deep test has many limitations:

1. It can be extremely long and laborious.
2. It cannot "deep test" more than two sounds at one meeting if they are evaluated in all phonetic contexts.
3. The results are not valid for children with certain types of speech problems.
4. The children who speak slowly and children with multiple articulation error have difficulties blending the two separate words into one single word without pausing. Yet these children do not have difficulties in speaking when the word pairs are part of natural speaking situation. Children with neuromuscular disorders involving the articulators, have trouble also in joining words without a pause particularly when fricatives are blended together.
5. The children are not able to make the articulatory adjustments necessary.

6. The construction of "funny word" can provoke too much laughter and thus reduce motivation.
7. Some children may even resist saying the word because of these reactions and thus the validity of test results may be negative.
8. Many hours of listening to the responses of children to the test items would be necessary before concluding the finding to be valid.

In spite of these limitations, the deep test of articulation has definite advantages over other diagnostic articulation test. This necessitates its inclusion in the assessment of an articulation disorder. At present "Deep Test" of articulation is available only in English, Kannada, Malayalam and Bengali languages.

McDonald constructed a deep test in 1964. He constructed a deep test of articulation in English in picture form and sentence form given a, /y - x - z/ when x is the speech sound of interest y and z are the immediate contextual environment. Coarticulation research using different variables has shown broad context to influence production of a given speech sound (Daniloff and Moll, 1978, Wang and Fillmore, 1961; Harris, Shery, and Lysawght, 1962;

Ohman, 196E; Schwartz, 1967; Amerman, Daniloff and Moll, 1970; Curtis, 1970 and Moll and Daniloff, 1971).

However, McDonald (1964) cited evidence indicating that phonemes not immediately adjacent to a target sound have little influence on the correctness of articulation with which that sound is heard. While the coarticulation studies cited did not use correctness of articulation as a dependent variable, they suggest that phonemes in broad context might influence the production of a given sound as measured by an articulation test. Indeed, Shrines, Holloway, and Daniloff (1969) recommended that coarticulation and context be considered in selecting speech unit for use in correcting articulation.

McDonald's deep test of articulation is constructed to elicit production of the tested sound as one of a series of phonemes. Three factors that influence how a sound is articulated in connected speech are manipulated in the tests. The tested sound occurs (1) in different syllable roles (release and arrest), (2) as different consonant types (single, abutting and compound) and (3) in systematically varied phonetic context to require a diversity of coarticulatory movement.

Both the picture form and sentence form assess production of 13 consonants. The picture test uses nonsense material the sentence test uses semantically meaningful material. An individual record sheet permits the examiner to determine the percentage of correct production as well as the phonetic contexts in which correct production occurred. The test provides information for a distinctive feature analysis of articulation. They identify correct productions that are valuable starting points for therapy. A comparison of the number of correct responses can be used as an indicator of progress resulting from maturation on speech training.

I. DEEP TESTS

1. DEEP TEST FOR /r/ (Dorsay, 1959):

The first deep test of articulation was developed by Dorsay (1959). He provides a deep test of articulation of 50 item sentences for /r/. The 50 sentences present /r/ in a representative sample of more than 200 phonetic contexts.

2. DEEP TEST-PICTURE FORM (McDonald, 1964):

In this test, pairs of pictures are named to make a "Funny big word" out of the two little words. The pictures chosen were those which elicited the desired name from 80%

of a large group of kindergarten children. Children are given the names for other pictures in a demonstration procedures and then are instructed to name the two pictures as a bisyllable ie. with no pause between the words. The test may be administered as either a spontaneous or imitation test. Although real words are used, the combination results in a nonsense bisyllable.

In this picture form there were SS phonemes. These were /p/ /b/ /t/ /d/ /k/ /g/ /m/ /n/ /f/ /v/ /o/ /s/ /z/ /ʃ/ /ts/ /d / /I/ /</ /n / /i/ /u/ /ɔ/ /ɪ/ /j/ /w/ /h/ /J/ /ε/ /æ/ /ʌ/. McDonald had taken a total of 80 pictures. 40 pictures were on the left side and 40 pictures were in right side of the book-let.

Pictures were ordered as follows:

Left side	Right side
1. TUB	1. VASE
2. TEETH	2. THUMB
3. CAGE	3. SHEEP
4. BAT	4. MAN
5. NUT	5. PIE
6. CUP (p)	6. PIPE (p)
7. TUB (b)	7. BELL (b)

The main advantage of this test is that it can be used for children younger than those used to test in sentence form. But it also has the disadvantage; (1) As the child has to produce a non-sense bisyllabic word, if they are not familiar with those words their production may be erroneous and (2) these funny bisyllabic words may lead the children to loose their interest.

3) DEEP TEST- SENIENCE FORM (McDonald, 1964):

Short simple sentences are employed in this test. Usually words in the sentences are selected from primary, first and second grade reading texts, and a few from third (3rd) grade reading level and are used to elicit meaningful connected speech. The test might be administered by having the child read the sentences, which are written at an easy reading level for the average third grade child. Children who cannot read might be asked to repeat the sentences. The length of the utterance of most sentences is 4 to 5 words with a few containing more than 8 words.

In this sentence form McDonald has tested 13 phonemes, which are /s/ /z/ /r/ /j/ /s/ /ts/ /dz/ /φ/ /r/ /k/ /g/ /f/ /v/. He has constructed a number of sentences representing phonetic context for each phoneme as follows:

Phoneme	No.of sentences
/k/	49
/g/	47
/f/	49
/v/	49
/φ/	49
18/	22
/s/	49
/z/	49
15/	49
15/	49
103/	49
/j/	49
/r/	49

If a child is not able to read the sentences fluently, the picture deep test of articulation is used. It is noted that a sequential numbering system has been used for the pictures and sentences in the deep test. There are however gaps in the sequences. For eg. in the picture deep test there is no number 12. The number correspond to those assigned to the phonetic contexts as they appear on the individual record sheet which is devised for use with either

the picture or the sentence deep test of articulation. It is noted that the number 12 refers to the sound//. Since there is no picture beginning or ending with this sound, the number 12 is missing in the picture sequence of the sentence "Deep test" in which /ɪ/ follows the sound which is being deep tested.

Since the reading vocabulary of children below third grade does not include many words which end with /ɪ/, number 12 does not appear in the sentence sequences where /ɪ/ would precede the sound being deep tested.

A number always identifies that sound which is combined with the sound being deep tested. To illustrate: sentence and pictures numbered 13 include /s/ and/t/is combined with the sound which is being tested and on the individual record sheet. The context for /s/ are /ps/ and /sp/. A similar numbering arrangement is followed for each sound and the individual record sheet provides the key for identifying the various contexts.

4) SCREENING DEEP TEST OF ARTICULATION (SDTA) (McDonald.)

The SDTA employs pairs of pictures to elicit ten productions of each nine commonly misarticulated consonants

(k, g, d, t, s, z). Administration time for beginning kindergarten children is about 10 min. and about 5 min. for older children. It yields a score for each subject. This may be interpreted in terms of the percent of phonetic contexts in which each tested consonant was articulated correctly. When these scores are plotted on the record form, a phonetic profile may be drawn for each subject tested. The profiles portrays the pattern of a child's development of articulatory skill and has potential implication for prognosis, therapy and evaluation of therapy outcomes. The SDTA indicates when further deep testing is needed.

The test pictures are bound in a booklet approximately 4 by 5 inches. The booklet also contains information about how the test is constructed and directions for administration, recording responses and interpreting results. Individual record sheets are available. On these the clinician may indicate the child's errors, draw his phonetic profile, summarize pertinent findings, and list recommendations.

5) DEEP TEST FOR /S/ (Zehel and Shelton 1972):

Zehel and Shelton (1972) modified McDonald's /s/ list. In broad context, McDonald tests the /s/ sound in two series

of items, designated as lists 1A and 1B. In list 1A the test word - Sun-is preceded by adjacent words in such a way that 19 different consonants and 3 vowels are used as they immediately precede the /s/. Each word pair is uttered as a single word. In list 1B the word-house-is immediately followed by 20 words initiated with 20 different consonants and 4 vowels.

Three lists of items which differ systematically from McDonald's items were designed for this study. They are termed lists 2, 3, and each list has A and B subtests. Within the A list, as in McDonald's original test, the /s/ appears in the second word in the word pair and the second word is common to all items. In the B list, /s/ appears in the 1st word in the word pair, and it is common to all items. The second word is different for each item. For example housepoke or housebook.

List 2A and 2B use the test words sun and house, as in McDonald's test. However, the adjacent word for list 2A, the sound abutting the /s/, was the same as used by McDonald but the preceding consonant or consonant/vowel were altered. The alteration was extended to changing the height and place of the tongue for vowels, and the place but not the manner of articulation of consonants. Thus, where possible, high front vowel was changed to low back vowel and vice-versa.

In each adjacent word, for list 5B, the consonant abutting the /s/ was again the same as used by McDonald, but the following vowel or vowel and consonant were altered in the manner described previously. Thus, as an eg., McDonald's adjacent word-bell-in house bell was altered to book.

List 3A used the words cup, tub, kite, and others as in McDonald's test, but the test word was altered in the manner previously described. Thus "sun" was changed to seek. List 3B used the adjacent words pipe, bell, tie and others as in McDonald's test but the test word house was altered to face.

List 4A and 4B used the adjacent words of list 2A and 2B and the test words of list 3A and 3B.

6) DEEP TEST FOR /s/ (Rockman and Eibert,1984):

Rockman-Elbert (1984) modified McDonald's /s/ list in their study regarding untrained acquisition of /s/ in a phonologically disordered child. Contexts in which /s/ was evoked by imitation were as follows:

word medial-2
morphemes
[CVC + inflection]

-ing
- ie
-er

Word initial [CV or CVC]			Word medial-one morpheme (CV VC)
Sell	Race	Racing	Passum
Sit	Miss	Missing	Wrestle

7) SENIENCE DEEP TEST IN KANNADA (Rohini,1989):

Rohini (1989) constructed a deep test of articulation in Kannada (sentence form) 13 consonants /g/ /d/ /d/ /c/ /j/ /n/ /s/ /ʃ/ /h/ /y/ /r/ /l/ /v/ were tested in vowel, consonant and consonant cluster context. 3 to 4 word long meaningful simple sentences were used. There were a few 7 word sentences. Totally 305 sentences were used to test all the 13 phonemes in all possible phonetic contexts including 108 sentences in cluster context. Rohini (1989) tested 120 children in the age range of 5 to 9 years in both the sex. For response each child was required to repeat the sentences after the tester or read the sentences. Each correct articulation was given a score of one and the total correct response was computed. The results indicated a maximum correct score of 96.63% at 8-9 years age group and the articulatory proficiency increased with age. She found that /h/ and /s/ were the most difficult phonemes to articulate. Also, it was observed that the vowel environment was easier for children to articulate than the consonant environment. Among consonants, consonant cluster environment was more

difficult than single tone. T' test showed no significant difference between males and females within the age group and also no significant difference between the age group 5-6 years vs. 6-7 years, 6-7 years vs. 7-8 years, 7-8 vs. 8-9 years in terms of articulatory skills at .05 confidence level.

8) SENTENCE DEEP TEST IN MALAYALAM (Maya, 1990):

Maya (1990) also developed a deep test of articulation (sentence form) in Malayalam. She used eight key phonemes /j//s/ /ʃ/ /s/ /r//l/ /r/ /l/ which were most commonly misarticulated by the children. Simple meaningful sentences were used. The sentence length was 2-3 words. These 8 target phonemes were tested in vowel, consonant and consonant cluster environments. The test consists of 87 sentences including 57 sentences in which target phonemes were tested in cluster environment.

Ninety Malayalam speaking children in the age range of 5 years to 8 years (in both the sex) were tested. Each child was instructed to read or repeat the sentences which were read by the examiner and the responses were recorded. Each correct articulation was given a score of one and the total correct response was found out. She reported a maximum score of 95.36 at 7-8 years. T' test

showed no significant difference between males and females within the age group. However, there was an increase in the total score with the increase of age and /s/ and /s/ were the most difficult items to articulate in all the age groups. She also found that vowel environment was the easiest and consonant cluster environment was the most difficult. In her diagnostic picture articulation test, she found that /s/ was acquired by Malayalam speaking children only by 4.6 to 5 years and /s/ by 5-5.6 years and /s/ by 4-4.6 years. She opined that this could be the reason why children had difficulty in producing /s/ correctly in the deep test of articulation.

9) PICTURE DEEP TEST IN BENGALI (Animesh 1991):

Animesh (1991) developed a deep test of articulation (picture form) in Bengali. He used eight key phonemes which are most frequently misarticulated by the children in Bengali language. These are /k/ /g/ /t/ /d/ /d/ /j/ /s/ /r/ /l/ and /h/ which were selected in simple meaningful and picturable words with these phonemes in initial and final position as a means of eliciting a response from the children. Two such word lists were prepared with twenty one picturable words in the first list and twenty picturable words in the second list. The words were selected from lower kindergarten I, II and III standard books and were picturized.

Animesh (1991) tested twenty Bengali speaking normal children (10 males and 10 females) each in the age range of 4-5, 5-6, and 6-7 years. Children were tested individually in a quiet environment and they had to utter the two words as a continuous word. The experimenter provided two demonstrations for the children. For example: /Cup-take/ uttered as a single word /cuptake/. The responses were recorded and for correct response, the symbol V' was used. He reported that there was no significant difference between males and females in terms of articulatory skill on T' test (.05 level) within the age group. However, there was significant difference between the age groups with low scores in younger age group and high scores in the older age groups in terms of articulatory skills (at .05 level). Overall it was observed that, females scored better than males though it was not significant.

The results indicated that the articulation skill increased with age. On the items analysis it was observed that /r/ and /d/ were the most difficult. Also, the voiceless stop consonant environment was the most difficult followed by trill and fricatives and the voiced consonant environment was the easiest.

II. STUDIES USING DEEP TESTS OF ARTICULATION:

Several investigators have used the deep test of articulation to evaluate articulatory performance. Tempi in (1957) in her normative study, in which she introduced the 50 item test, stated that "it would seem that at eight years of age, the ceiling of sound discriminability, as measured by the deep test, is being pushed".

Aungst and Frick (1964) in their study investigated the hypothesis that consistency of articulation is more directly related to the ability to judge one's own speech productions as correct/incorrect than to the ability to discriminate between paired auditory stimuli presented by another speaker. Along with three new tests, they used "deep test" of articulation for /r/, additional test for discrimination constructed by Dorsay (1959) according to the principles suggested by McDonald (1959). Correlation among the tests indicated that the ability to judge one's own speech production as measured by the deep test is significantly related to the consistency of articulation. Therefore, tests of this ability should prove to be valuable in diagnosis, therapy and research.

The negligible correlation between the traditional test and the deep test of articulation as reported by Aungst and

Frick (1964) in their study does not necessarily indicate that "external and interpersonal" discrimination ability is unimportant in the development of articulation ability. However, the finding of their study seem to indicate that the traditional speech sound discrimination tests samples an ability which is well established by eight years of age and is not related to articulation defect which persist after that age.

Zehal and Shelton (1972) while studying the influence of broad production as measured by deep test found that broad context had little influence on the articulation of /s/ phones. However, it is difficult to generalize from these data to the treatment of the individual. The clinician who wishes to encourage generalization from context in which a sound is produced correctly must find contexts suitable for the individual so that one investigating articulation remediation might consider contexts when selecting words for use and also record information about responses to specific item. In this way, if training is suitably controlled. information about context as a factor in articulation remediation could be gathered as a side benefit.

McReynolds, Kohn and Williams (1975) in their study analyzed the discrimination and production performance of severely misarticulating children. Their performance on the McDonald deep test of articulation and minimal pair discrimination test was compared to the performance of children without articulation errors. The normal children performed well in production and discrimination. However, the phonologically disordered children performed poorly on the production test but performed as well as the normal children on the discrimination test.

Sundstrom (1988) while describing process of /s/ acquisition among young children who substituted an interdental fricative for /s/ made use of the deep test of articulation for /s/ and concluded that the deep test of articulation seemed to be reliable indicator of whether or not /s/ would be acquired within five consecutive months.

Martin (1989) conducted a comparative study of two deep tests of articulation where the articulatory responses of children with articulatory disorder under two stimulus conditions: (1) the traditional two picture elicitation procedure for compound words (McDonald, 1964), and (2) a single picture elicitation procedure modelled after Clark (1985) were compared. This investigation has provided

evidence for an additional factor for consideration when assessing contextual influences in the type of elicitation of stimuli. The finding paralleled the discrepancies between articulation performance in response to single word stimuli and connected speech sample, thus highlighting the importance and necessity of the deep test of articulation.

All these studies highlight the importance of deep test of articulation and its use. Also, it is evident that any discussion of articulation in terms of assessment, diagnosis or therapy should take into account the specific language. There is a need to have deep test of articulations in various languages. In this context the present study is planned. This study is aimed at developing a deep test of articulation (Picture form) in Nepali language.

CHAPTER III

METHODOLOGY

MATERIAL: In the Nepali deep test of articulation, fourteen phonemes which are most frequently misarticulated were chosen as in Table-1.

Phonemes	Phonetic Description
/k/	Velar voiceless unaspirated plosive
/g/	Velar voiced unaspirated plosive
/ṭ/	Retroflex voiceless unaspirated plosive
/ḍ/	Retroflex voiced unaspirated plosive
/t/	Dental voiceless unaspirated plosive
/d/	Dental voiced unaspirated plosive
/p/	Bilabial voiceless unaspirated plosive
/b/	Bilabial voiced unaspirated plosive
/c/	Palatal voiceless affricate
/j/	Palatal voiced affricate
/s/	Dental voiceless fricative
/ʃ/	Palatal voiceless fricative
/r/	Retroflex voiced trill/flap
/l/	Palatal voiced lateral

Table-1 Phonemes selected for the test.

Simple meaningful, picturable words with these phonemes in the initial and final positions were selected and two such word lists (Table II) were prepared with twenty seven words in each list. Word ending with /d/ could not be tested as it does not occur in Nepali language.

The pictures for these words were selected from the TUTH (Tribhuvan University Teaching Hospital) and UNICEF tests which formed the material.

List-I		List-II	
1. fra:ck	kita:b	1. na:k	ka:ngiyo
2. ka:g	gila:s	5. bhare:ng	gai
3. ne:c	cosma	3. pa:nc	cora
4. dara:j	jutta	4. kami:j	ja:l
5. ko:t	to:pi	5. kha:t	tika
6. paha:d	dunga	6. ha:d	darktar
7. pa:t	tarka:ri	7. da:nt	ta:r
8. -	dara:j	8. -	de:vta
9. a:np	psha:d	9. Ta:p	Patt
10. kita:b	bira:lo	10. Kita:b	Bas
11. ba:s	sank	11. ta:s	si:si
12. Bra:s	Salai	12. Ha:ns	Saikai
13. ba:ndar	ra:jo	19. ina:r	rupaivva
14. thail	langada	14. Phu:l	Lasun

Table-11 Mord Lists for the Nepali Deep Test

PICTURE ARRANGEMENT*- All the pictures representing words with phonemes in initial position were placed on the right side and pictures with phonemes in final position were placed on the left side, so that any picture on the left could be combined with that on the right side. Thus, the first list of the picture set had fourteen pictures on the right side and thirteen pictures on the left side. The same arrangement was made in the second list also (Fourteen pictures on the right side initial position of phonemes and thirteen pictures on the left side final position). A test booklet was made which was used for further testing purposes (Appendix-1).

SUBJECTS*- Fifteen males and fifteen females each in the age group of 3-4, 4-5, 5-6 and 6-7 years who had normal speech and had no history of any ear discharge were selected. Their mother tongue was Nepali and all of them were from middle socio-economic status. Totally 120 children (60 males and 60 females) were chosen from various schools in Kathmandu, Nepal.

PROCEDURE*- The children were seated comfortably facing the examiner and the test material was placed so that the children could see the pictures without any difficulty. Children were tested individually in a quiet environment of

the school in Nepal. Before testing two demonstrations were provided.

The first two pictures of the demonstration item /mug/ and /gamala/ were shown to the child and were uttered as a single word /muggamala/ by the experimenter. Following this, the second picture pair /mug and ball/ was presented which was again uttered as a single word /mugball/ and practice session followed the demonstration.

For the main testing, the pictures on the left side were kept constant and only the pictures on the right side were turned over. The child was instructed to combine the word on the left with that on the right side and to utter the words together as a single unit (funny word). When necessary they were instructed to repeat this until they were able to utter the words without pause.

Each phoneme was tested at the word initial and final position. A picture which ended with the target phoneme was selected. For example, if /d/ phoneme was to be tested, the pictures on the left side (List I) were turned over until the picture with /d/ in final position was exposed. Keeping the picture on the left side constant, the pictures on the right side were turned over one by one. The picture on the

left side was to be combined with the pictures on the right side depicting various phonetic environment to utter a single funny word. The next step was to turn over to the page where /d/ occurred in initial position. Keeping the picture on the right side constant, the pictures on the left side were turned over one by one to elicit a combined responds of the left and the right pictures.

Once all the phonetic environment were tested the next target phoneme was selected and the same procedure was repeated. List-II was also tested in the same way. Children's responses were audio recorded on cassettes. During the testing, if the child failed to utter the desired word, the examiner prompted the child by uttering the word. Thus, in List-I and List-11, each phoneme in initial and final positions was tested in thirteen phonetic environments. In total, the test elicited 364 responses (182 + 182) from each child.

ANALYSIS*- The recorded sample was listened by a speech pathologist and the responses were noted on the score sheet (Appendix III). Depending upon the child's response, appropriate symbols were used to indicate whether he had articulated the test sound correctly or not.

	Symbol	Score
Eg. Correct response =	C	4
Substitution =	S	3
Omission =	0	1
Distortion =	D	2
Addition =	A	-
No Response =	NR	0

The total number of correct responses for each child was computed and the percent of correct response was determined by using the formula:

$$\% \text{ of correct response} = \frac{\text{No. of correct responses} \times 100}{\text{Total number of response}}$$

The % of correct responses of all the children in each age group was statistically analyzed using the T' test to find out the age and sex differences and the performance of children. An item analysis was performed to list the order of difficulty of items. This data will be used to bring about the articulatory development in children.

CHAPTER IV

RESULTS AND DISCUSSION

Results are discussed under the following readings

1. Distribution of total score
5. Distribution of scores among sub-groups
3. Item analyses
4. Order of difficulty of the items.

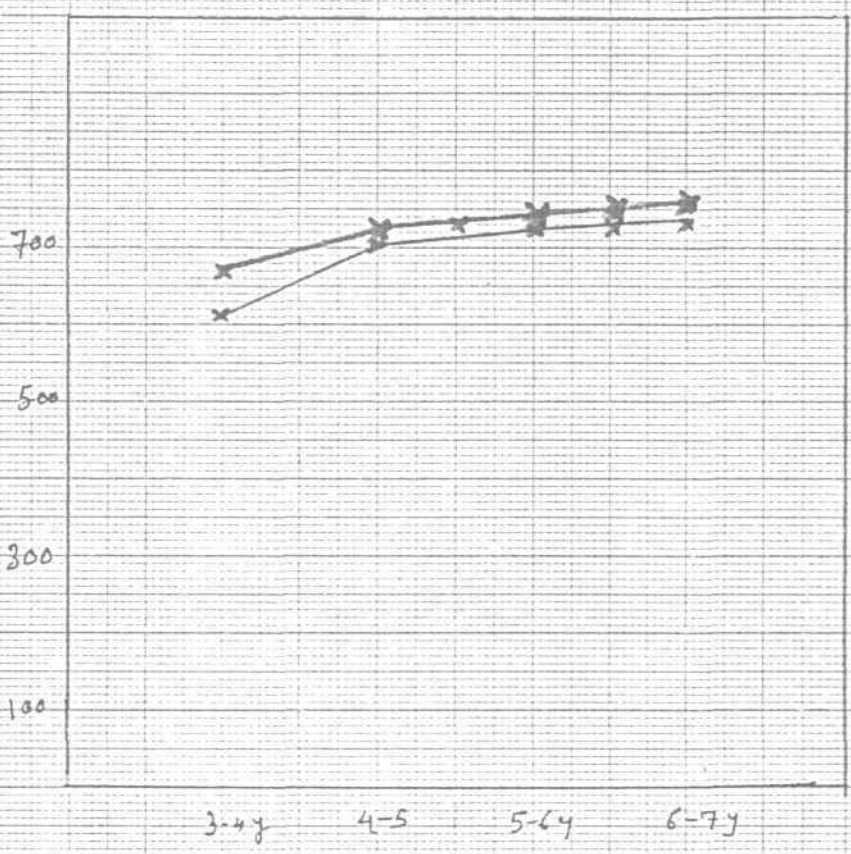
I. DISTRIBUTION OF TOTAL SCORE It was observed that the scores increased linearly from 4-7 years of age. There was a sudden increase in the score in the age group 4 - 5 years. Also males, had lower scores when compared to females. Table IV depicts the raw scores and the percent scores.

Sl. No.	Age range (years)	Male	Female	Average score	Standard Deviation
1.	3-4	655 (90%)	695 (95.3%)	674.98 (92.7%)	30.59
2	4-5	711.23 (98.09%)	714.3 (98.1%)	712.68 (97.89%)	18.841
3	5-6	721.3 (99.1%)	724 99.2%	723.415 99.15	8.5344
4	6-7	727.69 (99.95%)	727.76 (99.96%)	727.7 (99.95%)	1.2844

Table-IV Shows mean score for each group (% score in parenthesis)

Figures 1 & 2 depict the mean scores and the X score obtained by children in different age groups. The results

Set I
[List I]
Scores



Male
Female

Set II
[List II]
Scores

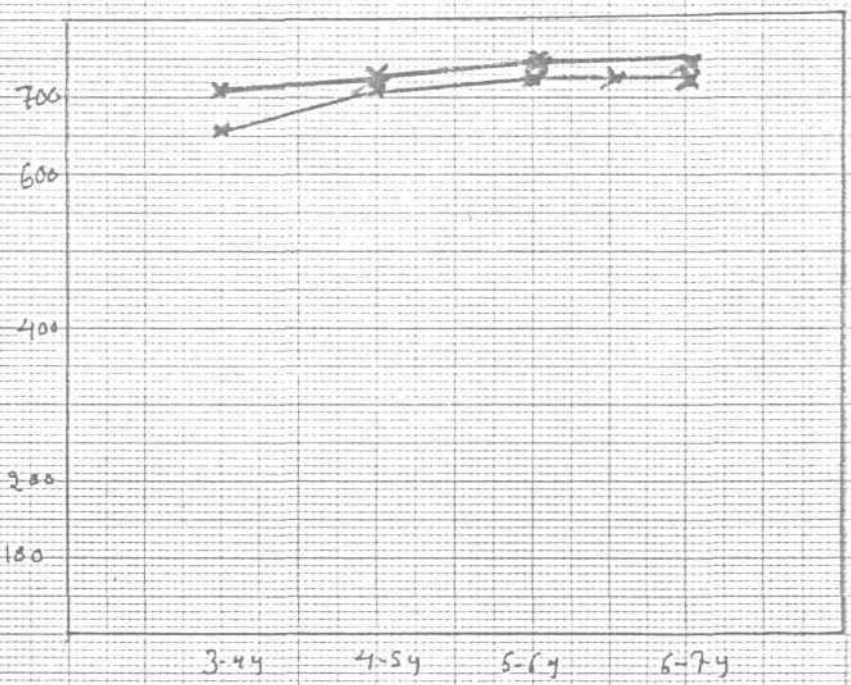


FIG II- Total score obtained by children

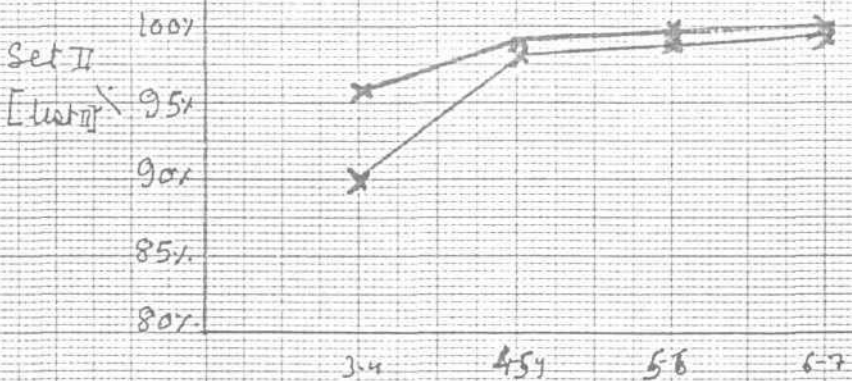
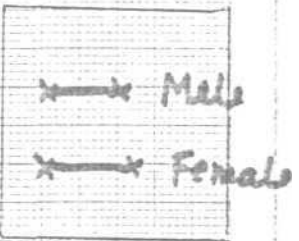
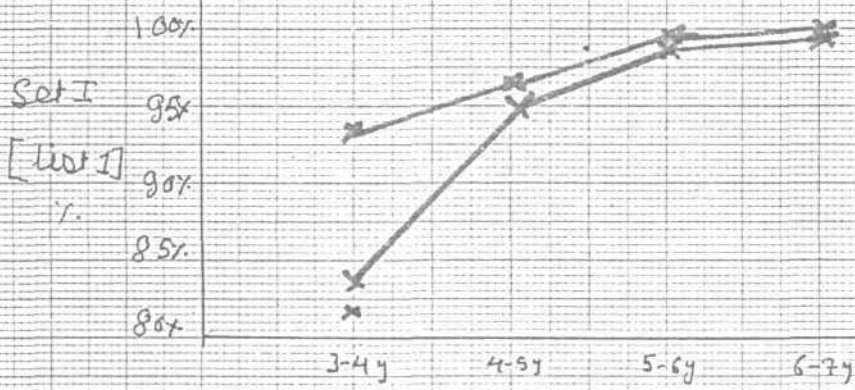


Fig:- % score obtained by children

of the T-test did not indicate a significant differences between the performance of males and females. However within, the age groups there were significant differences. Table V shows significant of difference between various age groups for the two Lists of the test.

List I					List II				
Age	3-4Yr	4-5Yr	5-6Yr	6-7Yr	Age	3-4Yr	4-5Yr	5-6 Yr	6-7Yr
3-4	-	S	S	S	3-4	-	S	S	S
4-5	S	-	S	S	4-5	S	-	S	S
5-6	S	S	NS	NS	5-6	S	S	NS	NS
6-7			NS		6-7	S	S	NS	

S=Significant difference; NS=No significant difference

Table V: Significance difference between the scores of age groups. List I and List II.

Between the groups there was significant difference, with low scores in younger groups and high score in the elder age groups which is in Table VI. Over all it was found that females scored better than males though not significantly and it was noticed that the subjects scores were better in the second List than in the first List except in the age group of 6-7 years.

3-4 years vs. 4-5 yaars	-> S
3-4 years vs. 5-6 years	-> S
3-4 years vs. 6-7 years	-> S
4-5 years vs. 5-6 years	-> S
5-6 years vs. 6-7 years	-> N

Table VI: Significance of differences between age groups for articulatory performance.

II. DISTRIBUTION OF SCORES AMONG SUBGROUPS:

The scores were higher for List II than List I and females always performed better than males. Table VII and VIII show the mean and % score both the sets.

S.No.	Age range (years)		Mean Score		Average Score	
			List I	List II	List I	List II
1	3-4	M	610	655.5	648.165	677.7
		F	686.33	702.55		
2	4-5	M	705.6	716.86	707.7	717.66
		F	709.6	718.46		
3	5-6	M	720	724.9	722.16	725.115
		F	724.32	725.33		
4	6-7	M	727.5	727.72	727.66	727.72
		F	727.66	727.78		

Table VII: Mean score for each age group.

S.No.	Age range (years)		% of Score		Average % of Score	
			List I	List II	List I	List II
1	3-4	M	83.79%	90.04%	89.03%	93.23%
		F	94.27%	96.50%		
2	4-5	M	95.8%	98.46%	97.19%	98.57%
		F	96.93%	98.68%		
3	5-6	M	98.9%	99.57%	99.19%	99.60%
		F	99.49%	99.63%		
4	6-7	M	99.93%	99.95%	99.95%	99.96%
		F	99.95%	99.96%		

Table VIII: % score in each group

II. ITEM ANALYSIS

An item analysis was carried out on the 21840 responses of ISO children to the 14 items to obtain the information on the item correct/wrong and to arrange the item in the order of difficulty. Table X (A & B) shows the difference types of articulation error at different age groups for both the sets. It was observed that the easiest phoneme was /p/ /b/ (bilabials) and the most difficult was /r/ /l/ /j/ /s/ and while children in the age group 3-4 years had difficulty in several phonemes those in 6-7 years had mastered the articulation of almost all the phonemes. Also, children's performance in List II was better than that in List I.

Phoneme	Age group in years			
	3-4	4-5	5-6	6-7
/p/	93.81	97.14	100	100
/I/	93.81	96	99.04	100
/b/	93.58	95.25	100	100
/t/	92.66	97.86	98.57	100
/t/	90.72	94.2	98.57	100
/r/	86.5	89	98.05	98.5
/g/	84.29	90.23	98.57	100
/d/	79.06	88.54	95.4	100
/c/	78.86	92	98.09	99.3
/k/	76.79	90.24	94.26	100
/J/	74.7	88.88	98.09	100
/s/	74.14	90.23	93.04	100
/{/	69.86	89.20	94.04	100

Table-Xa: Percent correct response for phonemes of the Nepali Deep Test of Articulation for List-1.

Phoneme	Age group in years			
	3-4		3-6	6-7
/p/	95.23	97.6	100	100
/b/	95.23	96.6	100	100
/t/	95.20	97.84	98.8	100
/l/	93.8	97.6	98.89	100
/i/	92.16	97.14	99.24	100
/r/	89	94.04	98.57	100
/g/	87.6	95.1	98.57	100
/k/	87	94.9	98.57	99.9
/c/	86.19	97.14	98.09	100
/d/	85	93.8	96.46	100
/j/	83.09	95.55	98.84	100
/s/	75.2	87.4	95.4	100
/ʃ/	72.14	89.76	95.4	100

Table-Xb: Percent correct response for phonemes for List II

Based on percent scores obtained for each phoneme from item analysis (general) the phonetic environment of the items were listed in the order of difficulty, for each age group. The item /ʃ/ (palatal voiceless fricative) and /s/ (dental voiceless fricatives) were found to be the most difficult in these age groups (3-4, 4-5, 5-& years) in both the lists and /k/ (velar, voiceless, stop) and /c/ (palatal voiceless affricate & trill) were most difficult item for 6-7 years group in both the lists. The order of difficulty of phonemes as indicated by the item analysis was as follows:

a) 3-4 Years: In the first list the order of difficulty of the phonemes for both sex was /p/ /l/ /b/ /t/ /ʃ/ /r/ /g/ /d/ /e/ /k/ /j/ /s/ /ʃ/. With /p/ being the easiest and /ʃ/ being the most difficult.

In the second list the order of difficulty of the phonemes for both sex was /p/ /b/ /t/ /ṭ/ /ḍ/ /r/ /g/ /k/ /c/ /d/ /J/ /s/ /ʃ/.

b) 4-5 years: In the first list the order of difficulty of the phonemes for both sex was /t/ /p/ /l/ /b/ /ṭ/ /c/ /k/ /g/ /r/ /J/ /ʃ/ /ḍ/ /s/ and in the second list the order of difficulty of the phonemes for both sex was /b/ /t/ /p/ /d/ /ṭ/ /c/ /J/ /g/ /k/ /r/ /ḍ/ /ʃ/ /s/.

c) 5-6 Years: The order of difficulty of the phonemes for both sex was /p/ /b/ /l/ /t/ /ṭ/ /g/ /J/ /r/ /e/ /ḍ/ /k/ /ʃ/ /s/ in the first list. And in the second list, it was /p/ /b/ /t/ /ṭ/ /J/ /l/ /k/ /g/ /r/ /e/ /d/ /s/ /f/.

d) 6-7 Years: In the first list the order of difficulties for bothsex was /p/ /b//l/ /t/ /ṭ/ /g/ /J/ /r/ /e/ /ʃ/ /s/ /k/ /ḍ/ and in the second list it was /p/ /b/ /l/ /t/ /ṭ/ /g/ /J/ /r/ /e/ /ʃ/ /s/ /ḍ/ /k/.

In general across all the age groups, it was found that /p/ /b/ /l/ and /t/ were the easiest phonemes and /ʃ/ /s/ /J/, were the most difficult phonemes except for higher age group (5-6, 6-7 years). In this age group /s/ /ʃ/ /k/ and /c/ /r/ & /k/ phonemes were the most difficult.

To summarize, the results indicated the following:

1. Articulation skill increased as age advanced (in both the sex.
2. Females performed better than males, though not significantly.
3. The item /s/ and /ʃ/ were the most difficult to articulate in general.
4. Trill and fricative environment were the most difficult and bilabial and dental consonant environment were the easiest.
5. Items in the second list obtained better score than those in the first list.

IV. ORDER OF DIFFICULTY OF ITEMS:

Table XI depicts the item analysis results. It was observed that the easiest phonetic environments were /k/ /g/ /c/ /j/ /l/ /d/ /t/ /p/ and /b/ and the most difficult phonetic environment were /s/ /ʃ/ /r/ and /d/. while children in the age group of 3-4 years depicted difficult phonetic environments, those in the age group of 6-7 years scored 50-60% for all the phonemes.

Item analysis in specific environment:

Phoneme	Order of difficulty	3-4 years	4-5 years	5-6 years	6-7 years
/k/	1-Order (50-60 score)	k, g, e, t, l, t, p, t, b	k, g, c, J, t, d, p, b, l	k, g, e, L, J, t, d, t, s, p, b, s, r, l	k, g, c, J, t, d, t, p, b, s, s, r, l
	2-Order (40-50 score)	J, d, s	d, s, s, r	Nil	Nil
	3-Order (>30 score)	r, s	nil	nil	nil
/g/	1 order "	k, g, c, J, t, t, d, p, b, l	k, g, c, J, t, t, t, d, p, b, l	k, g, c, J, t, d, t, p, b, s, s, r, l	k, g, c, J, t, d, t, p, s, s, r, l
	2 order "	d	s, r, s	nil	nil
	3 order "	s, s, r	nil	nil	nil
/C/	1 order "	g, c, J, t, d, t, p, b, l	k, g, c, J, t, d, p, b, l, r	k, g, c, J, t, d, t, p, b, s, s, r, l	k, g, c, J, t, d, t, p, b, s, s, r, l
	2 order "	k, s, r	s, s	nil	nil
	3 order "	s	nil	nil	nil
/J/	1 order "	J, t, d, t, p, b, l	g, e, J, t, d, t, p	k, g, c, J, t, d, t, p, s b, s, s	k, g, c, J, t, d, t, p, s, s, r, l
	2 order "	k, g, e	k, s, s	nil	nil
	3 order "	s, s, r	nil	nil	"

Phoneme Order of 3-4 years 4-5 years 5-6 years 6-7 years
 difficulty

/t/	1 order "	k, g, e, J, t, d, t, p, b, l	k, g, e, J, t, d, t, p, b, r, s	k, g, c, J, t, d, t, p, b, s	k, g, c, J, t, d, t, p, s, r, l, s
	2 order "	s, s, r	l	s	nil
	3 order "	nil	s	nil	nil
/d/	1 order "	J, t, d, t, p, b, s, l	k, g, c, J, t, d, t, p, b, s, s, r, l	k, g, e, J, t, d, t, p, b, s, s, r, l	k, g, e, J, t, d, t, p, s, s, r, l
	2 order "	k, g, e, s, r	nil	nil	nil
	3 order "	nil	nil	nil	nil
/t/	1 order "	k, g, c, J, t, d, t, p, b, s, s, r, l	k, g, c, J, t, d, t, d, p, b, s, s, r, l	k, g, c, J, t, d, t, p, b, s, s, r, l	k, g, c, J, t, d, t, p, b, s, s, r, l
	2 order "	nil	nil	nil	nil
	3 order "	nil	nil	nil	nil
/J/	1 order "	J, t, d, t, p, b, l	g, e, J, t, d, t, p, b, r, l	k, g, c, J, t, d, t, p, b, s	k, g, c, J, t, d, t, p, b, s, s, r, l
	2 order "	k, g, e	k, s, s	nil	
	3 order "	s, s, r	nil	nil	

.Phoneme Order of 3-4 years 4-5 years 5-6 years 6-7 years)

Phoneme	Order of difficulty	3-4 years	4-5 years	5-6 years	6-7 years
/b/	1 order	k,g,c,J, t,d,t,p, b,l	k,g,c,J, t,d,t,d, p,b,∫,s, r,l	k,g,c,J, t,d,t,p, b,∫,s,r, l	k,g,c,J, t,d,t,p, b,∫,s,r, l
	2 order	s,∫,r	nil	nil	nil
	3 order	nil	nil	nil	nil
/∫/	1 order	d,t,p,b, l	t,d,t,d, p,b,∫,s, r,l	k,g,c,J, t,d,t,p, b,s,r,l,∫	k,g,c,J, t,d,t,p, ∫,s,r,l
	2 order	k,g,c,J, t,∫,s,r	k,g,c,J	nil	nil
	3 order	nil	nil	nil	nil
/s/	1 order	g,c,J,t, d,t,p,b	k,g,c,J, t,d,t,d, p,b,s,∫	k,g,e,J, t,d,t,p, b,∫,s,r, l	k,g,c,J, t,d,t,p, s,∫,r,l
	2 order	k,∫,s,r, l	nil	nil	nil
	3 order	nil	nil	nil	nil
/r/	1 (50-60)	k,g,c,J, t,d,t,p, b,l	k,g,c,J, t,d,t,p, b,∫,s	k,g,c,J, t,d,t,p, b,∫,s,r, l	k,g,c,J, t,d,t,p, b,∫,s,r, l
	2 (40-50)	∫,s,r	r,l	nil	nil
	3 (>30)	nil	nil	nil	nil

!Phoneme) Order of , 3-4 years 4-5 years 5-6 years 6-7 years
difficulty

		3-4 years	4-5 years	5-6 years	6-7 years
/l/	1 Order	k,g,c,J, t,d,t,d p,b,l,ʃ	k,g,c,J, t,d,t,p b,ʃ,s,r, l	k,g,c,J, t,d,t,p, b,ʃ,s,r, l	k,g,c,J, t,d,t,p b,ʃ,s,r l
	2 Order	s,r	nil	nil	
	3 Order	nil	nil	nil	

Table-XI: Order of difficulty of phonetic environments.

(1: Least difficult with a score of 50-60

2: Difficult with a score of 40-50

3: Most difficult with a score of 30-40)

DISCUSSION

The findings of Wellman (1931), Poole (1934) and Tempin (1957) indicated that "phoneme" development is correlated with age and that some sounds are mastered, earlier than the others. The results of the present study confirms those of the above in that articulation scores and thus the articulation skill increased with age.

The results of the present study do not indicate any significant differences between the articulation scores of males and females. Roe and Milisen (1942) and Winitz (1969) stated that sex is a minor variable in the development of articulatory skills. Perkins stated that the results were conflicting. Differences reported were small and they were virtually non-existent in well controlled studies. Rohini (1989), Maya (1990) and Animesh (1991) also found no significant difference between the performance of males and females within the age group. The results of the present study is An accordance with the above. The results of the present study that there are significant differences between the articulation scores of various age groups agrees with the results of Rohini (1989) and Animesh (1991) who found that there was significant difference between the articulation scores of the age groups.

Over all, it was observed that females scored better than males, though, it was not significant and it was noticed that the subjects scored better in second list than in the first list except in the age group of 6-7 years.

The results of the study conducted by the Rohini (1989), maya (1990) and Animesh (1991) are compared here (Table IX).

Age group in years	Rohini (1989)	Maya (1990)	Animesh (1991)	Present study
3-4		-	-	92.7%
4-5		-	95.25%	97.89%
5-6	93.17X	85.8%	94.5%	99.15%
6-7	94.19X	95.86%	97.49%	99.95%

Table IX: Cutoff score as compared to the other studies.

Rohini (1989) reported a maximum score of 93.96% for males and 92.37% for females in 5-6 years and 94.66% for males, 94.38% for females in 6-7 years group. 94.6% for males and 93.79% for females in 7-8 years age group and 96.63% for males and 95.78X for female in 8-9 years of age.

Maya (1990) reported the maximum scores obtained by different age groups as 85.8% in 5-6 years of age, 93.8% in 6-7 years of age and 95.8% for 7-8 years of age group.

The results of the study conducted by Animesh indicated that the maximum scores obtained were 91.8% for males and 92.8% for female in List-I and 91.8% for males and 92.5% for female in List-II in 4-5 years, 93.8% for males and 94.4% for female in List-I and 94.7% for males and 95.1% for females in List-II in 5-6 years group, and 97.1% for male and 97.4% for female in Set-I and 97.5% for male and 97.8% for female in Set-II in 6-7 years.

The results of the present study agree with that of Rohini (1989), Maya (1990), Animesh (1991) in that the mean percent of scores increased with age. However, the percent scores obtained in this study was high when compared to the others. This may be because of the difference in the material used. While this study and Animesh used picture form, Rohini and Maya used sentence form and the picture form is simple for the children and thus their performance might have been enhanced.

When the results were compared with those of the others, Animesh (1991) stated that /d/ and /r/ were the most difficult sounds (phonemes) in Bengali for all the age groups for both the sex. Maya (1990) stated that the /s/ and /s/ were the most difficult phonemes in Malayalam to articulate correctly indifferent phonetic environments

Rohini (1989) stated that /h/ was the most difficult phoneme in Kannada, which was followed by the fricatives. In the present study /s/ and /ʃ/ were the most difficult. The acquisition of /s/ and /ʃ/ in later age group is probably the reason that these phonemes were the most difficult.

In general, the scores increased linearly from 3 to 7 years and females performed better than males though not significantly. It was observed that the children tested in this study did not obtain the maximum score ever at the age of 6-7 years. While the maximum possible scores was 728 for 1st List and 2nd List, the maximum scores obtained by the children participated in this study was 717.7 in the 1st and 727.78 in the 2nd . On the basis of the results the cutoff scores in % for different age group are as in Table XII which could be noted in evaluation.

On the basis of the results of this study cutoff scores (Table XII) are provided which could be of use in diagnosis.

Age in years		3-4	4-5	5-6	6-7
Cutoff score	List-I	89.03%	97.19%	99.19%	99.95%
	List-II	93.23%	98.57%	99.60%	99.96%

Table XII: Cutoff score in

It could be concluded that the present test helps in Dep testing articulation in Nepali language on the basis of which therapy can be programmed for patients with phonological disorders.

CHAPTER V

SUMMARY AND CONCLUSION

The Deep Test of Articulation is a diagnostic articulation test which evaluates the phonemes in all the possible positions and in all the possible phonetic contexts. It is very useful as a diagnostic and as a therapeutic tool. At present Deep Tests of Articulations are available in English (McDonald, 1964), Kannada (Rohini, 1989), Malayalam (Maya, 1990), and Bengali (Animesh, 1991) among the Indian languages. Deep Tests are essential for use with phonologically disordered and for the population of a given language. In this context the present study was planned. Its aim was to develop a "Deep Test of Articulation in Nepali Language" which would help in identifying specific, phonetic environment which are easy or difficult for the client and also help in programming therapy which would enhance the progress of the client.

In this study, 14-Key phonemes were selected (/k/ /g/ /c/ /j/ /t/ /d/ /t/ /d/ /p/ /b/ /s/ /ʃ/ /r/ and /l/) which were the most frequently misarticulated. Meaningful picturable easy Nepali words with these phonemes in initial and final positions were selected. The test material

consists of two Lists each of which comprised of 27 picturable words. Each List consisted of two word lists. Words with the target phonemes in the final position were placed on the left side of the booklet and those with the target phonemes in the initial position were placed on the right side of the booklet. Each set had 13 pictures on the left sides and 14 pictures on the right side of the booklet (as /d/ did not occur in final position no picture was available for this). All the pictures were used and a test booklet was prepared. The study included thirty (15 males and 15 females) Nepali speaking normal children each in the age ranges of 3-4, 4-5, 5-6, and 6-7 years. None of the children had any speech problem and had any history of ear discharge and hearing problem. All of them were from middle socio-economic status and totally ISO children (60 males and 60 females) were chosen from various schools in Nepal.

The children were instructed to produce a big funny word by combining the word depicted by the picture on the left side with that on the right side. They were instructed to produce the big funny words by seeing the picture or reading the words which were written below the pictures. When they were unable to produce the sounds properly in the first instance, they were given a second trial and were

instructed to repeat after the tester. Two trials were given before the actual testing started.

After two to three trials or even after repetition, if the children were unable to produce the target phoneme then it was considered as an error. In this manner 180 responses were elicited for both the Lists of the test which were recorded and analyzed. Each correct articulation of the subject was given a score of 4, for substitution the score was 3, for distortion the score was 2, for omission, the score was 1, and for no response, the score was 0. The total score of each subject was calculated and statistically analyzed. On "T" test, it was found that there was no significant differences between males and females, in general, within the groups and also in between the groups in terms of articulatory skills (Confidence level 0.03).

The results indicated that the articulation skill increased with age. On the item analysis, it was observed that the phonemes /s/ and /ʃ/ were the most difficult to articulate. Also the fricatives and trill consonant environment were the most difficult environment to articulate and bilabial and dental environment were the

easiest to articulate. The scores for the second List were better than the scores for the first List.

On the basis of the results, cut off score have been provided, which could be used in diagnosis.

Age in years		3-4	4-5	5-6	6-7
Cutoff Score	List	89.03	97.19	99.19	99.95
	List	93.23	98.57	99.60	99.96

Table XIV: Cutoff scores (in percent)

The present test helps in the evaluation of articulation in detail in various phonetic environments. A therapy programme can be made on the basis of these easy to difficult phonetic environment. It also aids in research to find out the coarticulatory effects of the preceding and the following sounds. However, the test-retest-reliability and the validity of the test should be assessed on a large population and norms are to be developed to identify children who are at risk or failure to develop mature articulation.

CHAPTER VI

BIBLIOGRAPHY

Amerman, J.B., Daniloff, R., Moll, K.L. (1970): Cited in "Item context and /s/ phone articulation test result" by Zehel, Z., Shelton, R.J., Aungst, W.B., Wright, V. and Albert, H. J.Speech.Hear.Res. 1972, 855.

Animesh, B. (1991): "Deep test of Articulation in Bengali: Picture Form: Unpublished Dissertation submitted in part fulfilment to the Master's Degree in Speech and Hearing, University of Mysore

Aungst, L. and Frick, M. (1964): "Auditory discrimination ability and consistency of articulation of /r/. J.Speech.Hear.Dis. 29(1), 76-85.

Clark, E. (1985): "Baby talk" (Video tape) Boston, W.G.B.H. Educational Foundation.

Curtis, J.F. (1970): Cited in "Item context and /s/ phone articulation test result" by Zahel, Z., Shelton, R.J., Aungst, U.B., Wright, V. and Albert, H. J.Speech.Hear.Res. 1972, 852.

Daniloff, R.G. and Moll, K.L. (1978): Cited in "Item context and /s/ phone articulation test result" by Zahel, Z. Shelton, R.J., Aungst, W.B., Wright, V. and Albert, H. J.Speech.Hear.Res. 1971, 852.

Dorsey, H. (1959): Cited in "Auditory discrimination ability and consistency of articulation of /r/" by Aungst, L. and Frick, M. J.Speech.Hear.Dis. 29(1), 76-85, 1965.

Grierson, G.A. (1968): general Introduction of Nepali as Khas-kur language" Linguistic Survey of India. Vol.IX, Part IV, 17-52.

Harris, Shery, M.S. and Lysawght (1962). Cited in "Item context and /s/ phone articulation test results" by Zahel, Z. Shelton, R.J., Aungst, W.B., Wright, V. and Albert, H. J.Speech.Hear.Res. 1972, 852.

Kozhevnikov, J. and Chistovich, H.A. (1966): "Rech Mtikulyastriyai: Vapriyaliya 1965. Translated as speech articulation and perception, Washington, Joint Publications, Research Services Vol.30, 543.

Martin, W.M. (1989): "A comparative study of two deep tests of articulation", Journal of Communication Disorders, ES(6), 383-395.

Maya, P. (1990): "Articulation Test Battery in Malayalam" Unpublished Dissertation submitted in Part Fulfilment for the Master's Degree in Speech and Hearing, University of Mysore.

McDonald, E.T. (1959): "Rationale for a Deep Test of articulation", ASHA, 1, 103.

McDonald, E.T. (1964) Cited in "Item context and /s/ phone articulation test results" by Zahel, Z., Shelton, R.J., Aungst, W.B., Wright, V. and Albert, H. J.Speech.Hear.Res. 15, 1072, 852.

McDonald, E.T. (1964): "Articulation testing and treatment a sensory motor approach". Stanwix House, Pittsburgh.

McDonald, E.T. (1964): "A Deep test of articulation", Stanwix House, Pittsburgh.

McDonald, E.T. (1968): "Screening Deep test of articulation". Stanwix House Inc, Pittsburgh.

McReynolds, L.V., Kohn and Williams (1975): "Articulatory defective children's discrimination of their production errors". J.Speech.Hear.Dis. 39, 3S7.

Moll, K.L. and Daniloff, R.G. (1971): Cited in "Item context and /s/ phone articulation test results" by Zehal, Z., Shelton, R.J., Aungst, W.B., Wright, V. and Albert, H. J.Speech.Hear.Res. 1992, 852.

Nicolosi, L., Harryman, E., and Krescheck, J. (1978): Terminology of communication disorders", Baltimore, Williams and Wilkins.

Ohman, S.E. (1962): Cited in "Item context and /s/ phone articulation test results" by Zehal, Z., Shelton, R.J., Aungst, W.B., Wright, V., and Albert, H. J.Speech.Hear.Res. 1972, 852.

Rockman, K. and Elbert, M.S. (1984): "Untrained acquisition of /s/ in a phonologically disordered child". J.Speech.Hear.Dis. 49, 246-253.

Rohini, H. (1989): "Deep test of articulation in Kannada-Sentence form", Unpublished Dissertation submitted in part fulfillment of Masters Degree in Speech and Hearing, University of Mysore.

Schwartz, M.F. (1967): cited in "Item Context and /s/ phone articulation test results" by Zehal, Z., Shelton, R.J., Aungst, W.B., Wright, V., and Albert, H.. J.Speech.Hear.Res. 1972, 852.

Spriesterbach, D.C., and Curtis, J.F. (1953): "Misarticulation and discrimination of Speech sounds" Quarterly Journal of Speech. 37, 489-491.

Sundstrom, P. (1988): "Acquisition of /s/ among kindergarden children who misarticulated /s/ measured by the deep test of articulation", J. Communication Disorders, 21(3), 177-187.

Tempin, M. (1965): Cited in "Auditory discrimination ability and consistency of articulation of /r/" by Aungst L.O. and Frick, M. J.Speech.Hear.Dis. 29(1), 76-85.

Van Riper, C. (1959): Cited in "Voice and articulation" by Van Riper C, Medical Publishing Co. Ltd., London.

Wang, M.S., and Fillmore (1961): Cited in "Item context and /s/ phone articulation test result" by Zahel, Z., Shelton, R.J., Aungst, W.B., Wright, V., and Albert, H. J.Speech.Hear.Res. 1975, 852.

Zahel, Z., Shelton, R.J., Aungst, M.B., Wright, V. and Albert, H. (1975): "Item context and /s/ phone articulation test result" J.S.H.R. 15, 85S.

