Age and Sex as Variables in a Oral Form Discrimination Task

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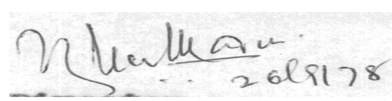
<u>CERTIFICATE</u>

This is to certify that the dissertation entitled "Age & Sex variables in Oral form discrimination Task",is The bona fide work in part fulfillment for M.SC. in Speech And Hearing of the student with Register Number.



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C E R T I F I C A T E

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GUIDE

D E C L A R A T I O N

This dissertation is the result of my own study undertaken under the guidance of Dr.(Ms) Shailaja Nikam, Head of the Department of Audiology, All India Institute of Speech and Hearing, and has not been submitted earlier at any University for any other Diploma or Degree.

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CONTENTS

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CHAPTER I

INTRODUCTION

Disorders of speech can be classified into two broad categories 1) Organic and 2) Functional. In the organic speech disorder a definite anatomical or physiological disturbance can be pin pointed as the etiological factor. But in case of functional disorders the cause is attributed To some psychological or environmental factor.

Among the functional disorders of speech, the most prevalent was found to be functional misarticulation. A survey of literature reveals that in school population about 75 to 80 percent of all speech defectives are functional miserticulation cases (Powers, 1971). Inspite of the large incidence until recently very little research was devoted to this area as compared to other disorders of speech.

In recent years there is a trend towards the identification of possible etiological factors in functional misarticulation cases. Feedback channels have gained importance in speech development, with the conception of the speech process as a servosystem. (Fairbanks, 1954; Mysak 1966; Heneke, 1967). Two of the most important feedback channels In articulation are the auditory and tactile-kinesthetic Channels.

The auditory feedback has been subjected to through investigations and its relation to various speech disorders and normal speech development are well established (Prins, 1963; Costello & Flowers, 1963; Sherman & Gieth, 1967). The positive Relation between auditory discrimination and articulation has led to the use of auditory discrimination training in articulation therapy (Van Riper, 1954; Van Riper & Irwin, 1958). In comparison, the oral tactile and kinesthetic perception has not been explored extensively.

In-sight into the role of oral sensation and perception has been gained from observation of individuals with sensory pathologies and experimentally induced sensory deficiencies. In the former case speech has been noted to be minimally intelligible with severe misarticulations. In the latter case, where sensory disturbance is induced by means of nerve-block anesthesia speech was found to be highly intelligible, but Consonant misarticulation was observed (Gammon et al, 1971; Ringel & Steer, 1963; Scott & Ringel, 1971).

The effect of sensory disruption on articulation has led to the construction of various tests to assess various aspects or oral sensory capabilities. They are tests of – tactile acuity, texture discrimination, localization, pattern recognition, kinesthetic pattern recognition, two point discrimination, vibrotactile sensitivity and oral stereognosis (Rutherford & McCall, 1967; Fucci, 1972; Mcdonald & Augst, 1967; Ringel et al 1970; Ringel & Ewanowski, 1965). In general, except for oral stereognosis tests, other have not been very successful in differentiating pathologic from normal speakers.

Oral Stereognosis

Oral stereognosis may be defined as the ability to recognize the form of the objects placed in the mouth, through the sense of touch. Performance on a oral stereognostic test reveals a person's ability to integrate complex patterns of tactile and motor information to accurately judge the spatial characteristics of the object. Similarly for the precise articulation of speech sounds, the person should develop an internalized spatial representation of his oral cavity. Due to the frequents association of motor activity with the development of the representation and the acoustic results, he is readily able to specify the motor action necessary for articulator to reach a given target point. (MacNeilage, 1970) Hence a person with poor oral stereognosis may be expected to Have poor articulatory control and viceversa.

Various tests have been developed to test stereognostic ability. In a typical oral stereognosis test, the subject is Required to explore the 3-dimensional objects orally and match Them with the respective pictures. They are termed as "Oral Form recognition" test.

Clinical Application of Oral form recognition tests

Oral form recognition tests have been used with normal speakers and various pathological groups such as dyserthria, stuttering, miserticulation, cleft palate (moser et al, 1967; Mason, 1967; McDonald & Aungst, 1967; Hechbergs & Kabeenell, 1967). But due to the differences in test meterals used and the procedures adopted the results from the several studies cannot be compared (Terrans & Beesley, 1975; Lass et al, 1971).

In oral form recognition task, two sensory modalities Are involved – vision and tactile-kinesthetic channel. Hence oral form recognition tests do not measure oral sensory capacity alone but a form of inter-sensory matching capacity (Weinberg, 1968; Ringel et al, 1968).

Oral form discrimination test

In an attempt to eliminate the intersensory nature of the form matching task, Ringel et al (1968) developed a test employing simple discriminatory type of response. The subject was required to say whether the two forms presented orally were same or different. This procedure was found useful in discriminating functional miserticulation cases from normal speakers. Significant difference in performance was found between different degrees of misarticulation (Ringel et al, 1968; Ringel et al, 1970).

Variables in Oral form discrimination

Attempts in standardization of oral form discrimination tests, has resulted in the study of various variables affecting performance.

Stimulus variables: A few of the stimulus variables studied are form retention time, interstimulus interval, shape and size of the forms, site of placing the forms, and whether force had handles or not (Less et al, 1972; Less & Clay, 1973; Torrens & Beasley, 1975).

Subject variables: A few subject variables have been studied such as effects of learning, memory, age, and feedback information regarding correctness of response (Lass et al, 1972; Lass & Clay, 1973). Some of the variables which have not been studied systematically are effects of age, sex, socio-economic status, language and multilingualism.

Need for the study

Age:- Age was found to be an important variable affecting performance on oral form recognition tasks (Arndt et al, 1979; McDonald & Aungst, 1967; William & La Pointe, 1971). This variable was also observed to be significant in oral form discrimination, with children making more errors then normal young adults (Ringel et al, 1979). Hence normal development or oral form discrimination ability may be important in normal speech development.

Speech sounds have been observed to be acquired at different Age levels. The overall accuracy of articulation of speech sounds increases with age and reaches maturity at eight years age level (Wellman et al, 1931; Poole, 1934; Templin, 1957).

Some children have been noted to retain wrong articulatory patterns beyond the articulation acquisition period. Such Children were found to significantly differ from children with normal articulation on tests of gross motor ability (Dickson, 1962). Since oral form discrimination ability is more related to articulation ability than general motor ability, former may be more sensitive in identifying children who are likely to retain their misarticulation. Specifically, children having poor oral form discrimination scores may retain their misarticulation. Thus early remedial steps would prevent functional misarticulation from occurring. Hence information regarding the development of oral form discrimination skills in children is very important.

Oral form discrimination tests were found to have prognostic value. A high correlation was found between tests of stimulability and oral form discrimination scores (Lass & Moreau, 1974). Thus a determination of oral form discrimination scores at different age levels will be useful in oral form discrimination and articulation training.

Sex:- A study of the sex differences in performance on oral form discrimination task is necessary in view of the sex differences found in various other sensory and motor abilities.

In audition, a sex difference was noted in the occurrence of congenital deafness due to unknown causes and congenital haemolytic diseases of the newborn, with more males being affected (Fisch, 1976). The hearing acuity of females, in frequencies above 1000 Hz, is significantly better than that of males (Corso, 1967). A sex difference in the rate of onset of presbycusis has also been reported.

In vision, color vision was found to be more highly developed in girls than in boys (Thompson, 1969). Crudden (1941) showed that primary school girls were superior to boys in abstracting a known figure from a relatively unknown configuration.

A sex difference in favour of females was reported in manual dexterity (Tyler, 1965). However, in performance on Lincoln Oseretaky Motor development test, the boys excelled the girls (Thompson, 1969). In speech sound development, a highly skilled motor action, a sex difference was noted, with girls reaching 95 percent correct articulation about one year earlier them boys (Templin, 1952; Templin, 1957).

Wellman et al, (1931) found girls superior to boys on consonant production, though sex difference on vowel production was inconclusive. It was suggested that vowel production may be mainly dependent upon auditory feedback, while consonant production was dependent mainly on tactile kinesthetic feedback (Ladefoged, 1967). A sex difference in oral form recognition

Ability was not reported (William & La Pointe, 1971). This failure in detecting sex differences may be mainly due to the fact that the study was conducted on adult population and with oral form recognition test material. However, oral form discrimination tasks have been found to be more related to speech proficiency than oral form recognition tasks. Thus, the sex difference in consonant development may be revealed in oral form discrimination ability.

Language:- So far studies in oral form discrimination ability have been mainly conducted with monolingual English speakers. Linguistic experience does influence various aspects of human behaviour (Whorf, 1956). Speech perception and production were found to be influenced by the language of the individual (Ledefoged, 1967). In visual perception, language had effect on the reproduction of visually perceived forms (Herman, Lawless & Marshall, 1957). Effect of mother tongue and multilingualism has not been ruled out as a significant variable in oral form discrimination tasks. Hence, oral form discrimination development has to be established in different language and in multilingual environment.

Specifically, the present study was designed to answer the following questions:

1. Is there a significant increase in oral form discrimination ability with an increase in age?
2. Will the performance of boys and girls differ significantly in a oral form discrimination task?
3. Is there an interaction effect between age and sex in a oral form discrimination task?

CHAPTER II

RIVEW OF LITERATURE

Information on the relation between oral sensation and speech production has been obtained from various studies employing different methodologies. They will be reviewed under the following four headings.

I. Effect of sensory pathology on speech production.
II. Effect or oral anesthesia on speech production.
III. Oral Sensitivity measures and speech production.
IV. Oral stereognosis measures and speech production.

I. Effect of Sensory Pathology on Speech Production.

A few cases of sensory pathologies have been studied (Bloomer, 1967; Chase, 1967; McNeilage & Roots, 1967). It may be noted that when sensory pathology is congenital speech production is more disturbed than when it occurs in adulthood.

(a). Congenital Sensory Pathology:- Two girls with congenital sensory pathology and similar natal and post-natal history were observed independently (Bloomer, 1967; Chase, 1967). During infancy difficulty in sucking and swallowing was noted along with drooling. Their developmental milestones were normal, but clumsiness in fine movements and problems in coordination was noted.

Neurological evaluation of the subject reported by Bloomer

(1967) suggested that the speech problem could be due to muscular in-coordination of the oral structure, especially the tongue. No either neurological disturbance was noticed. At eight years of age she was diagnosed as having cranial nerve palsy, with weakness of the muscles of the tongue, jaw and pharynx. Her speech remained almost completely unintelligible in both single word and spontaneous speech even after two years of intensive speech therapy. Frequent substitutions and omissions of sounds were observed. She had difficulty in coordinating phonatory and articulatory movements.

At ten years of age, on a test of oral stereognosis the subject was not able to distinguish even the most dissimilar plastic forms. Oral diadokokinetic rate such as repletion of /p/,/t/,/k/ and /p-t-k/ was found to be abnormal. The case was diagnosed as having dyadiadokokonesis and oral astereognosis.

The subject reported by Chase, (1967) was neurologically examined at seventeen years of age. The examination revealed absence of corneal reflex and absence of pain in the oral cavity either on probing with a sharp instrument or on deep pressure with a blunt instrument. Coordinated movement of the oral structure was impaired. Protrusion and lateral tongue movement was impaired. Gay reflex was absent, but smell and taste sensation was normal. Sensory examination revealed market impairment in localization of point stimulation and two-point discrimination on the face and lips, though normal on the extremeties. Marked impairment of stereognosis was noted. General motor ability was within normal limits but marked disorder was present when visual feedback was eliminated.

The subject’s speech was limited to the production of vowels and even after speech therapy, remained minimally intelligible.

Rootes and MacNeilage (1967) administered a series of tests of speech perception and production. to a sixteen year old girl with impairment in somesthetic perception and motor function. The levels of performance on speech perception tasks revealed that the subject had no overal dificit. In speech production tasks, the overal amounts of muscle activity produced was comparable to the normal subject. Speech was of limited intelligibility. The subject appeared to have problems especially in coordinating voicing and upper articulatory actions.

Several studies on the phonetic characteristics of the subject’s speech was carried out. The voiceless stops were Within requirements for correct phonetic identification. Variation in voicing, place and manner of articulation resulted in misarticulation of voiced stops. A trend from voiceless to voiced fricatives was noticed. Abnormally long separation between syllables was present. Vowels however, were acceptably produced.

From these few reported cases, it appears that severe congenital oral sensory pathology can result in severe speech retardation as observed in cases of congenital sensory neural deafness. Thus a need to study oral sensitivity in different degrees of oral sensory pathology and their speech is felt.

(b). Sensory Pathology in Cases with Motor Dysfunction:- Oral sensation and perception has also been studied in cases of dysarthria, apraxia and aphasia.

Five tests of oro-facial sensation and perception were designed by Rutherford and McCall (1967) based on the supposition that sensory discriminations important for speech sound learning are, location of tactile contact, size or configuration of area having tactile contact, direction and rate of movement of articulators. The tests employed were:

1. Tactile acuity was tested through the ability to detect a groove engraved on the smooth surface of a plastic piece. The depth of the groove ranged from 0.5 mil. To 5 mil.
2. To measure tactile localization, the subject was touched twice in rapid succession. Them he was asked whether he was touched at the same or different points.
3. Tactile pattern recognition was assessed by tracing a series of geometric designs on the dorsum of the tongue with a blunt

plastic stylus. Then the subject was shown a series of similar designs, out of which he had to pick out the one made on his tongue.

4. For kinesthetic pattern recognition task, a pattern was cut out of a plastic piece. The subject was asked to trace the pattern with his tongue. Then the subject was shown a series of pictures out of which he had to pick out the pattern he had traced.

5. Two-point discrimination was measured by a modified caliper. Employing the method of minimal change, threshold was determined by averaging scores on three ascending and three descending trails with increments of 0.025 inches.

These tests were administered to 17 cerebral palsied subjects consisting of spastic and athetoid quadriplegics. Their age ranged from 12 to 20 years. A group of 11 normal children of 12 to 13 years matched in mental age served as the control group.

The results revealed that the cerebral palsied group performed significantly poorer than normal group on only three tasks – tactile acuity, kinesthetic pattern recognition and two-point discrimination. The spastics were significantly poorer than the athetoids and the controls on kinesthetic pattern recognition test. But no differences were found between the athetoid and normals (Rutherford & McCall, 1967).

Twenty dysarthric patients were matched for age and sex with 20 control subjects. Both groups were administered tests of oral sensation and perception. A ten minute sample of imitative and spontaneous speech were recorded and rated for intelligibility on a 7 point rating scale by experience speech pathologists. The tests for assessing oral sensitivity consisted of oral form discrimination test, two-point discrimination test, and mandibular kinesthetic test.

1. Oral form discrimination test (Ringel et al, 1968) – The patient was blindfolded and two plastic geometric forms differing either in shape or in size, were placed in his mouth successively. The subject had to judge whether the two forms were same or different.

2. Two-point discrimination threshold was measured useing an esthesiometer on tongue tip and blade.

3. Mandibular kinesthesia test (Ringel et al, 1967) - The subject had to judge whether a series of seven mouth openings were equal to, greater than or less than a standard mouth opening.

The results indicated that the dysarthric group scored significantly lower than theecontrol group on all three tests. However, no relationship between oral sensitivity and speech intelligibility was found (Crech & Wertz, 1973).

The above three tests were administered in a random order to three groups of subjects: (i) thirty adults with cortical lesions (ii) ten aphasics adults without apraxia (iii) thirty normal adults serving as control. The Results revealed that the first group had significantly greater difficulty on all three tests. Severity of apraxia was found to be significantly related to performance on all three tasks (Rosenbeck et al, 1973)

The results of the above studies reveal that patients with neurological disorders which affect motor control of the articulators may also be having deficits in oral sensation and perception. This deficit may be adding to their speech problem. Hence accurate standardized clinical tools are necessary in assessing oral sensory pathology.

(c). Structural Chages and Oral Perception:- Children with cleft lip and pelate present asymmetries in maxillary arch form, abnormal communication between oral and nasal cavity. These anatomical changes may be accompanied by changes in oral sensation and perception. Surgical repositioning of tissue may also have deteriorating effect on oral sensitivity. A majority of the subjects need intensive speech therapy even after successful surgery. This may be due to deficiency in oral sensory perception.

Forty-two subjects with cleft palate in isolation or in combination with cleft lip were administered a test of oral stereognosis. The subjects ranged in age from 6 to 45 years. Some were post-surgical and some used prosthetic aids. Patients were tested with and without the prosthetic aid.

The test stimuli were 20 geometric shaped plastic pieces mounted on a handle. These were placed in the oral cavity for the subject to explore with the tongue. The subject than had to identify the form placed in the mouth by pointing to the correct form placed in front of him. No time limit was placed on oral exploration of the form.

The results revealed no perceptual deficit with in the cleft lip and palate population. Prosthesis does not appear to effect performance on this task. Tissue manipulation during surgery also did not appear to affect oral stereognostic scores (Mason, 1967). However, controversial results have been reported.

Oral stereognosis test was administered to 12 cleft palate adults and 30 normals. The sample was heterogeneous with respect to age, type and extent of cleft, type of management, speech proficiency and other associated disabilities. The cleft palate subjects were tested with and with-out the prosthetic aids. The results revealed a significantly poorer performance by the cleft palate subjects. They performed significantly better with the prosthesis than without it. The older cleft palate subjects performed significantly better than the younger cleft palate subjects (Hochbergs & Kabcenell, 1967).

The above studies fail to give details regarding the speech of the subjects and its relation to oral sensation and perception.

more detailed analysis and homogeneity of grouping is needed in-terms of (i) number of years after surgery (ii) number of years of use of prosthesis (iii) age (iv) number of years of speech therapy (v) speech intelligibility and effect on oral sensory perception. A more sensitive test of oral form discrimination (Ringel et al, 1968)may be used to test oral stereognosis before conclusive statements can be made.

II. Effect of oral Anesthesia on Speech Production:

A series of investigators have attempted to determine the role of tactile-proprioceptive feedback in speech by eliminating this channel with anesthesia. The two techniques of Anesthetization used were:

(a). Topical anesthesia – the oral region is applied with xylocaine Hol 4%. This appears to remove tactile feedback alone.

(b). Nerve-block anesthesia – achieved by bilateral injection of xylocain e 2% with epinepherine to infra-orbital, posterior palatine and medical naso-palatine nerve.

Effect of the combination of anesthesia and masking noise on speech production has also been studied.

(a). Topical anesthesia:- This technique appears to have minimal disruptive effect on speech. Ringel and Steer, (1963) administered topical anesthesia to 13 females with normal speech and hearing. Analysis of speech after anesthesia revealed a significant increase in average peak level of speech. No significant change in fundamental frequency, speech duration and articulation was noted. But when a combination of topical anesthesia and binaural masking noise was used, significant articulation impairment was noted as compared to conditions when either only topical anesthesia or masking noise was used.

Five subjects read a test passage and made spontaneous remarks under a control and three experimental conditions: (i) binaural masking noise, (ii) topical anesthesia of the surface of the lips, tongue and roof of the mouth, (iii) combination of (i) and (ii).

The speech of most subjects was very disorganized in condition (iii) although still intelligible. In condition (ii) the subjects had difficulty in controlling their lip movements resulting in misarticulation of /p/,/b/,/m/,/f/&/v/. Difficulty in producing satisfactory /s.z/,/t,d/ and striking variations in articulation of /1/ was noted. In condition (1) vowels were considerably affected along with nasality and pitch. Thus it appears for vowel production auditory feedback is important, while most consonant production depend on tactile feedback (Ladefoged, 1967).

The results of the above two studies do not agree regarding the effect of topical anesthesia alone. It has been observed that topical anesthesia disrupts tactile feedback which is important in fine articulatory movements. Hence the loss in tactile feedback does not effect speech production, as a slight shift in place of articulation may still result in correct acoustic results (Sussman, 1970). Studies with spectrographic analysis of speech after topical anesthesia may reveal the role of tactile feedback in speech production.

(b). Nerve-block anesthesia:- Among the first to use this technique was McCrosky (1959, 1958). He reported that most articulatory changes were of the substitution type.

Effect of nerve-block anesthesia alone and in combination With wideband noise has been studied (Ringel & Steer, 1963). A significant increase in average peak level of speech was noticed in both conditions in all the 13 normal subjects. A significant increase in phonation/time ratio at 0.05 level was noted. The difference in mean syllable duration between nerve-block condition and control and topical anesthesia condition was found to be very large. But the difference was not found to be statistically significant. Articulation was most severaly affected by nerve-block anesthesia or in combination with masking noise. Distortion was the major type of misarticulation.

Two normal adult males were required to produce 2 bisyllable words from OID auditory test w-1 with and without nerve-block injection. Phonetic transcription of the words were done along with wideband spectrogram analysis. The results revealed that articulation of stop consonants during experimental condition was characterized by (1) retracted place of closere for /t,d,k,g/, (ii) upper lip inactivity for /p,b/, (iii) the affricated release of voiceless syllable-initial stops.

The fricatives were noticed to retain their manner of production. They were produced with less close constriction an-d a retracted place of construction. The spectrogram revealed that the high frequency energy segment of /s/ was considerably diminished in experimental condition.

In sonorant production almost total loss of retroflexion was noticed in /x/i/w/ was characterized by delabialization, Nasality was found to be unaltered.

As in consonants, vowels needing labial movements were altered during experimental condition. A slight tendency toward a more neutral vocal tract configuration during vowel production was noticed (Scott & Ringel, 1971s).

The effect of labial sensory deprivation on articulation of /p/,/b/&/m/ in the initial position of monosyllable words were studied (Putnam & Ringel, 1972). One adult female with normal speech and oral structures was the subject. Anesthetization was by bilateral infra-orbital and mandibular injection to the trigeminal nerve branches.

The results revealed that during experimental condition, Lip movement was less accurate and less extensive. Bilabial consonants appeared unilabial and incomplete closure for /p/ was seen in /Sp/ clusters. A qualitative analysis revealed that during anesthesia lack of accurate monitoring of the intrabuccal air pressure in /p/ resulted in fricative sound. But this change was not seen in /b/ or/m/ with /m/ being least effected. Anticipatory lip rounding was noted in clusters like /pr/&/Br/. An interesting point noted was that no major changes occurred in the manner of production of a single initial /p/,/b/or/m/ under anesthesia. This may be due to the passive motor system, in which the lower lip in moved up and down from the upper lip by movement of the mandible. The movement of the mandible are believed to be monitored by the tempere-mandibular joints, the sensory feedback of which would remain unaffected by anesthesia.

Articulation and stress/juncture production has been studied under oral anesthesia and masking noise (Gemmon et al, 1971). Eight college students of whom four were aware of the experimental design and purpose, and four who were naïve served subjects. Besides one control condition, the three experimental conditions consisted of (i) auditory masking binaurally with wideband noise at 110 dB S.P.L>, (ii) tactile nerve-block anesthesia and (iii) combination of (i) & (ii).

The subjects were required to read 30 paired sentences and a prose paragraph. The results revealed that stress and juncture were not disrupted in all three conditions. And similar to earlier studies consonants suffered more in condition (ii) and (iii) than in (i). Feedback regarding articulatory shape, area of contact and pressure of contact appeared to be important in consonant production. Fricatives requiring precisic of opening for turbulence, were more often misarticulated than plosives.

Changes in intraoral air pressure and consonant duration in subjects with sensory deprivation due to anesthesia was studied by Prosek and House (1975). Four young adults with normal speech and intact oral structures were asked to read 20 bisyllabic words, first in isolation and than in sentences. A list of 13 sentences were also read which provided a wide variety of allophonic variants of the stop consonants under study. The results revealed that the characteristic carriage of the tongue shifted posteriorly, the rate of speech was slower and misarticulation of consonants were present in anesthesia condition. In addition the consonants were produced with slightly greater intraoral air pressure.

A review of literature on oral sensory deprivation reveals the importance of oral sensation in speech production. All the studies reveal that anesthetization has maximum disruptive influence on consonant production. Stops and fricative production were most effected. Loss of retroflexion in /r/production was noticed with complete omission sometimes. Most of the studies used very small number of subjects. One of the major criticism has been that anesthelization may also have impaired motor nerves due to their proximity to the sensory nerve. In none of the studies motor disturbances were tested. (Locke, 1968). However, Scott and Ringel, (1971b) compared the speech samples obtained from individuals with motor disability and individuals with sensory disruption due to anesthesia. The subjects consisting of 6 dysarthric adults and two normal adults with nerve-block anesthesia read 11 spondee words.

Phonetic transcription and wideband spectrogram analysis revealed several differences between the two groups. The authors concluded that motor and sensory dysfunctions result in a variety of defective articulatory patterns. However, better conclusions could be reached if the investigators had tested the oral sensory perception of the dysarthric group.

The very important question of the relative significance of tactile-kinesthetic feedback in children who are developing speech remains to be answered. A procedure to alter or remove tactile-proprioceptive feedback in children without the use of painful injection is yet to be developed (Frick, 1964).

The effect of sensory deprivation on oral stereognostic ability has also been studied in 30 normal subjects. Right unilateral mandibular block anesthesia does not appear to effect scores on oral stereognostic tasks. While bilateral mandibular block anesthesia appeared to be a critical factor in breakdown or oral perception (Mason, 1967). The effects of anesthetization on gross oral functioning were estimated using a test of oral stereognosis on 10 normal speakers. Results revealed a significant increase in number of errors after anesthetization (Burke, 1975).

More systematic study of effect of topical and nerve-block anesthesia of different artuculators on speech production and oral sensitivity test scores are needed before conclusive statements can be made.

III. <u>Oral Sensitivity Measures and Speech Production.</u>

A number of tests constructed have attempted to accurately evaluate sensory function other than those pertaining to modalities of chemical, thermal and pain sensation. Attempts to relate these measures with speech proficiency have been made.

Nylon filaments of varying diameters were used in tests of oral tactile stimulation. Tactile stimulation of various oral and nonoral sites were accomplished with six filaments ranging from 0.071 to 0.142 m.m. diameter. Two men and four women between the ages 35 and 40 years participated in the study. All oral sites of tactile stimulation were in the midline. They were the incisive papilla, the dorsal surface of the tongue tip, and upper and lower lips. And two extra oral sites were also choosen. The filament was placed on the test site and a “Just noticeable bend” of filament was achieved by contact with the test surface. Immediately the question was asked “Do you feel it now?” The question was also asked without touching the site. The results demonstrated that the upper lip was significantly more sensitive than any of the other sites. The tongue and lower lip did not differ however they were significantly more sensitive than the other oral and extra-oral sites (Grossman, 1967).

Tactile acuity has also been operationally defined as the ability to detect a groove engraved on a smooth plastic piece. Normal acuity was found to be 1.5 mi. Another test kinesthetic pattern recognition test where the subject has to first trace a pattern cut into a plastic piece with the tongue. After that he is asked to point to the picture of the pattern he traced. These two tests were found to successfully differentiate normal and dysarthric children (Rutherford & McCall, 1967; McCall, 1969)

Texture discrimination was tested in 24 normals adults. The oral spatic-temporal discrimination ability is hypothesized to be related to textural discrimination. The stimulus material consisted of six pieces of emery cloth varying in coarseness. The paycho-physicial method of magnitude estimation was used. The subject is presented with a standard stimulus and its number is informed. Then he is presented in random order a series of ‘variable’ stimulus, above and below the value of the standard. The subject is instructed to assign a numerical value which expresses its proportional relationship to the ’standard’. The subject was blindfolded throughout the procedure The stimuli were presented to selected oral and extra-oral structures. The results suggest characteristic patterns of response for the structures evaluated in relation to the texture of the stimuli (Ringel & Fletcher, 1967).

The change in mandibular positioning which is necessary for the perception of such change is termed mandibular kinesthesia difference limen. Thirty normal adults were tested to determine normal mandibular kinesthesia DL. The results revealed that as the size of the oral aperture increase, proportionately smaller difference limens (DL) were noticed (Ringel et al, 1967).

The above tests of oral sensitivity are not very objective. Tests of tactile acuity, kinesthetic pattern recognition and mandibular kinesthesia have been found to differentiate normals and dysarthric groups (Rutherford & McCall, 1967; Crech & Wertz, 1973). However, further research regarding their relation to speech production has to be studied in detail before they are useful as clinical tools.

A much more successful method of oral sensation measures in differentiating normal and abnormal speakers is the Vibrotactile threshold. Vibratory stimuli were found to share the same central nerveas system pathway as touch and involve high level perceptual judgements skin to speech (Grossman, 1967). Oral vibrotactile sensitivity of functional misarticulation subjects was found significantly less than normals. The subjects threshold for vibrotactile stimuli was determined at 60, 100, 200, 400, 600 & 800 Hz. Similar results have also been found for children with speech defect (Fucci, 1972; Longen, 1974; Telague, 1973).

Oral two-point discrimation has been used to differentiate normal and abnormal speakers (Rutherford & McCall, 1967). Studies in two-point discrimation has revealed that in normals it varies from one oral site two another. Asymmetry on right and left sides of selected oral structures have been demonstrated (Lass & Park, 1973; Lass et al, 1972; Ringel & Ewanowski, 1965; Henikin & Banks, 1967). These investigators agree that the tip of the tongue is the most sensitive.

More systematic studies are needed with speech defectives before it is use-ful as a clinical tool. The role of two-point discrimation in speech development has yet to be studied.

IV. <u>Oral Stereognosis Measures and Speech Production:</u>

(a). <u>Oral form recognition test:-</u> One of the most common and successful method in testing oral sensory perception has been the test of oral form recognition. The test forms consist of three dimisional geometric plastic forms. In the test procedure, one form at a time is placed in the oral cavity of the subject. Care should be taken in not allowing him to see the form. The subject is then asked to identify the form kept in his mouth from a set of visually presented forms or their pictures.

Different sets of forms have been developed, each set varying in number, shape and size. Some of the more common ones are-

1. Twenty forms developed at National Institute of Dental Research (N I D R). (Shelton et al, 1967).

2. Five, 3-dimensional forms produced by the Speech and Hearing Clinic of the Pennsylvania State University and NIDR (McDonald & Aungst, 1967).

3. Sixteen forms in Nuttall Test of Oral Streognosis (Thompson, 1979.

Shelton et al, (1967) developed a standard oral stereognostic Test. The stimuli were 20 plastic forms fixed on a handles. Some were geometric and others irregular and presented a range of difficulty. The forms are commonly called as NIDR – 20.

A significant difference in performance on a oral form recognition test among misarticulation, stutters, cerebral palsy and normal speakers has been noted. (Moser et al, 1967).

The effect of variation in size of stimuli was studied along with the time required for lingual form perception in different pathologic groups (Class, 1966). Six geometric forms varied in size from 1/8 in to ½ in maximum height and width dimension. The test procedure adopted was a simple oral form recognition task. The results revealed that sizes 1/4 in. 3/16 in. and 1/8 in, were increasingly difficult to identify and needed more time Sizes above 1/4 in. did not have significant effect on performance and the time required did not vary much.

Various variables such as age, sex, education of the subjects, size, thickness of the forms and the time required for identification affecting oral form recognition were studied (William & La Pointe, 1971). Twelve test forms varying in shape and each shape varying in 8 different sizes were obtained. The time taken for identification was noted. This test was administered to 40 normal subjects. They were grouped into different age levels ranging from 20-29 years, 30-39 years, 40-49 years and 50-59 years. The results revealed that a hierarchy of difficulty for shape existed. There was no linear relationship between size of the stimuli and performance. However, the two smallest in size were found to be the most difficult to identify. Age levels were suggested as an important variable in performance on a oral form recognition task. An inverse relationship was found between the time taken for identification and the scores obtained. Sex and education were not found to be significant.(

Comparisons of subject performances on separate tests of oral stereognosis has been attempted. The five forms developed at Pennsylvania State University was the most difficult followed by NIDR – 20 and then Nuttal test (Thompson, 1970; Torrans & Beasley, 1975).

To study the relationship between oral form recognition test and lingual touch sensitivity, twenty-five adults between the age range 21-47 years were administered the following tests-

1. Ten form test of oral stereognosis.
2. Test of light touch.
3. Two-point discrimination test.

The results revealed no significant relationship among the three measures (William & La Pointe, 1971).

A comparison of the performance on the oral stereognostic and articulation tests under conditions of increasing oral sensory deprivation was made. The results revealed a positive relationship between articulation and oral stereognostic skills. The placement of a palatal sheild resulted in less errors on oral stereognostic test but more articulation errors. Thus elimination of palatal taction effects these skills differently if lingual sensory feedback is intact (Thompson, 1970).

Surprisingly, training in oral form recognition leading to better scores did not result in reduction of articulation errors (Shelton et al, 1973 articulation did not result in improvement in oral form recognition scores (Ruscello & Lass, 1977).

(b). <u>Oral form discrimination test:-</u> Ringel et al, (1968) Felt that the reason for the inconsistent support for the positive relationship between articulation and oral sterognosis may be due to the intersensory nature of the oral form recognition task. Hence they eliminated the participation of the visual channel by developing the oral form discrimination test. The ten test stimuli, representing a wide range of item difficult and confusability were selected from the NIDR – 20 forms. The forms could be categorized into four geometric classes – triangular, rectangular, oval and biconcave. The pairing of the forms resulted in "within class" and "between class" stimulus pairs. In all 55 form pairs were used along with ten pairs selected randomly for reliability check. The subject was required to tell if a pair of stimuli was some or different When placed consecutively in the mouth. This test was administered to 20 normal speaking subjects and 27 functional miserticulation cases. The latter group was further divided into mild and moderate misarticulation. The results revealed that the misarticulation group as a whole made more errors to a significant degree than normals. Significant differences in performance between mild and moderate misarticulation group was noted with latter group faring poorer.

The relationship between stimulability and oral form discrimination skills has been studied in children. The Carter-Buck prognostic speech test and Ringel et al, (1968) Oral form discrimination test was administered to 49 children with misarticulation with mean age of 7.2 years. A positive correlation was found between the two tests. Thus the oral form discrimination test was capable of distinguishing between children who will improve their articulation through maturation and those who will not (Moreau & Lass, 1974). However, evidence of positive relationship between stimulability and oral form discrimination was not found in the study by Someers et al (1972). The investigators suggested that the results may be due to selection of children with mild misarticulation.

The oral form discrimination abilities of manually trained deaf subjects was compared with normals and orally trained subjects. In general significant difference in performance was found when there were differences in shapes. However when the forms were presented in the hand no such difference was found between the two groups. Thus suggesting that the poorer performance on oral form discrimination test by the manual deaf was not due to general cognitive deficit (Bishop et al, 1972, 1973).

Improvement in articulation ability has been found to be accompanied by improvement in oral form discrimination skills (Ruscello & Lass, 1977). However studies have not been conducted to see if the converse is true.

Various variables effecting oral form discrimination scores have been studied. Lass et al (1972) conducted four separate experiments with normal adults subjects to determine variables affecting scores on oral form discrimination in test. They concluded that –

1. Feedback information concerning the correctness of subjects responses had no significant affect on performance.

2. Subject’s oral form discrimination skills did not improve with simple repetition of the test. However they suggested that the role of learning in oral form discrimination should be further explored.

3. The fact that the forms had handles or not, did not affect the scores.

4. The location of the forms in the oral cavity i.e, in front or back of the mouth, affected the scores, fewer errors being committed when placed on the tongue tip.

To study the effect of memory on performance on a oral form discrimination task 30 normal adults were administered oral form discrimination test under two conditions – No-delay condition where the pair to be discriminated was placed simultaneously in the oral cavity and delay condition where an interval of 5 seconds was allowed between successive presentation of the two forms. However, no time limit was placed on the exploration of each form. The results revealed that subjects performed better in the delay condition. It seems that when two forms are placed in the mouth simultaneously, exploration of the form in the midline is not possible. This may result in poorer performance (Lass & Clay, 1971).

Age appears to be an important variable in both oral form recognition and oral form discrimination tasks. McDonald & Aungst, (1967) administered a 25-item test of oral form recognition to 367 subject varying in age from 6 to 89 years. The results revealed that scores improved as a function of age up to midteens and decreased markedly in the geriatric group. They noted that the leveling of the growth curve in the midteens seemed to parallel the complition of the growth of oral and facial structures.

Children were found to have more difficulty than adults with oral form discrimination task (Ringel et al, 1970). It was noted that the proportion of between class errors for children and adults increased monotonically as a function of severity of articulation defects.

Most of the studies with oral form discrimination test have revealed that a more positive relationship exists between ”between class” discrimination skills and articulation proficiency. Thus “within class” and “between class” comparison tasks appear to be evaluating performance at different levels of discrimination. Performance on “within class” discrimination appears to be independent of speech function. Ringel et al (1970) have suggested further research using the test stimuli classified as “between class” pairs.

Thus the review of literature on oral sensation and perception reveals that growth of oral form discrimination in children has not been studied. Since a sex difference in the development of articulation skills is observed it would be interesting to note if this difference is present in development of oral form discrimination skill.

CHAPTER III

EXPERIMENTAL PROCEDURE

A Test of oral form discrimination was administered to 60 school going children. All of them attended Kannada medium schools. The total errors made on the test was tabulated and analysed to study the effect of age, sex and their interaction effect.

Subjects:

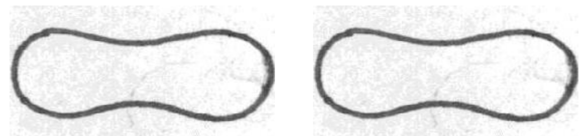
The age range of the subjects was from 5 years to 13 years. Based on age five groups were formed with every alternate year being skipped. At each age level within – 6 months difference was allowed. Six boys and six girls were selected for each group.

All the subjects were required to have speech, hearing and intelligence within normal limits. They were examined for gross defects in superficial tactile sensation and motor coordination. The subjects were required to have normal oral structures without any congenital abnormalities. Any subject not meeting the above critera was rejected.

Test stimuli:

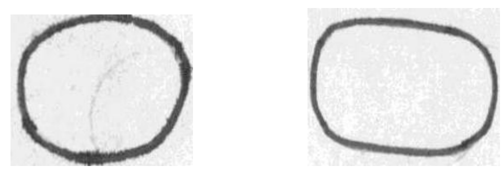
The test stimuli were eight geometric forms made out of white plastic material. The forms could be manipulated in the mouth by means of a handle. They were drawn from a standard twenty item set developed at the National Institute of Dental Research. (McDonald & Aungst, 1967). They were selected to

Biconcave



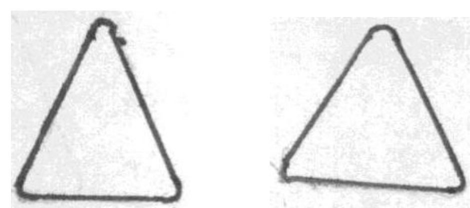
(1) (2)

Oval



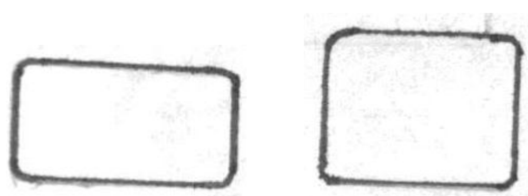
(3) (4)

Triangle



(5) (6)

Rectangle



(7) (8)

Figure:- A. The 8 geometric forms drawn from the pool of 20 plastic NIDR – 20 forms.

ensure the multiple occurrence of the same geometric forms and size. The different geometric categories were : biconcave, oval, triangle, and rectangle (Figure. A)

Test environment:

The noise and distractions in the test room was kept at a minimum. The subject was seated comfortably at a table.

Procedure:

At least two sessions, screening and experimental sessions were required for each subject. There was a minimum of 24hours gap between the two sessions.

Screening test:

The screening test consisted of the following items:-

1. Speech proficiency: The subjects were asked to read a passage in Kannada to detect any deviation in their speech. The passage was taken from the screening part of the Kannada Articulation Test (Babu et al, 1972). The passage had been so constructed so as to contain all the segments in kannada language except for the aspirated ones. The aspirated phoemes were not tested as they are relatively less used by children. The passage was also readable by elementary school children (Appendix).

While the subjected was reading the passage, the child’s speech in terms of articulation and voice was assessed. Any child judged as having misarticulation or voice disorder was excluded from the study.

2. Hearing acuity:- The subject’s hearing was considered normal if his hearing thresholds for puretones for both ears were within 20 dB (I.S.O.) for the frequencies 250 Hz-8000 Hz. The subjects were tested in a reasonably quiet room. The instructions were as follows: “You will hear a tone in one of your ears. Everytime you hear the tone raise your finger. As soon as the tone stops, drop your finger. If you hear the tone in the left ear raise your left finger, if in the right ear then raise your right finger. Raise your finger even when you hear a very faint tone. Any questions?”

A Madson portable audiometer was used for screening purposes. Biological caliberation was done prior to testing.

3. Oral cavity structure:- The subjects were asked to open their mouth and say ‘ah’. They were then asked to move their tongue up and down, side to side and protrude. If any deviation was noticed them that subject was eliminated from the study.

4. Test of superficial tactile sensation:-

a) Localization of tactile sensation- The subject was asked to tell on which part of his body he could feel a cotton-ball being pulled a short distance over the skin. The skin areas which were likely to be touched were shown. Then the cottonball was presented randomly to the right and left forearms, hands, cheeks and the forehead. If the subject failed to localize the tactual sensation even once, that subject was eliminated from the study.

b) Manual stereognosis – Objects like spoon, pencil, watch, coin and key was used to test the subject’s manual stereognostic ability. The subject was blindfolded and one of the objects placed in his preferred hand. He was asked to feel the object and name it. If any one of the objects was incorrectly identified, then that subject was not included in the study.

c) Postural sensibility – The subject was asked to stand with his hands out stretched horizontally. Then the subject head was moved up or down. The subject was required to tell whether he felt his hand moving up or down. If the subject failed to respond correctly even once, then he was eliminated from the study.

5. Test of coordination:- The subject was asked to touch the tip of his nose with the tip of his index finger with eyes open and closed. He was asked to do this task as rapidly as possible, first with right hand and then with left. Gross deviations in performing this task disqualified the subject from participating in the study.

6. Intelligence:- The Raven’s colored progressive matrix was administered to all thee subjects. The three sets (A,A_B,B) of twelve problems have been arranged to assess the chief cognitive processes of which children under 11 years of age are usually capable. Instructions were as follower: “Look at this (point to the main figure). You see, it is a pattern with a piece cutout of it. Each of these pieces (point to the six alternatives) is the right shape to fit the space, but only one of them is the right pattern. Write the number of that pattern in your answer book, a Any questions?”

The first problem was solved by the investigator. Extra instructions and help was given to the child when the child failed to understand the task. No time limit was set for complition of the task. The subject with very poor performance on this test was eliminated from the study.

Experimental session:

The subject’s task was to compare two forms presented successively in the mouth and judge whether they were ‘same’ or ‘different’

The pairs of stimulus was formed first by grouping the various forms into four geometric categories: biconcave oral, triangle and rectangle. Then the forms in each geometric category was paired with each form in the other geometric category. Thus 24 pairs were obtained as the order of pairing was ignored (e.g. either one of the pairs (5-1) or (1-5) was selected). To this, eight more pairs were added by pairing each form with itself, forming a total of 32 pairs. The order or presentation of stimulus pairs was randomized and six lists were formed. The lists were so formed that half the subject would get a particular form of a pair first and the other half would get the other form of the pair first.

Out of the 32 pairs, five were randomly selected and presented again for checking reliability. A fifty percent test retest reliability was required for the subjects to be included in the study.

The task was explained to the subject. He was then blindfolded. One of the pair of forms was placed in his mouth for 5 seconds. The subject was encouraged to move the form around with the handle and explore it orally. Then the form was removed and within 5 seconds the next form was placed in the mouth. Again the subject was allowed a duration of 5 seconds to explore the form. Then the form was removed and the subject was required to any whether the two forms were ‘same’ or ’different’. The subject’s response was noted down in the data sheet by the investigator. The forms were sterilized after use with each case with an antiseptic solution (Savalon).

The 5 seconds intervals were strictly maintained with the help of a stop watch. After 16 pairs had been completed a rest period of 10 minutes was provided to rule-out fatigue effects. The instructions were as follows: “I have forms like these (show forms). I will place one of these forms in your mouth for 5 seconds. Then I will take it out and put another form in your mouth and allow you to feel it again for 5 seconds. You may move the forms around in your mouth with the handle. After feeling it with your tongue and mouth, I want you to tell me if the two forms were ‘same’ or ‘different’. Guess if you are not sure. Are there any questions?”

For the younger age group these instructions had to be supplemented by demonstration. The subjects were not given any information regarding the corrections of their response during the experimental sessions. But at the end they were given the scores.

Scoring:

The total number of errors were calculated for each subject. However, this did not include the 5 pairs of stimuli included as reliability check.

Analysis:

The scores were descriptively analyzed interms of mean, median, range, and standard deviation. The two way ANOVA for unrelated sample was applied to test the hypothesis. (Garrett & Woodsworth, 1973). The Fischer exact probability test (Siegel, 1956) was applied to determine if the medians of the boys and girls at various age levels differed significantly.

CHAPTER IV

RESULTS

The total errors committed on a test of oral form discrimination formed the raw data. The mean error scores for boys and girls at different age levels were arranged in a two dimensional table. The two way ANOVA for unrelated sample (Gappett & Woodsworth, 1973) was applied to determine the effects of age and sex on error scores. The F-statistics was used in testing the statistical significance of the variance that could be attributed to the two main effects and the two-way interaction effect. The data was descriptively analyzed in terms of mean, median, range and standard deviation and was presented both in tabular form and through graphic representation. The data is presented inferentially by means of ANOVA (Table.4)

Effect of age on Oral form discrimination scores:

The mean error score, range and standard deviation at different age levels is presented in a tabular form (Table.1). An increase in mean error score is noted at 9 years age level. Application of the t-test for independent sample (Garrett & Woodsworth, 1973) revealed that there was no significant increase in mean error score from 7 years to 9 years age level. Compared to the other age groups, the standard deviation at 7 years and 9 years age level is very large, 3.33 and 3.03 respectively.

The total error scores for boys and girls is presented graphically (Figure.1). The histogram reveals that the mean

TABLE – I

Group	Mean age (years)	Oral form disc. Error score			
		Mean	Range	Standard	Deviation
I	5	9.00	7	2.48	
II	7	5.00	13	3.33	
III	9	6.58	12	3.03	
IV	11	3.42	9	2.34	
V	13	3.56	12	2.86	

Table I – Mean error, Range, and Standard deviation on a Oral form discrimination test at different age levels.

Figure:- Mean error scores on Oral form discrim. test for both boys and girls in the five age groups.

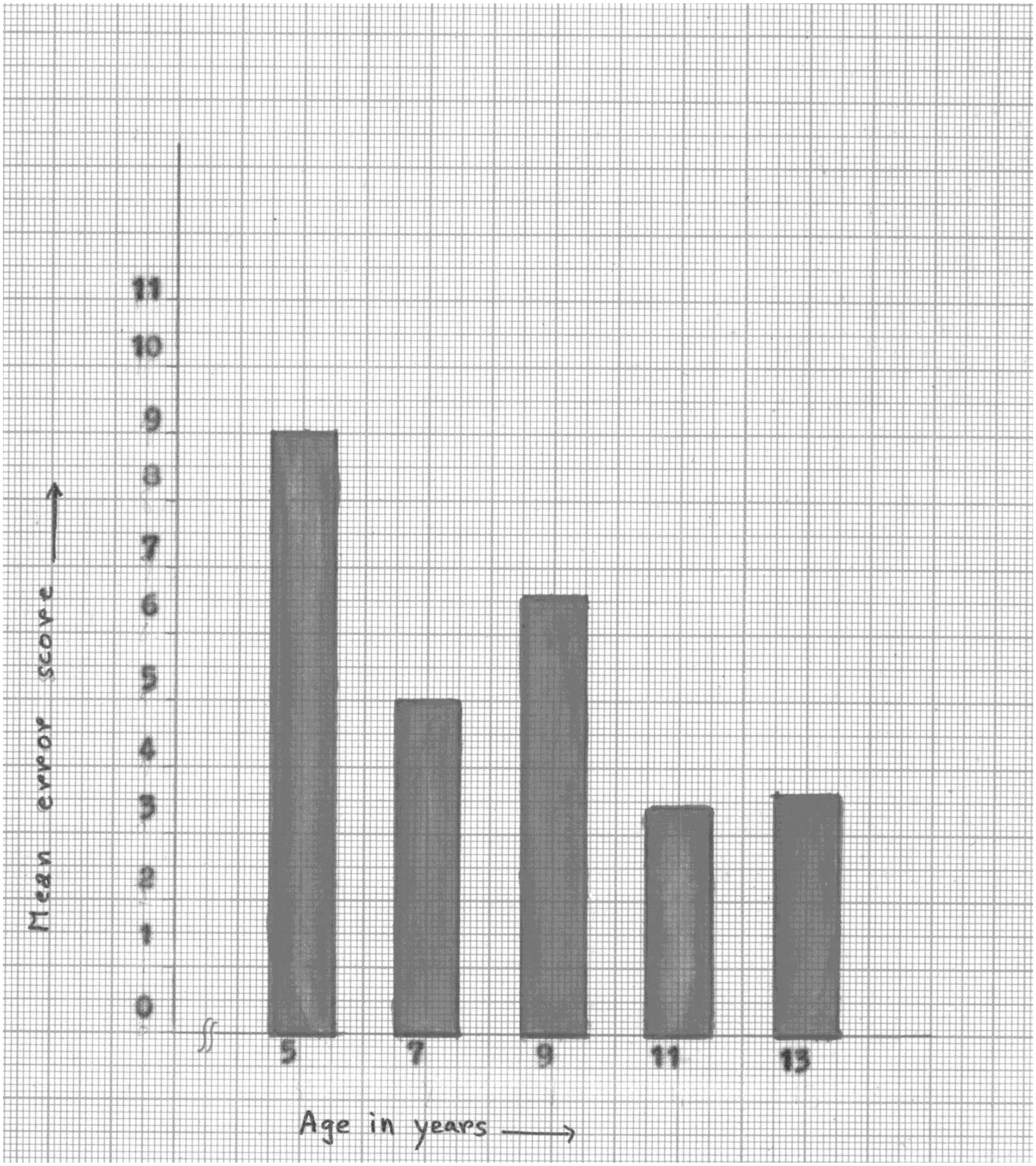
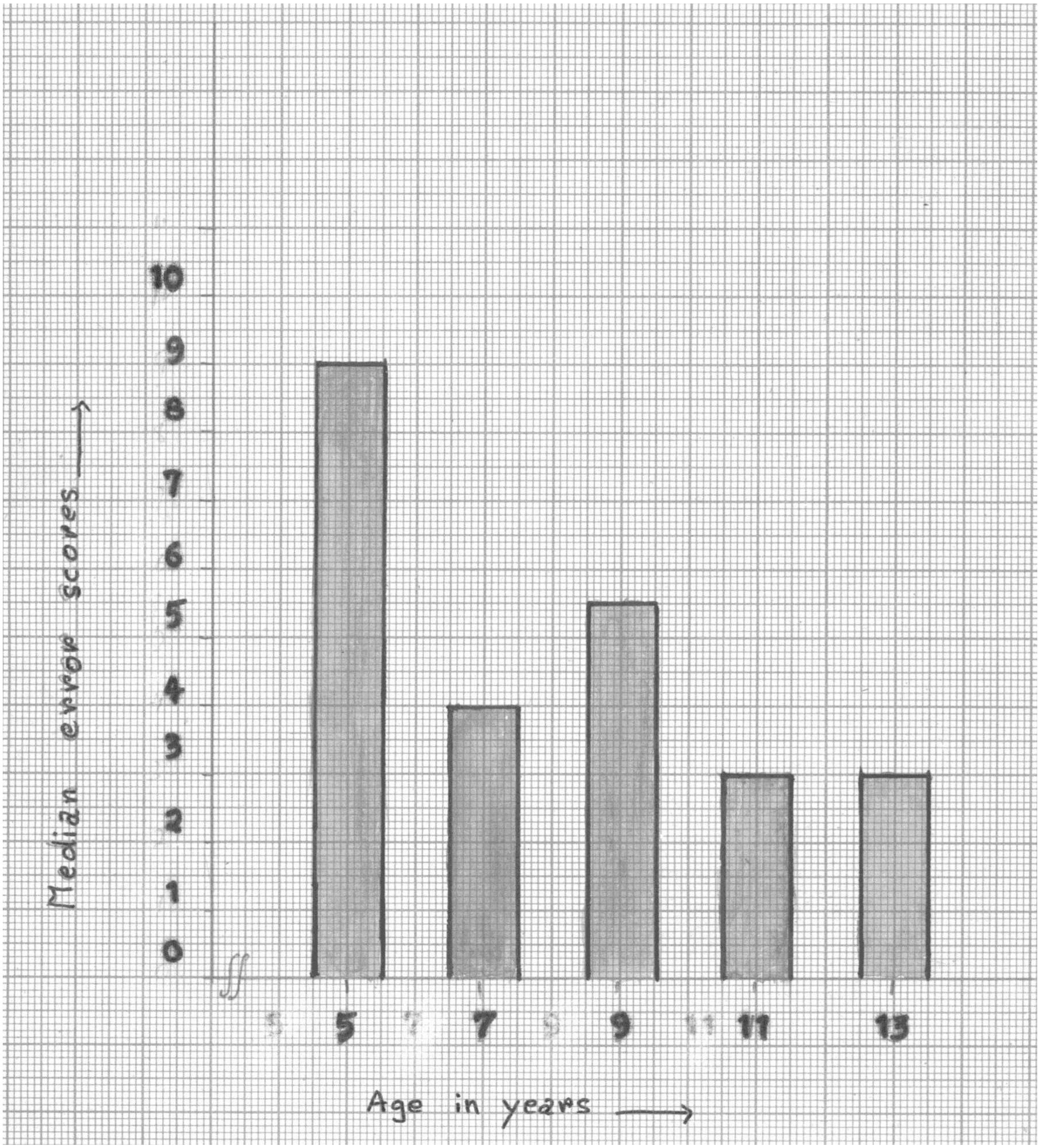


Figure :- 2. Median error scores on Oral form discriz test for both boys and girls in the five age groups.



error scores decrease from age 5 to 11 years. After that the performance appears to reach a plateau. The F-ratio for age is found to be significant beyond 0.01 level (Table.4). Due to the increase in error scores at 9 years age level and the large standard deviation, the median error scores were presented graphically (figure.2), However not much difference between figure (1) and figure (2) is noted.

Effect of sex on oral form discrimination scores:

The mean error scores, range and standard deviation for Girls and boys is presented separately in Table (2) and (3).

It can be noted from Table (2) that girls of 13 years age commit the least errors. But this level of performance appears to have also been reached at 7 years age level. But in the next age group (9 years) an increase in error score is noted. However, the maximum variability is seen at 9 years age level.

The boys of 11 years age, made the least number of errors on oral form discrimination test. This group also had the lowest standard deviation (Table.3). The mean error scores for boys and girls at different age levels is shown graphically (Figure.3).

The curves for boys and girls are seen to almost coincide for the 9 and 13 year old groups. At five years age, the girls

TABLE – 2

Group	Mean age (years)	Oral form disc. Error score		
		Mean	Range	Standard Deviation
I	5	10.00	7	1.90
II	7	3.17	13	1.67
III	9	6.33	12	3.45
IV	11	4.67	9	2.43
V	13	3.00	12	2.55

Table 2 – Mean error scores, Range, and Standard deviation for girls at different age levels.

TABLE – 3

Group	Mean age (years)	Oral form disc. error score		
		Mean	Range	Standard Deviation
I	5	8.00	7	2.58
II	7	6.83	12	3.57
III	9	6.83	7	2.54
IV	11	2.17	4	1.34
V	13	4.12	10	3.03

Table 3 – Mean error scores, Range and Standard deviation on a Oral form discrimination test at different age levels for boys.

TABLE – 4

Sources of Variation	df	Ms	F
Age	4	65.06	7.76
Sex	1	00.42	0.05
Age x Sex	4	18.88	2.25
Error	56	8.38	-

Table 4 – Results of two-way ANOVA for the main effects of age, sex and their intersaction.

Figure:- 3. Mean error scores on Oral form discrim. for boys and girls separately in the five age groups.

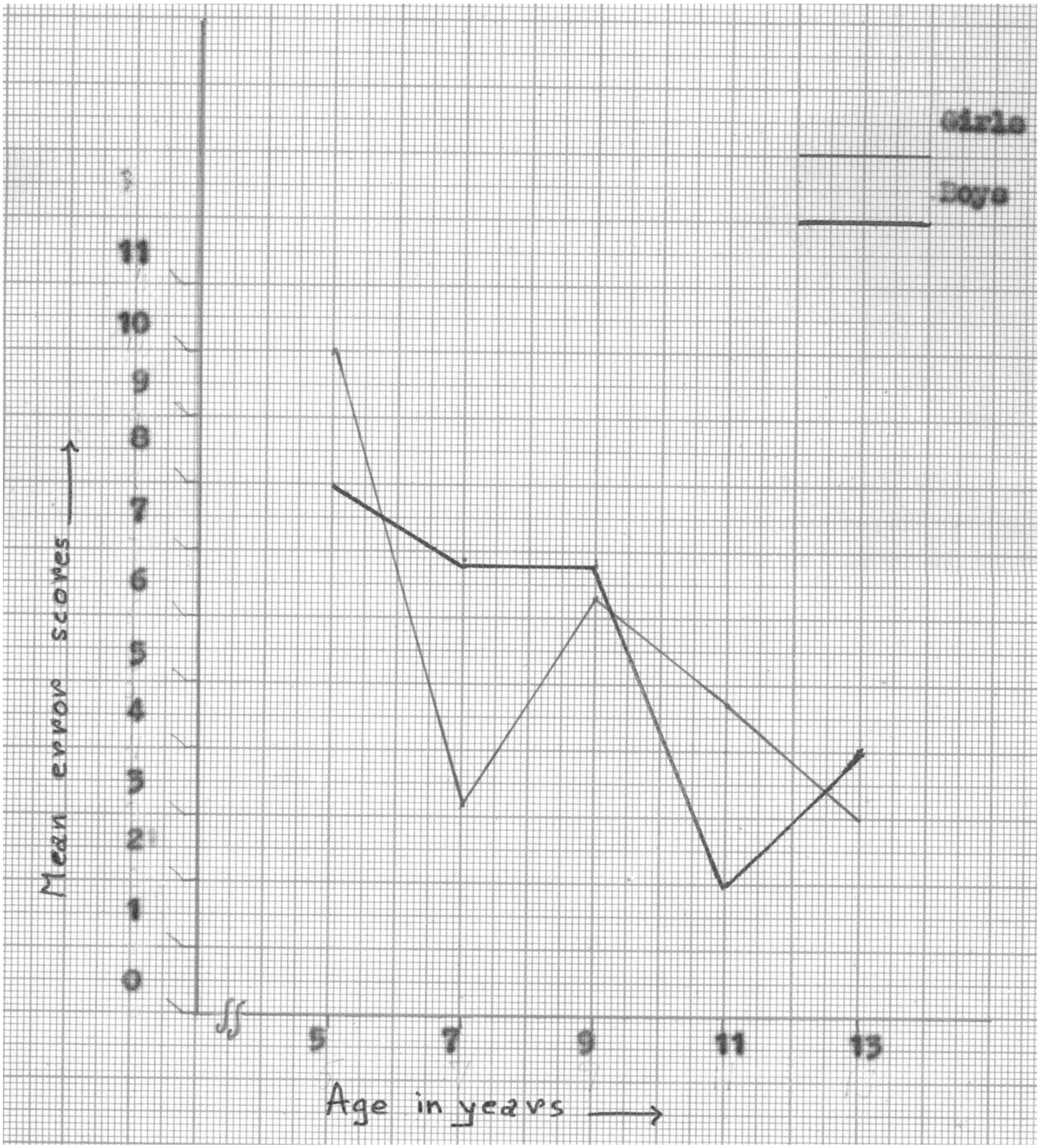
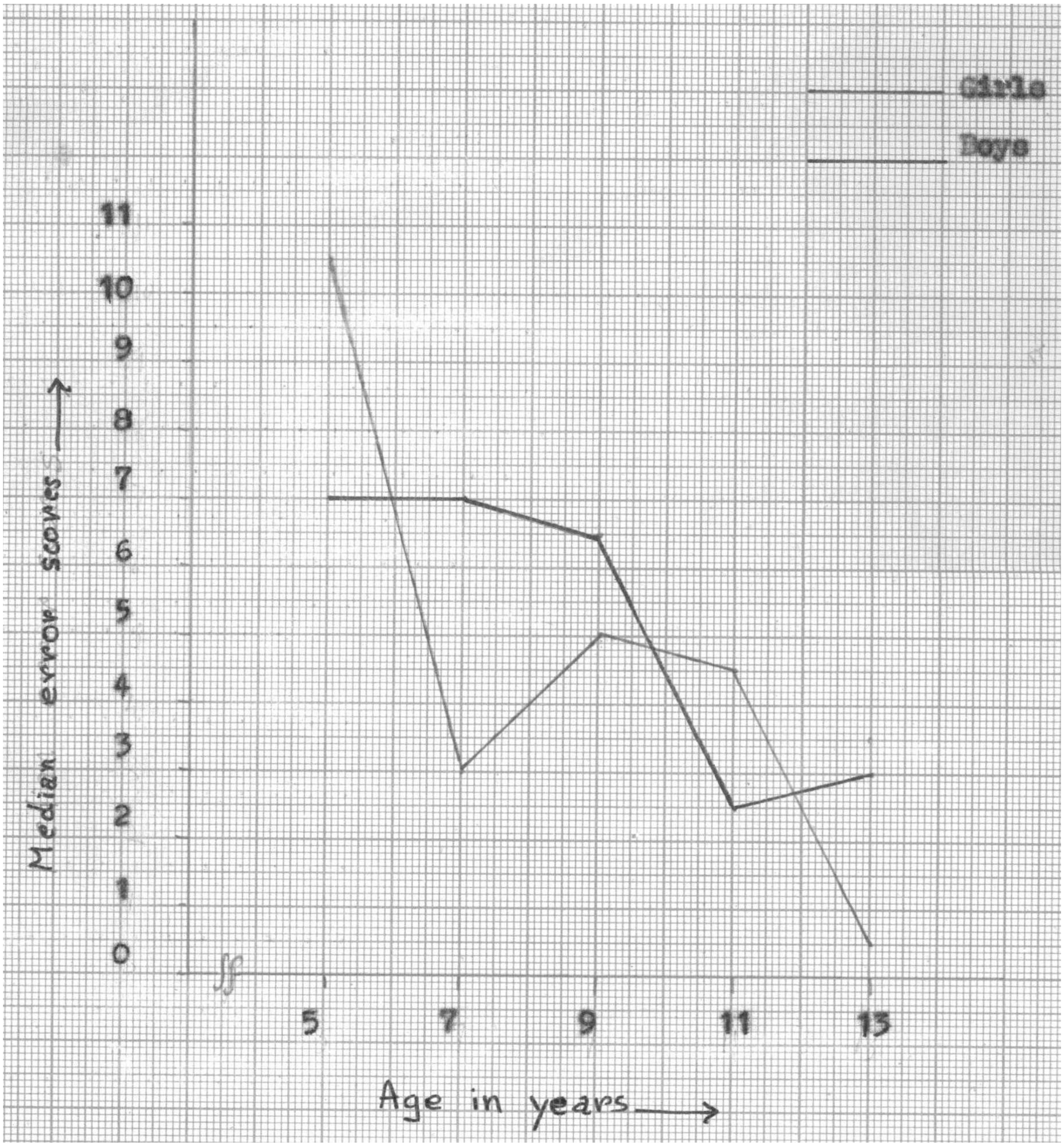


Figure:- 4. Medium error scores on Oral form discrim, for boys and girls separately in the five age groups.



are seen to make more errors then boys. But this relation is reversed in the next age level; seven year old girls make fewer errors than the boys. Again at age 11 years, the boys make fewer errors than the girls. However, the F-ratio for sex was not significant (Table.4).

Due to the differences in standard deviation between boys and girls at different age levels, the median error scores for boys and girls was plotted separately (Figure.4). Large differences between boys and girls may be noted in the performance. However, application of Fischer exact probability test (Siegel, 1956) revealed no significant differences at all age levels.

CHAPTER V

DISCUSSION

The results of the present study reveal that the errors on an oral form discrimination task decrease significantly with increase in age. However, significant sex differences were not found in this ability. The results will be discussed in the light of earlier findings.

Oral form discrimination development in children:

A significant F-ration was obtained for the main effect of age which reveals that oral form discrimination ability increases up to the age of 13 years.

An improvement in oral form recognition ability from 6 years of age up to midteans was reported by McDonald and Aungst, (1967). However, the scores on oral form recognition test were not stastically analyzed to determine if the trend was significant. McDonald and Aungst (1967) noted that the leveling of the growth curve for oral form recognition ability in the midteens seemed to parallel the completion of growth of the oral and facial structures. Hence it was hypothesized that the increase in performance was due to increase in the oral cavity size which might have resulted in easier exploration of the stimulus forms.

The oral structures have been observed to reach adult dimensions by 17 or 18 years of age (Hixon, 1970). Figure (1) and Figure (2) reveal that oral form discrimination ability reaches near plateau at 11 years of age. Thus anatomical maturation may not play a decisive role in the development of oral form discrimination.. Another reason for the plateau in oral form discrimination ability at 11 years of age may be that the present oral form discrimination test was not sensitive enough to assess the growth in oral form discrimination ability after this age level.

Oral form discrimination development may be in spurts. From Figure (1) and (2), it may be noted that there is a sudden decrease in mean error scores at age 7 years and then a slight increase at 9 years age level which was not found statistically significant. However, this could be confirmed by testing a larger sample. At 11 years age level again a significant decrease in mean error scores is noted, with no increases at 13 years of age. A slight but insignificant increase in oral form discrimination error scores at 9 years age level may be due to the following reason:

(i. Presence of the teacher only while testing the 7 year olds which may have acted as an incentive to do well.

(ii). The 9 year old groups were found to be more distractable and careless due to absence of teachers.

(iii). Large variability as indicated by the standard deviation for 7 year and 9 year age groups (Table. 1). This indicates a need to test more homogeneous sample at these age levels.

In a study by Ringel et al, (1970), the mean error scores of 8 year old children (1.7) were more or less comparable to the mean error scores of adults with normal speech (0.2) and those with mild misarticulation (1.4). These results were noted only for ‘between class’ comparisions on an oral form discrimination test. However, tests of statistical significance were not applied to determine if the differences were significant or net.

A study of articulation development in Kannada speaking children revealed that in general they acquire adult articulation earlier than the English speaking children (Banu, 1977). At 6.6 years of age only two sounds (/v/and/h/) were misarticulated in word level, where as the English speaking children are known to complete acquisition of speech sounds only by 8 years of age. Although articulation development at the word level is complete at around 7 years of age, oral form discrimination development appears to continue beyond this age level. Hence it may be concluded that amount of oral form discrimination skill possessed by a 7 year old child may be sufficient for correct articulation of speech sounds at the word level. Specefically, a child with misarticulation after the articulation acquisition period may not need training in oral form discrimination, if his oral form discrimination skill is equal to the skill of a 7 year old child. However, we do not know the amount of oral form discrimination skill needed in connected speech.

Sex difference in Oral form discrimination skills:

So far sex difference in oral form discrimination has not been studied either in adults or in children. The sex difference was not found significant as indicated by the obtained F-ratio (Table.4). The interaction of age and sex were also found to be not significant.

Sex difference in oral form recognition test was studied by William and La Pointe (1971). Forty normal subjects between the ages 20-59 years were administered a test of oral form recognition. Depending on age, four groups were formed, with five males and five females in each group. No significant difference between males and females were obtained. Hence, a similar lack of sex difference in oral form discrimination may have been obtained in the present study.

Sex difference was not obtained in the articulation acquisition of Kannada speaking children (Banu, 1977). This lack of sex difference in articulation development may be due to the lack of differencial development in oral form discrimination ability in boys and girls. However, it may be pointed out that oral form discrimination test was administered after The articulation development period. Large differences in performance in oral form discrimination test is seen at 5 years and 7 years age levels. Application of Fischer exact probability test (Siegel, 1956) revealed no significant difference at all age levels. As revealed by the results of the present study no significant sex differences appear to be present in any age level in oral tactile-kinesthetic perception.

Clinical application:

The development of oral form discrimination appears to take place in spurts. The development in oral form discrimination at 7 years of age may be sufficient for normal articulation. There is no need for separate oral form discrimination test norms for boys and girls.

CHAPTER VI

SUMMARY AND CONCLUSIONS

The developmental trends and sex differences in oral form discrimination skill were studied in 60 normal children ranging in age from 5 to 13 years, attending Kannada medium schools. Five age groups were formed with ages 5, 7, 9, 11 and 13 years. Equal number of boys and girls were selected in each groups.

The test stimuli consisted of eight plastic forms from four geometric class (triangle, rectangle, biconcave and oval). They were paired top form 32 'between class' pairs. The pair of forms were presented in the mouth successively. The child was required to say whether the pair of forms were same or different. The total number of errors were calculated for each child and they formed the error scores.

Statistical analysis of the error scores revealed significant agetrends. However, significant sex difference was not obtained.

Conclusions:

1. Oral form discrimination skills increase from age 5 years to 13 years. However, the increase is not a uniform gradual increase but a stepwise increase.

2. Sex difference was not present in the development of oral form discrimination across the age levels studied.

Suggestions for further research:

The results of the present study have thrown light on possible variables affecting oral form discrimination testing and need for their study.

1. Variables such as socio-economic status, motivation, intelligence, practice may be studied.

2. The oral form discrimination development may be studied in the even age groups which were not included in the present study so as to complete the oral form discrimination growth curve.

3. Sex differences may be studied in younger age groups to determine if such a difference exists in oral form discrimination ability during the articulation development period.

4. Development of oral form discrimination skills may be studied using 'with-in class' stimulus pairs and compared with the results of the present study.

5. Oral form discrimination test may be administered to children during the articulation acquisition period to ascertain whether children with poor scores retain their misarticulation after the articulation development period.

6. Size as a variable in oral form discrimination development may be studied as a function of age.

7. Oral form discrimination test used in this study may be administered to various clinical population and their scores compared to the scores obtained in the present study.

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Appendix

The Data sheet used in the present study

Name: SCREENING TEST Age:____.

Std:______ S.No.______Sex_____Cp_.

	A		AB		B
1		1		1	
2		2		2	
3		3		3	
4		4		4	
5		5		5	
6		6		6	
7		7		7	
8		8		8	
9		9		9	
10		10		10	
11		11		11	
12		12		12	

Experimental Session

Total Score__________.

TS	Resp	Ts	Resp	Ts	Resp
1		17		33	
2		18		34	
3		19		35	
4		20		36	
5		21		37	
6		22		38	
7		23		39	
8		24			
9		25			
10		26			
11		27			
12		28			
13		29			
14		30			
15		31			
16		32			

The Passage selected from Kannada Articulation Test

ಬಕ್ಕ ತಲೆಯ ಮನುಷ್ಯ ಮತ್ತು ನೊಣ

ಒಬ್ಬ ಬಕ್ಕ ತಲೆಯ ಮನುಷ್ಯನಿದ್ದ. ಬೇಸಿಗೆಯಲ್ಲಿ ಒಂದು ದಿನ ಅವನು ಕೆಲಸಮಾಡಿ ಸೋತಾಗಿ ಕುಳಿತುಕೊಂಡಿದ್ದ. ಆ ಸಮಯಕ್ಕೆ ಸರಿಯಾಗಿ ಒಂದು ನೊಣ ಬಂದು ಅವನ ನುಣ್ಣನೆಯ ತಲೆಯ ಮೇಲೆ ಸುತ್ತ ಹಾರಾಡುತ್ತಾ ಬಕ್ಕತಲೆಯನ್ನು ಕಚ್ಚಲಾರಂಭಿಸಿತು.

ನೊಣವನ್ನು ಹೊಡೆಯಬೇಕೆಂದು ಅವನು ಕೈ ಎತ್ತಿ ಹೊಡೆದ. ನೊಣ ತಪ್ಪಿಸಿ ಕೊಂಡಿತು. ಪೆಟ್ಟು ಅವನ ತಲೆಗೆ ಬಿತ್ತು. ನೊಣ ತಿರುಗಿ ಬಂತು. ಅವನು ತಿರುಗಿ ಹೊಡೆದ ಏಟು ಪುನಃ ಅವನ ತಲೆಗೇ ಬಿತ್ತು. ಆಗ ಅವನಿಗೆ ಬುದ್ಧಿ ಬಂತು. ಕ್ಷುದ್ರ ಪ್ರಾಣಿಗಳನ್ನು ಗಮನಿಸುವುದರಿಂದ ನಮಗೆ ಹಾನಿ ಎಂದುಕೊಂಡ.