A STUDY OF THE ROLE OF A MIRROR IN SPEECH TRAINING

MALLIKA

A DISSERTATION SUBMITTED IN PART FULFILMENT
FOR THE DEGREE OF MASTER OF SCIENCE
(SPEECH & HEARING)
UNIVERSITY OF MYSORE, 1980

DEDICATED
IN
MEMORY OF MY FATHER

CERTIFICATE

This is to certify that the dissertation entitled "A Study of the Role of a Mirror in Speech Training" is the bonafide work in part fulfillment for M.Sc in Speech and Hearing of the student with Register No. 7

Director
All India Institute of Speech
and Hearing
Mysore - 570 006

CERTIFICATE

This is to certify that this dissertation has been prepared under my supervision and guidance.

Guide

_D_E_C_L_A_R_A_T_I_O_N_

This dissertation is the result of ay own study undertaken under the guidance of Dr. N. Rathna, Professor and Head of the Department of Speech Pathology All India Institute of Speech and Hearing, Mysore, and has not been submitted earlier at any university for any other Diploma or Degree.

Mysore,
Date !

Register No.7

ACKNOWLEDGEMENTS

I most earnestly thank Dr. M. Rathna, Professor and Head of the Department of Speech Pathology, All India institute of Speech and Hearing, for his invaluable guidance in all phases of my work.

I am grateful to Dr.(Miss) Shailaja Nikam, Professor and Head of the Department of Audiology, All India Institute of Speech and Hearing, for having permitted me to use the earmuffs for the study.

I am thankful to Mr. B.D.Jayaram, Junior Research Officer, Data Processing Unit, Central Institute of Indian Languages, for his kind help in the course of my statistical analysis.

I wish to thank Miss Nalini Devi Okram, III BSc (Speech and Hearing) student, who served as the main tester during the study.

I wish to thank Mrs. Sowmyamala, Mrs. Indira Prakash, Mrs. Iffath Aslam, Mr. E.P. Balakrishnan and Mr. Chandra for their timely help.

I am grately indebted to my subjects and friends.

Finally, I thank Miss Padmavathi Bai for typing my manuscripts in time.

CONTENTS

CHAPTER I

INTRODUCTION

"Mirrors have held a traditional role in speech training for hearing-impaired children." (Pflaster, 1979).

References to the use of a mirror are found in most major texts that deal with teaching speech to hearing-impaired children. There seems to be a general consensus among educators of hearing-impaired children that mirrors are a valuable adjunct to speech training and development.

"Pictures used to advertise oral schools for the deaf frequently show children seated in front of the mirror during speech training" (Pflaster, 1979).

The use of mirror can be traced back to a few centuries, when Amman (1687) stated his belief that "the muteness accompanying deafness is caused by the deafness." He extensively used mirror practice for teaching both speech and lip reading.

Practice before a mirror as an aid to speech reading developed as a byproduct of teaching articulation to hearing impaired children. Nemoy and Davis (1954) suggested that "the mirror might be used as a tool in correction, to study the position of the tongue." Berry and Elsenson (1956) also emphasized that the mirror might be used to create an image of how the sound looks."

Nitchie (1912) recommended mirror practice for eye training. Bell (1916) considered that familiarity with speech through the use of a mirror leads to a perception of muscular feeling of the positions assumed by the vocal organs". O'Neill and Oyer (1961) also emphasized home assignments consisting of mirror practice.

Park (1970) suggested that "by using the mirror, an additional medium, children will obtain greater feedback in their attempts at pronouncing and understanding words."

Butt et al (1970) suggested that "a mirror hung on the baby's crib would encourage babbling and provide visual feedback." However, they emphasized that "this does not mean to diminish the importance of acoustic

stimulation and amplification for deaf children."

References to the use of the mirror discuss its relationship to language development (Stark,1972; Rees, 1975; and Tldwell, 1976); Auditory training (Dassen, 1966); and Speech reading (Nitchie, 1912; Bruhn, 1915; Deland, 1931; Berger, 1973).

"Although the mirror has been frequently recommended as an aid to correction of speech, not all are in agreement as to the precise role and function of the mirror as a visual feedback." (Pflaster, 1979).

Bwing and Bwing (1964) made no mention of mirrors even when discussing the necessity of a multisensory approach to speech training. They considered that "manner and place of cues could be more effectively signalled usually by flicking techniques in which configuration of the hands and movement of the fingers replicate the actions of the jaw, tongue and lips."

Ling (1976) questioned the value of using a mirror. He reported that ha rarely found it necessary

to use a mirror. In accord with Guillaume (1971), he said that children could imitate visible speech organ gestures without seeing themselves to do so.

Pflaster (l979) attempted to determine the value of using a mirror for speech training in deaf children and found no difference between the number of errors made under the two auditory-visual conditions,one employing direct vision and the other using a mirror. Therefore, he concluded that "the use of a mirror neither enhanced nor detracted from the accuracy of responses." Further, he concluded that the usefulness of a mirror as a general aid in speech teaching was doubtful.

Need for the present study

The diversity of opinions and recommendations relating to the use of a mirror in the speech training demonstrated the need for the present study. Further, Pflaster'a (1979) conclusion that "the usefulness of a mirror in speech training is doubtful" could be

tested under different conditions. Therefore the present study was undertaken.

It attempts to study"the role of a mirror in speech training by comparing two visual conditions, one employing direct vision and the other employing a mirror."

The study was mainly based upon Pilaster's (1979) study, with some modifications. Instead of using deaf children, normal children with simulated hearing loss were included to (1) overcome the effect of mirror practice in deaf children; and (2) overcome differential experience under therapy. Further, instead of using CV syllables, fifteen words from an unknown language, Manipuri, were selected to overcome the familiarity with known languages.

The task in the present study was not just identification and repetition of CV syllables (as it was in Pilaster's study). The task was identification and repetition of words until there was mastery of all

the words. Thus, there was an attempt to study the usefulness of a mirror in providing self correction in children.

The atudy intended to answer the following questions:

1. What is the role played by a mirror in Speech training?
2. Are there any differences between two visual conditions, one employing direct vision and the other using a mirror, in speech training?
3. Are there any differences between the two auditory-visual conditions and the audition alone condition?

To answer the above quastions, the following hypotheses were putforth:

1. There will be no difference between the two visual conditions, one employing direct vision and the other using a mirror.
2. There will be no difference between the two auditory-visual conditions and the audition alone condition.

3. There will be no sex difference between the three conditions used in the study.

4. There will be no reduction in the number of trials required for mastery of responses with increasing ages.

To test these hypotheses, the study was conducted on fifteen normal children with simulated hearing loss. Both the sexes were included, ranging in age between 5 years and 12 years. The study included three experimental conditions:

1. Audition alone (A).
2. Audition plus direct vision (AV),and
3. Audition plus vision using a mirror (AVM).

Fifteen words, selected from an unknown language, Manipuri, were used as speech stimuli for the three different experimental conditions. The order of conditions and the presentation of the test words were all randomized. The test words were presented by live voice under the three conditions and the

subjects' responses in terms of trials required for mastery of fifteen words were noted down. Two consecutive correct repetitions of a particular word was considered to indicate that word was mastered.

Limitations of the study:

1. The study was confined to a small sample of 15 children.
2. Attenuation provided by earmuffs was only 20 dB
3. Attempts were made to present the test words at a constant level. But these were made subjecti vely and it is possible that human error would have entered.
4. No instructions for correction were given when the children made errors in repetition.

OoO

REVIEW OF LITERATURE

"The problems encountered by individuals suffering from hearing impairment are many and varied. The core of these problems is a breakdown in the process of communication. The development and use of speech as the major component of human communication is primarily dependent upon the possession of normal hearing by the individual." (Sanders, 1971).

"Normal hearing is essential because speech signals are transmitted in the form of sound waves that can only be received by the listener via the auditory pathway. The nerve impulses that the acoustic signals trigger in the organ of hearing travel by way of the sensory system. Simultaneously additional information may be received by the listener through other sense receptors such as those of vision, touch, taste and smell. The complex signal used in communication then requires analysis and interpretation at higher levels of nervous system, a process involving the integration of the various sensory data into a meaningful whole. Therefore, in considering the problems arising from auditory impairment, it is essential to direct attention to the total process of communication" (Sanders, 1971).

Sanders (1971) emphasized that in addition to the information transmitted in the form of sound waves received by the auditory mechanism, relevant information may be received through the other senses. Though we are particularly concerned with the role of hearing in speech communication, we should not forget that hearing, together with the other senses has a more fundamental prupose. The three major functions of sensory perception are to provide information, protection and orientation.

According to Gibson (1966) "Learning involves active exploration, a "tuning" not only of hearing, but also of all the senses. The child does not just hear, he listens. He does not just see, he looks. He does not just touch, he feels."

Myklebust (1960) remarked that "in life situations, the reception of speech is a process of co-ordinating information from all of the senses, with audition and vision being of primary importance. The reliance on each sense may be expected to vary from person to person, depending in part upon the intactness of sensory modalities of the individual."

Ling (1976) emphasised "In order to learn how to speak, the hearing impaired child must, in some way,

receive the speech patterns on which his own production can be modeled. In addition or as alternatives to residual hearing, there are three sense modalities available; vision, touch and kinesthesis. Each can be made to serve a somewhat different function in speech reception and speech production."

According to Ling (1976), Hearing is particularly sensitive to temporal events within the frequency range of 80-8,000 Hz, while vision, though relatively poor as a temporal sense, excels in providing spatial information. Touch, which is Maximally sensitive in the frequency range 200-800Hz is not quite as effective as the ear in dealing with time, or as the eye in dealing with space, but it outstrips the ear as a spatial sense and the eye as a temporal sense (Geldard, 1970; Montagu, 1971). Kinesthesis, which provides information in orientation of one's body and its part in space, plays considerable role in speech reception, but assumes considerable importance in speech production. (Gammon, Smith, Daniloff and Kim, 1971).

Ling (1976) quoted that "of the available senses, residual audition must be regarded as potentially the

aost important because it is the only one directly capable of appreciating the priaary characteristics of coaaunicative speech, which are acoustic". Beth are exteroceptive senses, vision and touch, aay be regarded *a surrogates capable of responding only to the secondary characteristics of speech: the visible aoveaents associated with sound production and the tangible correlates of speech such as the breath stream and vibration." "Vision, like hearing, is a distance sense which gives it some Advantages over touch, for the distance within which touch can operate is normally restricted." "However, speech sounds can be transformed to vibrations by means of electronic aids (eg. hearing aid coupled to a vibrator) and presented to the skin, thus converting touch into a distance sense."

"The proprioceptive use of our senses in speech production differs in many ways from their exteroceptive use in speech reception. Audition of our own speech involve* reception of both air - and bone-conducted elements, and what we hear parallels the orosensory-motor patterns, both tactile and kinesthetic, which are associated with movements in the vocal tract. Vision is not normally used proprioceptively in speech production and can be

used to only a limited extent in teaching hearing impaired children to talk." (Ling, 1976).

In this regard, Ling (1976) quoted that "The development of well differentiated orosensory-motor patterns should be the teacher's prime concern, in fostering A hearing impaired child's speech production skills." "For the totally deaf child, there is no alternative since audition is not available and vision provides too little information." "For the child with useful residual hearing, well developed oro-sensory-motor patterns which underlie automaticity in speech production serve to provide a frame of reference which facilitates auditory or multisensory speech reception."

"Present day knowledge of the role of the senses in speech production is piecemeal" (Ling, 1976). Accordingly, current theory and practice are somewhat speculative (MacNeilage, 1972). Until quite recently speech production was considered to be a closed loop system : one in which, by constant monitoring through the senses, we control the serial timing of speech and the immediate

adjustment of the articulators as they assume one target position and move to the next (Fairbanks, 1954). This view, derived from Wiener, 1949 , is no longer tenable." (Ling, 1976).

"If we wish to be certain that a production unit maintains a particular standard of operation, then it is necessary to devise a means of assessing and controlling the quality of the product. This is necessary in the production of speech. To make this quality control possible, we must feedback into the system information concerning its output" (Sanders, 1971).

Sanders (1971) considered feedback as an integral part of the communication system. According to him, "without feedback, effective communication is impossible." It is of particular importance to an understanding of the communication problems resulting from impairment of hearing, since these problems result primarily from a impairment of the feedback process."

"The continual monitoring of the message signal (speech sound, written symbols, gestures, etc) is

necessary to insure the greatest possible accuracy of the message." In this connection, Sanders (1971) quoted Fairbanks (1954) who proposed a model that is helpful in understanding the internal feedback mechanism by which we control the quality of our speech production. The system is divided into two linked units, one concerned with converting the neural message signal into speeoh sounds (effector unit); the other (sensor unit) concerned with feeding a copy of the output back to a control unit which modifies future signals.

Sanders (1971) commented that "Fairbanks' model is only concerned with an explanation of the manner in which the output of the spoken word is monitored by the speaker." Further, he extended that "this internal monitoring is referred to by Irwin and Van Riper (1958) as an intrapersonal communicative circuit." In conclusion, ha said that "an understanding of the total communicative process necessitates an expansion of this model to include the monitoring of other forms of symbolic output, such as those transmitted by the hands, face, and other body parts." Apart from this intrapersonal feedback, Sanders (1971) suggested that "we must also take into

consideration the influence exerted upon the speaker by the reception of information concerning the effect of his message upon the person to whom it is directed." "This constitutes the interpersonal communicative Circuit." This view of Sanders' is in agreement with Mysak (1966).

Mysak (l966) quoted that "Control and monitoring of speech are the functions of the sensor system." "The major function of the system is intrapersonal speech - perception, and a minor function of the system is interpersonal speech perception." "Intrapersonal speech perception includes automatic speech control, or control that is simultaneous to and ongoing with the speech act, and automatic speech monitoring, or monitoring that follows the speech act." "The interpersonal function of the system involves the capacity of the system to monitor the utterances of others."

Further Mysak (1966) attempted to describe these two levels in terms of the contributions of the different senses. According to him, "On the intrapersonal level, auditory and tactile - kinesthetic senses are primary

sensors, and the visual sensor is a secondary sensor (supplementary). On the interpersonal level, auditory and visual sensors are primary." "In the developed speaker, the intrapersonal auditory sensor controls and monitors spoken symbols and the voicing, loudness and rate of those symbols, while the tactile - kinesthetic sensor basically controls and monitors articulation of those symbols." 'Intrapersonal control and monitoring are usually on an automatic or "subconscious" level. However, under certain circumstances, like for eg. during therapy, control and monitoring functions may be made more voluntary or "conscious."

"On the interpersonal level, the auditory sensor system is responsible for simultaneous auditory control of running speech as well as for post utterance monitoring, In the developing speech system, auditory sensor system is responsible for control and monitoring of vibro-acoustic events, as well as for the articulation, voicing rate and rhythm of those events. As the total system develops, a division of labor of sensor responsibility slowly occurs and the tactile-kinesthetic sensor eventually assumes an important amount of responsibility over control and monitoring of articulation."(Mysak,1966).

So, from these evidences, we are now aware of the fact that different senses differ in their contributions to feedback in terms of reception, production and Monitoring. Taking these into account, the different senses should be given inportance in speech training to the deaf. Depending upon the availability of the senses in the deaf, proper training should be undertaken.

Regarding the aural rehabilitation program and the relative emphasis placed on different feedback systems, there are two important approaches of which, one is Unisensory and the other is Multisensory.

Unisensory Approach:

In 1802, a Paris Otologist, Itard noted that by intense stimulation of the ear, increased hearing perception could be obtained. This idea was further developed by Urbantschitsch in 1835. Hollowing these earlier innovators, Goldstein (1939) developed the acoustic method.

As early as 1939, Goldstein recommended the acoustic method which was "stimulation of the hearing mechanism and associated sense organs by sound vibrations as applied either by Voice or any sonorous instrument." Pollack (1948) limited the number of visual cues available to enforce the development of audition as the child's primary receptive sense.

"Acoupedics, a unique program of hearing therapy is designed to meet the needs of a new generation of acoustically handicapped children, whose hearing losses have been detected in infancy." "The goal of acoupedics is to use the residual hearing of a partially deaf child to help him develop as a fully integrated personality within the world of sound and to teach him speech through the auditory sense." (Niemann, 1972).

Acoupedics is a word coined from a combination of "acoustics" and "Paediatrics". Huizing (1959) described "acoupedics as a new philosophy, primarily based on the education or reeducation of the function of hearing." The term acoupedics is necessary since integrating hearing into the child's personality goes far beyond just auditory training. Acoupedics refers to

a comprehensive habilitation program for the hearing impaired infant and his family, which includes an emphasia upon auditory training without formal lip-reading instruction."

As quoted by Earlo (1972), Mrs. Pollack explained: "When one modality is impaired such as hearing, the natural tendency of the body is to compensate by allowing a healthy modality to take over. In this case, it would be sight. A child would be instinctively learning to lipread at this stage if he were not taught to listen and to associate the sound with an object, a feeling, a word, a smell." So in the acoupedic approach, one trains neither awareness of, not attention to visual cues through lip reading, cued speech, early teaching of reading, or finger spelling. All the training is concerned with awareness of and interpretation of sounds heard through hearing aids which are worn throughout the child's waking hours.

Frisina (1966) gave importance to the auditory channel in speech production. He said that "Perceiving

speech of others and monitoring one's own voice through the auditory channel is the surest means for developing intelligible speech production."

Stewart (1965) stated the theoretical premises of the acoupedic approach as follows!

1. The auditory sense is the most suitable perceptual modality by which a child learns speech and language.

2. The multisensory approach to management favours the development of the impaired modality as the primary communication system at the expense of the impaired modality, whereas the Unisensory approach stresses the development of the impaired modality at its fullest potential

3. The development of sound awareness, vocal production and eventually the beginnings of speech and language can best be achieved in the child's home so long as suitable acoustic stimulation is provided.

4. Preaent day nursery school procedures patterned after those developed for totally hearing children are preferable to those designed around "special education."

Stewart (1965) placed early detection and prescription of a hearing aid as the first steps. This has to be followed by a systematic training of the listening function which is not dissimilar to the steps in use for auditory training.

This new trend towards the acoupedic method also called educational audiology, not only emphasized early auditory training but also underemphasized speech reading. The concern now is the possibility of speech reading interfering with learning to listen. Berg (1970) reported that "in an educational audiology, more attention was given to the employment of residual hearing than to that of vision. Residual hearing provides the potential for utilization of greater number of relevant sensory speech cues than does vision. At its peak, hearing combines a refined versatility for processing the speech signal with an uncanny competence for receiving it from any location within a talking distance."

Huizing (1959) who maintained that "children who become skilled lipreaders before maximum use of residual hearing is obtained do not fully understand the value of auditory communication since they have adapted to another world of perception and are not able to exert the necessary auditory effort."

Whetnell (1953) felt that "teaching a deaf child only to lipread appeared to make him incapable of adding the additional ability of listening." Whetnoll and Fry (1964) strongly suggested that "amplification be given at an early age." They warned "with insufficient amplification, so little satisfaction is obtained out of hearing that the child slowly ceases to listen and uses his eyes increasingly." They further felt that "if at this stage lipreading is more emphasized than hearing, such training will intensify the process and the child will become a fixed visualizer, and ignore sound."

Carhart (1966) also warned similarly. "A child who has a hearing impairment at birth or very early in life, instead of learning to assign meaning to the few sounds he hears, he may acquire the habit of disregarding them." He also added that, "the child who habitually

ignores sound is no longer conscious of even loudness which could help him to adjust to people and things." Carhart (1966) emphasized that "It is to avoid this happening, that early trainings should be provided in listening." This belief in ear amplification and auditory training gained strength from the concept of 'critical age'. This concept assumes that there is, in the stages of development of a child, a particular period of maximum responsiveness, a period when adequate stimulation of any modality makes for maximum development and a period in which the lack of stimulation produces dystrophy of cortical areas associated with the modality. This may perhaps be explained as a period when brain cells are ready to specialize.

Mrs. Pollack (1964) recommended an avoidance of lipreading and other competition of sensory stimuli. She stated that "the eye could not detect vocal rhythm, loudness, pitch changes etc." She alao suggested that "there was sufficient information available in the auditory channel of the hearing impaired child for him to be taught to be independent of vision." Further she concluded that "the limited hearing child can be taught

to interpret correctly the signals coming over a communication channel of minimal capacity, if those signals are heard consistently."

Stewart and Funeki (1968) compared children from Pollack's program with children treated in a traditional multisensory oral program. They found that in all areas of speech and language acquisition, the acoupedically trained children were found to be superior to those visually trained. But the study was confounded by variables either unmentioned or ignored (Luterman, 1976). Luterman (1976), as part of a followup study, evaluated 49 hearing impaired children for language skills. Of these, 27 had received visual/oral treatment, and 22 had received auditory/oral treatment. The results showed that auditorily trained children were more superior in language skills to the visually trained children. Therefore, Luterman (1976) concluded that "the auditory/oral approach was strengthened as the method of choice." However, the other advocate* of the method do not really discourage lipreading. Stewart (1965) said that "it did not mean a complete avoidance of lipreading but a postponement of learning the skills until after the auditory

sense has developed to the fullest extent." He indicated that "lipreading cues be kept to a minimum and that no formal instruction be given in lipreading."

McCroskey (1967) reported that "in the programme of home training, lipreading as a special skill was not taught and was not encouraged - nor was it discouraged." "It developed naturally in virtually all of the children."

Bentzen (1962) suggested that "residual hearing be trained first of all and then other systems such as the visual system or the use of the hands be given." Whetnall (1963) emphasized that "throughout the training, the way in which the normal infant learns to hear and to talk must be constantly kept in mind and this knowledge must be continuously applied to the direction of the learning process in the deaf child."

The assumption that the visual cues are eliminated will be the greatest obstacle in the acceptance of the approach. The difficulties will be

enhanced by the followers of the method who will take the name "unisensory Approach" and will fallow their old techniques minus the use of lipreading.

After a comparative study of the progress of groups following the acoupedic approach and the multi-sensory approach, Stewart (1965) recommended that "for children whose resitual hearing extended into the high frequencies and whose hearing losses were relatively flat, the Unisensory approach seemed most appropriate."

While auditory training has had a very long history,until recently it has been used as a supple-ment for other communication avenues. In practice, the visual system, (whether lipreading or the language of the signs was utilized) has been the main channel of communication for children with a hearing loss (Stewart, 1965).

Lipreading, speech reading or visual hearing are all terms that have been used to describe a parti-cular form of non-auditory communication. In this situation "the eye is the primary receptor, with the

some slight assistante. Thus an additional sensory pathway can be used by a person who is aurally handicapped." (O'Neill and Oyer, 1961).

Multisensory Approach :

As quoted by Silverman (1966), "Watson (1961) has adequately equitomized the view that the sum of reinforced multlaensory stimulation is greater than any of its parts." "It is infact the nearest approach to the normal that can be made by the deaf child." "The acoupedic method is bound to be attacked by the oral-auralists that de emphasizing the visual clues, will make the deaf child more handicapped." They claim that not all people will benefit by the acoupedic Approach and children falling in the technique will have to pick up lipreading at a later age if one has to wait for a real attempt with the training of listening. They may also put forth psychological frustrations and problems a child will face to support their methods,

O'Connor (1960) stated that "many parents are led to believe that through the magic of hearing aid together with a few hours of special tutoring in a

clinic and perhaps, also through the influence of maturation, their child will be able to join six year old normally hearing first graders. The ultimate traumatic damage this naive guidance can do to both parents and child when both must face the cold realism of failure is incalculable.". Hudgins (1953) found that it is not likely that many of the profoundly deaf children will even be able to understand speech to a useful degree by ear alone.

Eiwing and Ewing (1965) cautioned that children who are very deaf cannot learn to speak solely on the basis of hearing. This report supported Huizing (1959) who had disagreed with the usefulness of aeoupedic method in severely impaired children.

Carhart (1966) said "There are three major channels which may be substituted for the ear, vision, the sense of touch and the internal senses of movement and position. Carhart, who is an advocate of auditory training indicated "any superior programme of training will interweave stimulation through these three channels, and of course, the auditory channel." The emphasis in general was on lip reading. For the individual with a moderate to severe hearing loss, the visual shape and

the movement of the speaker's articulators become the important communicative elements. In this situation 'the eye is the primary receptor with the ear affording some slight assistance." (O'Neill and Oyer, 1961). Pauls (1966) suggested that deafened man must compensate for his lost hearing by giving greater attention to the use of his eyes and to his interpretation of the movement.

Ewing and Bring (1967) categorically held that "it is important for all hearing impaired children to be able to combine lipreading with listening." They explained "it is not a matter of alternatives - either reliance on acoustic phonetics or motor phonetics - but of teaching deaf children to gain a maximum amount of information and help from both sources." They also contended that "when deafness is total or subtotal, kinesthetic without auditory feedback can still make good speech possible."

Traditionally, the oral method meant only the teaching of speech and lipreading. Speech was taught by the multisensory approach which was also called

TVA - tactile, visual and auditory. The multisensory approach which utilizes all available channels is the method followed by a great many people all over the world.

Gaeth (1967) stated that "one of the aspects of deaf education on which there is fair agreement is the Multisensory Approach."

"The Multisensory approach or the method of supplementary speech information, supplements the insufficient capacities of lipreading and hearing aids, with vibrotactile and visual kinesthetic information (Schulte, 1978). In this connection . Schulte (1978) suggested that "For hearing impaired children to develop the best possible oral communication, they must use all speech information that is available". Further, he emphasized that "hearing aids and lipreading, the traditional receptive systems for the hearing impaired child are not completely adequate by themselves." Thus he contended that they must be supplemented by cues that tell the deaf child how phonemes and sequences of the phonemes are articulated and this can only be achieved by use of a multisensory approach.

"Tor tha profoundly deaf child, the absence of auditory feedback has disastrous consequences on the development of speech. It is therefore natural to consider the use of one or more of the remaining senses to provide him with the feedback vital to speech acquisition." (Stratton, 1974).

Hartbauer (1975) stated that "deaf or deafened must rely on alternate avenues of communication. If ha cannot hear he is faced with the urgency of using his vision as the second best modality. The hearing handicapped also develop a greater sensitivity to touch. The kinesthetic circuit is tuned, and in many individuals, the sense of smell and taste are more acute."

Multisensory approach may be in the form of bimodal or multimodal presentation/stimulation. The bimodal presentation utilizes either vision or touch to audition. While, the multimodal presentation utilizes all the three channels - vision, touch and audition.

With the considerable amount of evidence, it has been shown that speech reception in communication

is anhanead when vision and audition are both employed. Much less work has been done on the use of touch to supplement residual hearing, vision or both. (Ling,1976). The multisensory approach may be well understood when either vision or touch are combined with audition, separately and also when all the three are combined together.

Audition and Vision:

Although there are still differences of opinion over the advisability of combining hearing with vision, with regard to the early education of hearing iapaired children (Pollack, 1964), there is no doubt that the combined use of audition and vision in the aural rehabilitation of the deafened adult is an established fact (whitehurst, 1964). Studies in the auditory-visual perception of speech have been carried out with both normally hearing and hearing impaired persons. (Erber, 1974).

Ewertzon and Nielson (1971) stated that "It is common courtesy to look at the person to whom you are speaking." the virtue involved in this phrase may often be a requirement. "Vision is such an essential factor

in linguistic communication that it may be reasonable to characterize normal perception of speech as a bi-sensoric phenomenon." " Vision constitutes an important factor in speech perception for which reason the attention should be concentrated on the interplay of audition and vision, if the aim of the rehabilitation is to measure the communicative powers of an individual with defective hearing."

According to O'Neill (1954) "speech is usually regarded as an oral-auditory process. It has visual characteristics, however, that the deaf and hard of hearing may employ in the understanding of speech through lipreadlng, and that may contribute to normal communication. Since most verbal communication is direct, face to face, oral sending - receiving, the perception of speech might be regarded a* a bi-sensory (auditpry-visual) phenomenon." In his conclusion, O'Neill stated "If the auditory channel of communication is employed alone, a high level of noise tends to make communication more difficult, then the visual channel supplements the auditory channel, there is an increase in the understanding of the vowels, consonants, words and phrases that are transmitted."

Myklebust (1960) also reported that "in lift situations, the reception of speech is a process of coordinating information from all of the senses, with audition and vision being of primary importance."

Siegenthaler (1969) stated that the technique called "Look and Listen" has been used for evaluating the effectiveness of speech reading, of hearing, and of their combinations for speech reception by the hearing impaired. In studies using this procedure, significant improvement was found in intelligibility for speech received through hearing and lipreading combined, in contrast to speech received by either sense alone (Johnson, 1939; Hudgins, 1948; Quick, 1953; Prall, 1957).

It is likely that there is an Interaction between vision and audition for speech reception in the hearing impaired and that the effectiveness of each sense is heightened by the use of the other. This effect was shown by Numbers and Hudgins (1948) and by Hatton(l958). Hearing impaired subjects when using vision and audition simultaneously had speech intelligibility scores far in excess of their speech reading scores, and auditory scores, or the sum of their speech reading and auditory scores.

Button, Curry and Armstrong (1959) found that subjects with sensorineural ear pathologies in contrast to the subjects with mixed or conductive pathologies, tended to show greatest improvement in speech intelligibility utilizing the combination of hearing and vision.

Whitehurst (1961), indicated that visual cues provide information not perceived through audition and vice versa. She suggested that "in one instance the trained eye will fill in the missing auditory links and in the other instances the trained ear will bridge in visual gaps."

Oyer (1966) suggested that "a combined approach of auditory training and lipreading was highly desirable, because strong association bonds can be established between visual and auditory sense modalities" Further, he stated that "even though the acoustic component of a spoken word may be distorted to the hard-of hearing person and the visual component somewhat obscu- the combined stimuli provided more cues or information than either one given alone."

Hudgins (1951) reported that bimodal presentation provides considerably more information than the unimodal channel of vision, even though the scores obtained for hearingalone suggests that the auditory pathways contributes no information.

Kelly (1967) reported the scores obtained by six hearing impaired childres on a discrimination task requiring the identification of spoken words and spoken names of letters of the alphabet. The test items were presented through vision, audition and vision and audition combined. The scores obtained for the recognition of the names of letters of the alphabet were considerably higher than those for word recognition. Under both conditions, vision contributed less information than audition. This can be explained by the fact that visible aspects of speech contain less information than the auditory. The bimodal presentation of speech material conveyed more information than either the visual or auditory channel alone. This finding was further supported by Prall (1957) who indicated that the deaf

children's speech discrimination performance was substantially enhanced when visual cues are presented together with the acoustic signal.

Sanders (1961) investigated the speech-discrimination performance of 30 primary-school-aged children with hearing losses ranging from 55-110 dB's. The subjects were grouped into four hearing loss categories : (a) 55-64 dB; (b) 65-74 dB; (c) 75-94 dB and (d) 95-119dB. Test mateiials consisted of a amultiple-choice picture identification task. Pour conditions of presentation were used: (1) unaided hearing without visual cues, (2) unaided hearing with visual cues, (3) aided hearing (personal hearing aid) without visual cues, and (4) aided hearing with visual cues. The results obtained indicated that the amount of information that the children were able to obtain from the auditory channel without amplification decreased as the hearing loss increased. For hearing losses in excess of 75dBs, the auditory channel alone was insufficient to permit the recognition of the names of familiar objebts on the basis of the auditory cues alone, even when the choice of alternatives was

limited to six items. The benefit derived from amplification was also shown to be in inverse relationship to the severity of the hearing impairment. In other words, even with amplification, the amount of information that the auditory channel was capable of contributing to speech discrimination became progressively less as the amount of residual hearing decreased.

In all categories of hearing loss the number of items correctly discriminated without amplification increased when visual cues were made available. The least increase occurred in the category of children with the greatest amount of residual hearing. The possible explanation for this may be that the children in this group had sufficient residual hearing to obviate the need for heavy dependence upon the visual cues of speech, and were, therefore less skilled in speech reading.

Under the most favourable communication condition (amplified speech with visual cues), the children in hearing - loss categories (a), (b), and (c) obtained significantly better discrimination scores than under any

other condition. The children under (d) category were clearly dependent upon the visual channel as the major source of information and derived so much from visual cues that the amplified speech signal contributed no significant additional information.

Oaeth (1967) published data concerning the auditory-visual approach to deaf education. The results seemed to provide evidence contrary to the basic assumption that bimodal presentation providea a greater degree of information than unimodal.

When the material was presented to a group of hard of hearing children with losses of between 16-30dBs ASA, Gaeth (1967) found no significant difference between the rate of learning attained through the visual audio-visual and that attained through the visual presentation. However, a significant deficiency in learning was demonstrated when the material was presented through the auditory channel alone. The same findings were obtained for the other two groups of children with hearing losses ranging from 31-45 dBs and from 45-60 dBs in the better ear.

Gaeth (1967) reported that with a group of children whose hearing losses fell within the range of 61-75dBs, the resultant learning curves indicated that the combined presentation produced a poorer learning rate than the visual presentation rate. In reacting to these findings, Gaeth commented.

"A reasonable Inference seems to be that for groups with the milder hearing loss, the auditory material was meaningful or atleast intelligible to the children and this did not interfere with the performance, though it did not help it either. In the case of the children with the hearing losses between 61-75 dB, the material was not intelligible and either confused the tasks or distracted the children from functioning as efficiently as they did visually."

Auditory-visual perception of speech in normal hearing persons:

Simultaneous auditory-visual perception of speech has been studied in both hearing impaired and normal hearing persons. (Erber 1971). "The reason that auditory-visual perception is important to the hearing impaired is obvious; in order to communicate orally, they usually attend to speech information that is available on the face of the talker, that is, simultaneous observation of both auditory and visual

cue is the typical mode of speech perception for impaired persons. Normally-hearing persons often need to communicate in noisy or reverberent locations where speech perception through listening alone is difficult or Impossible. Under these circumstances, they usually watch the talker's mouth and face for speech information." (Erber 1972).

Most studies with normally-hearing observers attempt to duplicate these adverse acoustic conditions in order to gain a better understanding of the problem. Typically, the acoustic signal is degraded in some way. Some normal hearing investigators have occluded their war canals (Hebb, etal 1954), while others have used masking noise to eliminate auditory sensation (Vdnder Leith, 1973). But most studies and demonstrations have used low pass filtering of speech to simulate the effects of hearing impairment. (Harford, 1964; Glorig, 1971; Ross etal 1973). Although low pass filtering may produce a sound quality that is similar to that heard by severely hearing impaired listeners, the method probably grossly over-estimates the acoustic information that is available to those who are profoundly deaf (Erber, 1972, 1974).

Erber (1974) emphasized that "when a normal hearing parson attends to a talker in quiet surroundings, he generally receives auditory and visual cues for speech that are closely related." According to him "The vision provides mainly redundant information." Erber reamrked that "when the acoustic signal-to-noise ratio is less than optimnal, weaker speech sounds are masked." Further he reported that "the more severe the masking situation, the more the normally hearing observer must rely on lipreading for satisfactory perception of the message intended by the talker. In conclusion, he suggested that "when the observer must decode speech under extremely poor acoustic conditions, where no meaningful auditory cues are available, lipreading is the only source of speech information."

Reports by O'Neill (1954), Sumby and Pollack (1954); Erber (1969) and Ewertsen and Nielsen (1971) have provided data to support Erber's (1974) points. In general, their findings indicated that combined

auditory-visual recognition of words is more resistant to noise than is recognition of under conditions of listening alone. They also emphasized that "a normally hearing person who has never been trained in lipreading always receives more speech information in noise when ha watches the talker's face than when he does not."

Sumby and Pollack (1954) utilized the information found by O'Neill (1954) in a study that examined the contribution that the visual aspects of speech make to intelligibility. They demonstrated that "under severe noise conditions, subjects who were not formally trained in lipreading performed remarkably better when auditory cues were reinforced by visual cues."

Neely (1956) attempted to further quantify the effects of visual cues on speech intelligibility of noramal hearing persons. He found that the addition of visual cues had increased the speech intelligibility of speech by 20%.

In three of the studies by O'Neill (1961), Sumby and Pollack (1954) and Neely (1956), the variation

in the amount of information was available in the auditory channel was achieved through manipulation of the signal-to-noise ratio. But Goodrich (1967) in a study of the relative contribution made by the visual and auditory components of speech to speech Intelligibility, manipulated the amount of information in the auditory channel by subjecting the speech material to four conditions of frequency distortion. Using phonetically balanced word lisa* drawn from the CID Auditory test W-22, she presented normal hearing subjects with the test items under the three conditions of vision, audition and vision and audition together. Comparisons were made of the scores obtained under these three conditions for four conditions of frequency filtering. The filtered conditions were :

1. A wide bandwidth passing frequencies from 100-3000Hz.

3. A low-pass filter passing only frequencies below 500Hz.

3. A high-pass filter passing only frequencies above 200Hz.

4. A 15,000 cycle bandwidth passing frequencies between 500 and 2000Hz.

The results indicated that the Node of presentation (audition, vision, audition and vision combined), the filter frequency bandwidth, and the interaction of the mode of presentation and the frequency filter bandwidth all affected the subjects' discrimination of the speech sample. It was found that, by audition only, speech discrimination was most seriously affected by the low pass filter. Both the 1500Hz bandpass and the hig pass filter reduced auditory discrimination performance, but not to any serious extent. The effect of the bimodal presentation was to increase the discrimination performance for all frequency conditions. The increase was greatest for the low-pass condition, which produced the greatest reduction of information in the auditory channel.

In his studies on normal children, Gaeth(1967) used the method of paired-associate models, requiring the individual to respond with the second of a pair of stimull when presented with the first. Six to ten paired items were used. These consisted of simple words, nonsense trigrams, nonsense drawings and novel noises.

The presentation was made auditorily, visually, or audio-visually with the criterion for learning being either the number of trials taken to reach a certain level of performance, or the number of correct responses obtained for a specified number of trials. In addition to controlling the method of presentation the method of learning and practicing was also controlled, providing a total of nine different conditions represented by nine groups of children.

Gaeth provided the learning curves for 90 fourth grade normal children divided into three equal groups. The three groups learned by the three methods of presentation. The results showed that no difference occurred in the learning curves, regardless of the methods of presentation. The combined auditory-visual presentation was not superior to that achieved by either of the unimodal presentations.

Using large numbers of children with normal hearing, Gaeth also conducted experiments using three

syllable nouns, nonsense syllables and a set of non-verbal, non-meaningful visual symbols. From the results that he obtained in his experiment, he concluded:

1. The combined auditory-visual presentation of simple words, pronounceable nonsense syllables, or nonmeaningful symbols and noises does not result in improvement of performance over single modality presentations.

3. When there is a difference in performance between the auditory and visual method of presentation, the combined presentation is never better than the better of the two unimodal presentations, although it may occasionally be slightly poorer but usually not significantly so.

3. When the different materials are presented via the auditory and visual channels, the performance with the combined presentation tends to be between the two

> individual performances when they are aignificantly different, or to approximate the better conditions when the two unimodal conditions do not deviate markedly.

Pollack (1971) stated that such results as these cannot be passed over lightly, for they seem to stand in contradiction to the whole basis of our approach to auditory-visual training. Certain factors need to be considered when examining these results. (1) The bulk of the data presented waa obtained from normal hearing children, although a small sample testing of hearing-impaired children indicates the same learning behaviour. (2) The performance on the tasks presented did not involve the attributing of meaning to the stimulus complexes but specifically measured learning on the identification of a missing paired associate.

In his paper, Gaeth briefly directed his comments to the benefit that individuals have been shown to derive from bimodal presentation by suggesting that

the improvement in such situations results, not from the "integration of simultaneous bimodal presentation, but from the integration of rapidly alternating unimodal stimulation." He also suggested in another part of the paper, that perhaps the bimodal presentations may be critical in situations in which the young hard-of-hearing or normal child encounter* new words or new concepts.

Sandera(1971) quoted that "the challenging ideas that Gaeth data provide still await careful examination and further testing by those concerned with the education of the hearing impaired child. They constitute the kind of challenge that should keep us aware of how little we still understand about either the communication or learning processes of the hearing impaired subject. They should stimulate us to conduct more of such experimental studies, breadening the avenues of investigation thereby atributing meaning through a unisensory versus a multisensory approach."

Audition plus touch:

Much less work has been done on the use of touch to supplement residual hearing, vision or both (ling,1976.

"The study of the value of bimodal presentation of information to deaf subjects has not been confined to a combination of the visual and auditory channels" (Sanders, 1971).

Ling (1976) quoted that "well designed studies of the use of touch as a supplement to residual audition have not yet been reported." Further he reported that "research in the field has been mainly concerned with tactile sensation as a means of augumenting speech reading." Nevertheless, the amplification systems which incorporate a vibratory output (Schulte, 1972) are currently used in many schools for the deaf."

Pickett (1963) reported experiments involving the encoding of speech information into vibro-tactile information to provide an information source complemental to the visual and the auditory channel. He designed an instrument known as a "vocoder" to transpose the frequency vibrations of the spoken message signal into an equivalent vibratory signal. The signal is received by the student through the finger tips. Using the vocoder with deaf children, he compared the

discrimination of speech sounds through the tactile sense with discrimination of the same sounds through vision. He then compared scores obtained under the bimodal condition of touch and vision with those obtained through vision alone. It was demonstrated that sufficient information can be presented by vibro-tactile means to permit speech discrimination. Further, it was shown that better discrimnition can be obtained for some speech sounds using vibro-tactile information than can be obtained through visual information.

Comparison of hearing and touch with respect to temporal gap detection have been made by Boothroyd (1973), and potential problems in using vibratory signals in classroom communication have been indicated in observations made by Erber and Zeiser (1974). Their work confirmed that ambient noise tends to distort the temporal patterning of the teacher's speech.

Ling (1976) reported that multlsensory speech reception rarely reflects the range of those conditions encountered in everyday life. He also suggested that

until more research is carried out on multisensory approach, we can but hazard an informed guess as to the effects of our teaching procedures; for multi-modal presentation poses many unanswered questions. for eg.

1. If either vision or touch supplements residual audition in certain ways, can they detract from the use of audition in others?
2. What is the exact nature of the cues that touch can add to audition, to visioh, or to both?
3. Are the cues that one sense modality, or does some form of sensory inhibition or enhancement operate to reduce or to radically change them?
4. If we find that the simultaneous use of two modalities enhances phoneme reception in nonsense syllables or words, can we assume that similar enhancement will occur in running speech?

5. The characteristics of short tern memory associated with each of the three input modalities are known to differ: What effects do such differences cause in multimodal presentation?

6. We know that hearing impaired children have difficulty in generalizing from skills acquired thraugh training on specific tasks: Does the use of simultaneous use of two or three modalities in teaching encourage the child to adopt strategies for the perception and memory of speech that are inappropriate to, and detract from, performance in communication situations when the same number of modalities cannot be used?

7. Does the use of a visual phonetic symbolization system provide the child with a frame of reference that truly assists in speech perception at a phonetic level, and if so, does such a frame of reference assist or inhibit speech reception at a word, sentence, or supra segmental level?

8. Does the concurrent use of signs detract from speech reception?

In conclusion, Ling (1976) suggested that "there are more such questions that ane might ask and none of the answers is available at the present time".

In the multisensory approach to teaching the deaf different types of visual media are included. Simple visual cues provided by objects such as a piece of paper, a flame, a fragment of cotton, or anything else which moves in response to breath stream may be useful in teaching speech to the deaf child."(Ling,1976).

Bartlett (1949) discussed the importance of using visual aids such as flash cards, filmstrips and slides for the development of attention span. He felt that such training would increase the child's attention span as well as his ability to observe essentials and ideas.

Wooley (1949) discussed the use of the tachistoscope in teaching lipreading. He stated that " by use of the tachistoscope as a visual aid, we hope to widen

the students' span of vision, increase his quickness and accuracy of the observation, and enlarge his "unitary see-ing."

O'Neill and Oyer (1961) recommended silent motion picture films in visual training programmes. They also gave importance to television viewing.

Risberg (1968) emphasized the usefulness of visual displays of speech elements in the phase of speech training, where it is important to describe and define the task. Further he suggested that a very simple and inexpensive display can be provided by meters like 'S' indicator, fricative indicator, intonation indicator, rhythm indicator, nasalization indicator and so on. According to him, these displays give direct feedback of articulatory movements and are useful to describe the task to the deaf.

The history of visual speech displays goes back to many years to A.G. Bell. Today, visual displays of speech patterns are still considered primarily as aids to speech teaching or speech correction.

Complex visual aids like vocoder, visible speech translator, cathode ray tubas and oscillographic displays do find their place in speech teaching. These devices transform the acoustic or articulatory pattern* of the speech so that they become visible. (Ling, 1976).

Of all the forms of visual feedback, the most obvious form is that provided by a mirror. Mirrors have held a traditional role in speech training for hearing impaired children.

References to the use of a mirror are found in most major textbooks that deal with teaching speech to hearing impaired children. There seeps to be a general consensus among educators of hearing impaired children that mirrors are a valuable adjunct to speech training and development.

The use of a mirror in speech training can be traced back to a few centuries. Amman (1687) stated his belief that the muteness accompanying deafness is caused by the deafness. He extensively used mirror practice for teaching both speech and lipreading.

Nitchie (1912) recommended Mirror practice for eye training. Be11 (1916) considered that "familiarity with speech through the use of a mirror leads to a perception of muscular feeling of the positions assumed by the vocal organs".

Practice before a mirror as an aid to speech reading developed as a byproduct of teaching articulation to hearing impaired children.

Nemoy and Davis (1954) suggested that "the mirror might be used as a tool in correction to study the position of the tongue." Berry and Eisenson (1956) suggested that " a mirror be used to create an image of how the sound looks."

Harris (1950), while suggesting outlines for language sessions emphasized that a mirror and a hearing aid be used to familiarize the child with consonants /p/, /b/ & /m/ in words beginning with these consonants and in words presented as concepts.

Berry and Bisenson (1956) were of the opinion that " a mirror reveals many exterior things about the individual,

but it also gives clues, through behaviour, gestures and the like - to the thinking of the persons" They also asserted that "clues to the unhealthy evaluation of the self are revealed - with these clues as a guide, the student seeks insight into his behaviour." Thus, they have suggested that "if phonetic placement method is used as a procedure, diagrams,, mirrors and direct imitation of the therapist are useful."

O'Neill and Oyer (1961) emphasized "home assignments consisting of mirror practice, or the presentation of practice materials by a friend or member of the family." They suggested that in an ideal situation, mirror practice can serve two purposes.

1. It can make the subject conscious of individual lip movement (analytical appreach), and,

2. it can give an opportunity for practice with lip movements as they appear in everyday conversation.

According to Black (1964), a speech room would not be a speech room without a mirror. He suggested

that the mirror may be of any size or shape. He re-Harked that some like the mirror fastened to the wall; others like it mounted in a movable frame within a bulletin board or chalk board on the back. Further, he concluded that "in addition to the large mirror, pocket size mirrors and one of the magnifying type can all be used."

Park (1970) suggested that "by using the mirror, an additional medium, children will obtain greater feedback in their attempts at pronouncing and understanding words. He also emphasized that "it enables the child to watch his teacher's mouth movements, and at the same time, See if he is making the same movements." Therefore, he concluded that "it provides the reinforcemant for the correct mouth movements."

Butt et al (1970) emphasized that "if the baby is given visual feedback to replace the lost auditory feedback, he will actually increase his sound making activities." Further they suggested that "if this is true, a mirror hung on the baby's crib would encourage babbling and provide visual feedback." But they also

Warned that "this visual feedback does not diminish the importance of acoustic stimulation and amplification for deaf children."

Sanders (l971) emphasized the use of mirror practice to visual communication training. He suggested that "with the mirror practice, the child not only can see the way in which he produces certain sounds, but also can become aware of the motor-kinesthetic sensations occuring as he prodaoea them."

Further references to the use of a mirror discuss its relationship to language development (Streng, et al 1958; Stark, 1972; Rees, 1975; and Tidwell, 1976), auditory training (Dassen, 1966) and speech reading (Nitchie, 1912; Bruhn, 1915; Deland, 1931; Jefferw and barley, 1971; and Berger, 1972).

Although the mirror has been frequently recommended as an aid to correction of speech, not all. are in agreement as to the precise role and function of the mirror as a visual feedback.

Haycock (1933) strongly counselled that "the mirror should not be used except in the correction of

faults or in tine of difficults." and warned against Baking a necessity of it. Further he emphasized that "when the mirror is being used, the light should always fall upon it." In this way, the light will be thrown back into the child's mouth and his reflection in the mirror will show the inside of his mouth made visible." In this connection, he suggested that "the teacher 9hould sit or stand with a good light falling on his face, and the pupil with his back to the light."

Piaget (1951) reported that, "without using a mirror, children are capable of deliberate vocal feedback and of visual imitation by the second month of life." On the basis of his observation, he noted that "by about one year of age, children would observe their own images and their own gestures in a mirror in much the same way as they would attend to those of a model."

Swing and Ewing (1964) made no mention of mirrors even when discussing the necessity of a multisenaory approach to speech training. They

considered that "manner and place of cues could be more effectively signalled visually by flicking techniques in whioh configuration of the hands and movement of the fingers replicate the actions of the jaw, tongue and lips."

Even though Guillaume (1971) suggested that children learn what their bodily and facial expressions look like by seeing themselves in a mirror, thus facilitating imitation of facial expressions, posture and perfect self-awareness, he pointed out that "even children who have never seen themselves in a mirror engage in imitation and know themselves to be similar to other human beings."

Ling (1976) reported that he rarely found it necessary to use a mirror. Inaccord with Guillaume (1971), he said that "children could imitate visible speech organ gestures without seeing themselves to do so." Furthermore, he pointed out that "such gestures that are visible do little to indicate what specific characteristics differentiate manner of consonant production." Therefore, ha questioned the value of using a mirror.

Pflaster(1979) reported that ha knew of no studies concerned with the imitation of speech using mirrors. Thus

he attempted to determine the value of uaing a mirror, for speech training. He analysed the data derived from manner, place, and voicing and blend errors produced by 27 hearing impaired children, while imitating CV syllables under 3 conditions - (1) Audition alone, (2) Audition plus direct vision and (3) Audition plus vision using a mirror. Further he tried to determine :

1. whether the use of a mirror enhanced or detracted from the accuracy of their responses relative to the other two conditions?

2. whether different types of errors were made under any of the conditions, and

3. whether error types under each condition were related to age and hearing level.

Pflaster (1979) found that although more place errors occurred under the auditory condition, the difference between the number of errors made under the two auditory-visual conditions was not significant. Therefore, he concluded that "the use of a mirror neither enhanced nor detracted from the accuracy of responses" of the subjects. Thus, he cast doubt upon the value of using a mirror as a general aid in speech training.

Based upon Pflaster's (1979) findings, one cannot come to a general conclusion that mirrors are of no value in speech training. There are some shortcomings in Pflaster's study.

Although the advocates of a mirror advocate ita use in speech eorrection, Pflaster used it only during the repetition of CV syllables. Further the deaf children with some previousa training in speech with the use of a mirror were included.

The diveraity of opinions regarding the use of a mirror and the findings of Pflaster (1979) demonstrated the need for the present study. The present study overcomes some of the shortcomings of Pflaster's(1979) study.

oOo

CHAPTER III

METHODOLOGY

The present study based upon Pilaster's (1979) study was designed to determine the value of using a mirror in Speech training. The study was carried out on 15 normal subjects, under three different conditions, namely :

1. Audition alone,
2. Audition plus direct vision, and
3. Audition plus vision using a Mirror.

The performance of the subjects in terms of trials required to master the speech stimuli were compared under these three conditions. Thus an attempt was made to study the role of a mirror in Speech training.

Subjects:

The study included 15 normal school going children, ranging in age between 5 years and 12 years. Both boys and girls were included. The children were selected only when they met the following criteria ;

1. Should be free from Speech and Hearing problems,
2. Should have normal or average intelligence,
3. Should not be aware of Manipuri language.

The first criterion was met by assessing the children for speech and hearing problems. By engaging the children in conversation with the tester, speech problems were ruled out. Only those children without any speech problems were selected for the study. All the children were screened for hearing at 20 - 25 dB HL at all the test frequencies (250 Hz-8 KHz) in both the ears.

The second criterion was met by assessing the intelligence of the children on Seguin Fora Board(S.F.B.). Only those children with average or above average I.Q.'s were selected.

The third criterion was met by selecting those children with native languages other than Manipuri, like Kannada, English, Hindi, Telugu, Tamil, Malayalam and Konkani.

The fifteen subjects were divided into three subgroups, each subgroup consisting of five subjects for the random presentation of the three experimental conditions.

Test Room:

ThE study was conducted in a distraction free room. One of the therapy rooms was selected with arrangements similar to those encountered in a typical speech training session. A mirror kept leaning again3t the wall was used only during the third condition i.e., Audition plus vision using a mirror (AVM).

Instruments:

The following instruments were used in the study:

1. A pair of earmuffs (No. 322/G 110) to stimulate hearing loss. The earmuffs provided an attenuation of 20 dB for speech.
2. A mirror measuring 2ft x lift (60 cms x. 45 cms), placed approximately 1 ft. (30 cms) away from the subjects, was used in the third condition. The mirror was kept leaning against the wall.

Test materials:

She speech materials for the study were chosen from an unknown language, Manipurl, in which tonal quality

is a characteristic feature. This particular language was selected to overcome the familiarity with known languages.

Manipuri, also called Meithei, i* a language belonging to the Kuku-chin group of Tibeto-Chinese sub-family. It has harrowed extensively over the centuries from the neighbouring languages, namely Indo-Aryan languages, due to geographical, historical and cultural reasons.

The speech material consisted of fifteen words including both monosyllabic and disyllabic words. The words selected had either the raising, falling or level types of tones. These words were randomly selected from a Manipuri Phonetic Reader and were randomly grouped into three equivalent lists of five words each. The speech mate, rial comprised of four raising, five falling and six level types of tonal words. It included : -

1. three blends of initial consonants, dr, kl and bl.
2. three aspirated words of Initial consonants K^h, p^h and g^h.

3. three words formed by the combination of initial, voiceless, unasplrated alveolar step /t/ with vowels /i/, /a/ and /o/, and consonants /n/ and /p/.
4. Three words formed by the combination of initial, voiced, lateral /I/ with vowels /a/ and /o/ and consonant /k/.
5. three words formed by the combination of initial vowel /i/ with consonants /p/, /b/ and /m/.

The consonant phonemes differed in two voicing dimensions (voiced and unvoiced); two manner dimensions (plosive and lateral); and two place dimensions (alveolar and velar). The vowel phonemes differed in the length of the duration (short and long).

The following were the words used in the study:

1.	Ì:ba	(to write, writing)
3.	imà:	(mother)
3.	ipá:	(father)
4.	Khá	(south)
5.	Phi	(fee)

6.	g^hi	(refined butter)
7.	dram	(drum)
8.	ble:t	(blade)
9.	Klip	(clip)
10.	tàn	(bread)
11.	tÌn	(insect)
12.	to:p	(gun)
13.	làk	(mode)
14.	lo:k	(phlegm, cough)
15.	laká:	(heart)

These fifteen words were randomly grouped Into three lists of five words each, and each list contained all the features mentioned. These three lists of words were used for the three different conditions.

Testers:

A native speaker of Manipuri language (a student of Speech and Hearing)at All India Institute of Speech and Hearing served as the main tester. Another person, a non Manipuri speaker served as an additional tester. The main tester presented the speech stimuli

to the subjects and also noted down their responses; in terms of number of trials taken to master the stimuli. The other tester was mainly included to give instructions to the subjects and also to note down their responsesa in terms of trials required. This tester sat behind the main tester and the subject throughout the three conditions.

Procedure:

Before conducting the actual study, the attenuation provided by the earmuffs was arrived at on three adult normal subjects under free field condition. The subjects were tested individually. The speech stimuli in the form of words to repeat and questions to answer were presented to each subject and the levels at which they did not respond were noted down. later with earmuffs on, the levels at which they did not respond the speech stimuli were noted down. The difference in the two levels was taken as the attenuation. For the first and third subjects, the attenuation was arrived at by presenting the speech stimuli first without earmuffs and later with earmuffs. This procedure was reverted for the second subject where the attenuation was found out by presenting the speech stimuli first with earmuffs on and later without them.

The average of the three subjects' attenuation was found to be 20 dB. After knowing this attenuation level, the actual study was conducted under three different conditions.

a. Audition along (A),
b. Audition plus Direct Vision (AV),
e. Audition plus Vision using a mirror (AVM).

Testing under three conditions were separated by an interval of 5 minutes. The order of presentation of the conditions was completely randomized. The fifteen aubjects were grouped into three subgroups (a), (b), and (e) of five subjects each.

Subjects belonging to subgroup (a) received the three conditions in the order of A, AV and AVM. Subjects belonging to the subgroup (b) received the three conditions in the order of AV, AVM, And A. The subjects in the subgroup (c) received the three conditions in the order of AVM, A and AV. The table (1) below shows the order of

presentations:

Subgroup (a)	A	AV	ATM
Subgroup (b)	AV	AVM	A
Subgroup (c)	AVM	A	AV

Further,the order in which the fifteen words were presented in the three word lists was also randomized, in such a way that no single word appeared twice in the same order.

Each subject was tested individually under the three conditions. The subject sat beside the maintester and the other tester gave the instructions depending upon the condition used first. The instructions were given before placing the earmuffs on the subjects.

1) <u>Audition above condition</u> (A)

In this condition, each subject sat by the side of the Main tester and the following instructions were given by the Second tested

" Now, I will be placing these earmuffs (showing them) on your ears. With these, you will not be able to hear the words clearly. What you have to do is, to close

your eyes and repeat the words presented by the tester (by pointing to the main tester). Don't open your eyes until I ask you to "open."

"ನೋಡು, ಈಗ ನಾನು ನಿನಗೆ ಇದನ್ನು (ಕಿವಿಗೆ ಹಾಕುವುದನ್ನು ತೋರಿಸುತ್ತಾ) ಕಿವಿಗೆ ಹಾಕ್ತೀನಿ. ಇದನ್ನು ಹಾಕಿಕೊಂಡಾಗ, ನಿನಗೆ ಪದಗಳು ಸ್ಪಷ್ಟವಾಗಿ, ದಿನಾಗಿ ಕೇಳಿಸುವುದಿಲ್ಲ. ನೀನು ಏನು ಮಾಡಬೇಕು ಅಂದ್ರೆ, ಕಣ್ಣು ಮುಚ್ಕೊಂಡು, ಇವರು (ಮೊದಲನೆಯವ ಟೆಸ್ಟರನ್ನು ತೋರಿಸುತ್ತಾ) ಏನು ಹೇಳುತ್ತಾರೋ ಅದನ್ನು ಮತ್ತೆ ಹೇಳಬೇಕು. ನಾನು ಹೇಳುವ ತನಕ ನೀನು ಕಣ್ಣು ಬಿಡಬಾರದು."

With these instructions, the five test words were presented by live voice (as scheduled previously) by the main tester, and trials taken to repeat the words correctly were noted down by both the testers. Two consecutive correct repetitiona of a word was considered to indicate that the word was mastered. In this way, a11 the five words were presented and the number of trials required to master each word were noted down by both the testers. Great care was taken by the main tester to present the test words in a normal conversational level and exaggeration of the articulators was avoided or limited. Whenever the subject made a mistake, the main tester stopped pre-

senting the words and said 'No' and continued present-Ing it after a few seconds.

2. Audition plus direct vision condition (AV):

In this condition, the subject and the main tester were facing each other at a distance of 11/2 ft. (approximately). The second tester gave the following instructions:

"Now with these earmuffs on your ears, you should look directly at the tester (Showing her) and correctly repeat the words of the tester as you hear and see them."

With these instructiona, the main tester presented the test words by live voice and the number

of trials taken to master the words were noted down by both the testers. Whenever there was an error in a particular word, the main tester said 'No' and the presentation of that word was continued until there waa mastory of that particular word.

3. Audition plus vision using a Mirror Condition (AVM)

In this condition, a airror vas introduced. It waa placed on a table and vaa leaning againat the wall. The Mirror vaa placed at a distance of 1 ft. from both the subject and the main tester. The subject and the main tester looked directly into the mirror. The subject repeated the words of the main tester as heard and seen through the mirror. The second tester gave the instructions similar to the ones used in above AV condition, but with appropriate changesa.

"Now, you should look at the tester (showing the tester) through this mirror. You should observe the tester presenting the words and then repeat them as heard and seen through this mirror."

The test procedure was the same as in the other two conditions.

In this way, all the 15 subjects were tested individually, under the three different conditions. After each condition was over, earmuffs were removed and 5 minutes rest was given to the subjects.

Judgement and Scoring of Responses

The scoring of responses in terms of trials required to master the words under each conditions were done by both the testers separately. The average of the two testers' scores was considered the correct number of trials for a particular subject.

Statistical Analysis

1. To test for significance of differences between means of three conditions, one way analysis of variance was done.
2. When the above analysis of variance indicated Significant differences between means of three conditions, 't' value was computed to test which of the three means differed significantly.

3. The significant differences between Means of girls and boys was also computed and later compared.

000

CHAPTER IV

RESULTS AND DISCUSSION

In the present study, the role played by a mirror in speech training was studied on fifteen normal subjects (with simulated hearing loss) under three different conditions:

1. Audition alone

2. Audition plus direct vision

3. Audition plus vision using a mirror.

The subjects' performances in terms of trials required for mastery of fifteen words under the three conditions provided the raw data for the study.

To the raw data, descriptive statistics in the form of Mean and S.D. were applied. Tb test for the significance of differences between the means of three different conditions, 'F' ratio was computed. Tb test which of the three means differed, 't' value was computed. The values obtained for 'P' and 't' were tested for their significance at 0.05 and 0.01 levels.

Results:

I. Differences between means of three conditions:

Table (2) shows the total number of trials, Mean

TABLE 2 - showing the total number of trials taken to master the speech stimuli under A, AV and AVN Conditions.

Subjects No.	Audition Alone	Audition + vision	Audition + vision through mirror
1	39	23	28
2	31	22	20
3	34	20	21
4	48	26	23
5	60	29	36
6	48	30	24
7	48	44	39
8	40	35	37
9	45	34	25
10	41	34	25
11	31	20	24
12	44	88	86
13	26	18	28
14	37	19	88
15	49	32	34
Total	621	398	412
Mean	41.4	26.53	27.47
S.D.	8.82	7.35	6.13

and S.D. of fifteen subjects under the three different conditions.

The mean of the group as a whole under Audition alone condition was 41.4 with S.D. of 8.82. The mean under Audition plus direct condition was 26.53 with S.D. of 7.35. In the third condition, i.e. Audition plus vision using a mirror mean was 27.47 and S.D. was 6.13.

These scores indicated that there were more number of trials under Audition condition. S.D. value was also greater in this condition indicating that the variability among subjects was greater.

The two mean values obtaied under the two auditory-visual conditions differed very little, by only 0.94. There was not much of a difference in terms of variability among subjects under these two auditory-visual conditions. The difference was 0.91.

One-way Analysis of variance between the three conditions Indicated an 'F' value of 4.39. This '?' value was significant at 0.05 level. Thus there were significant

differences between the means of three conditions.

Further to find out which of the three means differed in conditions, 't' values were computed. These 't' values indicated that there were significant differences between the audition alone condition and audition plus direct vision condition. Between these two conditions 't' value was found to be 7.59 indicating significance at 0.01 level. Similarly, the difference between audition Alone condition and audition plus vision using a mirror condition was found to be significant at the 0.01 level, 't' was 7.53. However, there was no significant difference between the means of the two- auditory-visual conditions, 't' was 0.83 indicating non-significance at 0.05 level.

Table (3) shows the 't' values obtained under the three different conditions.

II. Differences between means of threa different conditions with respect to sex:

There was seven boys and eight girls in the study. The performance of both the boys and girls under the three conditions are shown separately in Table (4) and Table (6).

TABLE 3 - showing the 't' values og the group when the three different conditions were compared for their significance.

Conditions	't'	Significant at
A and AV	7.59	0.05 & 0.01
AV and AVM	0.83	Not significant
AVM and A	7.53	0.05 & 0.01

TABLE 4 - showing the performance of the boys under A, AV and AVM conditions.

Subject No.	Audition alone	Audition + vision	Audition + vision through mirror
1	31	22	20
2	60	29	36
3	48	44	39
4	40	36	37
5	44	22	26
$	48	30	24
7	31	20	24
Total	302	202	206
Mean	43.14	28.86	29.43
S.D.	10.30	8.57	7.66

The results of the boys under the three different conditions revealed that the mean was greater under the Audition condition (43.14). The Variability among the boys under this condition was more (10.30).

Under Audition plus direct vision condition, the mean was 28.36 with S.D. of 8.57. There was not much of a difference between these mean and S.D. Values and/in those the third condition i.e. condition with Audition plus vision using a Mirror, Mean and S.D. values in the third condition were 29.43 and 7.66 respectively. Thus there was not much of a difference between these two auditory-visual conditions,

Table (5) shows the 't' values in boys for three different conditions.

On testing the significant differences between means of the three different conditions in boys, it was found that there were significant differences between audition alone condition and audition plus direct vision condition, 't' was 3.71. Similarly there were significant differences between audition alone condition

TABLE 5 - showing the 't' values in boys when three different conditions were compared for their significance.

* * * *

Conditions	't'	Significant at
A and AV	3.71	0.05 and 0.01
AV and AVM	0.57	Not insignificant
AVM and A	4.35	0.05 and 0.01

and the audition plua vision using a mirror condition, 't' was 4.35. However, there was no significant difference between the two auditory-visual conditions 't' was 0.57.

Table (6) shows the performance of the eight girls under the three different conditions.

Results of the girls indicated that the mean under the Audition condition was 39.83 with S.D. of 7.68. The mean values under the two auditory-visual conditions were 24.50 and 25.50 respectively; showing not much of a* difference between the two conditions. The S.D. values under the two auditory-visual conditions were 5.90 and 4.20. The variability among girls was greater under Audition condition and was smaller under the condition using a mirror.

(Table (7) shows the 't' values in girls for the three different conditions.

There were significant differences between two auditory-visual conditions and the audition alone condition.

Table TABLE 6 - showing the performance of the girls under A, AV and AVM conditions.

Subject Wo.	Addition alone	Audition + Vision	Audition + vision through mirror
1	34	20	21
2	49	32	34
3	39	23	28
4	48	26	23
5	45	24	25
6	26	13	22
7	41	34	35
8	37	19	28
Total	319	196	206
Mean	39.88	24.50	25.75
S.D.	7.68	5.90	4.20

TABLE 7 - showing the 't' values in girls when three different conditions were compared for their significance.

conditions	't'	Significant levels
A and AV	7.93	0.05 and 0.01
AVand AVM	0.78	Not insignificant
AVM and A	6.14	0.05 and 0.01

The 't' value between A and AV condition was 7.93, significant at the 0.01 level. Similarly, 't' value between A and AVM was 6.14, which was significant at the 0.01 level. But the 't' value between AV and AVM conditions was found to be nonsignificant, with a 't' value of 0.78.

Table (8) shows the 't' values when the sexes were compared for the three different conditions.

It was found that under Audition alone condition, there was no significant difference between the sexes, 't' was 1.34 indicating no significance at 0.01 level.

Under Audition plus direct vision condition, the comparison revealed that there was significant difference between the two means, 't' was 2.2, significant at the 0.05 level.

Under Audition plus Vision using a mirror condition, the comparison revealed a significant difference between the two means at the 0.05 level, 't' was 2.26.

TABLE 8 - showing the 't' values when both sexes were compared for similar conditions.

conditions	't' values	Significance
A_G & A_B	1.34	Not significant
AV_G & AV_B	2.22	0.05
AVM_G & AVM_B	2.26	0.05

Mote: A_G - Audition condition in girls

A_B - Audition condition in boys

AV_B - Audition plus direct vision in boys

AV_G - Audition plus direct vision in girls

AVM_B - Audition plus direct/vision using a mirror conditon in boys.

AVM_G - Audition plus direct vision using a mirror condition in girls.

III. Relation between the number of trial3 with respect to the ace of the subjects.

The study included 15 normal children ranging in age between 5 years and 12 years. But these number of children differed from group to group.

Table (9) shows the relation between the number of trials with respect to the age levels.

The results showed that there was a tendency for the number of trials to decrease with inereasing age levels.

Between the ages of 5 and 6 years, the total number of trials required for mastery of all the fifteen words were 125-*131. At the age of 7 years, there was reduction in the number of trials to 90-115. However at the age level of 8 years, there was one exception to the group finding, where the subject scored the least (66) of all the subjects. Between the ages of 9 and 10 years, there was not much of a difference. The number of trials were maintained to 92-100. Finally, at the age of 11 years, there was further reduction in the number of trials to 75 and 84.

TABLE 9 - showing the total number of trials taken by the children under different age levels.

Subject's age	No. of subjects	Total number of trials
5 years	3	73, 75, 125
6 years	1	131
7 years	5	90, 94, 97, 112, 115
8 years	1	66
9 years	1	100
10 years	2	92, 102
11 years	a	75, 84

Although there was a tendency towards decreasing number of trials with increasing age levels there were three exceptions, to this general finding. Two 5 year old subjects scored 73 and 75 trials and one 8 year old subject scored the least (66) of all the subjects.

Reliability of the two testers;

There was fairly good agreement between the scoring of two testers Independently. The correlation was 0.85.

Discussion:

The results of the present study provided evidence pertaining to the three research questions.

As there was no significant difference between the means of the two visual conditions, one employing direct vision and the other using a mirror, the finding cast a doubt upon the usefulness of a mirror in speech training. This finding is in support of Pflaster(l979) who also found similar results on a group of deaf children.

Thus, the hypothesis (1) statingthat there will be no difference between the two auditory-visual conditions was accepted.

The two auditory -visual conditions were found to be superior to the audition alone condition. The children required significantly more number of trials to master the words under Audition Condition than in the other two auditory-visual condition*.

Thus, the hypothesis (2) stating that there will be no difference between the two auditory - visual conditions and the audition alone condition was rejected.

The better results obtained under the two auditory-visual conditions are in agreement with many of the studies dealing with audio-visual methods of speech training (Hudgins, 1951; Sumby and Pollack, 1954 ; O'Neill, 1934; Sanders, 1961; Berger, 1973; Erber, 1975; Binnie and Mentagomery, 1976).

Regarding sex differences between the three different conditions of the study, it was found that there was no

significant difference between the means of boys and girls under audition alone condition. However,, there were significant differences between means of boys and girls under the two auditory-visual conditions.

Thus, the hypothesis (3) stating that there will be no sex difference between the three Conditions was partly accepted for audition alone condition and rejected for the two auditory-visual conditions.

The hypothesis (4) stating that there will be no reduction in the number of trials with increasing ages was rejected. It was observed that children at younger age group of 5-6 years required more number of trials when compared to older age group of 10 and 11 years. Even though there was reduction in the number of trials with increasing age levels, there were three exceptions to this group finding. Two five year old subjects scored very less whan compared to their peers. Further, one 8 year old subject scored the least of all the subjects.

It was observed that most of the children in the study were distracted by the introduction of mirror,

There was not much of a difference between the two visual conditions. This finding casts doubt upon the value of using a mirror as a general aid in speech training.

From the study it can be implied that in speech training, the use of mirrors have limited value. They may not provide any more clues than a condition which provides a combination of audition and direct vision. Thus, the mirror is not useful in eliciting desired words.

The tasks in the present study were identification and repetition of speech stimuli rather than discrimination. Taking Pflaster's(1979) view, "a closed set of discrimination task would be more sensitive and more appropriate, because it relates more closely to a typical speech teaching situation - one in which small sets of sounds are evoked, compared and contrasted," we can expect different results from discrimination tasks. But Pflaster(1979) suggested that this discrimination task would take many more trials under each conditions.

Failure to demonstrate significant differences between the two visual conditions in this study does not imply that such differences would not have been found in studies employing different types of subjects, or different types of speech tasks, quite different results might be expected from adult subjects with hearing impaired, children with aisarticulation problems but no hearing impairment.

It is also possible that deaf children of similar age who have had less auditory training might perform better under the AVM condition (if it actually provides more useful cues than direct vision), because they would rely more heavily on visual information. Conversely, the deaf children who have had more auditory training or more residual hearing might perform poorly under auditory plus vision using a mirror condition because the mirror could divert their attention from the auditory pattern.

These speculations serve to emphasize the need for further research.

000

_C_H_A_P_T_E_R_ _V_

SUMMARY AND CONCLUSION

There have not been many studies regarding the use of a mirror in speech training. A recent study by Pflaster (1979) relating to the use of a mirror in deaf children cast doubt upon its usefulness in speech training.

The diversity in the opinions and recommendations of many advocates to the use of mirror demonstrated the need for the present study. Further, as there were some shortcomings in the Pflaater's (1979) study, an attempt was made to overcome some of them.,

Based on Pilaster's (1979) study, the present study was conducted on fifteen normal children with simulated hearing loss under three different conditions!

1+ Audition alone (A)
2. Audition plus direct vision (AV)
3. Audition plus vision using a mirror(AVM)

To overcome the effect of mirror practice in the deaf children, the study was mainly conducted on normal

children with simulated hearing loss (simulated by the use of earmuffs). The ear muffs provided an attenuation of 20 dB for speech.

Also to overcome the familiarity of the known languages, an unknown language, Manipuri, was selected. Fifteen words were selected from this unknown language and were randomly grouped into three lists of five words each for the three different experimental conditions.

The fifteen words contained different features of Manipuri language including tonal differences.

The study was conducted under the three experimental conditions, by presentation of speech stimuli by live voice. A native speaker of Manipuri served as the main tester. She noted down the childrens' responses in terms of trials required for mastery of test words under each of the conditions. Two consecutive correct repetitions of a word was considered to indicate that the particular word was mastered. Another tester, a non-Manipuri speaker, having some training in

Manipuri language vas included in the study to give instructions to the children,and also to note down their responses in terms of trials required for mastery of words. The average of these two testers' trials were considered as the scores for the study.

The presentation of the test words and also the order of the three conditions were completely randomized.

The three conditions were separated by an interval of 5 minutes and all the subjects were tested individually. In the audition alone condition, subjects were asked to close their eyes and repeat the words presented by the main tester until there was mastery of the words. In the audition plus direct vision condition the subjects were asked to look at the tester directly and repeat the words of the tester. Similarly, in the audition plus vision using a mirror condition, the subjects were *sked to look at the tester and themselves in the mirror and repeat the words until there was mastery of the words.

A mirror leaning against the wall was used during the third condition, i.e. AVM. The rest of the arrangements in the three conditions were similar to those encountered in a typical speech training session.

The responses of the subjects in terns of trials required for mastery were analyzed. The results indicated that:

1. There was no significant difference between the two auditory-visual condi-tlona,and employing direct vision and the other employing a mirror.

2. There were significant differences between the two auditory-visual conditions when compared to the audition alone condition.

3. There was no sex difference under Audition alone condition. However, the sex diffe-rences were seen under the two auditory visual conditions.

4. There was a tendency for the reduction of the number of trials with increasing age levels. However, there were three excep-tions to this finding.

Thus the present study agreea with Pilaster and indicatea that the use of a mirror does not provide any more clues than a condition which provides a combination of audition and direct vision. The mirror is not useful in eliciting desired words.

Failure to demonstrate significant differences between two visual conditions does not imply that such difference may not be found in studies employing different types of subjects, or different typea of apeech tasks. Quite different results may be expected in such cases.

Recommendations for the future studies:

1. A similar study may be carried out using a large sample of subjects.
2. A similar study may be carried out by giving Instructions to the children for correction of words.
3. The study may be extended to deaf children and also to children with misarticulation problems.

4. The study involving the discrimination task may be carried put instead of just identification and repetition of the speech stimuli.

5. Further studies using varied linguistic materials like phrases, sentences may be carried out to determine the use of a mirror.

oOo

BIBLIOGRAPHY

Bell, A.Q. - The Mechanism of Speech, New York : Funk and Wagnells. 1916, as cited by Ling. D. in Speech and the Hearing Impaired Child: Theory and Practice, A.G. Bell Association for the Deaf, Inc. Volta Place, Washington D.C. (1976).

Bentzen, 0. - Hearing problems in Children - Address to membership of Colorado Hearing Society (1962), as cited by Rathna, N, in Battle of Methods in the Education of the Deaf. J.A.I.I.S.H., VOl.l, 1970,p.33-49.

Berg, F.S. - Educational Audiology: Hearing and Speech Management, Grune & Stratton, Inc. 1976.

Berry. M.F. & Bisenson, J. - Speech Disorders, New York, Appleton-Century-Crofts, (1956).

Blnnie, C.A., Jackson, P.L. & Montgomery, A.A. - Visual Intelligibility of consonants: A Lipreadlng Screening Test with Implications for Aural Rehabilitation, J. Speech. Hear. Dis. Vol.41, 1976, p.530*539.

Black M.B., - Speech Correction in the Schools. Prentice-Hall, Inc., Englewood Cliffs. H.J. 1964.

Boothroyd, A., Wickerson, R.A., & Stevens, K.N. - Temporal Patterns in the Speech of the Deaf: A Study in remedial Training. S.A.R.P. 15. Northampton, Mass., Clarke School for the Deaf, 1974 as cited by Ling, D in Speech and the Hearing Impaired Child: Theory and Practice. The Alexander Graham Bell Association for the Deaf. Inc. 3417 Volta Place, N.W. Washington, D.C. 1976.

Burklandt M. - Use of Television to Study Articulatory Problems. J.S.H.D., Vol.42, 1967, p.80-81.

Butt (Dolorer, S) & Chreist (Fred. M) - A Speech Reading Test for Young Children. Volta Review, Vol.70, 1968, p. 225-239.

Calvwrt, D.R. & Silverman, S.R. - Speech and Deafness, Washington, D.C.: A.G. Bell (1975) as cited by Pilaster. 6. in Mirror Mirror on the Wall, JSHD., Vol. 44, 1979, p.373-387.

Carhart, R. - Auditory Training, in Davis. H and Silver-Nan, S.R.(Eds) 1966 - Hearing and Deafness, New York, Holt, Rinehart and Winston (1966).

Carhart, R. - Conservation of Speech in Davis and Silverman (Eds). Hearing and Deafness, New York, Bblt, Rinehart and Winston (1966).

Clouser, R.A. - Effect of Vowel Consonant Ratio and Sentence Length on Lip Reading Ability. Amer. Ann. Deaf., Vol.121, 1976, p.513-518.

Davis, H. - Hearing & Deafness: A Guide for Laymen. Murray Hill Books, Inc., New York, Totonto (1947).

Dicarlo, L.M. - The Effect of Hearing One's Own Voice among Children with Impaired Hearing in Ewing (Ed), The Modern Educational Treatment of Deafness, Manchester, Univ. Press, 1960.

Di Carlo, L.M. - The Deaf. Englewood Cliff: Prentice-Hall. (1964), as cited by Rathna, N. - Battle of Methods in the Education of the Deaf. J. A.I.I.S.H. Vol.1, 1970, p.33-49.

Earle, J. - Acoupedics; Children's Hearing Therapy. The Denver Post-Contemporary, 1970, p.6. as cited by Niemann S.L. in Liston An Acoupedlc Program, Volta Review, Vol.74, 1972, p.85-89.

Erber, K.P. - Interaction of Audition and Vision in the Recognition of Oral Speech Stimuli.JSHR,Vol.12, 1969, p.423.

Brber, N.P. - Auditory and Audio-visual reception of Words in Low-frequency Noise by Children with Normal hearing and by Children with Impaired Hearing. JSHR, Vol.14, 1971, p.496-512.

Brber, N.P. - Visual Perception of Speech by Deaf Children: Recent Developments and Continuing Need, JSHD., Vol.39, 1974, p. 178-185.

Brber, N.P. - Visual Perception of Speech:* A Survey, in Visual and Audiovisual Perception of Speech. Ed. by Nicksen, 3.K. & Kampp, B. Sixth Danavox Symposium (1974) Denmark.

Barber, N.P. - Auditory Visual Perception of Speech. JSHD., Vol.40, 1975, p.481-92.

Brber, N.P., and Zeiser, M.L. - Classroom Observation under Conditions of Simulated Profound Deafness. Volta Review, Vol.76, 352-360, 1974.

Bwertsen, H.W. and Nielsen, B.K. - Audio-visual Speech Perception, Acta. Suppl. 263, 1970, p.229-230.

Bwertsen. H.W. and Nielson, B.K. - A Comparative Analysis of'the Audio-visual, Auditive and Visual Perception of Speech. Acta Oto. Vol.72, 1971, p.201-205.

Fairbanks, G. - Systematic Research in Experimental Phonetics: Speech as a Servo Mechanism in Journal of Speech and Hearing Disorders. Vol.19. 1954, p. 133-139. Cited by Sanders. D.A., in Aural Rehabilitation, Englewood Cliffs, Prentice-Hall, Inc. 1971.

Fisher, H.B.,- Improving Voice and Articulation. Houghton Mifflin Company, Boston (1966).

Frisina, R. - The Auditory Channel in the Education of Deaf Children. Amer. Ann. of Deaf., Vol.111, No.5, 1966, p.633.

Gaeth, J.H. - Deafness in Children. National Symposium on Deafness in Childhood. McConnell Freeman and Paul. H. Word (Bds.) Nashville, Tenn., Vanderbilt University Press, 1967.

Gammon, S.A., Smith, P.J., Daniloff, R.G. and Kim, C.W.- Artlculation and Stress/juncture production under oral anaesthetization and Masking. J. Sp.Hear.Res. Vol.14, 1971, P. 271-282.

Garrett, H.B. & Woodworth, R.S. - Statistics in Psychology and Education. Longmans, Green & Co., Inc., U.S.A. (1958).

QBLDARD, ?.A. - Vision, Audition and Beyond. Contrlb. Sens, Physiol., 24, p.498-517, 1929-30 as cited by Ling.D. in Speech and the Hearing Impaired Child! Theory and Practice. A.G. Bell Association for the Deaf., Inc., Volta Place, Washington. D.C. (1976).

Gibson, J.J. - The Senses Considered as Perceptual Systems, Boston: Houghton Mifflin, 1966. as cited by Ling. D. in Speech and the Hearing Impaired Child: Theory and Practice. A.G. Bell Association for the Deaf. Inc., Volta Place, Washington, D.C. (1976).

Goldstein, R. - The Acoustic Method. St. Louis, Laryngo-scope Press (1939) as cited by Rathna, R. in Battle of Methods in the Education of the Deaf. J. A.I.I. S.H., Vol. 1., 1970, p.33-49.

Ouillaame, P. - Imitation in Children. Chicago. Uhiv. Chicago Press, 1971. as cited by Pflazter, G. in Mirror, Mirror on the Wall.. JSHD., Vol.44, p.373-387 1979.

Harris, G.M. - Language for the Preschool Deaf Child. 2nd edn., Grune & Stratton, New York, (1950).

Hasplel, G.S. - Rationale for Ltpreading Therapy. Volta Review, Vol.67, 1965, p.684-687.

Haycock, Q.S. - The Teaching of Speech, Washington D.C. Volta Bureau (1933).

Hudgins, C.V. - Auditory Training : Its possibilities and Limitations. Volta Rev.,Vol. 56, 1959, p.339-349.

Huizlng, H.C. - Potential Hearing in Deaf Children. It* early Development and use for Auditory Communication (1959) as cited by Rathna, N. in Battle of Methods in the Education of the Deaf. J. A.I.I.S.H., Vol.1. 1970, p. 33-49.

Button, C.- Combining Auditory and Visual Stimuli in Aural Rehabilitation. Volta. Rev., Vol.61, 1959, p.316-319.

Button, C. - A Diagnostic Approach to Combined Techniques in Aural Rehabilitation. J.S.H.D., Vol.25, 1960, p.267-272.

Ling, D. - Speech and the Hearing Impaired Child : Theory and Practice. A.Q. Ball Association for the Deaf. Inc., Volta Place, Washington D.C. (1976).

Lieberth, A. and Subtelny, J.A. - The Effect of Speech Training on Auditory Phoneme Identification. Volta Rev., Vol.80, No.6, 1178. p.410-417.

Ludvigsen, C. - Auditive and Audio-visual Perception of P3 words masked with White Noise. Scand. Audlol., 2, 1973, p. 107-111.

Luterman, D.M. - Comparison of Language Skills of Hearing Impaired Children Trained in a Visual/ Oral Method and an Auditory/oral Method. Amer. Ann. Deaf. Vol.121, 1976, p.389-393.

Mac Nellage, P.P. - Speech Physiology. In J.H. Oilbert (Ed), Speech and Cortical Functioning. New York, Academic Press, 1972, as cited by Ling. D. in Speech and the Hearing Impaired Child* Theory and Practice. A.G. Bell Association for the Deaf. Inc., Volta Place. Washington* D.C. (1976).

Me Croskey, R.L. - Progress report on a Home Training Program for Deaf Infants. International Audiology, Vol.6, No.2, 1971.

Me Coraiek, 3. - Audiovisual Discrimination of Speech, Clinical Otolaryngology, Vol.4, Mo.5, 1979, P.355-362.

Montagn, A. - Touching: The Human Significance of the Skin. New York: Harper and Row, 1971. as cited by Ling. D. in Speech and the Hearing Impaired Child : Theory and Practice. The Alexander Graham Bell Association for the Deaf. Inc., 3147 Volta Place, Washington D.C., (1976).

Myklebust, H.R. - The Psychology of Deafness, New York, Grune and Stratton, 1960.

Mysak,.E.D. - Pathologies of Speech Systems. The Williams and Wilkins Company, Baltimore, Md. 1976.

Neely, K.K. - Effect of Visual Factors on the Intelligibility of Speech. Jour. Acoust. Society. Amer., Vol28, 1956. p.1275-77 as cited by Erber, N.P. in Auditory-Visual Perception of Speech : A Survey, in Scand. Aud., 1974, Suppl. 4.

Nemoy B. McG and Davis. S.F. - The Correction of Defective Consonants and Sounds Magnolia, Mass: Expression, (1954) as cited by Pilaster, G. in Mirror Mirror on the Wall, JSHD, Vol.44, 1979, p.373-85.

Nielsen, B.K. and Kampp, B. - Visual and Audiovisual Perception of Speech. Scand. Aud., Suppl.4, 1974, p.243.

Niemann. S.L. - Listen : An Acoupedic Program. Voita Rev., Vol.74, 1972, p.85-89.

Nitichie, B.B. - Lipreadlng : Principles and practices. New York, F. Stokes (19T2) as cited by Pilaster G. in Mirror, Mirror on the wall, JSHD., Vol.44, 1979. p.373-387.

O'Connor C.D. - Integretlon of Graduates of the Lexington School for the Deaf in Programmes for the Normally Hearing in Ewing (Eds) 1960.

O'Neill, J.J. - Contributions of the Visual Components of Oral Symbols to Speech Comprehension. JSHD., Vol.19, 1954, p.429-39.

O'Neill, J and Oyer, H. - Visual Communication for the Hard of Hearing, Englewood Cliffs, N.J. Prentice-Hall, Inc. 1961.

Oyer, H. - Auditory Communication for the Hard of Hearing. Englewood Cliffs, M.j. Prentice-Hall Inc., 1966.

Park, S.E. - Visuo-oral Teaching aid for the Partially Hearing Infant. 3.J.A., Vol.4, 1970, p.24-25

Pauls, M. - Speech Reading in Davis. H. and Sllveman. Hearing and Deafness, New York, Holt, Rinehart and Winston (1966).

Piaget, J. - Play, Dreams and Imitation in Childhood. Loddon. Heinemann, 1962 as cited by Ling. D. in Speech and the Hearing Impaired Child: Theory and Practice. A.Q. Bell Association for the Deaf. Inc., Volta Place, Washington D.C. (1976).

Pickett, J. M. - Tactual Communication of Speech Sounds to the Deaf:* Comparison with Lip Reading. J. Speech. Hear. Dis.,Vol.28, 1963, p.315-330.

Pilaster, G. - Mirror, Mirror on the Wall. JSHD, Vol.44, p.379-387.

Pollack, D. - AcoupeHics: A Uni-sensory Approach to Auditory Training. Volta Review, Vol.76, 1974, p.400-409.

Prall, J. - Lipreading and Hearing Aids Combine for Better Comprehension, Volta Review, Vol.59, 1957. p. 64-65.

Rathna, W. - Battle of Methods in the Education of the Deaf. J. AIISH., Vol.1, 1970, p.33-49.

Rees, M.S. - Imitation and Language Development. Issues and Clinical Implications, J. Speech, Hear. Dis., Vol.40, 1975. p.339-350. as cited by Pflaster. G. in Mirror, Mirror on the Wall, J. Speech. Hear. Dia., Vol.44, 1979, p.373-385.

Risberg, A. - Visual Aids for Speech Correction. Amer. Ann. Deaf., Vol.113, No.2. p.178-194.

Sanders, D.A. - A follow-up study of fifty deaf children who received Pre-School Training, Unpublished Ph.D Thesis. Royal Victoria Uhiv. of Manchester, Manchester, England. 1961, as cited by him in his book Aural Rehabilitation. Englewood Cliffs, N.J., Prentice-Hall, Inc. (1971).

Sanders, D.A. and Goodrich, S.J. - The Relative Contribution of Visual and Auditory Components of Speech to Speech Intelligibility as a function of three conditions of frequency distribution. J. Speech. Hear. Res., Vol.14, 1971, p.154-159.

Sanders, D.A. - Aural Rehabilitation. Prentice-Hall Inc., Englawood Cliffs, New Jersey, 1971.

Schutte, K. - Fonator System: Speech Stimulation and Speech Feedback by Technically Amplified one-Channel Vibrations. In 0. Fant (Ed). Speech Communication and Ability and Profound Deafness. Washington D.C. A.G. Bell Association for the D*af, 1972.

Schutte, K. - The Use of Supplementary Speech Information in Verbal Communication. Volta Review, Vol.80, 1978. p.12-22.

Shipply, T. - Auditory Flutter - Driving of Visual Flicker in Science, 145 (1954), p.1328-30 as cited by Sanders, D.A. in Aural Rehabilitation, Englewood Cliffs, W.J.,Prentice- all, Inc. (1971).

Siegenthaler. B.M. and Gruber, V. - Combining Vision and Audition for Speech Reception. J. Speech. Hear. Dis., Vol.34, 1969. p.58-60.

Singh, I. - Manipuri Phonetic Reader. Edited by 3.6. Misra, C.I.I.L., Phonetic Reader Series - 12, 1975.

Sortinil, A.J. - Importance of Individual Hearing Aids and Early Therapy for Pre-School Children. J. of Speech. Hear. Dis., Vol.24, 1959, p.346-353.

Stark, R.B. - Some Features of the Vocalizations of Young Deaf Children. In Bosma J.F.(Ed.) Third Symposium on oral sensation and perception. The Mouth of the Infant. Springfield, III. Charles C. Thomas (1972) as cited by Pilaster, 0. in Mirror, Mirror on the Wall, J. Speech, Hear. Dis., Vol.44, 1979, p.373-387.

Stewart, J.L. - Effectiveness of Educational Audiology on the Language Development of Hearing Handicapped Children, Project No.969, Contract SAE 8966, Colarado Seminary (1963), University of Denver, Colorado.

Stewart,J.L. and Funaki - Effectiveness of Educational Audiology for the Hearing Impaired Child, Tohok. J. Exp. Med. (1968) as cited by Luterman D.M. in Comparison of Language skills of hearing Impaired Child trained in a visual/oral method and an auditory/oral method. Amer. Ann. Deaf., Vol.121, 1976, p.389-393.

Streng, A., Fitch, W.J., Hedge Cock, L.D., Phillipe J.W., and Carrel, J.A. - Hearing Therapy for Children.2nd Edn., London, New York, Grune and Stratton, 1958.

Suaby, W.H. and Pollack. I - Visual Contribution to Speech Intelligibility in Noise. J. Acoust. Soc. Amer., Vol.26, 1954. p.212-215 as cited by Erber N.P. in Auditory-Visual Perception of Speech: A Survey in Scand. Aud. Suppl.4, 1974.

Tidwell, M.S. - John Tracy Clinic Language Guide. Los Angeles, John Tracy Clinic (1976) as cited by Pflaster, G. in Mirror, Mirror on the Wall, J. Speech. Head. Dls., Vol.44, 1979, p.373-387.

Tracy, S. - The John Tracy Clinic in Ewing. A.W.G. (Ed) 1960. as cited by Rathna. N. in Battle of Methods in the Education of the Deaf, J. AIISH., Vol.1, 1970, p.33-49.

Valentine, M. - Information Theory and the Psychology of Speech in the Psychology of Communication, Edited by J. Eisenson, J. Amer. and J. Irwin. New York, Appleton-Centnry-Crofts, 1963, qs cited by Sanders, D.A. in Aural Rehabilitation.

Van Riper, C., and Irwin, J.V. - Voice and Articulation, Englewood Cliffs, N.3., Prentice-Hall, Inc., 1958.

Vegeley, C. - Monitoring Monosyllabic Words by Deaf Children. In Proc. Int. Congr. Educ. Deaf. Washington, D.C. U.S. Govt. Printing Office. 1964, p.735-744. as cited by Ling, D. in Speech and the Hearing Impaired Childi Theory and Practice, A.G. Bell Association for the Deaf. Inc., Volta Place, Washington D.C. (1976).

Watson J.J. - The Use of Residual Hearing in the Education of Deaf Children. Volta Review, (Vol. 63, 1961, p.328.

Wedenberg, R. - Thirty years of Auditory Training. Volta Review, Vol. 69, 1967, p.588-594.

Whetne.ll, E and Fry, D.3. - The Deaf Child. London, William Heinmann, 1961.

Whetnell, E. - The Development of usable(Residual) Hearing in the Deaf Child. J. Laryngol and Otology, Vol.52, 1956, p.630 as cited by Rathna, N, in Battle of Methods in the Education of the Deaf, J. AIISH, Vol.1, 1970, /p.33-49.

Wiener. N. - Cybernetics; or. Control and Communication in the Animal and the Machine. Mew York: Wiley, 1948. as cited by Ling, D. in Speech and the Hearing Impaired Child: Theory and Practice, A.G. Bell Association for the Deaf, Inc., Volta Place, Washington, D.C. (1976).