Language as a Variable in Competing Message Task

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CERTIFICATE

This is to certify that the dissertation entitled "Language as a Variable in Competing Message task" is the bona fide work in part fulfillment for M.Sc. in Speech and Hearing, carrying 100 marks, of the student with Register No. 67

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C E R T I F I C A T E

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

GUIDE

DECLARATION

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

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CHAPTER I

INTRODUCTION

Man acquires his knowledge of the external world through his sense organs. There are a vast number of physical stimuli impinging on the sense organs at any given time. Therefore it is very difficult to attend to all aspects of the many stimuli with the same degree of awareness. So the individual learns to discriminate among those varied stimuli and attends only to a selected set of stimuli. Selection depends upon many physiological and some psychological factors.

Broadbent (1958) examined the psychological mechanism that determine how an individual handles conflicting sensory inputs. Ho suggested that the major factors determining the selection of a particular stimulus were intensity, biological importance (position of the stimulus in a hierarchy of patient's needs) and novelty i.d., the degree to which the stimulus differs from the preceding stimuli. The fluctuations in attention from one stimulus to other depend to a great extent upon conditions within the individual, Viz., his general health, his interest in the task and strength of his motivation for maintaining attention (Vernon, 1962).

The physiological factors may bo either temporary or permanent. For instance, fatigue, a physiological change may temporarily depress one's ability to discriminate among the varied stimuli that are impinging on his sense organs. However, after a short period when he is free of fatigue, the person is able to perform at an optimum rate.

Failures in perception and discrimination of sensory stimuli may also be due to some permanent physiological changes within the organism. Blindness or deafness of various degrees either in the sense organ or anywhere in the central nervous system are examples of permanent changes. A majority of individuals with such permanent changes often fail to perform at an optimum level.

The selected sensory data by an individual under specified physiological and psychological conditions will then be interpreted in the central nervous system. This results in our perception of those sensory events and other irrelevant sensory events are ignored. The selective nature of attention received much attention from psychologists since a long time.

These irrelevant events which belong to different sensory modalities may be either verbal or nonverbal in nature. From everyday experience we find that normal individuals are able to attend to a task of their interest inspite of these environmental distractions. Pathological cases on the other hand experience greater difficulty in sustaining their attention upon a given task in the presence of distracting stimuli.

Clinical Audiology is one discipline where attending to a stimulus in the presence of irrelevant events has been need to detect pathological conditions in the auditory system. Specifically, competing message speech audiometry which employed verbal messages along with test stimuli thus came to replace the traditional speech audiemetric procedures. Impetus for the development and standardisation of competing message tasks was gained only after 1950's when the clinicians realised that in our environment it is conflicting speech rather than noise that we come across most often.

The competing messages used so far in the audiology clinics ranged from nonverbal stimuli such as narrow band noise, broadband noise, amplitude modulated filtered noise to partially verbal such as noise from a cocktail party, from a cafeteria and recorded samples of babbles. The more recently used stimuli were competing speech messages, sentences spoken by one to several speakers talking simultaneously. The most commonly used test stimuli were PAL PB - 50 monosyllabic words or the synthetic sentences (Speaks and Jerger, 1965). Tests making use of these stimuli were successfully employed for various purposes in the clinical evaluation. They nave been employed in the detection of anatomical site of lesion in the auditory system. A majority of these tests were labelled as dichotic listening tests. The stimuli were presented binaurally and it was central integration of speech that was being tested rather than simple discrimination ability (Bocca, 1954, 1956 : Goldstein, 1956 : Gleiner and Lafon, 1956 : Calearo, 1917 : Calearo and Oimithi, 1956 : Matcher, 1958 : Hellema, 1960 : Qniros, 1961 and Tillman et al, 1966 : Kimura, 1961, 1963 : Feldman, 1962 : Kats, 1962, 1963, 1968 : Jerger, 1964).

It was possible to assess the real social handicap of individuals with sensory neural hearing loss through the use of competing messages along with traditional discrimination tests. Clinicians were better able to differentially diagnose the clinical population using these tests.

Competing message tasks have been proved as efficient clinical tools in demonstrating the differences in performance of different hearing aids and also in determining the relative efficiency of binaural hearing aids as compared to the monaural aids. (Jerger, Speaks and Malmquist, 1966 : Chappel et al 1966 : Dirks, 1966).

The influence of content of competing upon the perception of test stimuli was not stud-tensively until recently. Controversy existed as to whe-ther the semantic and morphological content of competing message should be given importance or not. Dirks and Bower (1969) Brandt and Stewart (1969) demonstrated that it is the masking spectrums rather than the semantic content of the competing message that is important. Trammel and Speaks (1970) Kacena and Tillman (1974) how-ever questioned the findings of Dirks and Bower (1969). It has been suggested by the latter investigators that the complexity of test stimuli or the primary message should also be considered as an important variable in determining the masking effectiveness of competing signals.

So far the role of native language as an inde-pendent variable in a competing message task has not been studied. Specifically, whether the competing message is in the native language or in the second language has not been studied. Such a study is highly relevant in countries like India, where multilingualism is very common. Empirical evidence is available to show that ajditory discrimination in better in native language. Thin fact was said to be true even in instances of language interference due to some pathology in the central nervous system such as aphasia.

The present study which requires the subjects to be familiar with the languages of primary as well as the competing messages of the discrimination test, will then be of much use in testing bilingual subjects as well as in hearing aid evaluation.

The present study was designed to answer the following questions:

1. Will there be any difference in the intelligibility scores between subjects who were required to respond to test stimuli presented in their native language and those who were presented with test stimuli in their second language under competing message situation?

2. Will various signal-to-noise ratios have differential effects upon intelligibility of both groups of subjects?

3. Will there be any interaction effect between the variables; language and singal-to-noise ratio?

<u>Definition of the terms used:</u>

1. Native language was defined as the first language or mother-tongue which the subject learnt at home from

his parents.

2. Second language is the language which the subject acquired either along with the mother-tongue or after having learnt the mother-tongue.

Proficiency in each language is defined as a minimum score of seventy on achievement tests which covered both expression as well as aural comprehension skills in mother-tongue and second language.

3. Primary message was defined as test stimuli to which the subject was required to listen carefully and respond.

4. Competing message consisted of sentences presented simultaneously with the primary message, which the subject was instructed to ignore.

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CHAPTER II

REVIEW OF LITERATURE

Besides the work on masking and intelligibility of speech, there are other aspects of auditory perception which received attention only during the last two decades. One of them is auditory discrimination under competing message situation. The available research pertaining to this topic is reviewed in this chapter. The material has been organised under two main headings, vis.,

1. Studies in which noise is used as competing signal;
2. Studies in which verbal stimuli are used as competing signals.

STUDIES ON NOISE AS COMPETING SIGNAL

Several studies on binaural intelligibility of speech and localisation have presented test material against competing sounds.

Hirsh (1948) compared the monaural and binaural thresholds by presenting both the tone and the noise to both ears, but altering the phase relations between the stimuli. The tone was always presented in phase and the noise, always out of phase through the earphones. The binaural threshold for hearing the tone was lower when one sound was in phase and the other out of phase, than when both were in the same phase relationship. This effect was greatest at low frequencies (Hirsh, 1948).

Licklider (1948) and Kock (1950 conducted similar experiments and reached the same conclusion i.e., a difference in the apparent localization of the speech and noise sources make understanding of the speech more easy.

The above described investigations were more theoretically oriented and did not offer much help to the clinicians. One of the first experiments conducted in the clinical setting was that by Miller, Heise and Lichten(1951).

Intelligibility of speech was measured in the presence of wide band random noise. Context of the test material was varied and its influence on intelligibility scores was observed by the investigators. Two normal hearing subjects who were familiar with the design and theory of this experiment served as subjects. Three diffe-rent kinds of test materials were used. They were (d) digits from zero to nine, (b) Sentences, constructed at the Harvard Psycho-acoustic Laboratories and (c) Nonsense syllables, those published by Egan (1948). The talker monitored his spea-king level with a VU meter. The signal-to-noise ratio was varied by holding the average voice level constanta and changing the level of the noise. Required levels of signal-to-noise ratios were thus produced. (-18, -12, -6, 0, +6, +12 and +18 dB). The overall acoustic level of voice at the listener's ear was approximately 90 dB SPL. Testing was done monaurally through earphones. Results indicated that:

1. Among the three types of test material employed, nonsense syllables were found to be most difficult to perceive. They needed higher signal-to-noise ratios for 50% intelligibility, compared to the other two types of test material;

2. The smaller the size of the test vocabulary, the easier it was to perceive the words;

3. A word is harder to perceive when it is presented by itself than when it is presented as part of a sentence.

Miller, Heise and Lichten (1951) concluded that for a given signal-to-noise ratio, the listeners receive a given amount of information per second. Articulation scores can be predicted for different types of test material on the basis of the average amount of information needed to receive each type of test item correctly. The relative amount of information necessary per item is a function of the range of alternative possibilities. As this range increases, the amount of information necessary per item also increases and so, the noise level must be decreased to permit more accurate discrimination.

The criticisms against live voice presentation of the test material hold good for this study also. The acoustic characteristics of the three types of test material employed in this study being very different, it is obvious that maintaining a constant level throughout is rather difficult. Any shift in the acoustic level at the ear of a listener changes the signal to noise ratio considerably.

Several clinicians have used speech in noise in an attempt to improve the efficiency of W-22 word lists to differentiate among various auditory pathologies.

Harris (1960) said that simply adding white noise to speech (test material) should not impair discrimination score severely. Adding a second factor such as sensori-neural pathology results in markedly reduced ability to discriminate speech.

Simonton and Hedgecock (1953) used noise alongwith PAL-PB-50 test material and found no difference in discrimination scores between normal hearing subjects and those with conductive hearing loss. Patients with sensorineural hearing loss however, showed reduced discrimination scores. Palva (1955) corroborated Simonton and Hedgecock's findings and stated that discrimination in noise may be useful in the diagnosis of perceptive deafness.

The fact that sensorineural hearing loss cases experience extra masking in a noisy environment is well illustrated in the following statement by Jerger, Tillman and Peterson, (1960); when a given narrow band of noise is adjusted to equivalent effective levels for the normal ear and the ear with sensorineural loss, the impaired ear will be masked excessively in the frequencies both above and below the noise bands.

Cooper and Cutts (1964) described the changes that occured in the slopes of articulation curves in the presence of noise. Normals as well as patients with sensorineural loss were included as subjects in this study. The normal hearing group consisted of sixteen subjects who were selected on the basis of a puretone screening test at 10 dB HTL from 125H% through 8000 Hz. The hearing impaired group comprised of fiteeen subjects who were selected based on the criteria as mentioned below;

a) Sensorineural loss as determined by puretone audiometry,
b) SRT in the test ear between 20 dB and 60 dB HTL.
c) Discrimination score in the test ear of 65% or better.
In addition, all the subjects were required to undergo a medical examination. Hearing impaired group was restricted to those with no active pathology such as Menierer's disease. Twelve out of fifteen subjects were old enough that presbycusic involvement was likely. The speech signals consisted of tape recorded versions of CIDW - 1 (Hirsh et al 1952) and NU 6 (Tillman et al, 1966) test lists. The stimuli were recorded by a male. Tape recordings made in a high shcool cafeteria served as noise source. Test tape along with noise superimposed on it was played on a tape recorder (Ampex model, 350). Signals were then transferred to a two track test tape using a second tape recorder (Ampex, 602) which was connected to a speech audiometer. (Grason-Stadler, model 162). A 1000Hz calibration tone preceded each list.

Discrimination scores were obtained with the speech level held constant and the noise level varied to produce desired signal-to-noise ratios of 0 dB,+ 4 dB, + 8 dB and + 12 dB. For normal hearing group the speech was held at a level of 50 dB HTL. Back subject in the impaired groap was tested in quiet at 40 dB SL (re: SRT). Test material was presented at 40 dB SL for this group.

Statistical analysis of the data revealed that there is systematically inferior performance for the impaired group as the signal-to-noise ratio was decreased. The differences in variability in scores between the gronps and the larger decrement of performance for the impaired group suggested that something more than a simple masking effect operated to reduce the levels of performance in the impaired population under noisy listening conditions (Cooper and Cutts, 1964).

The reference curves for normal hearing group (their performance in quiet) would have allowed a better comparison of that data with their performance in noisy situation. The masking effectiveness of the noise employed in the study is highly questionable if one considers the gross differences in temporal patterns of the test material and the noise.

The first of the multiple choice tests in which the test items were presented in noise was the Modified Rhyme Test or MRT, developed by House et al (1963, 1965). This test was a modified font of the Rhyme Test (Fairbanks, 1958). Test materials in both the tests consisted of rhyming English monosyllables. Noise was not used in Fairbank's test (1958). The MRT was however, presented to a group of normal listeners at varying signal-to-noise ratios ranging from - 10 to +30 dB in steps of 10 dB. In developing the test material House and his associates took no strict account of either word familiarity or phonetic balance. The subject was given a response sheet containing 300 items, arranged in six columns of fifty words each. For each stimulus word, the subject selected a response from the six alternatives. Other details regarding the experimental procedure were not mentioned. House et al (1963) reported that various forms of this test were statistically equivalent and that practice effects were negligible. Kryter and Whitman (1965) compared the performance on MRT with that of test using PB - 50 (Egan, 1948) of the same listeners. These investigators concluded that MRT was distinctly less complicated in administration and scoring and was not so demanding a task as that presented by the PB - 50 test in so far as word intelligibility in noise was concerned.

In the studies reviewed so far, the investigators used noise along with the traditional test material with an intent to improve their diagnostic efficiency. Emphasis was not given te the assessment of social handicap of hard of hearing individuals.

Kryter, Williams and Green (1962), Kryter (1963) and Harris (1965) hate demonstrated that the presence of noise in the listening environment differentially affects the subject's performance. Most of the spoken communication takes place in noise and thus measurement of speech discrimination in noise is more valid(Kruel et al 1968).

An attempt was therefore made by Kruel et al (1968) to adapt the MRT test for clinical use. These investigators felt that the format and test items of MRT were simple enough to be used with a wide range of clinical population and when used with masking noise, this test would be capable of rank ordering the patients with respect to their everyday listening ability.

Test items, same as those used by House et al (1963, 1965) were recorded by two males and a female. Each person uttered all the 300 words in the test vocabulary. The recording was done in a prefabricated double walled room using a taperecorder (Ampex model, 351). An inter-stimulus duration of 3 seconds was given so that the listeners could view the six alternatives of a multiple choice ensemble prior to making a selection. The speakers monitored the level of their voice by means of a VU meter. A 1000Hz tone and a ten second sample of masking noise was recorded as calibration signals at the beginning of each tape.

The noise was mixed electronically with the output of the tape recorder to produce three signal-to-noise ratios (+30, -10 and -5 dB). Using normal listeners noise level adjustments were made so as to produce three levels of discrimination scores, approximately 96, 83 and 75% correct response for the three speakers.

Thirtyeight young male and female college students with normal hearing served as subjects in this study. All the subjects had 15 dB or better HTL (ISO, 1964) at 500, 1000, 2000 and 3000 Hz. They had 25 dB or better HTL at 4000 and 6000 Hz. The combined speech and noise were presented from a tape recorder (Ampex, 351) which was connected to a Mixer and then to one earphone (HA-10 phones). Contralateral masking was presented to the other ear from a second noise generator.

Kruel et al (1968) suggested that it was possible to accept cut off levels of performance, two or more standard deviations below the general mean scores (obtained with normals) should provide conservative points below which abnormal performance is indicated, i.e., they suggested that performance falling below 90, 70 and 60% correct for the three signal-to-noise ratios and the suggested levels (+ 30 dB or 96% - 5 dB or 83% and -10 dB or 75%) respectively should be considered abnormal. The ass of these scores for a speaker gives not only an index of patient's difficulty with speech discrimination in noise, but differentiates the performance for increasingly difficult listening conditions. Many patients with sensorineural pathology may perform reasonably well in relatively quiet (+ 30dB condition) but will experience significantly great difficulty as the noise level increases. Patients with conductive hearing loss, on the other hand, will perform at or near the predicted performance levels for all the three conditions.

This proposed test is still undergoing clinical validation. More data on discrimination scores of patient population is necessary before this test.can be accepted as a diagnostic tool.

Still another test which purported to evaluate the social handicap of hard of hearing patients was that proposed by Groen (1969). His test consisted of free-field presentation of speech at 65 dB SPL, through a loud speaker at a distance of one meter in front of the testee. Primary speech consisted of meaningful monosyllables recorded on a tape by a trained male speaker. Noise having a spectral distribution of an average cocktail party was used. The level of this noise could be adjusted in steps of 5 dB (re: Speech Level). The noise was presented constantly through two loudspeakers kept at the ear level of the subject. Signal-to-noise ratios of +10, 0 and -5dB were employed.

Forty patients with presbycusis served as subjects. Age range of those subjects was between 62 and 81.8 years with an average of 73 years. A group of normal subjects was also tested. Criteria used to select this group and other details of experimental procedure were not mentioned.

The social handicap of an average presbycusic snbject was clearly expressed in his rapidly declining phoneme discrimination score which was revealed in this investigation. The decline was gradual. If the ambient noise reached speech levels and surpassed it, his scores compared unfavourably with those of normal listeners.

The constant presentation of noise from fixed locations in the test room does not represent the real life situations which the patient encounters. To this extent, the validity of this test may be questioned.

In addition, the patient population consisted of presbycusics only. So the conclusions cannot be generalised to other pathological groups.

Keith and Talis (1970) tested ten normals and twenty subjects with presumed cochlear hearing impairments in quiet and under different signal-to-noise ratios. CID W-22 word lists and white noise were used as stimuli. The normal hearing listeners had 10 do HTL from 230 Hz through 4000 Hz for air and bone conduction testing and a negative SISI score of 20% or less. They had discrimination score of 98% or more in quiet. The hearing impaired group had high frequency sensorineural loss with puretone thresholds higher than 25 dB at all frequencies. They had a positive SISI score of 60% or more and a discrimination score of 90% in quiet at 40 dB SL. Reordings of CID W-22 lists by Hirsh were used. Discrimination scores were obtained at -8 dB, 0 dB and + 8 dB signal-to-noise ratios. Bcltone 15 cx audiometer, Bekesy audiometer (Grason-Staler Model, E 800)- and a second speech audiometer (Grason-Stadler Model, 162) were used in a two room setting. The stimuli were presented through earphones (TDB - 39).

The results indicated that the difference in discrimination scores for both the groups in quiet was not significant. However, as signal-to-noise ratio changed from +8 to -8dB, the difference increased significantly. Keith end Talis (1970) concluded that the use of white noise alone mixed with seech does not seem to add further diagnostic information because of extreme variability in discrimination scores obtained in the presence of noise.

Young and Herbert (1970) reported a different investigation in which effects of ipsilateral and contralateral presentation of masking noise on speech was stu- ----- Seven normal hearing subjects, sixtyfive patients with unilateral sensorineural hearing loss and fifteen cases with bilateral symmetrical sensorineural hearing loss were employed as subjects. Puretone testing was done using an audiometer (Amplivex-81) and Speech Reception Threshold and discrimination scores in quiet as wall as in ths presence of various signal-to-noise ratios ware obtained using a speech audiometer(Grason-Stadler, Model - 162). The signal-to-noise ratios used were - 30 to + 30 dB in steps of 5 dB. Stastical analysis revealed that normal subjects yielded discrimination discrimination scores greater than 70% when the signal-to-noise ratio was + 5 dB an higher. The score was less than 50% at signal-to-noise ratio of - 20dB and less. This was true when speech and noise were mixed and presented monaurally and when speech was presented to one ear and noise to the contralateral ear.

The unilateral hearing loss subjects required signal-to-noise ratio of about 10 dB and higher than normal subjects to achieve discrimination scores equivalent to normals whenever speech and noise were presented to the impaired ear. But when speech was given to the normal ear and noise to the impaired ear signal-to-noise ratio of only 5 dB was required for equivalence.

For subjects with bilateral symmetrical sensorineural hearing loss, the effect of signal-to-noise ratios were similar to those for the normal subjects. These results gave further support to the contention that the noisy environment affects the sensorineural group more adversely than it does the normal group.

The phonetically balanced monosyllabic words (PAL PB - 50 words) and the rhyming monosyllabic words

It can be said conclusively from the above study that normal subjects do not exhibit any difficulty in listening environments that are relatively less noisy. As the signal-to-noise ratio is increased gradually, they do experience considerable difficulty in understanding speech. Also, speech as competing signal has more adverse effects on perceiving speech than does noise.

STUDIES ON SPEECH AS COMPETING SIGNAL

Though the use of speech as a competing message in clinical setting is comparatively recent, several experiments were conducted prior to 1940's in this area.

Miller (1946) measured the discrimination ability of normal hearing listeners in the presence of a babble of voices. PB - 50 monosyllabic words were used as stimuli. The competing message consisted of two, four, six and eight voices speaking simultaneously. The intelligibility function became much steeper in the transition from one voice to two voices. About 7 dB reduction in masker level was required to maintain a discrimination score. Further transition to eight voices or to continuous white noise itself produced an increased masking of only three and four dB respectively. Pollack and Pickett (1958) supported Miller's (1946) findings.

The detrimental effect of competing signal may be expected to be low as the temporal characteristics and the semantic content of the babble of voices was very much different from that of primary message. Perhaps no one voice in the babble was intelligible to disrupt the perception of primary message.

One of the earliest findings and one that agrees with everyday experience is that it is harder to understand two messages arriving simultaneously than two messages presented in succession. Broadbent (1952)conducted several experiments to study the variables affecting the performance in selective listening tasks.

The first experiment conducted by Breadbent(1952) considered the effeet of various instructions on performance. A set of questions about a visual display were recorded. Each of the fine numbered sections of this display carried a familiar geometrical symbol such as a circle or cross. Questions of the type "Is there a cross in section two?" were used and the listeners were asked to answer 'yes' or 'no'. When the questions were asked in the normal manner, most listeners could rapidly achieve a perfect score. If, however, the questions were asked simultaneously great difficulty was reported. The two voices which asked the questions were given names and the expo-rimenter announced for each pair of questions which voice was to be answered. The experimenter gave this indication either before or after the questions were asked. The former condition produced better results than the latter. It follows from these results that some mechanism within the listener discards part of the information reaching his ear. The information discarded varies with the experience of the listener. The peripheral mechanism does not meet these requirements. It certainly discarded part of the incoming information, but the part discardec is determined by intensities and frequencies of the sounds present. Consequently a visual signal could only influence masking by some adjustment of the seneory organ which would alter these parameters. In this experiment two questions were asked at once and both sets of sounds thus reached the ear at the same time. The difficulty in attending to one question may be attributable to peripheral masking.

Broadbent (1952) conducted another experiment to rule out the possibility of peripheral masking. Each questions was prolonged so that the gaps between the words became longer. It was then possible to fit each words of one question into a gap between two words of the other question. For example, two questions were heard as "Is is the my cat aunt on in the mat?" It is harder to answer the question 'Is the cat on the mat?' when it forms part of such a jumble of words. Yet no masking was present here. Ordinary spoken English was not used in this experiment because the transition probabilities between the words would clearly be upset by inserting words from a different question. For example, in ordinary english the probability of hearing the word's is' twice in succession is almost negligible. It has been experimentally established that the probability of a listener hearing a word correctly varies with the probability of that word occuring in that particular situation(Miller, Heise and Litchen, 1951). The alternating words from both the messages woald consequently disrupt the subject's speech habits if ordinary spoken English was used. Broadbent (1952) solved this problem by employing code names like G D O and Turrent to the two voices which asked the questions.

The questions were framed so thai the code 'circle cross two' meant 'Is there a circle and a cross in section two?'

Thirty normal listeners were divided into five groups. Age range of the subjects was between 19 and 30 years. In the first sequence, both voices asking questions started synchronously and the listeners were to answer only one of the two. In the second sequence, the second question came only after the first one ended and the listeners were to listen to both the questions.completely, before answering the required one. In the third sequence, the listener was informed as to which voice was to be answered. Otherwise it was similar to that in second sequence. In the fourth sequence, the two voices alternated each other speaking different words of both the questions. The fifth sequence was similar to that in sequence four except that the subjects were instructed as to which voice was to be answered. Results indicated that -

1. Listening to a message spoken by one speaker throughout was easier than that spoken by two speakers alternately; (2) It was easier to respond to two messages which occupy different periods of time than two which occupy scattered portions of the same time period; (3) Irrelevant message affects the performance significantly

when it occurs between sections of a relevant message as compared to presenting such speech before or after the relevant message; (4) Listening to messages spoken by one speaker was easier when the competing message was spoken by a different speaker than when both primary (relevant) and competing (irrelevant) messages were spoken by the same speaker.

These results suggest that human nervous system is limited in its capacity to handle messages arriving simultaneously and hence selects only part of the input information for analysis and response. The cues which are effective in allowing selection are the general physical characteristics of the message. For example, frequency spectrum, the intensity, the spatial localization (Broadbent, 1952, 1954 : Spieth, Curtis and Webster, 1954). In the absence of such distinctions between the messages, some selectivity of response appears to be possible on the basis of transitional probabilities between words(Cherry, 1953).

Broadbent (1952) quoted several other investigations (Poulton, 1953 : Peters, 1954 : Webster and Solomon, 1955 : Triesman, 1961 : Deutsch and Deutsch, 1963) in support of his findings. After saving reviewed all these experiments on selective listening. Broadbent (1952) concluded that (1) some central rather than sensory factors are involved when two messages are presented to the ear simultaneously; (2) the rate at which the information reaches the ear was important. Two messages which carry little information stand a better chance of being dealt with simultaneously than two messages which carry much information and (3) when some information must be discarded, it is not discarded at random.

These findings led Broadbent (1952) to propose a general theory of a selective filter operating at a central stage in the nervous system between reception and response. (Details of this so called 'Filter theory' are available in p. 90).

In these experiments, criteria for choosing subjects, presentation level of the messages, context of the test material and test environment were not specified. The experiments were done with normal subjects and hence the results cannot be applied to a clinical population without further studies.

Competing Message tasks in the evaluation of sensorineural hearing loss patients:

Speech was used as competing signal in the clinical set up only after 1950's when the clinicians became aware that in dealing with sensoryneural loss patients, one is not justified in testing the patient 's discrimination ability in quiet or in the presence of noise.

Carhart (1955) stated that since everyday environment contained fluctuating backgrounds rather than steady ones and since it is often speech as competing signal that we come across, a second talker should be added to the competing speech message rather than noise. In three of the experiments conducted, he made use of speech as competing messages

Pairs of words were spoken simultaneously by different speakers. The two words in each pair were identical except for the final consonant. The listeners were required to identify the words spoken by one of the speakers. This test proved relatively inefficient in estimating the discrimination ability of sensorineural patients in taxing listening environments. In another experiment, Carhart made use of short sentences, each an instruction spoken while the speakers were reading aloud continuous discourse. This test was found to be more useful as a research tool rather than a clinical one. The third test consisted of monosyllabic words as test items on which sentences were superimposed. These two trains of material were recorded on separate channels of a magnetic tape recorder. This test was found to have more advantages over the other two in that, 1) it allowed the examiner to choose whatever ratio of test item to competing messages he wished, i.e., the examiner could change the test difficulty at will; 2) it could be used in sound field or it could be presented through earphones as a dichotic test and, (3) the two signals could be mixed in a single channel to create a monaural test of discrimination under competing signals (Carhart, 1958).

Olsen and Tillman (1968) demonstrated experimentally that taxing listening environments seriously affected the comprehension of sensorineural hearing loss cases than the normal,hearing group. Discrimination scores for monosyllabic words were obtained with a normal hearing group and a group of eighteen patients with sensorineural hearing loss. Competing speech message was presented at different signal-to-noise ratios. Discrimination scores in quiet were compared with those in competing message situation. Results indicated that normal hearing group achieved scores on the order of 90% or better even in the most difficult listening situation (at signal-to-noise ratio of +6dB). The sensorineural group also achieved a score of 85% in quiet, but under + 6 dB signal_to-noise ratio, which is essentially nontaxing for a normal hearing individual, these patients achieved 60% only.

The nature of competing message and other details of experimental procedure were not reported. The sensorineural group were not differentiated on the basis of age or discrimination ability in quiet. This should have been done as the composition of the sensorineural group, might have affected the scores uniquely.

Carhart (1969) compared the intelligibility functions of a group of normals and conductive hearing loss patients with two groups of sensorineural hearing loss.

one group of sensory neurals had discrimination score of 80% or greater where PB words were presented in quiet. The other group had less than 80% score for the same stimulus.

The NU Auditory test No.2 was administered to all subjects at signal-to-noise ratios of +12 dB, +6 dB, 0 dB and - 6 dB daring monaural direct and monaural indirect conditions. The primary message was generated at a level of 26 dB SL (re: SRT). Test material along with competing sentences were presented through loud speakers positioned at 43° a rimuth. The tape output was connected to an amplifier so that one channel activated one loud speaker at a time. The listening condition was termed monaural direct, when the primary message came from the loud speaker on the side of the subject's open ear while the competing messages came from the other side. These relations were reversed in monaural indirect condition. Signal-to-noise ratios were estimated taking into account the head shadow effect. The intensity of all signals was specified in terms of SPL of an equivalent speech spectrum noise, measured at the position to be occupied by the subjects head.

Statistical analysis revealed that the interference function of six normal hearing subjects closely followed the reference function through the monaural indirect listening shifted slightly unfavourably. The interference functions for the six conductive loss cases also were close to the reference function. Thus their behavior when listening to words against competing messages was similar to that of normals when presentation levels were the same for both the groups. The sensorineural group, however, exhibited interference function that was markedly displaced to the poorer side. This relation signified that there was an interaction between the complexity of listening situation and hearing impairment. It was as though the competing message had acquired 12 dB more masking.

The semantic content or meaning of the competing message was not taken into account in discussing the results. There was no information about the temporal characteristics of the competing sentences in relation to that of primary message.

Tillman et al (1966) conducted a similar experiment and corroborated the findings of Carhart et al (1969).

The sensorineural bearing loss subjects in Tillman's study behaved as though the competing message was 14 dB higher in its masking efficiency.

Additional data reported by Olsen and Carhart (1969) lends support to the contention that sensory neural hearing loss cases suffer excessive masking in difficult listening environments compared tonormal subjects or conductive hearing loss group.

These investigators used the experimental procedure similar to that of Carhart et al (1969) except that CMC word lists of NU 20s test was used instead of the NU 2 test. These CNC words were generated at -20 dB SPL in a sound field with the competing sentence 12 dB weaker thus yielding a nominal signal-to-noise ratio of + 12 dB. An artificial head was inserted into the sound field at a point corresponding to that occupied by the subject's head. A condenser microphone was mounted at ear level on each side of the dummy head. The output of each mic, after appropriate amplification, fed a dual channel tape recorder. This arrangement allowed to create the monaural direct and indirect listening conditions. Signals were then presented to through earphones (TDH-39) to four groups of subjects. They were 12 normal hearing subjects, 12 presbycusies 12 sensorineural cases and 9 conductive loss patients.

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The behavior of all four groups in quiet and at different signal-to-noise ratios were compared. Normals and conductives once again yielded interference functions which were very close to the reference function but the presbycusis and sensorineural group yielded functions which were displaced to the poorer side by 14 dB and 11 dB respectively. These findings are is agreement with those reported earlier, confirming the fact that individuals with sensorineural hearing loss showed reduced resistance to interference from competing speech.

It has been experimentally established that for continuos discourse, for amplitude modulated filtered noise and for unmodulated filtered noise the subject's performance on discrimination test was systematically poorer as the number of speakers employed to produce the masker was increased. This was true upto a point, specifically 3 speakers but further increase in the number of speakers did not result in substantial increase in masking effectiveness of that masker (Kacena and Nichoolls, 1972).

Experiments reviewed so far may be criticized on the basis that none of them employed mere than one speaker to produce the competing message. Need for development and standardization of discrimination tests employing speech competing messages spoken by more than one speaker is thus obvious.

<u>Competing message tasks in hearing aid evaluation</u>:

Competing message tasks have been in use since nearly two decades in the evaluation of different hearing aids. Clinicians have used these tests even in the determination of efficiency of binaural hearing aids as compared to monaural hearing aids.

The limitation of contemporary hearing aids interact so unfavourably with a patients hearing loss that the effective signal-to-noise ratios may become 20 to 30 dB more adverse for them than for their unaided companions. In consequence, they are often bombarded by meaningless clatter in many situations when their associates are undisturbed by the moderate noise that is present(Carhart, 1967).

Carhart (1967) demonstrated in an experiment that the limitations of hearing aids may well be shown even with normal listeners. Intelligibility functions for monosyllables were obtained with a group of normal hearers who wore hearing aids. Test material was presented against competing sentences

The articulation curves displaced by about 10 dB to the poorer side from reference curve indicating that the hearing aid enhanced the interference from competition by this amount. The sensorineural group exhibited extra interference even in unaided condition. There was gradual slope in the reference function. Shift in articulation curve from the reference curve was further greater when the subject's aided discrimination was tested. The slope of the articulation curve was more gradual. These changes mean that even modest noise backgrounds interfere with the comprehension of hearing aid users more than normals.

The contemporary wearable hearing aids therefore change the effective signal-to-noise ratios of everyday environment to a significant degree. The hearing aids should be evaluated in the presence of competing messages (Carhart, 1967).

Conventional hearing aid evaluation procedures were based on two premises, viz: (1) that physical differences among the hearing aids can be reflected in behavioral tests and (2) that these performance differences are unique to a particular hearing aid.

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Experiments conducted by Shore, Bilger and Hirsh (1960) using CID W-22 lists and recorded PB - 50 monosyllables spoken by Hush Hughes failed to prove the first pre--ise. Direct evidence for the second premise is also lacking.

Jerger, Speaks and Malmquist (1966) therefore developed a test which would reliably distinguish between different hearing aids on the basis of their performance difference.

The three experimental hearing aids were designated as A, B and C. The first one or A had moderately flat frequency response with minimal harmonic distortion. Hearing aid B had less flat frequency response and moderate distortion and hearing aid C had flat frequency response with considerable distortion.

One group of subjects were six normal hearers between the ages of 20 and 42 years, The other group consisted of six patients with sensory neural hearing loss. The age range was between 16 and 52 years. Multiple choice sentence intelligibility tests constructed from PAL auditory test No.6 were used as primary signal. This was recorded on one track of a dual channel tape recorder (Ampex, 3552) by a male speaker. A passage of continuous discourse read by a female speaker was used as competeing signal which was recorded on the other track. The input signal to the hearing aids was 75 dB SPL. The primary and competing messages were delivered to each subject monaurally through earphones (TDH - 39) of a speech audiometer. Two signal-to-noise ratios, -6 dB and - 12 dB were used. Normal hearing group received the signals at 64 dB SPL. Analysis of individual performance revealed that most listeners could rank the three hearing aids in the same order as it was done previously i.e., they rank ordered them in inverse proportion to percent harmonic distortion. It was thus possible to reveal the performance differences of three different wearable hearing aids using a competing message task.

Criteria adopted in the selection of subjects were notmentioned. The signal-to-noise ratios were rather restricted (only -6 and -12 dB). The sensorineural group was not differentiated on the basis of age and performance in quiet. This would have been relevant as the age range of impaired group was between 17 and 52 years and hence presbycusic involvement was likely. Results should have been discussed differently for both the groups.

Tillman, Carhart and Olsen (1970) conducted an experiment to ascertain whether aided discrimination for monosyllables was poorer than unaided discrimination. Testing was done in the presence of competing sentences. The subjects were divided into four groups. The first group consisted of 12 normal listeners. Age range of this group of subjects was between 18 and 36 years. All had puretone thresholds better than 10 dB HTL (ASA,1966) from 250 Hz through 8000 Hz. Their discrimination score in quiet was 90% or more. The second group were 12 patients with conductive loss, within the age range of 18 and 63 years. Only patients with a diagnosis of middle ear pathologys were included in this group. All had an air-bone gap of 15 dB at three or more frequencies. The Third group of subjects were 12 sensorineural hearing loss patients. Age range of these subjects was between 33 and 68 years. Their hearing loss was obvious before the age of 50 years. The fourth group consisted of 12 presbycusis between the age range 60 years to 80 years.

Spondee thresholds, discrimination for monosyllables in quiet and discrimination for monosyllables in two levels of competing message were measured both with and without a hearing aid. Presentation was onebinaural and two monaural. Primary and the competing messages were generated from a magnetic tape recorder (Belant concertoue series, 30). Each channel, after amplification, fed one of the two load speakers. During aided conditions, the subject was seated in an auxiliary chamber. The electrical output of the hearing aid was fed through one channel of a speech audiometer (Grason-Stadler, Model, 162) to the hearing aid receiver worn by the subject. Presentation level of the test items were 70 dB SPL. The gain setting on the hearing aid was such as to yield 50 dB SPL. The main findings were: (1) Lower SPL values for SRT were obtained when the stimuli were presented through the hearing aid than when they reached the unaided ear in a sound field, for the hearing impaired; (2) Intelligibility of monosyllables presented in quiet was somewhat poorer in aided condition than unaided intelligibility scores at equal sensation levels; (3) Subjects with sensorineural loss and those with presbycusis were less resistant to masking by competing signals during unaided listening, compared to subjects with normal hearing and conductive hearing loss; (4) With sensation levels held constant, all four groups exhibited reduced intelligibility for words heard against competing sentences when the signals were reproduced through hearing aids.

These findings imply that there are situations when a person searing a hearing aid cannot understand his companions even though the amplofication is ample. This is true when the background competition is sufficiently mild that a normal hearing person can disregard it easily.

Regarding the evaluation of binaural and monaural hearing aids, Carhart (1953) stated,

> "Tests which compare the monaural and binaural hearing aids in quiet are ineffective and useless because single hearing aid works well when background sounds are missing. The advantage of binaural system should show itself when the listening environment is complex."(p/27)

Several investigators however, failed to show any binaural advantage over the monaural hearing aid (Belsile, Markle, 1958 : Hedgecock and Swets, 1959 : Dicarlo and Brown, 1960 : Jerger, Carhart and Dirks, 1961 : Jerger and Dirks, 1961). These investigators stated that the degree of improvement with binaural hearing aid over monaural aid on speech intelligibility tasks has been small and discouraging.

Jerger (1961) compared the speech intelligibility scores obtained from 8 subjects with sensoryneural hearing loss under conditions of both binaural and monaural amplification. NU 2 and NU 3 test lists consisted of PB words. Competing message was recorded along with the test words in NU 2 test, but it was presented to the contralateral ear in NU 3 test. Results failed to show any appreciable binaural advantage. In this connection Carhart and Dirks (1961) challenged the traditional notion about advantages of binaural amplification.

Chappel et al (1963) however, attributed the failures of binaural advantages to become evident in Jerger's (1961) study to the differences in test material. Chappel presented monosyllables in the presence of simultaneous conversation binaurally as well as monaurally. A group of 18 subjects with normal hearing were tested. Test material was recorded on a tape recorder. The subjects listened under earphones to a single channel presented monaurally as well as to both the channels Simultaneously. The average intelligibility score for the binaural condition was about 60% to 20% higher than for the monaural condition.

These results support the findings of some earlier investigations in which it was concluded that the image separation provided by binaural listening is a major factor in enhanced intelligibility which is absent in monaural listening condition.

Dirks and Wilson (1969) reported an experiment which was designed to show advantages of binaural hearing aids over monaural aids. Their findings corroborated the findings of Chappel et al (1963).

Carhart, (1965) stated that the binaural hearing aid wearer may achieve a sense of improved localization, may experience binaural squelch effect which reduces the masking from background sounds by about 3 dB. In addition one of the two aids will always be positioned advantageously unlike a monaural hearing aid wearer whose instrument would be unfavourably placed about half the time. In view of the results obtained in all these studies one can conclusively state that clinicians should modify and standardize the traditional tests used in hearing aid evaluation by including a competing message task.

Competing message tasks in the detection of Central Auditory Disorders:

Competing message tasks have also been used in audiological evaluation to determine the anatomical site of lesion. These tests were named `Dichotic Listening Tasks'. In a majority of these tests, the speech stimuli were presented binaurally. Subjects with normal Hearing could successfully attend to the primary signal while ignoring the competing signal. Patients with temporal lobe pathology, however, demonstrated marked reduction in scores if the signal was delivered to the ear contralateral to the site of lesion (Willeford,l963).

Jerger, (1960) described two different measures which typify this competing message task. In one, standard discrimination tests were used. Stimuli were presented at a comfortable listening level to one ear while different speakers presented complete sentences to the contralateral ear. The latter were presented at a slightly higher intensity than PB words. Jerger's other test required the subject to answer simple questions presented to one ear while the other ear was shalleuged by two separate speakers, who simultaneously read unrelated discourse. In both these tests normals achieved excellent scores on both tasks. On the other hand, subjects with temporal lobe lesions scored significantly lower scores in the ear contralateral to the lesion. Such a difference was not observed in patients with either brain stem or extraauditory cortical involvements.

Kats, (1962, 1968) described a test, the staggared spondaic word or SSW test which also made use of competing message task, ln this test familiar spondaic words were presented in a partially overlapped manner at 50 dB HTL when SRI was 0 dB HL or better. If SRT was poorer than this level then the presentation level was 50 dB SL in that ear (Katz, 1966). The SSW score referred to the percentage of errors, whether for a specific condition, ear or for the total test. Discrimination score obtained with traditional tests correlated significantly with SSW score. Katz (1962) reported that 5% or fewer errors on the noncompeting and 13% or fewer errors on the competing conditions indicated that the subject does not have any apparent central auditory pathology. Individuals with unilateral central lesions however, experienced considerable difficulty in perceiving the words presented to the ear contralateral to the site of lesion. The errors in these patients may account as much as 80%. It was also reported that the mormative data for the 12 year old groups differed from that of adult population for the left ear scores of 20% or better was suggested to categorise the subjects as normals(Katz, 1966). Several investigators (Basil and Smith, 1963 : Myrick, 1965 : Brunt, 1965 : Turner, 1966) determined the value of SSW test and concluded that it can be used as a valuable test in the differential diagnosis of central auditory disorders.

Feldman (1962) used a dichotic test to ascertain the presence of central auditory lesions. Two different digits were presented to each ear simultaneously. Each acted as competing stimulus to the other one. The subject was asked to attend to one of the stimuli presented. Normal hearing subjects could score 100% but patients with lesions in one hemisphere experienced greater difficulty in perceiving the stimuli in the contralateral ear.

A subject's performance on diehotic speech tasks reflected hemispheric dominance also. Investigations by Broadbent (1958), Milaer (1962), Inglis(1965), Studdert-Kennedy (1967), Kimura (1967) have shown that when two speech messages were presented to normals in a dichotic listening task, the stimuli presented to the right ear were generally reported earlier and more accurately. These findings have been interpreted as reflecting the primacy of crossed auditory pathway operating together with left hemispheric dominance for speech and languages.

Results of these dichotic tests provided insight into how speech information arriving at the two ears is combined centrally and what happened if there is some disruption in the auditory system. Observations of the performance of individuals who had undergone temporal lobe resections showed that scores for the ear contnalateral to the lesion were diminished. In addition it was also noted that the subjects with left temporal lobe resections showed an over all supression of performance on verbal dichotic tasks; on the other hand, subjects with right temporal lobe surgery had impaired performance when the dichotic test materials were segments of melodies (Kimura, 1961 : Shankweiler, 1966). In hemispherectomees, the contralateral ear performed as badly as the contralateral ear of a temporal lobe patient, but the ipsilateral ear performance was far better than the right ear of a normal subject.

In order to gather more information about phenomena such as speech perception and central integration of speech several investigators (Shankweiler and studciert-Kennedy, 1967 : Berlin et al, 1968 : Kirstein, 1971) presented pairs of stop consonant vowel syllables dichotically and simultaneously. The right ear syllable was perceived better than the left ear in normal subjects. But when the syllables were presented asynchronously instead of simultaneously, they found that a perceptual advantage appeared for the lagging syllable • i.e. when left ear syllables were presented at 30 to 120 m sec after the right syllables, the left ear scores were higher than the right ear scores. Right ear advantage was noted by lagging the right ear syllables. These investigators identified this phenomenon as " Lag effect".interestingly this phenomenon tends not to occur with non-speech sounds (Porter, 1973). Berlin et al (1972) reported the effects of dichotic presentation of monosyllabic words of simultaneous onset as well as asynchronous onset (ranging from 15 to 500 M.sec) with temporal lobectomy patients. These patients consistently scored poorer in their contralateral ears and there was no 'Lag effect'• Comparison of pre and post operative scores revealed additional degradation of contralateral ear score in both right and left temporal lobectomees. This led to the premise that right and left temporal lobes mast participate in some type of preliminary speech processing (Berlin et al, 1972).

Studies in which both verbal and nonverbal stimuli are used as competing signals

The studies reviewed so far have used either speech alone or noise alone as competing signals. Several studies reviewed below employed both speech (Verbal) as well as noise (non-verbal) as competing stimuli with the intention of comparing their relative effectiveness as maskers, Binaural scores were compared with monaural scores and in most of these studies the phass relations of the signals were manipulated to see their influence upon the discrimination score.

Carhart, Tillman and Johnson (1968) reported a study in which masked thresholds for spondee words were menenred under earphones. The maskers were (1) connected speech, series of competing sentences and (2) white noise modulating four times per second with -10 dB interburst ratio. Out of the seven experimental conditions, three were monaural. They consisted of measuring thresholds for spondees and discrimination for monosyllables in the presence of (1) connected speech only (2) modulated white noise only and (3) both these maskers presented simultaneously. The four binaural conditions were (1) homophasic diotic or both competing speech and white noise along with primary signal in phase at both ears; (2) Antiphasic. i.e., with primary signal in phase but each masker out of phase at the two ears, (3) parallel time delay i.e., with primary signal in phase at the two ears but both maskers delayed by 0.8. m sec to the same ear;and (4) opposed time delay, 0.8 m.sec delays given to all portions of the masker complex but not all masker signals delayed to the same ear. All the signals were tape recorded.

Six subjects with normal hearing served as observers. Their average age was 21.8 years. The choice of experimental condition and the test ear was randomized (for each subject). The monosyllables were presentedat 60 dB SPL. The three levels of masking employed were 70 dB SPL, 72 dB and 66 dB. For monaural testing one of these levels was employed and during binaural presentation these three maskers were combined without any reduction in the overall intensity. Statistical analysis revealed that, 1) the two masking signals, when operating alone were almost identical in their masking effects. This was especially true of spondees. With monosyllables, though the functions for masking via modulated noise were slightly steeper than those for connected speech, the difference was not statistically significant. (2) when the monaural listening task was complicated by combining both the maskers, excess masking was generated. Spondee thresholds became poorer by as much as 7.0 dB and the shift in threshold for intelligibility was 10.5 dB. Carhart et al(1968) stated that no more than 3 dB in each masker can be attributed to power summation that resulted by combining both the maskers.

3) most, if not all of this excess masking persisted during the homophasic diotic condition. (4) the masked thresholds for spondees as well as the intelligibility functions dropped down markedly, in the antiphasic conditions. In other words, the performance was better in this condition compared to all the other conditions. (5) interaural time delay whether parallel or opposing, yielded modest drop in masked thresholds but thedrop was less than in antiphasic condition. Carhart et al(1968) concluded that the capacity to recognize a sound and attribute azimuth location to its origin is therefore distinct from the capacity to achieve intelligibility for speech.

Carhart, Tillman and greetis (1969)performed a similar experiment as described above. Four different maskers(two modulated noises and two trains of connected speech) were combined with interanral phase differences to yield 37 experimental conditions. Thresholds for spondees were determined in each condition. 12 subjects with normal hearing bilaterally served as listeners. Their average age was 21.1 yrs. Testing was done under earphones. Results indicated that the masking level difference was comparatively smaller in the presence of single competing talker. Masking level differences were largest for antiphasic conditions as in the previous experiment(Carhart et al 1968). conditions employing 0.8msec parallel time delayed maskers yielded the next largest masking level difference, and those with opposed time delays yielded least masked thresholds. In fact, the subjective seperation of competing signals was more easy during delayed conditions than during antiphasic conditions. Yet the masked thresholds were lower for antiphasic condition. Those findings confirm the findings in Carhart et al study (1968). They also suggest that listening/ in interaurally complex conditions brings into play phenomena that cannot be explained by contemporary theories and models of peripheral masking. The excess of masking observed in the presence of more than one competing signal was termed as `perceptual masking'. Perceptual masking was reported to be greater when one of the multiple maskers employed in the background was speech (Carhart, Tillman and Greetis, 1969).

Carhart and Nicholls (1971) compared perceptual masking for spondees exhibited by young adults with that experienced by 45 elderly persons. The older group consisted of 23 women aged 70 to 85 years and 22 men aged 63 to 86 years. Mean age was 73.6 years. The young adult group ranged in age from 18-27 years. Each subject was required to get an SRT of 50 dB SPL in the poorer ear. The test material, competing signals, experimental procedure including the presentation levels of stimuli were essentially same as in the above two experiments.

Statistical analysis revealed that the two groups did not react in the same way to the several masker complexes.

The young listeners showed the expected pattern of no perceptual masking against single talker background. They suffered several dB of perceptual masking when the noise was added to a single talker. Further, this excess masking was approximately doubled when both talkers were included in the background were speech maskers. On the other hand, the elderly subjects experienced several dB of perceptual masking against a single talker. Carhart and Nicholls(1971) also reported that adding noise to a single talker reduced these subjects' discrimination efficiency only slightly. Here too the presence of both competing signals increased the perceptual masking substantially. In brief, the elderly persons exhibited reduced capacity for handling complex listening situations that include speech.

The relative efficiency of speech and noise as competing signals was further explored by Johnson and Young (1974). Speech reception thresholds were obtained monaurally in the presence of speech masker,a combination of connected discourse and in the presence of speech modulated filtered white noise. Unmodulated noise was also band passed and employed as a control condition. Twenty young adults with normal hearing served as subjects. SRTs were obtained inquiet and in the presence of speech and noise maskers.

Presentation levels of the maskers was 75 dB SPL. The results showed that (1) the unmodulated filtered noise produced least masking than any other speech maskers or even speech modulated noise masker. (2) the masked threshold was lowest for one talker modulated filtered noise. Masking effectiveness increased with the addition of second and third speech modulated filtered noise maskers. (3) speech maskers consistently produced more masking for speech than their counterparts. When only two talkers comprised the speech maskers, the masking effectiveness of speech masker was equivalent or even greater than that of any of the speech modulated noise maskers. This seems to be so because the central nervous system would be more efficient in seperating target speech from masking noise than it would be in seperating target speech from a speech masker. Because the speech masker and the target speech have more similar acoustical cues.

The results were interpreted to be consistent with Broadbent's Filter theory (1952) and Carhart's extention of that theory (1974). They postulated that successive stages in masking beyond pure peripheral masking can be expected to emerge as the demands of the auditory system are made more difficult, as in the presence of several competing speech maskers.

Studies manipulating the Linguistic Factors:

Among the several linguistic factors, of a speech masker, the semantic content or meaningfulness of the masker received attention from several researchers. Dirks and Bower (1969) explored the possible disruptive features related to the semantic content in the competing message. An attempt was made to demonstrate how much these disruptive features contribute to the total masking effect. A series of four experiments were conducted.

The subjects in the first experiment were eight university students who volunteered for the study. The age range was between 16 and 27 years. A puretone audiometric screening test ascertained that all the subjects had normal hearing (Thresholds not greater than 15 dB from 250 Hz through 4000 Hz). The primary message consisted of ten synthetic sentences (Speaks and Jerger, 1965). The Competing message was a passage of continuous discourse of Texas history. Both primary and competing messages were recorded by the same speaker. From the original recording, a second recording was reproduced in the forward mode. This was denoted as CMF condition . The same message was reversed and recorded and this was called CMB condition. The purpose of reversing the message was to disrupt the meaning of semantic content. The mixed output was presented to the subjects monaurally through earphones (TDH - 39) enclosed in cushions (MX - 41/AR). The speech audiometer (Grason - Stadler, Model, 162) allowed attenuation of each signal seperately for different signal-to-neise ratios. Testing was done in an acoustically treated test booth (IAC - 1200 A). The primary message was presented at 40 dB SBL and the presentation level of the competing message was varied to produce the required signal-to-noise ratios. During the practice session, the subjects listened to the sentences in quiet followed by presentation of test lists in forward mode and then backward mode. Subjects were instructed to press a button beside the correct sentence. This response activated one of the ten lights in the control room. Results indicated that there was no significant difference in the performance intensity functions of sentence identification under CMF and CMB conditions.

In the second experiment, Dirks and Bower (1969) compared the effects of CMF and CMB on the perception of sentences with four normal hearing unsophisticated listeners. Test material, method of administration and other details of experimental procedure was same as in Experiment I. No statistically significant difference was found between the two conditions once again. Based on these two experiments these investigators concluded that when a single speech masker was employed, the masking effect found in the sentence identification task was not altered by the disruptive features of the speech masker. Masking effectiveness of this masker was therefore attributed to the masking spectrum and not to semantic factors.

Dirks and Bower (1969) further felt tbe need to explain the reduced plateau effect (poor performance) in CMB condition and the poorer scores at 0 dB signal-to-noise ratio condition. They conducted the third expert-ment in which eight university students with normal hearing between the age range 18 to 27 years, took part. Experimental procedure, test material criteria for selection of subjects were similar to those in previous experiments. The only difference was that in order to maintain the temporal pattern and disturb the meaning, a foreign language (Latin, which was not at all familiar to the subjects) was used as competing signal in addition to the usual English competing masker. The CMF, CMB conditions were created for Latin competing speech also in the manner as described in previous experiments. Reduction in the scores at a signal-to-noise ratio of 0 dB and lack of reduction at a ratio of - 10 dB condition again appeared. This indicated the absence of favourable clue for identification as the acoustic intensity of both the signals was essentially same o dB condition. The reduced plateau was found in English and Latin CMF condition and not in CMB conditions. These results suggested that competing speech at 0 dB ratio was due to combination of equivalent message intensities and similarity in temporal pattern and quality of both messages rather than its semantic content.

Dirks and Bower (1969) investigated further to see the efiects of presenting the primary message also in backward mode. The expected finding was that the plateau effect should appear once again in Latin CMB condition because of similarity in temporal pattern of both the messages. The fourth experiment was designed to test this hypothesis.

A single normal hearing listener served as subject . Lengthy practices were given, allowing him to listen to the primary message which was also presented in backward mode. Other details of experimental procedure were similar to those in the previous experiments. The performance intensity functions were established in quiet when the subject could consistently score 100% in the sentence identification task. Later 10 performance intensity functions were obtained for CMF and CMB English and Latin conditions.

A large notch indicating significantly poorer performance was observed during CMB conditions irrespective of the language of the competing maskers. There was reduction in plateau during CMF English but comparatively less prominent reduction was found during Latin CMF condition. These results were anticipated because of market similarity in the temporal pattern of both the messages. Dirks and Bower (1969) concluded that tae destractible features attributable to the meaning or semantic content of the competing message had no measurable effects on the performance intensity functions for the synthetic sentence identification. The intensity differences and the temporal patterns of both the messages were the only discriminational clues when the same speaker delivered both the messages. Other Investigators (Brandt and Stewart, 1969 : Tillman and Kacena, 1972) supported the findings of Dirks and Bower (1969).

Trammel and Speaks (1970) however, questioned the findings of Dirks and Bower (1969). They conducted an experiment similar to that of Dirks and Bower (1969). Results suggested that the subjects in this study on the average achieved higher scores when the competing message was played backward. The level in dB corresponds 50% correct response was clearly different for both the conditions. Results thus indicated that when competing message was presented in forward mode, the listeners were distracted by the content of the message and hence scored poorly. Trammel and Speaks (1970) repeated their experiment once again, this tine the subjects listened to the competing message several times. If the listeners were distracted by what is said, presumably such an effect would diminish with repeated exposure to the same message. A single listener served as subject. Intensive practice was given in both the conditions. By the end of practice period, the semantic content or the meaning had ceased to have significant effect on performance.

These investigators, however, are hesitant to conclude that the semantic content in the competing message has deatracting influence upon the listeners. They point out that the potentially distracting factors residing in the signal and the degree to which the listener yields to these distractions varies very much and that the interest that the listerner has in the subject matter of competing message and the instructional biases imposed by the experimenter play a major role in determining the influence of meaning or semantic content of competing message. They also stated that even CMB condition can be distracting to the listeners because of its peculiar intonational and articulatory characteristics. This was because the speech was in backward mode in this condition.

Definitive conclusions cannot be reached therefore on the basis of above studies. The number of subjects employed in most of these studies were rather small. Further research is needed to make a conclusive statement as to the effects of semantic content of competing message upon the perception of primary message.

The linguistic complexity or the morphological content of the competing messages has been the most neglected area. Several of the studies reviewed till now employed continuous discourse as speech masker and some studies employed complete sentences. No attempts were made in the past to determine the relative effectiveness of each of these speech maskers. It was Kacena and Tillman (1974) who investigated on this problem. They reported that in several of their early investigations, they found that the sentence maskers produce consistently more masking than did the continuous discourse. The two possible reasons for this result as pointed by Kacena and Tillman were:-

1. Spondee words, the primary message was always presented simultaneously along with the competing message. In other words they were time locked with the sentences unlike in the continuous discourse. In the latter case they tend to occur in the silent spots in between the message and hence masked thresholds were usually better.

2. sentences were always distinguished by abrupt onsets, relatively constant outlines and silent interval between two sentences. The continuous discourse on the other hand, was more continuous. It seemed possible that subjects might be better able to ignore the continuous speech than the sentences, which came suddenly along with the spondees.

Kacena and Tillman (1974) purported to determine whether these factors were responsible for the greater masking efficiency of sentence maskers. Spondee thresholds were obtained for 20 university students with threshold levels of 15 dB HTL or better from 125 Hz through 8000 Hz (ANSI, 1969). The four maskers employed were; sentences, continuous discourse, time locked connected discourse and segmented connected discourse. All the maskers were tape recorded and were presented at 75 dB SPL. The continuous discourse was always presented in backward mode. The reason was, the cutting and splicing operation adopted to create time locked and segmented continuous discourse would have disrupted the coherency of competing speech. The second reason was, studies by Dirks and Bower (1969); Brandt and Stewart (1969) showed that both forward and backward competing speech were equally effective. Kacena and Tillman (1974) thought that they were justified by presenting the competing speech backward.

Results indicated that there was no significant difference between the mean thresholds obtained with various Torsions of continuous discourse and that the thresholds were significantly lower than than produced by sentence masker. These investigators tried to relate the difference to the differences in vowel duration which was relatively greater in sentences and to the backward presentation of connected discourse. Further research evidence is needed to substantiate the findings of this study.

As pointed out earlier, there has been controversy regarding the influenne of semantic content of competing message upon the perception of primary message.(Dirks and Bower , 1969) Brandt and Stewart, 1969 : and Speaks and Trammel, 1970). Kacena and Nicholls (1974) offered an explanation for these failures. They pointed out that in most of these earlier investigations, the primary message was either spondee words, CNC monosyllables or synthetic sentences (Speaks and Jerger , 1965). None of these targets demand prolonged or complicated integration.
It may be possible that the forward speech disrupts the perception of primary signal more than the backward speech when the listener's tank is more complicated. Kacena and Nicholls (1974) therefore employed two recordings of

continuous discourse, one by a male and another by a female. The target speech was two digit numbers between 21 and 99. 10 and multiples of 10 were excluded. These digits were embedded in the continuous passage. Subject's task was to listen to the passage and repeat the numbers he heard. Intelligibility of these numbers were determined both in quiet and in the presence of different maskers. The maskers were passages spoken by a male, a female and a male-female speakers together. In addition, three aud four talker combinations were employed. Amplitude modulated broad band noise was also used. All the maskers were presented both in forward and backward mode. Best of the experimental procedure was similar to that employed by Johnson and Young (1974).

Results indicated that the ability to discriminate embedded numbers in the presence of competing signal was maximal when the background consisted of only one talker. This was true for both forward and backward modes. For all three types of maskers, the subjects scored poorly as the number of talkers used to produce the masker was increased. This was true for the two and three talker conditions. The forward speech masker produced most disruption. Since the forward speech masker and the amplitude modulated noise had the same gross temporal and spectral characteristics, the two maskers should have produced equivalent masking. This was not true however. Whom the speech masker contained more than one talker, the forward speech was consistently better than backward speech or any other noise maskers. These findings contradicted the findings of Dirks and Bower (1969), Brandt and Stewart (1969) and Till an and Kacena (1972). It was therefore concluded that the more complex the target speech, the more effective the forward masker will be. These findings were interpreted to fit into the framework of Broadbant's Filter theory (1952) and the proposed extension of this theory(Carhart, 1974).

Kacena and Nicholls (1974) emphasized that the masking of speech by speech involves the semantic and morphological features unique to speech. In any case, it would appear that the masking produced by speech is dependent not only on the characteristics of the speech masker but also on the complexity of primary message.

Inspite of the realization of the importance of considering the complexity of primary (target) message, and other linguistic variables which may influence the auditory discrimination scores, not much research has been done to investigate the role of native language of a speaker in his performance in a competing message task.

After having reviewed the available literature on competing message tasks, the following conclusions were reached ;

1. Competing message tasks are essential in the realistic appraisal of communicative handicap of sensorineural hearing loss cases.

2. Performance differences of different wearable hearing aids may be effectively demonstrated if competing message tasks are included in the traditional hearing aid evaluation procedures. These tasks should also be employed in determining the relative efficiency of binaural and monaural hearing aids. This is especially useful to the clinician when he has to prescribe hearing aids to different patients.

3. The communicative handicappod of geriatric patients may be assessed using these tasks.

4. Speech competing tasks of different kinds may be employed in the audiology clinics in order to locate the anatomical site of lesion in the central auditory system.

5. Speech stimuli mask speech more efficiently than does noise.

6. The semantic and morphological content of competing speech messages should be given importance before developing a discrimination test in competing message situation.

The present investigation was designed to see the influence of native language upon discrimination scores in competing message situation,when the subject was familiar with both languages, the language of the primary message and that of competing message.

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CHAPTER III

METHODOLOGY

Subjects:

The subjects were 100 young adult native speakers of Telugu. Their age range was 15 to 28 years with a mean age of 20.9 years, and a median of 21.5 years. They were selected using the following criteria; (1) Thresholds not greater than 20 dB HTL (ANSI, 1969) for puretones from 250 through 6000 Hz; (2) Negative otological history; (3) Knowledge of English and Telugu as determined by means of achievements tests. None of the subjects reported exposure to noise, head injury or taking ototoxic drugs.

Test materials:

Construction of achiement tests:

The purpose of the two achievement tests was to determine the proficiency of all the subjects in English and Telugu.

The English achievement test was constructed with the help of a X standard English text book, some X standard Public Examination English question papers and a standard grammar book. This test consisted of 12 main items and a total of 50 sub-items. Details of the test are available in Appendix `B'. The twelfth item was a test for listening comprehension. It has two short paragraphs.

Each paragraph had 8 to 10 sentences and there were 3 to 5 words in each sentence.

The Telugu achievement test was equivalent in length to that of English test. This test was constructed after having adopted some of the items from the question papers administered to adults learning Telugu as a second language. The twelfth item of this test was also meant to test the listening comprehension of the subjects. The two telugu paragraphs were obtains d from telugu weekly magazines and from telugu children's literature. There were ten sentences of 2 to 8 word length in each paragraph. Ten short questions were asked after each paragraph with 8 seconds pause between the questions. This procedure allowed the subjects to answer the questions after they have listened to the paragraph carefully.

A female who spoke telugu as native language spoke both the paragraphs and all the questions regarding the paragraphs. This has been recorded on one track of a magnetic tape using a stereo tape recorder (Phillips. PRO 12). Each of the fifty items (including the 10 questions for listening comprehension) carried one mark each. The scores were expressed in terms of percentage. Only the subjects who scored 70% and above were included in the study.

Coastruction of test stimuli:

Experiment I consisted of presentation of two lists of Telugu sentences' with a Telugu two digit number inserted in the middle of each sentence (the Primary message) in the presence of English sentences of same length and duration (competing message).

All the 50 Telugu sentences were equivalent in length (consisted of 15 to 16 syllables) and lasted for 4 to 5 seconds each. They were constructed using Telugu children's literature and Telugu magazines. A stop watch was used to record the duration of each sentence. The digits were from 21 to 99 excluding 10 and multiples of 10. These numbers were arranged into two lists of 25 using a table of random numbers (Fisher and Yates. 1949). They were then embedded in the middle of each sentence.

The competing English sentences were constructed using children's literature in English. The length and temporal characteristics of these sentences were almost the Same as that of the sentences in primary message except that no digits were inserted in the middle of these sentences.

In experiment II, the primary message consisted of English sentences with English two digit numbers embedded in the middle of each sentence . Telugu sentences or equiva-leat length and duration comprising the competing message were presented simultaneously. Material for both the messages was obtained front English and Telugu children's literature and some magazines. The length of each English sentence was 10 to 13 syllables each of 4 to 8 seconds duration. The English digits were once again from 21 to 29 excluding Ten and multiples of ten. There were no digits embedded in the competing Telugu sentences.

Recording procedure:

The Telugu and English sentences with embedded digits which constituted the primary message in both the experiments were recorded by a female native speaker of Telugu. the competing sentences in English and Telugu were recorded by three native speakers of Telugu, two males and a female. They were seated in a semi circle in front of the unidirectional microphone (Ampex, 1100). The spea-kers were given sufficient practice in reading the sentences such that the needle en the VU meter road zero, on the average.

The primary message was recorded first, and then the competing message was recorded on the second channel of the name tape. An interstimnlns interval of 8 seconds was maintained with the help,of a step watch. A 1000 Hz calibration tone was recorded before each sentence list on the test tape. The instruments, procedure and speakers used in recording the stimuli for both experiments I and II were identical. Two seperate test tapes consisting of primary and competing messages on each were thus prepared.

Test material for control conditions:.

The control condition I consisted of 50 Telugu sentences arranged in two lists of 25 each. Two digit numbers in Telugu were arranged rancomly using a table of random numbers (Fisher and Yates, 1949), and were then inserted in the center of each sentence. The source for material, length and temporal characteristics of these sentences were similar to the sentences of primary message in experiment I.

50 English sentences with English two digit numbers embedded in each sentence comprised the control condition II. The length and duration of these sentences were similar to those of primary message in experiment II.

The English and Telugu sentences of control conditions were spoken by the same female speaker who spoke the primary messages for both the experimental conditions using the same instruments (Phillips, PRO 12 and Ampex, 1100 stereo tape recorders). An interstimulus interval of

8 seconds was allowed. These were then recorded on two different tapes. A 1000 Hz calibration tone preceded each list.

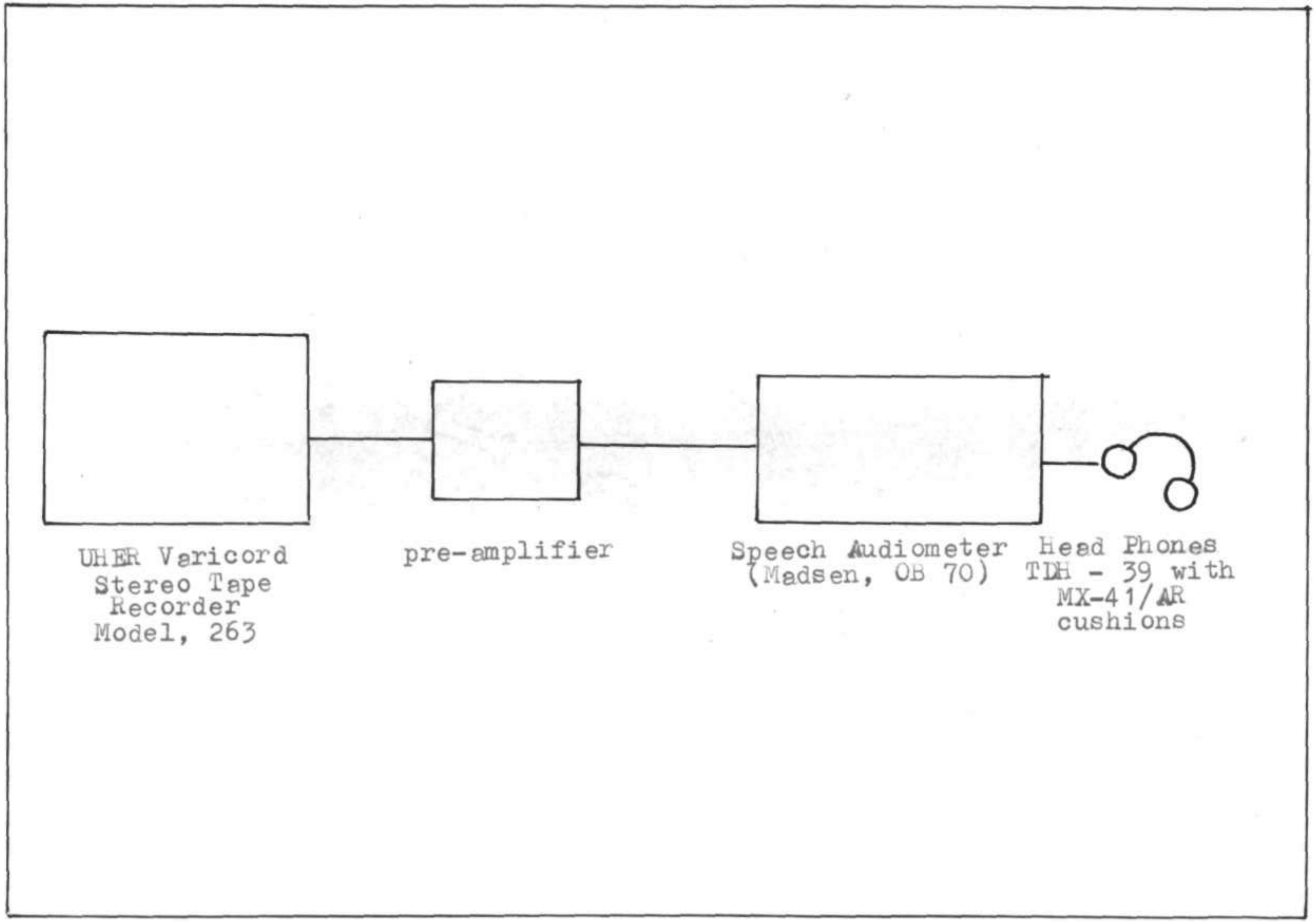
Equipment:

The audiometer selected for puretone and speech audiometric testing purposes was a two channel diagnostic audiometer (MadSen, OB 70) calibrated to ANSI, 1969 specifications. This audiometer was equipped with dynamic earphones (TDH - 39) housed in (MX - 41/AR) supra-aural cushions. Speech stimuli were recorded using two stereo tape recorders (Ampex model, 1100 and Phillips, PRO 12). The test tape consisting of both primary and competing messages was finally played on a different stereo tape recorder (Uher, Varicord, 263). This was in turn connected to the tape input of a speech audiometer (Madsen, OB 70), after appropriate amplification using a pre amplifier.

Calibration procedure:

The puretone audiometric calibration was done in the following manner.

The TDH - 39 earphones of Madsen OB 70 audiometer were coupled to the condenser microphone (Bruel and Kjaer,type 4143)



BLOCK DIAGRAM OF THE APPARATUS USED

of the SPL meter (Brnel and Kjaer, type 2203) with its associated octave band filter set (Bruel and Kjaer, type 1613) by means of a standard 6 c.c. coupler. The SPL output of each earphone vas checked at octave intervals from 280 Hz through 8000 Hz. Linearity check was performed at 125 Hz with the input constant at 70 dB HTL.

To ensure speech calibration, the following procedure was adopted:-

The sound pressure level of a speech signal at the earphone was defined an the RMS sound pressure level of a 1000 Hz signal adjusted no that a VU meter deflection produced by the 1000 Hz signal was equivalent to the average peak VU motor deflection produced by the speech signal (ANSI, 1969).

A 1000 Hz calibration tone was recorded on the tost tapes in the following manners-

The tape consisting of both primary and competing messages was played on Ampex stereo tape recorder (Model 1100). The ontpnt was fed to the tape input of a speech audiometer (Madsen, OB 70). The volume control of the tape recorder was adjusted so that the VU meter needle on the audiometer read zero. This level was marked on the tape recorder before it van disconnected.

A 1000 Hz puretone was produced from a beat frequency oscillator (Bruel and kjaer, type 1022). The attenuator on this instrument was adjusted in such a way that the VU meter needle on the audiometer read zero once again. Ampex tape recorder was then connected to the beat frequency oscillator without disturbing the settings. A 1000 Hz tone was thus recorded an the test tape before each test list for 2 minutes. Before each testing session during the experiments the audiometer was checked for its calibration and linearity of its attenuator.

Test environment:

Testing was done in a sound treated booth which was reasonably quiet. The ambient noise level measured on the C scale of an SPL meter (Bruel and Kjaer, type 2203), inside the test booth was 40 dB SPL. This level was sufficiently low as not to interfere with the test signal. Noise levels inside the booth at octave intervals were determined using SPL meter (Bruel and Kjaer, type 2203) with its associated filter set (Bruel and Kjaer, type 1613) and a condenser microphone (Bruel and Kjaer, type 4143). Details are available in Appendix `C'.

Test procedural

At the outset each subject was gives a puretone screening test consisting of puretones from 250 Hz through 8000 Hz presented at 20 dB HTL through the earphones of Madsen OB 70 audiometer bilaterally. The instructions were:-

> "You will now hear some tones in one ear first and then in the other ear. As soon as you hear the tone raise your finger and keep it up as long as yon hear it, but put it down the moment you don't hear the tone. Lift your finger even if you hear very soft tones."

All the 100 subjects were randomly assigned to one of the experimental conditions. The choice of the ear and that of signal-to-noise ratio was also random. A table of random numbers (Fisher and Yates, 1949) were used for this purpose. There were 50 subjects in each experimental group. Five signal-to-noise ratios ranging from - 12 dB, - 6 dB; 0 dB, + 6 dB and + 12 dB were employed. Ten subjects were tested under each condition of signal-to-noise ratio and no subject was tested under more than one condition of signal-to-noise ratio.

A sample of data-matrix is given in page 80.

Signal-noise ratio	ear	Sub-jects	Experiment I: Experimental condition I	Experiment I: Control I	Experiment II: Experimental condition II	Experiment II: Control II
-12 dB-	R	i,l toi 5				
	L	i6				
		i10				
- 6 dB						
+ 12 dB						

Piiot experiment:

In order to determine the presentation level of the messages, a pilot experiment was carried out on five normal hearing adults. Discrimination score was calculated in terms of correct number of digits repeated in reasonably quite condition. The subjects required a level of 30 to 45 dB HTL in order to scofe 100%. Hence an average of 40 dB was chosen to use as presentation level of test material in both the experiments. The nominal signal-to-noise ratio of 0 dB is thus equivalent to presenting both the messages at 40 dB HTL. Signal-to-noise ratio of - 6 dB meant presentation of primary message at 40 dB, 6 dB weaker than the competing message and so on for the other signal-to-noise ratios.

By manipulating the seperate attenuators on the audiometer (Madsen,OB 70) independently it was possible to administer the test at different signal-to-noise ratios monaurally. Only the left channel of the audiometer was need for the study. Signals were always presented through the blue earphone only while the red earphone covered the nontest ear, but not used. The instructions used in experimental condition 1 weret:-

> "You will hear some Telugu sentences with a Telugu 2 digit number in each sentence in your right/left ear. Along with it you will also hear some English sentences. Just ignore them. Please listen to the Telugu sentences carefully and at the end of each sentence, write down the digit you heard".

The same instructions were used in Experimental Condition II also except that the subject was asked to listen to English sentences,ignore the Telugu sentences. Examples were given in both the cases.

92 of the hundred subjects tested in experimental conditions I and II were 'given a control test which consisted

of measuring their discrimination score for digits embedded in sentences in the essence of competing message. A minimum of three days gap was given in between the experimental testing and control test. All the subjects were first tested in either experimental condition I or II i.e., in the presence of various degrees of competing message. Same subjects were then called back for control test. Instructions used in control condition I were:-

> "You will hear some Telugu sentences with two digit numbers in the center of each sentence in your right/left ear. Please listen to each sentence carefully and write down the digit that you hear. Any questions?"

In control condition II, the same instructions were used except that the subject was asked to listen to the English sentences with the digits in them and write down the digit that he heard.

The entire test, including administration of achievement tests, listening comprehension test and the discrimination test lasted for 1 hour for each subject. All the tests were administered in a single session. The subjects recorded their responses on a sheet of paper provided for this purpose. Discrimination seore was defined as the number of digits heard correctly out of the total 50 digits presented along with the sentenees. The raw score was expressed in percentage correct.

The Mean, standard deviation and variance was calculated for each group of ten subjects under each condition of signal-to-noise ratio. Analysis of variance was applied to see the effect of the independent varialiles of the present study, the language and the signal-to-noise ratio and also the interaction effects of these two variables on discrimination score.

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CHAPTER - IV

RESULTS AND DISCUSSION

Mean discrimination scores (percent correct) accompanying standard deviations yielded in each condition of signal-to-noise ratio in both experimental conditions have been summarised in Table I. This Table also displays the mean and standard deviation obtained by 92 subjects (out of the same 100 experimental subjects) in control conditions. Figure-I reveals the slopes of articulation curves obtained in the present study. Significant difference in discrimination scores were anticipated to exist between the two experimental conditions because (1) the language of the competing message was different in both the conditions - it was in subjects' second language in Experiment I and in his mother-tongue in Experiment II; (2) Signal-to-noise ratios ranging from -12 dB to + 12 dB in steps of 6 dB were employed.

It is apparent from Table–I and Figure-I that there is slight but consistent differences in the mean scores and standard deviations under control (quiet) as well as experimental conditions of both the experiments. In experiment II in which the subject was instructed to respond to test material presented in his second language while ignoring the competing message which was in his native language, the discrimination scores were higher compared to those in Experiment I. A difference of 2 to 18 dB was observed between the scores of both the experiments as the signal-to-noise ratio was changed (favouring Experiment II). However, at -12 dB the mean discrimination score in Experiment I was 2.2. dB better than that in Experiment II. In quiet (control condition) subjects in Experiment II scored 95.6%, 2.6% higher than those in Experiment I.

With regard to the effect of second independent Variable of the present study, the signal-to-noise ratio, it was observed that as the level of competing message was increased with respect to primary message, scores became poorer. At -12 dB signal-to-noise ratio the combined mean in both experiments was 2.5%, However, transition from -12 dB to -6dB resulted in performance shift of about 57.4% in Experiment I and 77.6% in Experiment II. Farther reduction in the level of competing message to 0 dB, + 6 dB and + 12 dB did not result in marked increase in discrimination scores. Thus -12 dB signal-to-noise ratio proved to be an extremely different listening condition even for normal subjects in the present study.

FIGURE - I : Articulation curves obtained for 100 normal subjects in Experiment I and II.

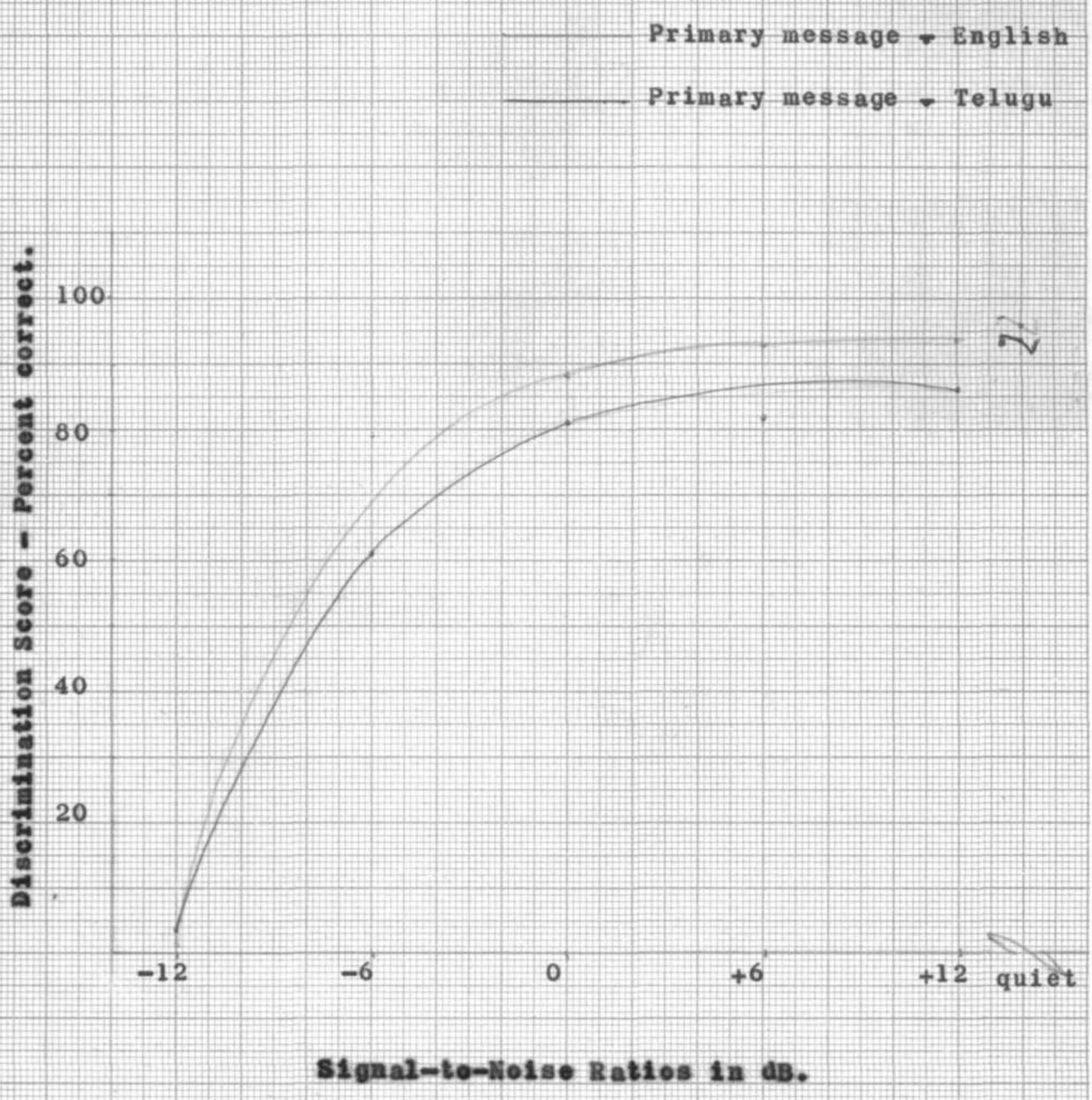

TABLE - 1

Signal to noise Ratio dB	Mean Expt. I	%Dise.Score -----------	Combined Mean %Dise. Score	Standard Deviation	
				Expt. 1	Expt. II
Quiet	93.6	95.6	94.3	4.10	5.42
-12	3.6	1.4	2.5	5.02	1.49
- 6	61.0	79.0	70.0	4.27	5.52
0	81.0	88.2	84.6	4.67	6.22
+ 6	81.2	92.8	87.0	2.41	3.00
+12	85.6	93.6	89.6	2.41	2.04

Table 1 - showing the Mean,and standard deviation of discrimination scores obtained by the subjects in both the experiments in quiet and nnder five signal-to-noise ratios.

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TABLE 2

SS		of	MS	EMS	F
SS(a) row	1936	4	1936/4	484	0.007
SS (b)	107781.16	1	107781.16/1	107781.16	1.604
SS (a.b)	61879.8	4	67879.81/4	15469.95	0.26
SS (E)	67174	90	67174/90	746.37..	
Total	238770.96	99			

Table 2 : showing 1the summary of results of Analysis of variance.

The data has been statistically analysed. The effects of language and signal-to-noise ratios upon the discrimination scores and their combined effect if any were obtained using Analysis of variance (Two-way model). Language was treated as fixed factor and signal-to-noise ratio as a random factor.
Table 2 summarized the results of Analysis of Variance.

It is evident from the table 2 that there is no effect of Language of the competing message upon the discrimination score ($P < 0.007$). Also, the differences in mean discrimination scores at different signal-to-noise ratios in both experiments are not statistically significant.

Discussion:

Effect of signal-to-noise ratios on discrimination score

The finding that discrimination score becomes better as the signal-to-noise ratio is made more favourable has been supported in earlier studies also. Several investigators in the past (Carhart, 1965 : Carhart and Tillman, 1970 : Tillman and Carhart. 1966 : Tillman, Carhart and Olsen, 1970 : Soeaks and Karaman, 1967 : Dirks and Bower, 1969) experimentally demonstrated that there existed a small difference in performance of subjects from quiet situation to those involving competing messages. Normal hearing subjects and conductive hearing loss cases were not affected seriously even in the presence of relatively high level of competing message. For example, normal hearing subjects in Speaks et al study scored as much as 70-85% at a signal-to-noise ratio of -10 dB. The primary message employed was synthetic sentences (Speaks and Jerger, 1965), and a passage of continuous discourse constituted the competing message. In a study by Dirks and Bower (1969) synthetic sentences were presented in the presence of a passage of continuous discourse at various signal-to-noise ratios. Normal subjects in this study scored as much as 90% at a signal-to-noise ratio of 0 dB and a constant ratio of -23.0 dB signal-to-noise ratio corresponded to 50% correct response. The articulation curves were much steeper compared to those obtained in the present study. The reason may be because none of these investigators controlled the linguistic variables such as the content of the competing message, its semantic and morphological features. Also single speaker spoke the message in these studies unlike in the present study in which three speakers were employed to produce the masker.

Effect of Language upon discrimination score;

The results of the present study clearly indicated that the performance of the subjects in a discrimination test will not significantly change with respect to the language of the test material. This is true, only if the subject has sufficient competence in that particular language or languages. However, several experiments in the past have demonstrated that auditory discrimination is better if the test material is presented in the speakers' native language. (Rouse and Tucker, 1966 : De;attre, P., 1964 : Politser and McMohan,1970) The findings of the earlier investigations and the present study do not agree probably because;

1. The two languages employed in the present study were English and Telugu. Of these English belongs to an Indo-Aryan language family while Telugu to a Dradidian language family. In this respect the two languages may be said to be different at phonological, lexical, and syntactic levels.

2. In most off the previous studies, the languages of the primary message and competing massage we same unlike in the present study, which employed linguistically quite different languages.

3. Though the difference is not statistically significant, from Figure 1 it is evident that the subjects in the present study performed better in the condition in which English was used as primary message compared to the condition in which Telugu was the primary message. This may be because the subjects being in Mysore, a place where the regional language is Kannada, were less exposed to Telugu.

Theoretical considerations:

It was felt that the listeners' task in the present study was more complicated when compared to the previous studies. The primary message was presented in the presence of three distinct trains of competing messages and the listeners had to listen to the numbers embedded in the primary message. The following comment made by Carhart et al (1969) is directly pertinent here :

> "It appears clear that whenever several distinctive signals are presented simultaneously to the auditory system there must occur within the nervous system a relatively complex process of sorting in order to disentangle various signals and to minimise interference to the perception of one signal by the others".(P. 417)

In this connection, it is logical to discuss the findings of this study within the framework of Broadbent's Filter theory (1952) and a proposed modification of this theory (Carhart, 1974).

Because of the limitation of the Central Nervous System in its capacity to handle all incoming information (Broadbeant, 1965 : Hick and Bates, 1950) the stimuli present in the environment cannot all be analyzed simultaneously. The sequential selection of the stimuli for analysis depends upon certain physical features of the stimuli. Broadbent (1952) suggested the major determining factors to be intensity, biological importance and novelty.

The filter received information (postulated Broadbent, 1952) from the sense organs by means of the sensory channel, each eye and each ear being considered a separate channel. The filter could be set to select certain classes of events by appropriately instructing the subjects. Even so, it had a permanent bias to select information from sensory channels that had not been active in the recent past. After this selection was done for sometime, a change was likely to take place in the channel. After passing through the filter, stimulus information proceeded to the limited capacity channel where it was analysed.

Adopting some of the concepts proposed by Broadbent and others, Carhart (1974) described a different model. This model is helpful in evaluating the instances where more masking occurs than can be attributed to the peripheral over-riding of one sound by another. This excess masking was called 'Perceptual masking' by Carhart (1969, 1974).

At the outset Carhart (1974) attempted to modify the traditional views about the nature of masking. Instead of regarding masking as an event where masker overpowers maskee, Carhart (1974) stated that masked threshold is the minimum level of the maskee at which selective attention between two stimuli first becomes possible. At this level the subject can choose to focus attention on the target ignoring the second signal. If a listener is presented with the target in the presence of two distinguishable background signals, the task is elevated sufficiently, it also becomes perceivable. Likewise, when three maskers are combined, a situation where the listener must select the target signal from a total array of four choices.

Now following Broadbent's suggestion, the discrimination test situation employing competing signals may be explained as follows:

The two competing acoustic stimuli (Figure -) create a conglomerate mixture of neural impulses that flow

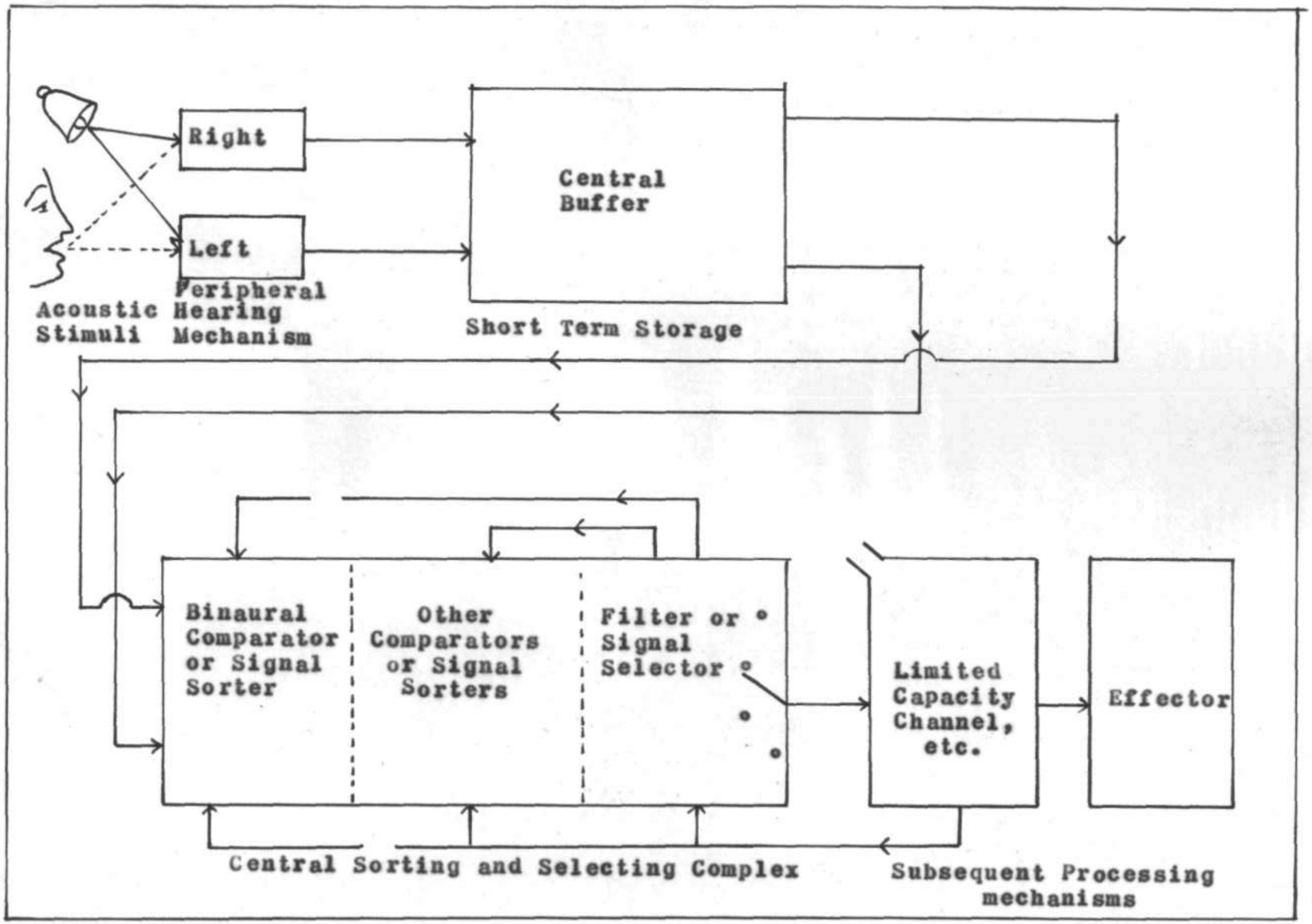

Figure – 2 : Schematic representation of central filter system adapted to perceptual masking from Bφradbent's concepts(Carhart,1974).

into the central nervous system through each auditory nerve. Within the central nervous system these two signals can be separated into two trains of discrete neural information, each representing an original stimulus. Subsequent portions of central nervous system cannot cope up with these stimuli in the absence of physical clues. Filtering must therefore occur. This filtering gives preference to one train of information allowing it to proceed to subsequent centers through a limited capacity channel. This train of information is then processed to be perceived. It becomes the focus of attention. According to the contemporary theory (Broadbent, 1952), all the other trains of information concurrently penetrate, but to a lesser degree.

A binaurally intact listener possesses the signal sorting and signal selecting functions. The signals are first segregated on the basis of interaural differences by the binaural comparator. (This accounts for the MLD) phenomena). Other comparators seperate the signals on the basis of vocal clues rather than localizational clues. The end result of this comparator is to make available a set of discrete information trains. These are then subjected to selection process. Only one of the information trains is allowed prominent access to the limited capacity channel. This train then becomes the momentary focus of attention.

At the masked threshold the filter mechanism is receiving enough identifiable neural data about the target stimulus to allow these data to be assembled into a new information train that can be selected and allowed to pass through limited capacity channel.

One of the possible implications of this model is that the masked threshold for a given target signal changes as a function of the number of competing signals and their degrees of perceptual similarity to the target. i.e., the poorer masked threshold may be expected as the task imposed upon the filter is made more complex by adding more signals or making them similar to one another.

Evidence to the finding that auditory systems task may be complicated by adding more than one speaker was supplied by Kacena and Nicholls (1974). It was also reported by the same investigators that the decrease in performance with increase in the number of speakers employed in the masker was true upto a point, specifically, three speakers. Beyond this no change in performance was reported.

The auditory systems task may also be complicated by making both the signals (PM and CM) similar. In this connection, a study by Dirks and Bower (1969) may be cited.

In their study, though both the signals (PM and CM) were verbal signals, ths morphological content of both were not similar. Subjects could score as much as 90% even at an signal-to-noise ratio of - 10 dB. The performance intensity functions were very steep compared to the present study. This may be because the primary message which consisted of synthetic sentences was rather discrete compared to continuous discourse. Listeners could easily distinguish these two signals and attend to one of them.

A situation in which the subject was familiar with one language while not familiar with the other language was also created by the same investigators (Driks and Bower, 1969). Even in this situation the subjects performed relatively better than did the subjects in the present study. For w example, at a signal-to-noise ratio of -15 dB, the subjects in Dirks and Bower study scored 50%, whereas the subjects in the present study scored less than 3%. The difference in the scores in both these experiments may be due to the fact that the primary and competing messages of the present study were more similar morphologically, unlike in the previous experiment. The messages consisted of sentences of similar length and duration and were also meaningful to the subjects. This might have resulted in poorer performance.

From the above consideration, it appears that besides the number of speakers employed to produce both primary and competing message, the nature of stimuli, verbal or nonverbal, type of stimuli, whether sentences or continuous discourse, meaningfulness of the stimuli seem to make significant difference in an auditory discrimination test.

Clinical implications:

From the present study it can be said that administration of discrimination test in the presence of competing messages in either the native language or the second language does not make significant difference, provided the subject has optimum competency in the language in which the primary message is given.

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CHAPTER - V

SUMMARY AND CONCLUSIONS

Speech discrimination scores were obtained for 100 normal hearing listeners for two digit numbers embedded in sentences in the presence of competing message. The competing signals consisted of sentences spoken by three speakers, two male and a female, simultaneously. The primary and competing signals were presented together monaurally. The sentences of the competing message were either in the second language (Experimental condition I) or in the I Language (Experimental condition II) of the subject. Five signal-to-noise ratios -12 dB to +12 dB in steps of 6 dB were employed. Ninetytwo of the 100 experimental subjects were tested in quiet using similar test material (Control Condition I & II). Discrimination score was defined as the number of digits in sentences, correct out of the total number presented. The score was expressed in percentage. Articulation curves were obtained for subjects in both the experiments.

Statistical analysis of the results revealed that the language of the competing message was not a variable in discrimination testing and that the different signal-to-noise ratios did not have differential effects upon the performance in a discrimination task. Subjects performance in quiet was

was significantly better than that under various degrees of competing message.

From the date, it may be concluded that,

1. With increasing signal-to-noise ratios, discrimination score for embedded two digits increases;

2. Language in which the competing messages are spoken, whether the native or the second language of the subject seems to have little effect on discrimination score.

Suggestions for further Research:

1. Auditory discrimination test of the kind used in the present study may be administered to different clinical groups consisting of sensorineurals. conductives and presbycusic patients.

2. An attempt may be made to see if the binaural scores obtained using the same test material differ from the monaural scores of the present study.

3. Data pertaining to the effectiveness of present test in the evaluation of hearing aids may be collected.

4. The effects of number of talkers used to produce competiny message using the similar test material as in the present study) upon the discrimination score may be studied.

5. The competing messages read by single talker may be administered in forward and backward modes to see the effects of semantic content of competing message upon discrimination score.

6. An Indo-Aryan language may ce used along with English in the administration of a speech discrimination test in competing message situation.

7. Speech discrimination scores may be obtained with normals in a situation in which they are not familiar with one of the languages of the test (either primary message or competing message).

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APPENDICES

APPENDIX – 'A'

1. తన గుడిసెలో ఆ నలభైఏడు ఉంగరాన్ని దాచే చోటు లేదు.
2. రాజు దాన్ని ఒక పీటమీద ఇరవైనాల్గు పెట్టి నిద్ర పొంచాడు.
3. పులిదార వేషము ఇరవై ఏడు తీసుకొని ఇంటికెళ్ళాడు.
4. రాముడు ఏదో పనిమీద ఇరవైఆరు దూర గ్రామం వెళ్ళాడు.
5. అందులో మనుషులు ముప్పైఎనిమిది నివసించిన సూచనే లేవు.
6. ఖడ్గవర్మ వాడి వెంయ్య యాభైనాల్గు పట్టుకొని గుంజాడు.
7. ఆ రాజుకి అరుణ యాభైఅయిదు అనే కుమార్తె ఉండేది.
8. చెట్టు పైనుంచి శవాన్ని యాభైనాడు దించి భుజాన వేసుకొన్నాడు.
9. వాడు బిందెలోని పాలని ఎనభైరెండు నదిలోనికి పోసాడు.
10. పుష్టి పెరిగిన ఉతరుని నలభైతొమ్మిది ఏనాడో వదిలేసాను.
11. మర్నాడు శాకలపురి ఎనభైమూడు సేనంతయుద్ధానికి వచ్చింది.
12. రావిచెట్టు కొమ్మ మీద నలభైఆరు గుడ్లగూబ కూర్చొనుంది.
13. నీ రెండు గుర్రాల్ని నేను డెభైఆరు కొనాలనుకొంటున్నాను.
14. వెన్నెల్లో అడవంతా అరవైఆరు చాల అందంగా ఉంది.
15. గుడ్లగూబ బంగారు నలభైఅయిదు పక్షిని చూడవచ్చింది.
16. ఆ చిన్న గుడిసెలో నుంచి డెభైనాల్గు పొగవస్తున్నది.
17. ఆ నెమలిరాణికి చాల యాభైఆరు అసూయ కల్గింది.
18. ధృతరాష్ట్రుడు శాంతిని యాభైతొమ్మిది కోరి నన్ను పంపాడు.
19. అందరం కలసి సుఖంగా ఇరవైరెండు ఉండవచ్చునికే.
20. ఇంద్రుడు తన పదవిని నలభైరెండు సంపాదించుకొన్నాడు.
21. గంగామాత కరుణ వల్ల ఇరవైఒకటి నా దరిద్రం తీరవచ్చు.
22. మీరాక నాకెంతో అరవైరెండు ఆనందాన్ని కల్గిస్తోంది.

A – 1 : Test materiah used as Primary Message in Experiment I

I list : 1– 25

II list : 26– 50

23. అతనా నగరంలో ముప్పైఆరు పేరు మోసిన గజదొంగ.

24. స్నేహం అనేది వ్యక్తుల ఎనభైఅయిదు మధ్య ఏర్పడే భావం.

25. అతను చూసినదంతా ఇరవైతొమ్మిది కాగితం మీద రాసుకొన్నాడు.

26. సేవకుడు వచ్చి అతని డెబ్భైమూడు గదిలో భోజనం ఉంచి వెళ్ళాడు.

27. ఆ రహస్యాన్ని నీవు పదిహేను ఎవ్వరికి చెప్పరాదందామె.

28. ఆ తోటనంతా అతనే యాభైఎనిమిది శుభ్రంగా చిమ్మేవాడు.

29. చిన్న మొక్కలను ఎంతో అరవైఏడు జాగ్రత్తగా చూచుకొనేవాడు.

30. పక్క మీద కూర్చొని యాభైఅయిదు కిటికీగుండా చూచేదామె.

31. తోటమాలి పువ్వుల్ని ముప్పైఎనిమిది కోసి మాలలు కట్టేవాడు.

32. ఆ మహాసముద్ర తీరాన అరవైరెండు పిట్టల జత ఉండేది.

33. తోటమధ్యలో అతనికి ఇరవైనాల్గు చిన్న గుడిసె ఉండేది.

34. నీటి కరువు వచ్చి ఆ ఎనభైఎనిమిది చెరువు ఎండిపోసాగింది.

35. గ్రామస్థులు దాన్ని పట్టుకొని యాభైనాల్గు చంపితినేసారు.

36. నీకన్న నేను ఎక్కువ నలభైఏడు నీటిలోపల జీవిస్తాను.

37. ఆ మడుగులో పెద్ద నలభైతొమ్మిది చేపలు చాల ఉన్నాయి.

38. క్రమంగా సూర్యుడు ఇరవైఆరు పడమటి దిశకి క్రుంగిపోతాడు.

39. జాలర్లు వచ్చినా నేను డెబ్భైనాల్గు ఉపాయంగా తప్పించుకొంటాను.

40. చీకటి పడేసరికి ఇరవైతొమ్మిది వాళ్ళొక అడవికి చేరారు.

41. నేను సరస్సులోనే చాల తొంభైఒకటి కాలంగా ఉంటున్నాను.

42. గోపి తలుపు తోసుకొని నలభైఒకటి ఇంటిలోపలికి వెళ్ళాడు.

43. మెడలో ఉన్న దండ తీసివేసి అరవైఎనిమిది వాడు నిద్ర పోయాడు.

44. భావన అనే రాజ్యానికి ఎనభైఆరు విక్రమసేనుడు రాజు.

45. తనూ రాజుతోపాటు యాభైఅయిదు కొండరాయి చాటున దాగాడు.

46. వెంటనే దూరాన గజ్జెల డెభ్భైఏడు చప్పుడు వినవచ్చింది.

47. ఆమె తలవంచుకొని ముప్పైతొమ్మిది రాజుకి జవాబు చెప్పలేదు.

48. ఒకరోజు రాత్రి నేను నలభైరెండు గుహ వద్దకు వచ్చాను.

49. అంత పెద్ద కొండచిలువ ముప్పైరెండు నేనెప్పుడూ చూడలేదు.

50. సోనాపూరు రాజకుమార్తె ఎనభైఅయిదు శాంతి చాల అందకత్తె.

APPENDIX -'A'

A 2 - Test Material used as Competing Message in Experiment I

1. He was so fat and so short that he looked like a rolling ball to us.
2. One day Krishna went alone to Yamuna in search of that big snake.
3. Kamala was drawing water from a deep well, all,by herself.
4. Immediately uncle arranged a lond ladder to be brought to the tank.
5. There she ran back to the woods to teach foxy tricks to her little fox cubs.
6. Grandmother would always follow me like a shadow saving 'Drink this milk'.
7. Slowly she untied the knot in her saree and showed him the ring
8. They all said it was below their dignity to let him marry princess sathya.
9. I was afraid stay there alone as I was reminded of all the ghost stories.
10. There he selected a quiet place under a huge tree and settled down.
11. As the days passed , the wheet grew taller and taller so they were happy.
12. Uncle helped my grandfather in looking after our fields and gardens.
13. Even today I have to read each book and each page, said the peacock.
14. He had once been to the zoo, after he came here, said Ramu's mother.
15. I am afraid that I cannot settle the matter peacefully, said Krishna.
16. Anybody whom you touch with your right hand will die and be reduced to ashes.

17. Children didn't like to come to our house because they were afraid of my father.

18. He ate some fruit from every tree until he was tired of eating.

19. Shiva had promised to arrive at midnight, but he has not yet co

20. He drank whatever was left in all the glasses and left that pla

21. Our headmaster looked so funny that I thought that I would draw a picture of him.

22. I will not look at any other woman if you marry me, said Bhasmsura.

23. The peacock opened his beak and began to sing a song loudly.

24. In the morning the wolf and the fox thought thay they would make some hot pancakes.

25. He gave her some dried herbs to be powdered and mixed with honey.

26. The elephant put her trunk into Kamala's vessel and drank all the water.

27. That year there were fewer showers of spring rain and the villagers were very happy.

28. That night I wanted to find out whether Rani was sleeping in the house.

29. People in the village used to call grand father for advice and help.

30. That young man was very fond of rich clothes and costly jewels.

31. The farmer picked up the two rotten pumpkins and went away.

32. The old woman was Very angry with Shamu and started scolding him.

33. Krishna was very happy that he would win back the love and trnst of the people.

34. My mother tried to remember whatever happened but failed to do so.

35. He wanted to eat his cocoanut then and there but his mother refused.

36. Munni ran into the shade of that big banyan tree along with her mother.

37. All the people prayed to the gods to save them from the coming danger.

38. A had pieces of sugarcane with me and I wanted to give them to laxmi.

39. Lord Krishna asked his companions to wait while he went inside.

40. They reached the top of the hill by evening and so they were tired.

41. He had lots of land in that village and one big house too.

42. But he had hardly anymore strength to stand and so he fell down.

43. Life will be lovely for you hereafter the palmist told Ramana.

44. Gopi blew grandmother's old conch shell all of a sudden.

45. Slowly she untied the knot in her saree and showed him the ring.

46. She took water in her trunk and poured it over her body several times.

47. The sun god gave him a precious stone and told him to look after it.

48. From ther I could see grand father sitting and doing his prayers.

49. Even today Imhave to read each book and each page, said peacock.

50. Grand father called the servants and asked them to go and look for me.

...

A-3

APPENDIX - 'A'

LIST-I

1. వేప తొట్టిలో అటూ ఇటూ ముప్ఫైరెండు తిరుగనారంభించింది.
2. రాజుకారాత్రి డభైతొమ్మిది భయంకరమైన కల వచ్చింది.
3. ఆ మూటను మధు తప్ప డభైఎనిమిది ఎవరూ చూడలేదు.
4. ఒకనెల్లో అతని తొంభైమూడు ఆరోగ్యం పూర్తిగా చెడింది.
5. అమ్మాయినిక షిఫ్టులోకి తొంభైఐదు పంపించకూడదు.
6. కొలన్లో రాయివేస్తే అలలు ముప్ఫైఎనిమిది కొలనంతా చెదురుతాయి.
7. అప్పుడు రామమూర్తి   తొంభైఎనిమిది ఆలోచన వచ్చింది.
8. ప్రశాంతంగా కనిపించే ఈ తొంభైతొమ్మిది నదిలో ఎన్నో సుడిగుండాలు.
9. ఇదివరలో రచయిత ఇరవైఒకటి కొన్ని కథలు వ్రాసారు.
10. నిద్రపోతున్న రాజు ఆ తొంభైమూడు మాటలకు కళ్ళు తెరిచాడు.
11. మధ్యాహ్నం అంతా నలభైమూడు మహాజింతుం చూడ్డానికెళ్ళారు.
12. శనివారం రాత్రి బంధువులందరి ఇరవైఐదు గుంటూరు వచ్చేసారు.
13. ఉమ తలెత్తకుండానే నలభైరెండు బట్టలు సర్దుతూ కూర్చుంది.
14. రాము నిత్యం ఆమెతో ఇరవైఏడు కలసి గుడికెళ్తాడు.
15. శాంత మంచానికి దగ్గరలో ఉన్న నలభైఐదు కుర్చీలో కూర్చుంది.
16. కిటికీ దగ్గరగా శిలా డభైరెండు ప్రతిమలా నిల్చుందామె.
17. తనకు నచ్చిన పాట తొంభైఎనిమిది వింటూ కూర్చుని పోయింది.
18. నీళ్ళతో బిందె నింపుకొని తొంభైనాల్గు ఇంటిలో కెళ్ళిందావిడ.
19. కొంచెం సేపటికి రాము నలభైనాల్గు ఇంటికి తిరిగివచ్చాడు.
20. ఈరోజు శివుడి గుడికి తొంభైరెండు వెళ్ళాలనుకుంటున్నాను.
21. అమ్మకు అన్నం పెట్టి ఇరవైఆరు ఇప్పుడే వస్తానన్నాను.
22. జానకామెను తన అరవైఎనిమిది గదిలోనికి తీసుకెళ్ళింది.
23. రాత్రి పొద్దుపోయేవరకు ఎనభైఆరు మేలుకునే ఉందామె.
24. ఆరాతి పగులులో'వో అరవైరెండు తళుక్కున మెరిసింది.
25. ఆమె దాన్ని తీసుకొని ఎనభైఐదు రాజుగారింటికెళ్ళింది.

A - 3 : Test Material used in Control - I

APPENDIX - 'A'

A - 3 : LIST-II

1. భోజనాలవగానే మళ్ళీ నలభైనాల్గు ఇద్దరూ గదిలోకొచ్చారు
2. తీర్పుని రెండురోజుల నలభైఏడు వరకూ వాయిదా వేశారు
3. దిండులో తలపెట్టుకొని ఇరవైఏడు పడుకొని ఉన్నాడతను
4. నక్కకు కూడా ఎలాగైనా తొంభైఆరు ఎగరాలనే కోరిక పుట్టింది
5. నాకు జరిగిన అన్యాయాన్ని డెబ్బైనాల్గు ఎవ్వరికీ చెప్పనులే
6. ఆ రెండు రోజుల్లో ఆయన నలభైతొమ్మిది చాల పుస్తకాలు చదివారు
7. వాడు వచ్చే వరకూ నీవు నలభైఆరు ఇక్కడే ఉండాలి
8. అంత బుద్ధిబలం ఉన్న అరవైరెండు మనుష్యులే ఎగరలేరు కదా
9. మంచి పనికోసంలోకాన్ని డెబ్బైరెండు ఎదిరించడం నేరం కాదు
10. కబుర్లలో కాలమే ఎనభైనాలుగు మరచిపోయారిద్దరూ
11. నాకు మాత్రం యాభైఏడు ఎగరటమే హాయి నడిచే జీవితం కన్న
11. నడిచే జీవితం కన్న నాకు మాత్రం యాభైఏడు ఎగరటమే హాయి
12. చాల ఆలోచించే ఈ యాభైఆయిదు నిర్ణయానికొచ్చిందామె
13. ఎర్రటి ఎండలో తారురోడ్డు యాభైనాల్గు నల్ల నిప్పుల బాటలాగుంది
14. ఆమె కూడా చిరునవ్వు తొంభైఆయిదు నవ్వుతూ రైలు దిగింది
15. ఆకాశంలో అక్కడక్కడా ముప్పైఆయిదు చుక్కలుమెరుస్తున్నాయి
16. కాకి పట్నంలోకి ఎగిరెళ్ళి యాభైరెండు గాలిబుడగలు తెచ్చింది
17. వాన మెల్లగా ఎక్కువ నలభైమూడు అవడం ప్రారంభించింది
18. గంధమెక్కడున్నా యాభైఆరు సువాసన వెదజల్లుతుంది
19. స్వార్థం లేకుండా మానవుడు డెబ్బైమూడు ఏపని చేయలేడు
20. కాంపల్లె అనే గ్రామంలో అరవైఒకటి పెద్దకాలనుండేది.
21. గాలి కిటికీ రెక్కని ఇరవై నాలుగు తోసుకొని గదిలోకొచ్చింది
22. కంగారుగా అతని డెబ్బైతొమ్మిది గదిలోకెళ్ళిందావిడ
23. మేడమెట్లు దిగుతుంటే ముప్పైనిమిది అరుణ కనిపించింది
24. మానవుడి ఊహా చిత్రాలు యాభైతొమ్మిది అంతులేనన్ని ఈ ప్రపంచంలో
25. భోజనాల దగ్గర ఎవ్వరూ ఇరవైమూడు మాట్లాడనే లేదు.

APPENDIX - 'A'

A - 4 Test material used as Primary Message in Experiment II

1. He pressed his hand on Nintysix the king's feet.
2. I will teach him a thirtyeight lesson tomorrow.
3. The king fixed his fortynine stunneyes on the sweeper.
4. The hospital was fortyseven a vary huge building.
5. Rats played on the seventyeight dying patients.
6. Govind was delighted fortyfour at the prospect.
7. Nobody in the eightyfour village bought the horse.
8. They had large beads eightytwo around their necks.
9. People ran to the eightythree palace to inform the king.
10. All but the princess eightyeight were happy on that day.
11. The dog looked at Mohan thirtythree wondering who he was.
12. Mohan quietly fiftyfive slipped out of the class.
13. They all,loved the fiftynine little house by the wood.
14. After the procession fortyeight they went home.
15. Karuna brought her sixtysix some food to eat.
16. Gopi sat down by the sixtyeight side of the road.
17. Suddenly the monkey fortytwo had an idea.
18. The neat had lots of sixtyfour birds in it.
19. He always learnt seventyfive his lessons quickly.
20. Saturday they made ninetyseven many clay dolls.
21. They all cameeto the twentytwo hospital to see Chandu.
22. Suddenly Chickoo fiftyfour felt very thirsty.
23. But nobody came eightyseven to help Motilal.
24. People passed by the seventyone their bullock carts.
25. The house was full of twentythreee people that morning.

A - 4 : List 2

1. I cannot stich your twentysix clothes till tomorrow.
2. Shamu could not sixtytwo believe his ears.
3. The beggar kept on thirtyeight crying for long time.
4. He was seared to look nintyseven at his own shadow.
5. All the honey in seventyfive the bottle was spilt.
6. Shamu folded his eightyfour hands and prayed silently.
7. After few days his fortyfour wound was completely healed.
8. The cock alone went and nintynine did all the sowing.
9. A dentist can give eightythree her a better dental care.
10. It costs money to fortysix feed the monkeys.
11. After the heavy thirtytwo meal they all fell asleep.
12. They baked those dolls twentyfour over a word five.
13. All the children ran eightyfive as fast as they could.
14. Vimala snapped elghtyeight her mouth shut.
15. Uncle and aunty will fortyfive come here any day now.
16. The pandit patted twentythree kumar on his back.
17. But her capacity fiftytwo was even greater.
18. What you lacked was thirtyseven a bit of humility.
19. One night two thieves fiftysix entered their house.
20. The little goat was nintynine happily grazing.
21. Soon all the people in thirtyone the country understood.
22. The windows looked sixtyeight like empty eyes.
23. Dry leaves crunched seventyfour under their feet.
24. You stars promise twentyseven an excellent year.
25. Tulasidas woke up twentynine early in the morning.

A - 5: Test material used as Competing Message in Experiment - II

1. రతిరోజు పార్కుకి పిల్లలెవరూ రాలేదింకా అన్నాడు రవి.
2. అప్పుడు ఇంటి ముంగిటున్న మా తోటలో పనిచేసుకుంటున్నాను.
3. ఆమె వెళ్ళిన రోజు రాత్రంతా ఆంచునకు నిద్ర పట్టనే లేదు.
4. ఎల్లుండి సాయంత్రం త్వరగా నన్ను ఇంటికి రమ్మంది అమ్మ.
5. మోహన్ దిగులుగా మేడ మెట్లపై కూర్చొని ఉన్నాడా రోజు.
6. ఒక గుర్రపు బండి పెద్ద గేటు లోనుండి వచ్చి ఆగింది.
7. ఆ మర్రి చెట్టు కిందే మా ఊరి పిల్లలు ఆడుకుంటూ ఉండేవారు.
8. మీ సహజ కోమలత్వానికి మైసూరు శాండిల్ సబ్బునే వాడండి.
9. ఇచ్చిన కాగితానికి ఒకవైపున మాత్రమే పెన్నుతో వ్రాయండి.
10. ఇంతలో ఒక కుర్రవాడు వెనుక నుంచి పరిగెత్తుకు వచ్చాడక్కడికి
11. ఇంతలో దగ్గరగా కారాగిన శబ్దం వినిపించిందతనికి.
12. తొడుక్కున్న కోటుకి గులాబీ పూవు గుచ్చుకునేవారు నెహ్రూ.
13. వెంటనే రంగ స్థలం మీది రంగులతెర మెల్లగా పైకి లేచింది.
14. నీలంరంగు చీర కట్టుకొని ఉన్నారు ఆమెఆరోజు.
15. వెంటనే దీపక్ లేచి దీపాలు ఆర్పివేసి పడుకొన్నాడు.
16. మా ఊరి జమిందారు గారి తోటమాలి పేరు వెంకటసుబ్బయ్య.
17. మల్లెపూవులను కోసి మాలలు కట్టేవాడు ఆతోటమాలి.
18. మా ఇంట్లో అందమైన పెద్ద రబ్బరు బొమ్మ ఒకటుంది.
19. అందుకే తాతయ్య గారంటే మా ఇంట్లో అందరికీ చాల భయం.
20. ఆసమయంలో దీపక్ హాస్య కథల పుస్తకం చదువు తున్నాడు.
21. నెహ్రూ హిందూదేశ చరిత్రను చాల ఆసక్తితో చదివే వారట.
22. ఆరాత్రి చింత చింత ఆలోచనలతో నిద్రపోయారు వాళ్ళంతా.
23. అందంగా ఉన్న ఒక యువకుడు నాకు ఎదురు వచ్చాడు.
24. స్వరాజ్యం, శాంతి నెహ్రూ గారి జీవిత లక్ష్యాలు.
25. అదే రోజు రాత్రి శంకర్కి, లక్ష్మికి నిద్ర పట్టనేలేదు.

APPENDIX - 'A'

1. వాళ్ళిద్దరికీ దేవుడి మీదున్న భక్తి కాస్తా పోయిందారోజుతో.
2. ఈమారు కన్పించితే పిచ్చమ్మల్ని కాఫీకి పిలవమంది మా ఆవిడ.
3. వరుసగా అమర్చిన ఆ దీపాలకాంతి క్రమంగా తగ్గిపోసాగింది.
4. ఎదుగూ బొదుగూ లేని ఈ సమాజంలో నవచైతన్యం రావాలి.
5. సుబ్బరామయ్య అక్కడ్నించి చీకట్లో గబగబా నడిచాడు ఇంటికి.
6. శారీరకంగా కృంగిపోయారేమోకాని మానసికంగా చెక్కు చెదరలేదు.
7. కాకి ముక్కుతో గాలి బుడగలను ఒక్కొక్క దానినీ వరుసగా పొడుస్తోంది.
8. పక్క కుర్రాడిని పాలకోసం పంపించి ఎదురు చూస్తూ కూర్చుంది.
9. కాలంతో పాటు ప్రేమా, దానికున్న విలువా మారి పోతాయట.
10. ఆరోజు అర్ధరాత్రయినా ఇంకా మేలుకొనే ఉన్నాడు రామలింగయ్య.
11. రాజుగారి తోటనంతా అతనే ప్రతిరోజూ శుభ్రంగా చిమ్మేవాడు.
12. ఏదైనా సైకిలు ఆగిన చప్పుడు వినబడుతుందేమోనని గేటు వంక చూశాడు.
13. పెద్దగా కూతవేస్తూ కొద్ది నిముషాల్లో నాంచుంటుపేట స్టేషను చేరింది రైలు.
14. పరీక్షలయిన వెంటనే వేసంకాలం సెలవిచ్చేశారు మాకు.
15. ప్రయాణం అనంతరం చక్కటి తలంటు ఆమెకు చాల హాయినిచ్చింది.
16. వెన్నెల్లో కుర్చీలు వేసుకొని కొంతసేపు కబుర్లు చెప్పుకున్నారు ఇద్దరూ.
17. మంచి గంధపు చెక్కతో తయారు చేసిన బొమ్మలు అమ్ముతూ ఉంటారక్కడ.
18. ఈవారమైనా ఆవిడ దగ్గర్నుంచి ఉత్తరం వస్తుందో, రాదో.
19. మొన్న అతనికి లక్ష్మి మీద అనవసరంగా చాల కోపం వచ్చింది.
20. అప్రయత్నంగా నా మనస్సు వర్తమానం నుంచి గతంలోకి వెళ్ళిపోయింది.
21. పనంతా అయ్యాక జానికమ్మ మెల్లగా అల్లుడితో బేరానికి దిగింది.
22. ఆడుకొంటున్న యువరాణి పులిని చూసి గట్టిగా కేకలు పెట్టింది.
23. వాంగ్, కువో వద్ద చాల లక్షల డబ్బు అప్పుచేశాడు.
24. ఈ వారం మాటికృషిణిలోని కవితాగేయం చాల బాగుంది.
25. తాగుబోతుకైనా తల్లితో మాట్లాడే మర్యాద అనేది ఒకటుంటుంది.

APPENDIX - 'A'

A - 6 : Test material used in control condition II

1. He took me to a shop and eightythree bought me an umbrella.
2. The squirrel grew bigger and eightyseven is able to play with me.
3. I stood behind the thee and seventyfive threw a stone at my grandfather.
4. She bought her baby squirrel and nintyseven placed next to me.
5. I noticed something bright twentyfive shining inside our task.
6. I sent a letter to my nintythree teacher for leave.
7. The cock listened for a while fortyseven to wolf's song in silence.
8. I had a bad dream and have not thirtythree been able to sleep.
9. The Indian classics are twentyfour old books written in Sanskrit.
10. They used to take the cattle out fiftyfour to the jungle in the morning.
11. Again the wolf believed nintyfive the cunning fox.
12. God heard our prayers and thirtyfour has given you back to us.
13. One evening grandfather and fortyfour I were going to the temple.
14. He wanted us to keep that nintyone elephant with us at our place.
15. Kittu told me that he liked ripe sixtynine bananas better than sugarcane.
16. I tried to catch a bee fiftythree and it stung me on my finger.
17. No sooner had the cock appreared eightyfive than fox gobbled him up.
18. Then he started praying to fortytwo all the gods to come to his hel
19. Mohini told him to take twentyseven rest before he started chasing Shiva.
20. The cock believed her and they both seventyfour ran off together to the woods.
21. Then he came out with me and twentynine saw that what I said was true.
22. I lived a quiet life in the fiftyfive forest and did not touch a soul.
23. The elephant refused to obey thirtyseven his order.
24. Suddenly they saw a very fortynine funny animal and got frightened.
25. He ran and ran and did not sixtytwo step until he reached a house.

A - 6 : List 2

1. Everybody was sorry sixtysix to hear the bad news.
2. The wealthy man heard thirtysix the beggar cry loudly.
3. All the attempts to nintytwo kill it ended in vain.
4. I noticed two strange sixtyfive thing during my illness.
5. I listen to the twentyone Ramayana in the evenings.
6. They were selling many fiftythree things at the mela.
7. Munni is Shamu's seventyfour little sister.
8. Time passed most fortythree happily for Rama.
9. His job was to get the eightytwo cut logs numbered.
10. There was a fight seventyeight between the two kingdoms.
11. She silenced the twentyseven angry demon for good.
12. His mother gave him fortyfive some bread to eat on the way.
13. The police had covered seventytwo it with a newspaper.
14. That is one lesson all fiftytwo our children must learn.
15. He parked the car twentysix infront of that Nehru lodge.
16. Nobody had ever sixtyseven visited him at that hour.
17. He had no idea where sixtynine he had fallen.
18. Wednesday is ideal eightyfour for meeting friends.
19. The trucks had fiftyone unloaded and left one by one.
20. He came out wiping his thirtyeight face with a towel.
21. As he turned he saw nintysix a gun pointing at him.
22. There was great fortyfive rejoicing at the palace.
23. The priests served fortysix them delicious food.
24. All the people around sixtyfour are jealous of one.
25. All the piligrims thirtyseven trembled in fear.

APPENDIX - 'B'

B 1 - English Achievement Test

General Directions

1. Read the directions under each part of the test carefully.
2. Try and answer all the items.
3. Please write with a pencil so that you can come back and correct if you have time.
4. Try to finish the test as soon as possible.

I. Directions: In each of the following lists there is one word which does not belong to the family of words given. Please underline such words.

EG. Pen Chalk Crayon Pencil Black-board

1. Sun Star Planet Radar Moon
2. Elephant Lion Cock Wolf Bear
3. Palm Fingers Wrist Hair Fingernail
4. Stream Tumbler Riner Sea Pond
5. Baloon Propeller Rocket Aeroplane Spaceship

II. Put in a, an or the as required in the brackets

Eg. We went to (the) zoo. (An) elephant is tied to (a) tree

6. When I got to ( )station, I found that ( ) train had already left.
7. John and Mary did not have( )home of their own so they lived for( ) year or two with Mary's parents.
8. ( )Field trip was organised for ( )students of Science department. The visit was( ) success.

VI. Transform the following statements into simple questions. Rewrite the question.

eg. He went to States last year.

Ans: Did he go to States last year?

21. She went to the park

22. There were four cups on the table

23. The students were late

VII. Change the following into assertive sentences, Rewrite the sentence.

eg. How beautiful her eyes look[8] !

Ans: Her eyes look beautiful.

24. How selfish and wicked he had been!

29. How lovely is the weather!

26. Waht a terrible dream I hadI!

VIII. Correct the following sentences if necessary, Begin with new sentence with the word "there"

eg. A pen is inside the desk

Ans: There is a pen inside the desk.

27. Three maps are on the table.

28. A cum is above the table.

29. Water is inside the well.

30. A five rupee note is inside my purse.

IX. Compelete the sentences by putting in who, which or that

eg. 1) Bring the book which or that is on your shelf.

ii) The girl who has just gone out is my sister.

III. Change the following sentences into singular. Make the corrections below each word which needs to be changed. Need not rewrite the sentence.

eg. The lecturers scolded the students for not
lecturer student

having attended the classes.
class

9. The old women smiled bravely through their tears.

10. We shall bend the front of those radiators.

11. The physicians gave them the best medicines but they grew worse everyday.

12. We shall not buy those mangoes, sold in those shops.

IV. Combine the following sentences into a good one using possessive, Rewrite the new sentence, Read the example carefully.

EG. Della had long hair. It was beautiful.
Delia's long hair was beautiful.

13. Motilal has four daughters. They live in England.

14. Raju had a friend. He was working in Railways.

15. She had a pen. It was black in color.

v. Read the following sentences carefully. Replace the Underlined words using suitable Noun/Noun group, as shown in example. Write your answer below the underlined portion.

EG. We have a lesson in science every Wednesday
Science lesson

16. He only reads news about sports

17. She was wearing a saree made of pure silk

18. He dropped the bottle used for milk

19. My brother has just passed his exam. in law

20. The earliest engines driven by steam were only used for pumping.

31. Please get me the pen_________is on dad's table.

32. What is the name of the girl_____is wearing a red saree.

33. The building________is collapsed, killed two people____ were living in it.

X. Complete the sentence by using question tags

eg. i) You left early, didn't you?

ii) Ram won't forget, will he?

34. That saree was not expensive. . . . . ?

35. She went home. . . . .?

36. The students enjoyed the game. . . .?

XI. Complete the sentences using -ing form or to infinitive of the verbs given in brackets.

eg. i) Krishna enjoyed meeting all his friends (Meet)

ii) They asked him if he liked to live in the city(live)

37. We saw several people.. . . . . in the lake(swim)

38. Why did you keep me. . . . .nearly an hour?(wait)

39. I told my friend. . . .along with me(come)

40. There we stopped. . . . .some breakfast(have)

XII. Listening comprehension.

I paragraph - Answers	II paragraph- Answers
41	46
42	47
43	48
44	49
48	50

Scores:

Time taken:

APPENDIX 'B'

B 2 - Telugu Achievemen Test.

సూచనలు

1. జవాబులు వ్రాయుటకు ముందు ప్రతి ప్రశ్ననూ చదవండి. ఇవ్వబడిన సూచనలను చదివిన తరువాతనే జవాబులు వ్రాయండి.
2. అన్ని ప్రశ్నలకు జవాబులు ఇవ్వడానికి ప్రయత్నించండి.
3. వీలయినంత త్వరగా జవాబులు వ్రాయండి.
4. దయచేసి పెన్సిలు ఉపయోగించండి.

I. క్రింద ఇవ్వబడిన పదములకు సరియైన అర్థమును గుర్తించి దానికను బంధమైన అక్షరమును బ్రాకెట్టులో వ్రాయండి.

ఉదాహరణ: అనాది నుండి

a. క్రొత్తగా b. ప్రారంభకాలం నుండి c. యుగప్రారంభమునుండి
d. ఈ మధ్య కాలం నుండి (b)

1. తేలికగా
   a. మెల్లగా b. వల్లగా c. సులభంగా d. బాగా ( )
2. ఊరు
   a. పట్టణము b. దేశము c. గ్రామము d. సంస్థానము ( )
3. తదుపరి
   a. అప్పుడు b. వెనుక c. తరువాత d. ఇల్లిప్పుడలా ( )
4. కలదు
   a. ఉన్నవి b. ఉన్నది c. ఉండేది d. ఉంటున్నాయి ( )
5. ఏకాకి
   a. ఒకానొక b. ఒకకాకి c. ఒంటరివాడు d. ఒక్కడేఉన్న ( )

II. ఇవ్వబడిన ప్రధాన వాక్యమునకు క్రింద ఇవ్వబడిన వాక్యాంశాలను జతపరిచి పూర్తి వాక్యములను ఎదురుగా వ్రాయండి. ఉదాహరణను జాగ్రత్తగా పరిశీలించండి. ఏ పదాంశాన్ని వదలరాదు.

ఉదాహరణ: అమ్మ అన్నము వండుతున్నారు (ప్రధాన వాక్యము)

వాక్యాంశములు:

ఇప్పుడు: అమ్మ ఇప్పుడు అన్నము వండుతున్నారు.

మాత్రము: అమ్మ ఇప్పుడు అన్నం మాత్రం వండుతున్నారు.

వంటగదిలో: అమ్మ ఇప్పుడు వంటగదిలో అన్నం మాత్రం వండుతున్నారు.

ప్రధానవాక్యం:

6. రోజూ:

7. సాయంకాలం:

8. రాముడి:

III. క్రింది వాక్యములను ఎదురుగా ఇచ్చిన పదములతో చేర్చండి. కొత్త వాక్యాన్ని తిరిగి వ్రాయనవసరం లేదు.

ఉదాహరణ: ఆమె అతనితో <u>కలిసి</u> అక్కడికి వెళ్ళింది. (<u>కలిసి</u>)

9. ఆవిడకి నేను చాల ఇష్టం (<u>అంటే</u>)

10. కొంచెం దూరం నడిచే అంవరానం వచ్చింది. (<u>సరికి</u>)

11. అతని అమ్మ వచ్చింది. (<u>మాత్రం</u>)

12. సీత పుస్తకాలు నాదగ్గరలేవు (<u>దగ్గరలేని</u>)

13. రాముడు నన్ను ఆగమన్నాడు (రెండుగంటలసేపు)

IV. క్రింది వాక్యములను బ్రాకెట్లలో ఇవ్వబడిన పదములతో కలిపి ఒకే వాక్యంగా వ్రాయండి. అవసరమైన మార్పులు చేయవచ్చును.

ఉదాహరణ: మీరు వెళ్ళారు. మీ అన్నయ్య వచ్చారు. (వెంటనే)
మీరు వెళ్ళిన వెంటనే మీ అన్నయ్య వచ్చారు.

14. ఆ పండు పచ్చిగా ఉంది. అది నాకు కావాలి. (ఉన్న)

15. ముందు అక్క వచ్చింది. బావ వచ్చారు. (తరువాత)

16. నేను అన్నం తింటున్నాను. సీత వచ్చింది. (ఉండగా)

V. క్రింది వాక్యములను కలిపి అవసరమైనచో మార్పులు చేసి క్రొత్త వాక్యమును వ్రాయండి.

ఉదాహరణ: నేను పదవ తరగతిలో ఉన్నాను. నేను మద్రాసులో చదువుచున్నాను.
జవాబు: నేను మద్రాసులో పదవ తరగతి చదువుచున్నాను.

17. సీతారాముడి చెల్లెలు. ఆమె మైసూరులో పని చేస్తున్నారు.

18. రామారావుగారికి నల్గురు కుమార్తెలు. వారంతా ఢిల్లీలో ఉన్నారు.

19. రైలు ఎనిమిదింటికి రావాలి. ఈరోజు తొమ్మిది గంటలకు వచ్చింది.

VI. క్రింది వాక్యములకు సరియైన అర్థమును గుర్తించి దానికనుబంధమైన అక్షరమును బ్రాకెట్టులో వ్రాయండి.

ఉదాహరణ: నేను ఢిల్లీ వెళ్తున్నాను అంటే
a. నేను ఢిల్లీ వెళ్లను
b. నేను ఢిల్లీ వెళ్ళవచ్చు (c)
c. నేను ఢిల్లీ పోతున్నాను.

20. 'మా అమ్మ భోజనం చేసేసింది' అంటే

a. మా అమ్మ భోజనం వండింది.
b. మా అమ్మ అన్నం వడ్డిస్తోంది. I I
c. మా అమ్మ అన్నం తినేసారు.

21. రవి మంచి నిద్రలో ఉన్నాడు అంటే

a. రవి నిద్ర పోంతాడు
b. రవికి నిద్ర రావటం లేదట I I
c. రవి నిద్రపోతాడు

22. 'రాముడేపని చేస్తే భీముడు ఆపని చేస్తాడు' అంటే

a. రాముడు చేసిన పనంతా భీముడు చేస్తాడు.
b. రాముడు చేయలేని పని భీముడు చేస్తాడు. I I
c. రాముడు, భీముడు కలిసి పని చేస్తారు.

23. 'శర్మ తప్ప ఎవరూ రాలేరు' అంటే

a. శర్మ రాలేరు
b. శర్మ మాత్రమే రాగలడు I I
c. అందరూ రావచ్చు

24. 'గోపి వచ్చాడట కదా' అంటే

a. గోపి రాలేదు
b. గోపి వచ్చాడా? I I
c. గోపి వచ్చాడు

VII. క్రింది వాక్యములను ప్రశ్నలుగా మార్చండి.

ఉదా: నిన్న మీరు గుడికి వచ్చారు.
నిన్న గుడికి వచ్చింది మీరేనా?

25. రాముడు నూర్కిలికి నడిచి వెళ్ళాడు.

26. నిన్న దీన్ని బజారులో కొన్నాను.

27. అప్పుడే ఆఫీసు టైము అయిపోయింది.

VIII. కింది ఖాళీలలో సరియైన క్రియాపదముల నంబరు మాత్రం ఆ వాక్యానికి ఎదురుగా వ్రాయండి.

క్రియాపదములు: 1. నేను 2. ఉంచి 3. ఆర్పివేసి
4. రానివ్వండి 5. లోపల 6. ముందు 7. ఉన్నంతరా?

28. ఆ కూజాలో మంచి నీళ్ళు . . . . .
29. కునుకు రోజూ పది గంటల . . . . . వదుపుతుంది.
30. మీరారు వాడిని లోపలకు . . . . .
31. మా ఇంటి . . . . పెద్దతోట ఉంది.
32. 'ఆ దీపం . . . . . . పడుకో ఇక' అన్నారు.

IX. కింది వాక్యాలలో గీత గీచిన పదాల్ని సరిచేసి, జవాబు దాని కిందే వ్రాయండి. కొత్త వాక్యాన్ని తిరిగి వ్రాయనవసరం.

ఉదా: రెండు కోతులు చెట్టు మీద కూర్చుంటుంది.

రెండు కోతులు చెట్టు మీద కూర్చున్నాయి.

33. వచ్చే సంవత్సరం మేము ఢిల్లీలోకి వెళ్ళాను.

34. ఆరాజుగారి కోట ఒకప్పుడు ఎంతో బాగుంటుంది.

35. నేనూ వచ్చేవాన్నిసీతో కాంటెం వరకస్థా కూర్చో!

36. మేమందరం నిన్న సినిమాకి వెళ్లను.

X. క్రింది బహువచనములో ఉన్న వాక్యాలను ఏకవచనములో వ్రాయండి.

ఉదా: మేము సైకిళ్ళ మీద ఆ ఊరు వెళ్ళాము.
నేను సైకిలు మీద ఆ ఊరు వెళ్ళాను.

37. మేము అరటి పళ్ళు తింటూ ఉండే వాళ్ళం

38. బాతులు నీళ్ళలోని చేప పిల్లలని తింటున్నాయి.

38. ఆకాశంలో కొంగలు ఎగురు తున్నాయి.

40. నా చెల్లెళ్ళు పరీక్షలన్నీ అయి పోయాయి.

XI. Listening Comprehension.

జవాబులు.

41 to 50

TABLE - A

Signal-to-noise ratios dB	Total score of subjects in		Mean score in	
	English test	Telugu test	English test	Telugu test
-12	1616	1708	80.8	85.4
- 6	1649	1687	82.45	84.45
0	1564	1670	78.2	83.5
+ 6	1506	1659	75.3	82.95
+12	1581	1689	79.05	84.45

Table showing the Mean Scores of 100 subjects in both the achievement tests.

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APPENDIX 'C'

C – 1 : Discrimination scores (% correct) obtained by fifty normal hearing subjects in Experiment I under five different signal-to-noise ratios.

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S/N ratio	SUBJECTS									
	1	2	3	4	5	6	7	8	9	10
-12dB	4%	0%	32%	0%	0%	0%	0%	0%	0%	0%
- 6 dB	56%	66%	66%	62%	66%	52%	64%	42%	66%	70%
0 dB	74%	90%	86%	76%	86%	84%	82%	84%	78%	72%
+ 6 dB	78%	80%	74%	78%	82%	82%	82%	84%	80%	92%
+12 dB	88%	92%	92%	78%	84%	90%	88%	82%	78%	84%

APPENDIX 'C'

C - 2 : Discrimination scores (% correct) obtained ihy fifty normal hearing subjects in Experiment II under five different Signal-to-noise ratios.

... ...

S/N ratio	SUBJECTS									
	1	2	3	4	5	6	7	8	9	10
-12 dB	0%	0%	0%	0%	0%	12%	0%	6%	0%	0%
- 6 dB	92%	84%	58%	90%	92%	78%	74%	68%	80%	74%
0 dB	70%	94%	96%	96%	96%	90%	82%	78%	96%	96%
+ 6 dB	96%	94%	96%	98%	98%	78%	94%	92%	94%	88%
+12 dB	90%	88%	88%	96%	90%	96%	98%	96%	96%	98%

APPENDIX 'C'

C - 3 : Discrimination scores (% correct) achieved by fortyfour normal hearing adults in Experiment. I Control Condition (quiet) re: 40 dB SPL.

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1.	86	11.	90	21.	92	31.	86	41.	90
2.	88	12.	84	22.	98	32.	-	42.	96
3.	90	13.	90	23.	88	33.	84	43.	92
4.	88	14.	90	24.	96	34.	90	44.	94
5.	-	15.	92	25.	88	35.	-	45.	92
6.	96	16.	94	26.	92	36.	86	46.	92
7.	90	17.	88	27.	92	37.	-	47.	92
6.	96	18.	88	28.	92	38.	-	48.	92
9.	96	19.	68	29.	84	39.	94	49.	96
10.	92	20.	96	30.	-	40.	94	50.	98

Mean discrimination score : 93.0%

Standard Deviation: 4.103

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APPENDIX 'C'

TABLE - B

Sl. No.	Scale	SPL values Re: 0.0002 dy/cm^2	
		Inside the booth	Outside the booth
1	A	22 dB	40 DB
2	B	30 dB	42 dB
3	C	40 dB	44 dB

C - 5 : Noise levels in (dB SØL) at 'A' 'B' and 'C' scales.

APPENDIX 'C'

TABLE - C

Sl. No.	Central frequency of the Octave band in Hz.	SPL values in the booth Re. 0.0002 dy/cm^2		ISO(1964) specification SPL values in audiometric room. Re. 0.0002 dy/cm^2
		Inside	Outside	
1.	125	24 dB	35 dB	31 dB
2.	250	22	40	25
3.	500	24	40	26
4.	1000	20	34	30
5.	2000	15	30	38
6.	4000	11	22	51
7.	8000	10	16	56

C - 6 : Noise levels in (dB SPL) inside and outside the test booth.