SPEECH PATHOLOGY AND LINGUISTICS•

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The field of Speech and Hearing is a young one in India. The beginnings of organised effort were seen only as recently as eight years ago. Even now there are only a few trained Speech Pathologists and Audiologists—in the country. Actually some of the trained people are yet to find jobs because posts are only now being created in several places. Except in large cities like Bombay and around the city of Mysore people are not aware of a field such as this; not all people of the medical profession with whom we share a lot of interests are aware of the availability of Speech and Hearing services or of the need for them. With this in mind I request the indulgence of this seminar while I briefly describe our functions. The intention of this paper is to indicate the kinds of information that linguistics can provide towards the improvement of our professional endeavours. If as a sideline, an impression of how concern with our field might prove to be of value to the general concerns of linguists is obtained this paper would have been well rewarded.

We deal with people who have speech and hearing handicaps. Audiologists amongst us emphasise the testing of hearing, diagnosis of hearing loss and rehabilitation of hearing loss. They may as a part of rehabilitation recommend medical or surgical treatment or prescribe hearing aids suitable to the individual and his hearing loss. In cases where hearing is lost before the acquisition or stabilization of language the audiologist is also interested in educational rehabilitation which includes training in speech, speech reading and language. He is posed with the task of establishing language habits in a child who lacks the most important avenue of language acquisition. In some cases the child has some residual hearing. He hears a part of the language around him and upon this distorted base he should build his language. The process of speech reading to which linguists do not seem to have paid much attention is one in which spoken language is comprehended by observing the movements of the lips and tongue.

The Speech Pathologists, amongst us are concerned with speech defects of all kinds. They do both diagnostic work and rehabilitation. We define a speech disorder as a deviation along any characteristic of speech, a deviation so great that it interferes with communication, that the attention of the listener is drawn towards the manner of speech instead of its content, that it is aesthetically

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unpleasant and/or that it causes concern to the speaker. The speech pathologist is also concerned with language delay, abnormalities and pathological losses. There are several ways in which we classify speech defects. One such is the break down given below:

1. Articulation disorders.
2. Phonation or voice disorders.
3. Rhythm disorders.
4. Language disorders.

Many speech problems do overlap into one another and it is also not possible to lump the problems in each category either for study or for therapy.- The causes of speech disorders may be maturational, organic or psychological Sometimes, perhaps more often than is commonly accepted speech disorders may be results of mislearning.

From this brief and elementary introduction it can be seen that this field of speech and hearing depends heavily upon an interdisciplinary approach. It draws its information from Medicine, Psychology, Education, Physics, Electronics for its instruments and above all Linguistics. Linguistics is perhaps where we have our greatest resources but the field perhaps is the one least tapped by us. It is only in recent years that more and more contact is developing between the two fields. Linguists like Roman Jacobson have devoted a good bit of their time to speech handicaps and we are beginning to see greater uses of linguistic principles in our therapy. This co-ordinated effort in the rehabilitation of speech and language disorders is still in its infancy.

The dependence of Speech Pathology and Audiology on linguistics needs to be seen clearly, especially by us in the field of Spjeech and Hearing. We are concerned with communication, how it is affected and how we can correct this defect. We are concerned with language, its acquisition, factors interfering with its acquisition, factors causing loss of language, techniques of instituting a language and of reinstituting a language. (The dichotomy of speech and language might sound naive to the linguists but as speech pathologists we do encounter speech defects with no language deficits, e.g., voice disorders). In other words we are concerned with a great deal of linguistics. As Corder (8) a linguist puts it 'the speech therapist is interested in verbal behaviour in |its development, corrections and re-establishment in his patients'. He continuesjto indicate 'anatomical and physical abnormality may be diagnosed either by direct *observation* or by *inference* from the patient's verbal behaviour. In the latter case the diagnosis is based on *linguistic* evidence and in the former case, of course, has linguistic correlates'. This makes it essential that the speech therapist knows his linguistics

Corder (8) assumes that the therapist is himself, of course, normally a native speaker of the language of his patients. 'He possesses, in other words a knowledge of what is normal behaviour in the language- he works in'. Of course, for various reasons this assumption cannot be held in India where people trained

in. two cities, Bombay and Mysore have to work all over the country. The Institutions do admit students from any language background. (However Bombay is limited in its programme in that it has to take a majority of its students from Bombay). However this will not remove the therapist who is not a native speaker. Ways have to be devised of providing this therapist with adequate knowledge of the language of the region in which he works. The situation becomes worse when we realise each region has more than one language and the therapist working in any centre or hospital is bound to work with several languages. This situation will not ease for many years to come till there is a proliferation of therapists in every part of the country. And Corder (8) says 'unless the therapist has the necessary linguistic knowledge, he is able neither to describe the initial behaviour of his patients, nor their terminal behaviour, nor prescribe the course of treatment, nor specify what is going wrong during the course'. The only solution to this problem is greater collaboration between the speech therapist and the linguist.

However, it must be mentioned that this problem is not new to the multilingual situation existing in India. The need for linguistics has been felt strongly in other countries also. House (16) commenting on a study made by Curtis and Hardy, two 'speech people' stated 'during the past few decades there have been a number of futile attempts to demonstrate to the satisfaction of practical speech therapists the intimate relationships between (1) linguistics and speech therapy, and (2) experimental phonetics (or speech science) and speech therapy'. He complained 'I have the uncomfortable feeling that most 'speech people' pick up their ideas about phonetics and phonemics in highly oversimplified accounts'. This is a real problem. Very few speech pathologists are even exposed to linguistics and fewer still get a good grounding in it. Linguistics is sometimes indicated as a desirable part of a training programme of speech pathologists; but it is not insisted upon. My own training does not cover any linguistics. Our programme at Mysore does provide an exposure to linguistics, though rather elementarily during the first year of our programme with the hope that the interested students would study up later. The training programme in Denmark (1) at the Teachers College for Advanced Studies includes a course in linguistics and phonetics. Programmes in Spain (31) and in South Africa (30) have courses in *Phonetics* in the first year of their training programmes. This is the same in Bombay and England. The programme in Australia includes linguistics in the first year as we do. However, we do realise that this is nowhere near enough. Curtis and Hardy (9) in reply to House (18) said 'we readily plead guilty of knowing less about the field of linguistics theory than we would like to know. We would as readily plead guilty to knowing less in the field of acoustics, physiology, psychology, statistics, electronics, etc., than we would like to know or than we ideally should know to be most effective in our day to day work'. They add in partial explanation, 'in a field which crosses as many disciplines as ours, we imagine these feelings are shared by many colleagues'. They imagine correctly. They do not negate the need for a study of linguistics. 'We certainly

agree with him (House) that a greater understanding of the principles of linguistics would be a help to persons interested in speech disorders' (9).

The problem we face is not one of recognising the importance of the study of linguistics, but of finding the time for it. It is true that, as Corder says (2), 'until recently the only rigorous study of languages undertaken in the schools of Speech Therapy was that of phonetics'. He complains this deals only with the 'surface phenomenon of language'. This is (true even today as indicated earlier. Though there is a greater awareness now about the need for a greater understanding of linguistics theory on the part of the speech pathologist this cannot certainly be a solution in itself. It is important that linguists become interested in our problems and the speech pathologists should know enough to follow what the linguists talk about. In other words there is a need for greater communication between the two fields. There are many questions we need answered. We need to know how best we can apply the answers we now have and those we will get to fulfil our ends. Let us cursorily look at two speech and language disorders for leads as to the kinds of questions being asked. Answers to some are available and these answers raise further questions.

The first disorder I would like to consider is Articulation defects. We can define defective articulation as articulation of a sound such that it is not identifiable as that sound by most normal listeners most of the times. Milisen (28) suggests, 'Defective articulation might be described as the act of producing speech sounds which deviate too far from the standard set by society'. In an earlier definition, and interestingly more in line with modern linguistic thinking, Milisen (27) stated, 'defective articulation, a substitute response for normal articulation, results from the disruptions of the normal learning process'. He then postulated that the disruption was due to certain reinforcement contingencies operating in the environment. The therapy then recommended was to identify the point of disruption and to follow the normal stages of sound learning using learning principles.

However, what has not been clear is the normal process. How does a child acquire the phonemic system of a language? Throiugh what stages does he go? What factors facilitate this and what factors interfere with this? What is the best way. to diagnose the defect? And most importantly how do we overcome it? There are several answers to these questions and; several hypotheses. These till recently were basically phonetic. We knew at what age the different sounds would occur; but we did not recognize any pattern in them. Some answers were available to the linguists; and only to a few speech pathologists. These are now available to more and more people.

Perhaps the most significant in this regard is the concept of 'distinctive features' given by Jakobson and Halle (21). As Leopold (25) says, 'the linguistic study of children's language learning will have to build henceforth on Jakobson'. Jakobson, Fant and Halle (23) have listed twelve distinctive features. 'For the identification of /p/ and of every other phoneme, a reference to the specific

property of each of its distinctive features is imperative'. Haas (17) holds these distinctive features have 'diacritical power' and adds that phonetic elements also have 'determinant' power—'the choice of one phoneme determines the range of other phonemes' that may follow or precede it. He suggests that the 'determinant power' of some phonemes helps in discriminating other phonemes in the context.

Jakobson and Halle (21) provided a hypothetical schemata for the sequencing of the stages of phonemic contrast development. They believe that the child begins with the only utterance/pa/. They say 'ordinarily child language begins, and the aphasic dissolution of language preceding its complete loss ends, with what Psychopathologists have termed the 'labial stage'. 'In this phase speakers are usually capable only of one type of utterance which is usually transcribed as /pa/'. Fry (14) indicates that the first forms of the phonemic system are nearly always /m/a/ and /d/. The first item according to him is 'ma ma' followed by 'dada'. Actually Jakobson and Halle believe that these contrasts and the sequences are universal regularities. As quoted by Leopold (25) Jakobson claims 'we find that the speed and time of sound acquisition varies enormously between different children; but the sequence in categories and the relative chronology are always and everywhere the same, at least in great outline'.

According to Jakobson and Halle one of the factors determining the sequence is the number of languages in which a certain phonemic feature occurs. 'The more limited the number of languages possessing a certain phonemic feature or combination of features the later is it acquired by the native speakers' (21). Leopold (25) suggests 'the child will first distinguish in what it hears only the coarser contrasts, and will need time to appreciate the finer sub-contrasts between the sounds which reach its ear. The same applies to the efforts to reproduce the sounds in its own articulation'. According to Fry (14) a child begins with a small system made up of very few cells and this system expands as the need for expansion arises. He suggests that three main factors influence the order of acquisition of phonemes (l) perception of the necessary differences between sounds, the need for finding additional acoustic cues, often the need for discovering a new type of cue (2) the ease or difficulty with which the corresponding articulation can be learned (3) the informational loading of the various phonemic units, that is, the frequency with which the distinction between a given pair of phonemes is used in the language to which the child is exposed, to mark off one word from another. These are all hypothetical and need experimental evidence. Caroll sums it up:

> 'there are probably clear and relatively uniform developmental sequences in the distinctions learned, but investigators have failed to trace these in sufficient detail, and have almost completely overlooked such features of language as intonation patterns which are likely among the first items distinguished' (7:334).

We in India, are in a good situation to test the universal regularity of these assumptions. Speech Pathologists are interested in the validity of these sequences because they would be extremely useful in programming our rehabilitative work. We should find ways of communicating the features to the child with defective articulation in such a manner that he can develop a normal phonemic pattern based on these distinctive features.

Several questions have been raised as to the validity of the speculations of distinctive features. The question of describing the distinctive features with acoustic patterns as done by Jakobson and Halle (22) raised more questions. It is now known that not all sounds perceived as the same are acoustically similar. 'It is generally recognised that there is no one to one correlation between the phenomena at various stages,' the articulatory, the acoustic, and the auditory (13-134). Fisher-Jorgenson adds 'the same acoustic effect may be obtained in various ways, and the same perceptual effect may be due to different acoustic stimuli'.

Fry (14) also emphasises the absence of a one to one relationship between acoustic features and the phonemes signalled by them. He holds that 'it is the organisation of acoustic information by the individual rather than the acoustic information itself that permits the functioning of the phonological system'.

We also have the hypothesis by Lieberman (26:150) 'speech is perceived by reference to articulation—the articulatory movements and their sensory effects mediate between the acoustic stimulus and the event we call perception'. This hypothesis is untenable, however, as evidenced by many handicapped people who have normal speech perception but not normal articulation ability. It is also known that speech perception and comprehension precede active speech. We need more information as to how phonemes are perceived and how they are classified. Fry (14) mentions Lieberman and agrees with him that there is a close link between phonology and articulation. However, he warns that 'abnormalities of articulation in an individual speaker do not mean that his phonological system is abnormal'.

We ought to know what acoustic data are relevant for proper identification. For example we are not yet clear what relationships between Formant Frequencies of vowels are important for vowel recognition. Peterson found 'while phonetically equivalent vowels have somewhat similar formant frequency ratios, it does not follow that all vowels with similar formant frequency ratios are phonetically equivalent'. 'For vowels to be perceptually equivalent it appears necessary that absolute values of their formant frequencies lie within certain limits' (32). Fairbanks and Crubb (12) found that their data were 'positive support for an absolute theory and demonstrate that the relative theory is not tenable as a complete explanation'. Peterson (32) adds other variables. 'Formant amplitudes, fundamental voice frequency and phonetic environment in addition to formant frequencies all appear to have an influence upon the perception of vowel qualities'.

In this context, is it possible to specify the acoustic phenomena for each phoneme contrast implying a one to one ratio between the two? Jakobson *et al.*

(23) do recognise the impact of redundancy and other factors on perception and descrimination. Is it possible to quantify the amount of information each of the factors involved contributes to the learning of a phonemic system? Could we specify the minimal contrasts necessary for effective perception for each distinctive feature? Could we rank them in the order of priority? Speech Pathologists would also like to know how deviant a sound can be before it causes phonemic confusions.

Jakobson holds (19) the dissolution of the sound pattern 'exhibits a time order of great regularity'. 'Aphasic regression has proved to be a mirror of the child's acquisition of speech sounds, it shows the child's development in reverse'. However, that is about the aphasic's loss of speech sounds. What about the misarticulations available in the child? We cannot hold maturation of ability as the sole factor. Winitz and Lawrence (40) found 'kindergarten children with good and poor articulation are equally facile in learning to perform a sound task consisting of sounds not present in the English Language' in a study that provided for the learning of new responses under a specific schedule of reinforcements. Winitz and Bellarose (39) found that 'articulatory learning ability of children with 'functional' articulatory errors is not different from normal speaking children as long as their impaired articulatory responses are not included in the learning task'. Even organic anomalies cannot be held responsible; many instances are available in the literature where even gross anatomical anomalies have permitted intelligible speech. Milisen (29) discussing the success of deaf education in the Netherlands under Huizing suggests 'from a theoretical view point, absence of one sense, however important will not act independently in destroying the act of articulation.' Several other factors have been tried out. One such is the influence of maternal attitudes. Andersland (2) in a study found that children in lower socio-economic groups who participated in kindergarten speech improvement achieved articulation success approximating that of upper class groups'. She concluded 'improvement training appeared to counteract negative effects upon children's articulation associated with high maternal Hostility—Rejection scores'. Such assumptions fail to locate individual causative factors. One can quite conveniently suggest that a combination of factors as is perhaps true, contribute to an articulation defect. However, this does not help the therapist who is entrusted with counteracting the defect.

Another question of interest which does not seem to have received enough attention is the possible similarities of pattern between linguistic change and misarticulations of children. Could we find explanations for the misarticulations in the explanations for linguistic change?

Gray and Wise (15:351) clarify some causes as follows :

1. Somatic e.g., *(a)* limitations of sensory perception which prevent accurate hearing of sound elements and distinguishing between them

(b) fading of neuromuscular patterns (c) tendency towards economy of muscular effort; *(d)* tendency towards simplification or convenience etc.,

2. Psychological e.g., *(a)* premature production of a sound through anticipation; *(b)* lack of uniform linguistic experience within a language group; *(c)* tendency toward analogy etc.,
3. Sociological e.g., *(a)* geographical separation; *(b)* political, economic, social and religious influences (c) language mixtures and substrata; *(d)* popularity or unpopularity of a dialect; *(e)* degrees of education etc., and assimilation change resulting from the attraction of a neighbouring sound'.

Some of these could explain the deviations noticed in children with articulation defects. This question becomes all the more valid in the light of some recent thinking which looks at a child's errors not just as deficiencies in the acquisition of standard phoneme systems; but as a separate independent phoneme system. Haas (16) studied a case of dyslalia and suggested ways of therapy. He says 'it would seem that Speech Therapy stands to gain in efficiency if, to a greater extent than has been usual, it could take account of the underlying and interfering "idiolect" of the treated child'. He adds 'frequently a child seems to settle down with a linguistic structure of his own'. Applegate (3) who studied the speech sound 'errors' of two brothers held morphological learning or mislearning responsible for the articulation difference. 'The children's speech does not represent a random attempt to imitate the language of the adult community; instead it is clearly an autonomous system with well developed rules'. This view is supported by Fry (14) who believes 'Language wherever it is found is a complete and self contained unit'. Beresford and Grady also indicate that 'many of the children who are referred for speech therapy do not exhibit pathological condition; their language reflects an environmentally determined usage.' They hold 'articulation errors may be described in terms of the relation between the morphological structure of the child's language'.

These questions become important to us because they will provide guidelines to our therapy techniques. It is now clear that linguistics can help us a great deal. Winitz (38) complains the present procedures in Speech Therapy, 'are primarily an extension of phonetic rules. Little use is presently made of phonological and learning principles'. He suggests 'the application of linguistic and learning principles in articulation correction seems to be potentially useful along several dimensions'. Haas (16) suggested a programme of correction based on the relationship between the child's acquired sound contrasts and the contrasts that occur in English for a child learning English. Winitz (37) suggests and lays out the guidelines for articulation programming. He describes the use of

Skinner's 'Successive Approximation' technique to proceed from any sound to the desired sound. He also suggests generalisation learning.

> 'Another approach which is tentatively suggested may ignore initially the teaching of any specific sound. Perhaps we may wish to teach distinctive features and then in some way combine the learned features into the sounds of the language'. (37:291)

This last is now being tried at Northwestern University U.S.A. quite successfully (personal communication). In short in terms of therapy we now realise that the technique of 'say ba' however fancifully stated, is not enough; present thinking has come a long way from that; but therapy generally is still lagging there.

It is to help bridge the gap that the aid of the linguistists is required. It is towards this end that our own languages need to be studied for our purposes. We ought to know the phonological and morphological rules by which children learn a language. We ought to know how we can diagnose and classify breakdowns in these patterns.

We may here briefly look at the problem of language learning and language losses. 'It has been shown that most children have by the age of six, mastered all the basic patterns of their language, and have acquired several thousand words' (36) Berko (4) found that pre-school and first grade children operate with dearly delimited morphological rules. The children he studied 'gave consistent and orderly answers'. 'They did not treat new words according to idiosyncratic patterns'.

However, there is not such a consensus regarding the beginnings of speech. Darley and Winitz (10) in their review of research on the age of the first word point out several difficulties of definition and identification of the first word and the prognostic value of this information. In addition they indicate 'the type of research project needed to afford an answer to this kind of question (age of first word for prognosis) would permit the testing of children over a period of time'. 'Longitudinal projects have heretofore been largely avoided in speech and language research because of the cost and labour involved', they add. Organisation of such a project and the availability of the children for study time and again over a long period is impossible especially in our country. However, as Darley and Winitz say 'the results of such a project, however, may allow speech pathologists to discern more clearly important landmarks of language development'.

This information would also help in better understanding language losses as under aphasia assuming with Jakobson that stages of such losses mirror stages of language development in children (19). Conversely we may be able to make speculations about language development by studying the patterns of losses. While the validity of Jakobson's hypothesis needs to be established with fresh studies of current losses and current stages of development, it must be conceded

that a study of language losses may be more practical than that of development if for no other reason than the short time over which such losses occur. It should also be possible to study language recovery in aphasics. Jakobson (11:29) in a discussion stresses this. 'An urgent and gratifying task is a linguistic investigation of various particularities of verbal behaviour in different kinds of dementia'. However, the real difficulty here would be the non-accessibility, over long periods of time, of our aphasics for study and the great variations among the aphasics noticed by therapists so frequently. However, Jakobson does not agree.

> 'The pathology of language far from being a random disturbance, obeys a set of rules; the rules underlying the regression of language cannot be elicited without the consistent use of linguistics techniques and methodology. The study of aphasia requires the structural analysis of language, yet the elaboration of such an analysis has come along only in the later stages of linguistic science' (19).

Jakobson (11:260) suggests one approach.

> 'The degrees of elipicity present a rich scale and for linguists investigating the aphasic deficiencies the focal question concerns what can be omitted in normal speech and what are the pathological omissions, because here we find a substantial difference'. One study made by Schuell *et al* (35) indicated:

> 'There is a reduction of vocabulary in comprehension as well as in speaking. Secondly this reduction is orderly; it is statistically closely related to the relative frequency of usage of words in languages as in the performance and normal subjects on tests for perception and recognition of words. Thirdly comprehension of words tends to improve during the course of treatment in an orderly and predictable manner'.

This is in keeping with Jakobson's hypothesis. However while discussing a paper by Howes, Jakobson held, Vord statistics which pay no attention to the morphological properties and syntactic functions of the counted words are unable to disclose and characterise the diverse types of aphasia, whereas a grammatical analysis leads to a precise classification of aphasic impairments.' (11:76)

Actually that is where the real problem lies for the speech pathologists. Concepts of morphology syntax, and phonology are not very familiar to most of us. A recent book (5) presents checklists for use in diagnosis of language disorders. However, these checklists do not fully utilise morphological stages or syntactic devices. A list of grammatical categories (parts of speech etc.,) are given and whether or not a child uses two or three word sentences is checked (5:225-229). Schuell (6:110-126) thoroughly listed as a part of an exhaustive outline the kinds of information needed regarding language in particular, language loss, language recovery and language retraining. She indicated 'no rationale

for therapy is possible until more information about language processes is available' (6).

And that is the task for the linguists. They should provide the information. Speech Therapists then should learn more and more about linguistics; this is essential because we are dealing with language and language rules. As Corder (8) pointed out 'speech disorders may be seen "either developmentally, as a failure to discover" these rules or, in aphasic disorders, as specific "forgetting" of the rules for producing and understanding sentences'. With as many languages as there are in our country, we need to know so many sets of rules. Would these were also universal regularities: these are not and we just have to learn them.

I may add that it is gratifying to note that Linguists in our country, Dr Krishna Murthy at JIPMER, Pondicherry and Dr N. K. Sinha at Delhi are already showing an interest in language disorders.

In short there is a great deal of information we need from linguists. We need to know how language develops in a child and what the various stages of their development are both morphologically and phonologically. We wish to know how much variation is normal and what minimal distinctions are essential for intelligible speech. For example we need to know if the mahapranas that our purists insist upon are a real factor in Kannada. We should learn from you how to compare normal and abnormal language and language development. We need to find out what factors really interfere with normal development and how we can prevent these factors from becoming active. We want guidelines to our therapeutic techniques. We should know what to emphasise and what sequences we should follow to obtain approximations of normal language in the shortest time. We should know what phonemes or features we should teach first; what structure first and what next and so on. The linguists should help us prepare testing materials for better diagnosis and teaching materials for the most efficient techniques based on principles of linguistics. And all this needs to be done in all the languages of India. Perhaps a part of this is already being done. Then we need better channels of communication.

As long as we remember what Jakobson says we will not tend to overstep our bounds. He said (11:76) 'I don't say linguistic analysis is the only scientific approach to aphasia but the verbal aspect of aphasic impairments belongs as, does any verbal material, to the field of linguistics'.

One more quotation from Hass states my summary better than I can.

> 'Linguistic analysis and comparison should be able to tell us more exactly what to teach, or to treat, in any particular case; and also what is more important and what is less'.
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> 'The contribution of linguistics is chiefly diagnostic. A linguistic diagnosis will contribute toward, working a rational sequence of therapeutic steps; i.e., a sequence which is adapted to the requirements of the individual

case and which embodies a scale of priorities according to the relative seriousness of the defects to be treated ... A linguistic diagnosis will not stand alone, it will have to be related to the physiological and psychological diagnoses of the case'.

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