Phonemic Variations in Hindi Speaking Aphasics During the Immediate Post-Morbid Period

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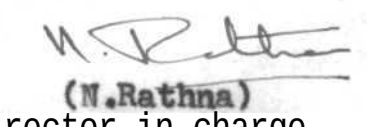
C E R T I F I C A T E

This is to certify that the dissertation entitled "PHONEMIC VARIATIONS IN HINDI SPEAKING APHASICS DURING THE IMMEDIATE POST-MORBID PERIOD" is the bonafide work in part fulfilment for M.Sc, Speech and Hearing, carrying 100 narks, of the student with Register No.17



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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

D E C L A R A T I O N

This dissertation is the result of my own study undertaken under the guidance of Dr.N.Rathna, Professor in Speech Pathology, Director-in-charge, 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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C H A P T E R I
INTRODUCTION

"If Aphasisa is defined first and foremost as a language disorder, then a linguistic analysis of the condition is a priority" (Roman Jakobson 1956).

There have been questions as to what sort of language disorder occurs in aphasia. Various schools of linguistics have compared the view of aphasia within structural linguistics with that in generative llnguis-tics. In structural linguistics aphasia is considered as a breakdown of the linguistic code or the set of linguistic signs, that is some sort of disturbance of the abstract set of relations between sound and meaning. However, in generative linguistics a distinction is made between competence and performance (Chomsky 1965) Competence referring to the knowledge of language or set of abstract symbols and performance to the actual use of language in concrete situations. Linguistically a single competence underlies the major part of our abi-lity to speak and understand, which have been considered as the processes of performance modalities. According to this school of thought what has happened in aphasia is that the connections between competence and the components of performance involved in speaking and/or understanding have been disturbed. Here, the knowledge of language is thought to be in tact.

Saussre (1916)considered aphasia to be a disturbance of langue, * view which haa generally prevailed in Speech Pathology and corresponds in outline to the concept of language (MacMahon '72). Jakobson has described aphasia as a breakdown of the linguistic code. Simillarly, Whitkar (1969, 1971) haa argued, that aphasia is mainly a disturbance of competence, a concept comparable to langue. Other aphasiologlsts (Biernish 1970, Weigh 1970) have considered it to be mainly a disorder of performance capabilities, Grewel (1987) haa believed in the existence of two aphasias - a disturbance of, 'possession of language' and a disturbance of neurological process by which the possession is applied in the construction and interpretation of a message.

Joyce w. Sefer and Robert Show (1962) agree with Cheasky (1963) that both competence and performance are involved in language and consider that the aphasic has the competence but that performance is impaired through the language disruption. Many studies of aphasia support the hypothesis that aphasics follow the same rules of language (i.e., have competence) aa non-aphasics. Schuell (1960) Wepman (1936), Schuell, Jenkins and Landis (1961), Rosenzweig and Postman (1958), G.M. Siegel (1959) Soloman and Postman (1952), Howes (1964), Bricker (1964) and Sefer (1966) all support the regularities of language

behaviour la aphasia, Indicating the underlying structure of language is preserved. Lenneberg (1967) says, "the patient with aphasia has net strictly speaking lost his language habits the way we aay 'lose' a poem once memorized and now forgotten, nor is he in a cognitive state that is eoaparable to the 30 month old infant before the advent of language learning. The language is not lost bat that its proper organization in either the expressive or the receptive process or both, is interfered with. He cannot organize his cogaltive activities to recruit, integrate and inhibit the many partial processes, which when consolidated art prerequisite for speaking and understanding."

MacMahon (1978) poses the question, whether aphasia should be considered a disorder of language in the narrow sense of a breakdown of the system which unites sounds and meanings at an abstract level, or whether it should not be thought of more appropriately as a disturbance of the access which is made of the system (performance strategies) when an utterance is in the process of being formed or decoded. Though a majority of linguistic studies so far have been undertaken on the assuaption that the disturbance lies in competence and not in the ability to utilise or realize

languageMacMahon (1972) suggests that no answer to this problem Can be forthcoming until a corpus of aphasic data is submitted to linguistic and psycholinguistic analysis of different kinds.

"Language" has been considered to be one of the moat important products of human cerebral action. D.B. Fry mentions that there is a series of heirarchies of language organization, a system consisting of several levels and organized in such a way that units which function on one level combine to form the units on the next level, the units at the lowest level are the phonemes, which combine together to fora the units at the next level, the morphemes, which have grammatical function. Morphemes joined together form words, which have lexical function and words combine to form sentences. There are rules according to which the units on the one level combine to form units on the next level. He says, "law of combination" is stored in the brain of every speaker and listener, and according to him at some cortical level the speaker formulates what he has to say in sentences, which are made up of approximate words, each consisting of the required morphemes, each morpheme being a sequence of phonemes. Formulation is a continuous process during spontaneous speech.

Profound behavioral alterations have been observed in aphasic patients and abnormalities relating to some or all or any of those levels can bo identified. Blumstein (1968) states that 'in pathology of language induced by aphasia certain aspects of the linguistic code break down according to the specifiable linguistic parameters." Some of these features have been considerably studied and others have been largely neglected. Among the neglected studies is the 'disturbance of phonology and its recovery' in aphasics. Phonology pertaining to the smallest unit of language has got important implication for the construction of words and sentences. Phonemes and words are related in different ways to the sign function of language. While everyword has its own particular and constant meaning, the phoneme performs only the function of distinguishing meaning without possessing any positive meaning of its own. Phonemes lose distinctive values, words lose lexical - meaning, morphology and syntax lose grammatical meaning, in aphasics (Jakobson, 1941).

On this aspect certain studies have been undertaken and same laws formulated.

> "The pathology of language far from being a random disturbance, obeys A set of rules". (Rowan Jakoobson).

Jakobson(1941) put forward the theory that the phonological system is aphasia is subject to systematic disordering, the break-down ia not haphazard. He proposes general laws of phoneaio patterning.

> "Phonemic progress of the child and the rogression of the aphasio obey the same laws of implication. If the child's acquisition of distinction 'B' implies his acquisition of distinction 'A', the loss of 'A' in aphasis implies the absence of 'B' and the rehabilitation of aphasic follows the same order as the child's phonemic development. The dissolution of the linguistic sound system in aphasic provides an exact mirror image of the phonological development in child language".

This theory has been the subject of study since 1941 but in general the opinion ia divided.

Various studies conducted to ascertain the nature of the phonological errors in the speech of aphasic patients either with the anterior (Beuman and Grunbaum 1925, Ombredane 1926, Alajouanine, Ombredane and Darand 1939, Fry 1952, Cohen et.al 1963, Shanhweiler and Harris 1966) or posterior (Luria 1947, 1948, 1961, 1964, 1970, Schenk 1969, Dabois et. al 1964, Blumsetin 1968, 1970, Lecours and Lhermitte 1969, Green 1969 etc.) of subcortical lesions, have similar observations. The errors included the substitution of one phoneme for another, addition and loss of phonemes and improper sequencing of phonemes.

The phonological research in aphasia has been undertaken using different theories of phonology and probably that is the reason why a clear distinction between phonetic and phonological disturbance has not always been made. Sound disturbance in aphasia can be traced to one or more of three different disorders.

1. a diaturbance of the abatract system ofphonemes,
2. a disturbance of the neuroauacular encoding of the phonological unit (the syndrome of phonetic disintegration), and,
3. an associated appraxia of motor speech mechanism.

Though theoretically it ia easier to make these clearcut diatinctionas it is difficult to distinguish

them while analysing data due to the overlap of these disorders.

The present study was intended to observe phonological disturbance and the process of phonemic recovery in the speech of aphasics.

Need for the present study

1. There is a very Halted literature on the phonological disturbances in aphasia.

2. All the work done till now has been done on a number of European, Chinese and Japanese aphasics and among them the English and the French speaking aphasics form the largest group. Hence restrictions are placed on the legitimate generalisations that can be drawn from them.

3. Very little has been done on aphasic language in India. No study on phonological disturbance of aphasic speech has been done so far.

Statement of the Problem

This study was an attempt to describe the 'phonological disturbances and their process of recovery in

the speech ef aphasics'. The main questions were:

1. What change does the phonemic system undergo in aphasics?
2. Are the changes systematic?
3. Is the phonemic recovery systematic?
4. Is the recovery process sequential?

Hypotheses:

1. Phonemic loss in aphasic speech is systematic.
3. The process of phonemic recovery it systematic and sequential.

The five aphasic patients presented in this study were medically diagnosed cases of cerebral vascular accident due to middle cerebral artery thrombosis. The patients were evaluated far their communicative ability on the 'Porch Index of Communicative Ability'. The speech samples of these patients were recorded everyday for the entire period of their stay in the hospital (7 - 10 days). The test consisted of an open ended conversation concerning the patients' illness, work, hobbles, view of polities, etc. Questions asked wore used only as a means of eliciting as much speech as possible. A 'Say after me' test was also given everyday to test all the sounds in all positions.

Each taped interview was listened to completely and transcribed. Those phonological errors made by the patients, were phonetically transcribed and analysed. The attempted target word was also noted. Only those errors whose target words could clearly be determined by the surrounding context were used for analysis.

Implications of the study

1. It may provide more information aad Understanding of the phonological disturbances and their recovery in Aphasics and would add to the existing data.

2. It may be helpful in diagnosis.

3. It may be helpful in cetraining the aphasics.

4. It may lead us to better understanding of individual aphasics and on the basis of linguistic analyses distinct language syndromes say be described.

Limits of the Study

1. The study is limited to the analysis of phonological aspect of aphasia language and other aspects have not been considered.

2. Even at the phonological level, the study is limited to answer the questions mentioned. The other aspects of phonology could net be studied in the time available. However it may be possible at a later time to use the same data for more extensive analysis.

3. The study is limited to the analysis of speech samples elicited by informal questions.

4. Tne study is limited to available number of aphasics.

Terminology

Various theories of phonology have been employed in aphasia research and the discussion and comparison of results have been invalidated by the acceptance of theoretical similarities where hardly any exist on the sole basis of terminological identities.

1. Aphasics: All patients medically diagnosed as Cerebro-Vascular Accident with right sided hemlplegia, and who obtained 'aphasic score' on "Porch Index of

Communicative Ability" were considered as aphasics for this study.

8. Phonology Phonology is a part of linguistics dealing with speech sounds with regard to the functions which they fulfil in a given language.

2. Severe Distortions: These errors are characterized when the phoneme is not identified as one within the Phonemic inventory of the language (Hindi).

4. Mild distortions: These errors are characterized when the phoneme is identified but is not exactly the 'same' as the intended one.

5. Phoneme substitution: These errors are characterized by the substitution of one phoneme for another

6. Omission: These errors are characterized by the loss of a phoneme or syllable in a word eg.,

7. Addition: These errors are characterized by the addition of a phoneme or a syllable in a word.

C H A P T E R II

REVIEW OF LITERATURE

"Aphasiology seems to be one of the best studied but least underatood subjects". (MacMahon'72). It has been the "battle ground" for the various experts interested in the subject, such as neurologists, psychologists, linguists and speech pathologists. The history of aphasiology is full of confusion as different specialists have studied the subject from different angles.

> "Aphasia is primarily an interference with language processes resulting from brain damage. The interference that produces aphasia, disrupts both analysis and integration of verbal messages". (Joyce W. Safer and Robert Shaw 1972)

Aphasia in adults usually has a well-defined and often abrupt onset. The most frequent cause of aphasia in adults is the vascular lesion. Cerebro vascular accident is either due to thrombosis (occlusion of the vessel due to a fixed clot), embolism (a clot travelling in the bloodstream until it is arreated by the narrowing lumen of the branching vessel), or hemorrhage (rapture of a vessel and oozing of blood into the tissue which gradually becomes a large hematoma).

In each case, the brain tissue is deprived of its blood supply and gets necrosed, resulting in a series of pathological changes. The disturbances can lead to functional disorders belonging to two classes (a) linguistic and (b) non-linguistic.

In the non-linguistic class the disorder included are dysarthria, apraxia or agnosia while in the linguistic class it is described as aphasia. In the vast Majority of cases the lesion occurs in the left hemisphere.

Various behavioral changes observed in aphasia have been grouped differently. About 113 types of aphasia have been mentioned in the literature by various experts interested in the subject. Some classifications are based primarily on the language behaviour of patients, others are baaed on the anatomical locus of the brain injury causing aphasia, whereas, others have tried to correlate certain loci with certain behavioral deficits. Most classifications have emphasized anatomical features and completely omitted consideration of physiological function. Moreover as Peter Harriot (1971) mentions, the description of language behaviour have not taken account of the structural and functional nature of language.

> "If aphasia is a language disorder, then may be everything else steas from it - the classification, the neurological theories of localization and may be therapy". (MacMahon 1972).

He also Mentions that in this case everything must be described in terms of linguistics categories rather than a mixture of linguistic, psychological and neurological terms.

Linguists, Neurologists, Neuropsyohologlsts and Speech Pathologists have contributed to the study of aphasia. The total number of descriptive and theoretical studies of aphasic language is almost 350 (MacMahon 1972) and includes studies of Bulgarian, Chinese, Dutch, English, French, German, Hebrew, Italian, Japanese, Polish, Romanian and Russian aphasics.

Language disorder in aphasia has been studied at different levels, like, Phonology, Semantics and Grammar but for the relevance of this study, linguistic research undertaken at the phonological level only has been reviewed.

Paul Broca's (1863) first description on the

Speech of his two patients was focussed on their loss of articulatory capacity. Ha used the term "Aphemia". This speech was later described as "dysarthric" which ia characterised by slow, slurred speech production, frequent phoaetic errors and often difficulty is imitating speech. Errors are consistent and are of the same magnitude in repetition aad spontaneous speech. Although their ability to comprehead speech ia unaffectad (Crltehley 1971).

Chroaologically Jackson (1866) was the first aphasiologist to study liaguiatic description of aphasia though he called it "psychological" analysis. Most of his analysis was concerned with retention or loss of syntactic structures. He distiaguiahed articulatory diffioulties due to paralysis of the tongue, lips or palate (dysarthria) from the true affections of speech (dyaphasia). He emphasized the fact that many of the dyaphasic patieats not only would not speak properly but they could not write correctly either.

Hughling Jackson (1915), Pre+aohels E. (1915) Head (1926 aad others have cited instances of

phonemic error in the speech output of certain types of aphasic patients, but those observations were made in the context of diagnostic descriptions of aphasic syndromes. There was no concept of the phonological system as a linguistic organization and thus no systemic studies of phonological errors were reported until 1935 or 1926.

Bouman and Grunbaum (1925) noted that certain phonemes were systematically altered in the speech of a Dutch motor aphasic. The patient showed the tendency for voiced consonants to change into their voice less equivalents, and occaaionally for a Consonant to change its place or articulation to one nearest the target sound. This might now be reviewed as a phonological disturbance of aphasia.

Ombredanes (1996) analysis of the speech of a French anarthric, (a term used by Pierre Marie in 1906) corroborated to a great extent, the results of the previous study by Bouman and Grunbaum.

Alajouanine, Ombredane and Durand (1939) studied the articulation of a number of French aphasics. They named the condition "Syndrome of

phonetic disintegration". This was the first experimental study which recognized articulatory disorder which sometimes accompanies motor aphasia (now called anarthria, cortical dysarthria, subcortical apraxia and afferent motor aphnia, The features of the syndrome on a descriptive phonetic level included impairment of the ability to articulate and sequence sounds. This resulted in fricatives and voiced consonants changing their manner of articulation, metathesis and aasimilation, in difficulties with transition between consonant and vowel particularly across syllable boundaries and in an impairment of intenation. (MacMahon '72).

Other studies have confirmed the results to a large extent. Alajouanine and Mhzzoeonacci(1947) Nathan (1947), Sabournd and Scherrer (1957), Bay (1957), (1962) Chatel (1968), Shcnhweiler and Harris(1966) Tissot et al (l970) have investigated the syndrome and agree that it is a disorder of "articulation" rather than of "language". Fry (1952) Cohen et.al. (1963) also had the same results. All of these

studies were concerned with patients with anterior or subcortical lesions. Inspite of the use of different tests, including repetition and reading of nonsense and/or real words, full sentences, and paragraphs, the investigators made quite similar observations.

Roman Jakobson's (1941) waa the first attempt to integrate concepts of linguiatic theory with language acquisition and language pathology. The first of his publications on aphasia was a monograph on the relationship between the phonology of children's language, aphasia, and universal features of normal adult phonology. He believed that the phonological system in aphasia is subject to systematic disordering. The breakdown is not haphazard. Be said that those aphasics, for example, who have made a distinction between nasalized and oral vowels would lose this diatinction very early in their illness, and if the condition deteriorated, the system would be reduced step by step to the simplest possible opposition. He makes a clear diatinetion between aphasia, aound diaturbances and arthritic diaturbances. In aphasia sound diaturbances neither the artieulatory

nor the auditory organs are themselves injured, nor is the bulbar apparatus, on which sound formation depends; rather "something which we have learned - a possession of memory - is lost". Aphasics lost the distinctive linguistic value of the sounds is question, though occasionally they may be able to produce the sound. There may be either sound confusions or an absolute non-recollection of these sounds - that is the sound disappears without being replaced. In both the cases a distinction ceases.

The center of Jakobson's theory of phonological loss in aphasia is the concept of child lang-
usage and aphasic language being governed by the Self, same laws of structure that operate in all normal adult languages. This means that children's and aphasic's phonology are related to each other is some way. The dissolution of the linguistic sound system ia aphasics provides an exact mirror image of the phonological development in child language. This has now come to be called "Jakabson's law".

Jakobson, Goldstein and others have consistently called this as "phonemic regression".

They mention,

> "In the development of child language (i.e. building up of every individual linguistic competence); the acquisition of secondary value presupposes the acquisition of primary value. The dissolution of individual linguistic competence is governed by the same regularity; the loss of the primary value presupposes the loss of secondary value."

Jakobson mentions that one of the first oppositions to be lost in aphasia would be that between /I/ and /r/, followed shortly by the loss of vowels and later by affricates, fricatives and stops, Eventually the phonology might be reduced to a single consonant /p/ and a single vowel /a/. Data from various researchers has provided confirmatory and contradictory evidense for this concept of systematic loss of Opposition.

Ombredane has found certain similarities between the speech defects in aphasics and the stage of language development in children. According to Ombredane one of the commonest and earliest defects in the speech of an aphasic

patient is the Ability to distiaguish the /I/ and /r/. The sounds preserved best and largest in the speech of an aphasic patieat are the vowel sound "ah" and the consonantal Sound /m/. He also mentions that sounds articulated by lips are retained better than any others. In the same way ho believed that nasal vowel sounds diaappear early from a French aphasic just as they are mastered late by the French speaking child. Inter-dental sounds are lost earlier than sibilants. Anterior and volceless consonants are better preserved than the posterior and voiced consonants. Regarding the substitutions he mentions that velar occlusives are pronounced as/t/ or /d/. Affricates sounds are lost first and then fricative, aspirants tend to be replaced by explosives so that /f/ becomes /p/, and/s/ becomes /t/. Combinations of sounds are particularly difficult, but he mentions that isolated sounds may prove to be more difficult to pronounce than the same consonantal sound occuring the middle of a word. Grewel (1951) used linguistic terms to describe various disturbances which aphasics may undergo. Among the other types like, Lexical losses, Agrammatism, paragrammatism,

disorder in the system of accents, disorder in non-verbal forms of communication, ha mentions phonemic disturbances, paraphonemia and para-pnasia. According to him, phonemic disturbances comprise of two types of errors:

(a) Aphonemia: When a patient loses certain phonemes, not as a part of dysarthria, but as a disturbed linguistic function, and,

(b) Dysphonemia: When phonemes are confused from loss of knowledge of the differentiating function and value between a pair of phonemes.

In parapaonemia he explains the aphasic is unable to assign the phonemes their appropriate place within the words.

In paraphasia he says, there is an inability to combine syllables correctly so as to constitute the appropriate polysyllabic word; or to form compound words out of their component parts.

Prof. D.B. Fry (1959) studied the phonemic substitution of an aphasic, who had difficulty in

expressing himself with intact comprehension. His difficulty was in forming the right phonemic sequences. Samples of his spontaneous speech were tape recorded. As he could not carry on the conversation for a considerable length of time, he was asked to road aloud two types of stereo-typed text. He had no difficulty in visual re-coginition of print. The first was a sentence articulation test and the second, word articula-tion test . The patient read a 100 word list, containing in all 1000 English phonemes. Perse-veration was noticed at the phonemic level. In reading the sequence of words, 'wood', 'kick' , 'wear', 'feet', he read correctly the first word, 'wood', and then retained the initial /w/ in the next, for which ha said /wik/. He pronounced 'wear' correctly and then followed it with /wi:t/ instead of /fi:t/. "Phonemic substitutions were slightly different from this kind of errors." Fry also studied the phonetic analysis observing the changes occuring in place of articulation and manner of articulation. The results obtained were then compared with children's speech. He found that there was very 'little in common'

between the patients' speech and the features of a group Of 162 childern. Though in this study very systematic observations are made, there are limitations as the observations made are from the speech ef only one patient. Wepman and Jones (1964) have strengthened the concept of regression in aphasia as their results show a marked parallel between the stages of language acquisition in children and stages of aphasia. They tentatively relate five aphasics corresponding to the five stages of language development in children.

Stages of development	Stages of Aphasia
Speechlessness	Global
Babbling - cooing	Jargon
Fortutious speech	Pragmatic
Substantive symbols	Semantic
Grammar	syntactic

Critchley (1958) and Albright (1958) have felt the theory about aphasics involving the child language to be unsound. Osgood and Miron (1963) at the Boston Conference on aphasia, held that the evidence available did not impressively support Jakobson's view.

Systematic studies conducted to ascertain the nature of phonological errors are those by Bouman and Grunbaum (1985), Oabredane (1926), Alajouanine, Qmbredane and Durand (1939), Nathan (1947), Fry (1959), Cahen et. al. (1964), Shankweiler and Harris (1966), Green (1969), Lacours and Leheraitte (1969). All wore concerned with patients with anterior or subcortical lesions only. All of them made similar observations. They found that the phonological errors were limited to the five main types :

(a) Substitution of one phoneme for another
(b) Loss of phonemes
(e) Addition of phonemes
(d) Assimilation errors of phonemes
(e) Improper sequencing of phonemes

Most of the investigators observed that phoneme substitution errors seemed to occur among "similar" phonemes, i.e., voiced and voioele*s consonants were substituted for each other, e.g. /do/ 'day' – /te/; nasals and their hoaorganic stops were confused, e.g. /muv/ 'move' – /buv/; spirants and stops were varied e.g. /sop/ 'soap' -- /top/. (Blumstein 1968).

Further investigations by Schuoll (1953), Dubois et. al (1964 Blumstein (1968), (1970),

Green (1969) observed that the phonological errors of the above mentioned type were not restricted to the patients with lesions of interior Speech area. Luria (1961) noted that among the various linguistic difficulties observed in the "fluent aphasics" i.e., patients with posterior lesions, phonemic substitutions or "phonematic" disintegration was a common characteristic. Luria mentions under the category of "sensory aphasia" the impairment in the posterior left hemisphere, that the patient is unable to pick out the meaning- differentiating cuts of speech sounds.

Jakobson and Halle's (1936) proposed hypothesis that the order of aphasic degeneration was the mirror image of that of acquisition has not been supported by Goodglass and Berko(1960). They found that the differential difficulty for aphasics of various inflexions was the result of their different morphological functions. Whereas Berko (1958), using a similar test has found that in case of children, phonological features probably caused the difficulty.

Recent opinion, however, favours the validity of the theory. Fradis's (1970) study of Rumanian children and aphasics' phonology agrees with Jakobson's views. Blumstein's detailed study of American English

Aphasic phonology (1968, '70) has noted a "close parallel" between the two systems.

Blumstein (1968, '70) studied the phonological errors from the speech of a number of different types ef aphasics. She studied 17 aphasics - 6 Broca's, 5 Conduction and 6 Wernike's. The speech samples were collected froa interview sessions and the phonological analysis revealed the aaae diatrlbutional pattern of errors in each group, though clinically these three groups were clearly distinguished. Her results suggest that the phonological system is hierarchically organized according to principles inherent to the language system and it ia this hierarchical organization of phonological relations which ia reflected in the phonological patterns of aphasic speech. Bluaatein says that, language is a highly integrated system organized according to a given set of hierarchically based universal rules or principles. It is always in relation to the system and its principles of organization that the phonological dissolution of speech can be characterized. Thus regardless of the area of brain damage, the most complexly organized structures are impaired in contrast to the relative preservation of the less complex phonological structures.

The number of conclusions that she mentions are:

1. An aphasic is more likely to make an error which results in the alteration of a single distinctive feature in a phoneme than more than one.

2. It is possible to draw up a rank scale of errors of phonological changes. The commonest error is simplification, the patient omits a phoneme or syllable, next are the errors which are triggered by a neighbouring feature which result in changes as metathesis and assimilation. Next are the errors of addition in which an aphasic introduces extra phonemes into words.

MacMahon (1971) mentions that Blumstein's conclusion which probably has the largest ramifications both for the assessment of the aphasia as well as for aphasia theory in general ia that the patterns of phonological breakdown are similar in Broca's, Wemicke's and Conduction aphasia. The site of lesion would Appear to have no fundamental offset en the disorganization of phonology.

Matfield (1972) has described the aphasic disturbance of language at phonologloal level of one

This patient had combined dysphasia and dyspraxia, affecting lips, tongue and certain finger movements consequent to cerebrovascular accident. The patient was only able to produce /m/ and /a/ is isolation and inconsisteatly in combination. He was helped by trailing to re-acquire the majority of English phonemes in isolation and in combination. The observations reported are : /n/ was acquired early; /l/ later and it often lapsed into /a/. At the beginning of therapy he was unable to imitate either the diphthong/ou/ or a pure /o/ type vowel. /p/ and /b/,/t/ and /d/ were elicited from their homorganic nasals. Often the patient did not differentiate sharply between the voiced and voiceless members of an articulatory doublet, using for both an unaspirated voiceless plosive, /f/ could be initiated fairly easily. The remaining vowels and the dipthongs wore acquired early in therapy and remained extremely stable apart from some /ou/ - /u/ confusion in the first period only, /k/ and /g/ were achieved with difficulty followed shortly by/s/ and than, rapidly /f/, /e/ a weak /w/ like /r/ and, with continuing difficulty, /ts/. Minimal consonant clusters were acquired considerably later than single

consonants and were unstable. Hatfield discusses this patient in terms of regression to the infantilism. He compates the phonological errors observed to the infantile mispronunciations. For example, he mentions, (when there was little or no evidence of dysarthria and when /k/ could easily be imitated isolately and in certain words) /t/ was replaced for /k/ in spontaneous speech /test/ for cake, /star/ for sky, /dast/ for desk). His observations are similar to the ones recorded by Alajouanine ombredane and Durand (1939). The limitation of this study is that therapy may have influenced the phonemic pattern of recovery.

Darley Frederic t. (1970) and Deal Jon L. tested twelve patients with apraxia of speech and minimal aphasic involvement in four experimental conditions. They observed the influence of response delay interval on a word-repetition task, the effect of noise, the effect of visual monitoring and the effects of instructions on the phonemic acouracy,. They noticed articulatory changes in fricatives, affricates and consonant clusters. Unrelated substitutions were the most common type of errors. This has also been observed by Shankweiler and Harris (1966) Jones and Darley (1970), Frost (1970), Janes and Darley (1970) concluded that the articulation errors

increase as word length increases. They also observed that the articulatory performance apparently improves when apraxic subjects are asked to read aloud for speed not accuracy. Their results showed that apraxic subjects were aware of their errors and apraxia of speech appeared to be essentially a motor speech disorder not significantly influenced by auditory and visual variables.

Some electromyographic studies of speech production of aphasics have been carried out by Shankweiler, Harris and Martha L. Taylor (1968).

It may be quite difficult to directly compare the results of these studies and come to any conclusion about the phonological breakdown in aphasia at the present due to the differences in terminology and theories of language and speech. Linguists would agree that the articulatory level of speech is structured in some way. This level of phonetic speech is distinguished from the phonological level of language. But in some other theories a further distinction is aade between the physical phonetic level, the systematic phonetic level and the phonological level - the last two being the aspects of

language. These differences of basic approach lead to different clinical conclusions in study on aphasia and certain other speech and language disorders. De Reuzi et. a1. (1966) have commented on the clinical relevance of this theoretical difference. They give the explanation for observable change of voiced consonants to voiceless consonants in aphasia as either a wrong choice of phonemes or a lack of synergy of the vocal cords with the muscles of articulation.

As the distinction between phonetics and phonology is now a standard part of linguistic theory the studies done earlier can be reviewed on these grounds. Some studies described as "articulatory" seems to be more likely to be descriptions of phonology. MacMahon reinterprets the study by Ombredane of an anarthric patient as the phonological study of aphasia. On the other hand he says that it's doubtful if the articulatory problems of Kelterer and Zwirner's (1932) patient were due to breakdown of language; they seem more likely to be either due to anarthria, dysarthria or apraxia. The study of Cohen et. al (1964) is reviewed as breakdown of phonology

At the phonological level in the speech of aphasics, phonemes lose distinctive value. These

phonological errors could be characterized by the distinctive feature framework discussed by Jakobson, Halle end Pant (1936). In brief, the theory states that every phoneme can be described in terms of a bundle of binary acoustic-articulatory features. Every phoneme is characterized by the minimum number of features needed to differentiate it from all the phonemes within a given system, for example, the only feature needed to distinguish /d/ from /n/ is nasality; /d/ 18 (-nasal) and /n/ is (inasal). As the authors write that according to this theory the phonemes differentiated by a single feature are more closely aligned structurally, motorically, acouatically than phonemes differentiated ny several features, for example, the relationship between d-n, distinguished by the feature (nasal) is closer than d-n distinguished by the features (nasal, place). Thus the expected chance in the phonological dissolution of aphasic speech of decreased errors as the phonological distance between phonemes increases was confirmed by Blumstein study (1970).

In addition to the concept of distinctive features, the phonological theory is also concerned with markedness, and also with the relationship between the two concepts. (Blumstein 1970). She mentions that there

is a hierarchial relationship between phonemes based on the (±) values of the features used to describe them. For example, the relationship between /p/ and /b/ is characterized by the absence of voicing in the former (-voice), and the presence of voicing(+voice) in the latter. The vibration of the vocal cords in voiced consonant is an additional articulatory feature apart from the place and manner of articulation being the same as in the case of voiceless consonant. Thus (+voice) is considered Harked value and (-voice), the unmarked value. Jakobson (1963), Blumstein (1968) hypothesized that the phonological patterns in aphasics would be characterized by an overall tendency towards simplification of the phonological system. Consequently, the marked features will be impaired in relation to the relative preservation of the unmarked structures.

Jakobson (1956) has described two dimensions of language which he feels may account for extreme types of aphasia, the similarity and contiguity disorders. The similarity disorders refers to impairment of paradigmatic function, that it, the selection of an item within a given context and substitution of one item for another. Contiguity disorder refers to impairment of syntagmatic

function, that is the sequancing of linguistic units and therefore, the construction of larger units from smaller ones. These two types of disorders were taken to be the extremes of a continuum applicable to all levels of performance. Jakobson suggested that this is probably not the only dichotomy operating. He also mentions the distinction between decoding (receptive) and encoding (expressive) phases of language behavior as another possible basis for types of aphasia. If this is the case than we say find seme aphasic with similarity disorders mainly An decoding and others with similarity disorders mainly in en-coding and in the same way, contiguity disorders in decoding versus encoding forms. The similarity-contiguity distinction resembles the representation - integrational dichotomy of Osgood.

Jakobson further mentions that there is a disturbance in combination in efferent aphasia and that on the phonemic level this means difficulty in using clusters, difficulties in constructing syllables and hindrances in making the transition from phoneme to phoneme and from one syllable to another. Fry's (1959) patient is an example here. His patient, whan reading the sequence of words:- wood, kick, wear, fact, he substituted 'w' for the initial consonant of the even words upon the

model of the odd words. Here may be an aphasic who shows an inability to utilize certain phonemic constituents; single distinctive features, as for instance, the consonantal opposition grave/acute or voiced/voiceless.

All the studies mentioned till now are studies on the analysis of segmental phonology (expressive aspect) of aphasic speech. There are other studies concerned with segmental phonology of (receptive aspect). Attempts have been made to study the role of language in the process of comprehension. Huber (1944, '45) studied Wornicke's aphasics, who experienced greater difficulty in perceiving diphthongs than in perceiving vowels and who showed a tendency to confuse voiced and voiceless consonants. The possibility of the disturbance due to a break down in the processes by which the incoming signal was presented to the phonological analyzer was ruled out. Later studies, particularly in Russia have developed the concept of a break down of phonemic hearing - a disturbance of the phonology for understanding in the absence of a physical hearingloss. Luria (1958, '63, '64, '66, '70) has presented exmaples of sensory aphasics who are unable to distinguish certain types of phonological oppositions. Pilch and Hammer (1970) have described similar results for a German aphasic.

However, Schuell, Jenkins and Jimenez Pabon (1964) have used the term sensorimotor impairment to describe the partial disintegration of phonemes found in some aphasic subjects and not in others. They observed that discrimination as well as production of phonemes is impaired, that there is a strong tendency to confuse phonemes with a similar place of articulation, such as /p/ /b/ /m/; /t/ /d/ /n/ /i/; /h/ /g/; etc. as well as the phonemes with similar acoustic patterns. Sensorimotor impairment as described by Schuell and Jenkins exists in the absence of the paralysis or paresis of the speech musculature. The patient frequently behaves as though he does not know where his tongue is in his mouth or what to do to move it in a given direction.

MacMahon concludes after reviewing the studies on segmental phonology that the tentative results so far indicate:-

1. that the syllabic structure of the word can be impaired;
2. that the consonant system is impaired differentially;
3. that phonological and grammatical context determine in some ways the characteristics of a particular change;

4. that the traditional distinction between motor and sensory aphasia is probably not relevant at the level of phonology; and,
5. that the overall impairment may be to certain features common to the Indo-European languages.

Apart from these segmental phonological studies attempts have also been made lately to study quantitative phonology. Statistical studies of phonological break-down have been carried out more extensively at the Institute of Neurology in Bucharest. Their work has shown that a correlation can be established between the rate at which phonemic errors occur in aphasic speech and the overall frequency of occurence of tha particular phonemes. Further, the frequency with which an aphasic incorrectly uses a phoneme is inversely related to its oocurence in normal speech. These results have been supported by Ov Charova, BaiKushev and Kalchev (1970), Green (1969) and Blumstein (1970).

Then, there have been supra-segmental phonological studies of aphasic speech. Before 1960 little attention was paid either by linguists or others to the suprasegmentals in aphasia. (MacMahon 1972).

A study of a Rumanian aphasic by Botez and

Mihailescu (1964) described incorrect patterns of sentence stress when reading aloud. Goodglass et.a. (1967, '68, '69) have studied the relation of stress to grammar. Some studies have been undertaken to study the breakdown in the intonation in aphasics by Alajouanine and Lheraittec (1961), Botez et al. (1966), Caler (1963), Dubois et. al. (1964), Pink (1969), Froeschels (1954), Nielsen and Mckeown (1961), Scheveiger (1968), Whittey (1934) and Swirner (1933).

Semaitskaja (1954), Luria (1966) have written about rhythm disturbances in aphasia. The research in this aspect of aphasia is premature (MacMahon)'72).

Most of the studies reviewed here have been undertaken on the 'old' aphasics. Among these where age is given earliest is 8 weeks after the onset of aphasia. The reason for not having tasted those patients earlier may be, the possible inconsistency in language behaviour during the early period of illness, indicated by Schuell (1966). To have studied the language behavior at the later period does not give any idea of the disturbances attained immediately after the occurence of aphasia and their direction towards recovery.

In the present study an attempt is made to observe the phonemic disturbances in aphasic speech immediately after the aphasic attack and the variations during the first post-morbid week.

C H A P T E R _ I I I

METHODOLOGY

Five aphasic subjects were selected from the in-door patlents of the Safdarjang Hospital, New Delhi. The selected patients had to satisfy the following criteria.

1. Subjects must be adult aphasics.
2. The aphasia in these patients must have resulted from leasions of vascular origin according to the medical assessment.
3. They must not have experienced aphasia previously.
4. They must be 'fresh' aphasics.
5. Subjects should have been either using Hindi as their "First Language" or the pre-aorbid language aust indicate considerable proficiency in Hindi.
6. They must pass the screening test of 'hearing' and 'vision'.
7. They aust obtain 'aphasic score' on the "Porch Index of Communicative Ability".

Adult aphsics were chosen for the study on the assumption that all noraal adults have complete commond of the phonological system of the language including the complete phonemic inventory with their rules of occurence and coabination and that each speaker reflects thi9 competence in hia verbal behavior.

Those patients who had experienced the similar problem earlier ware not the subjects of this study because it was assumed that the assessment of pre-morbid language would have been a more difficult task due to the probable residual effects of the previous attack.

The reason far studying the speech of 'fresh' aphasics was to analyze the speech from the 'no speech' to 'little speech' to 'more speech' period. Observations wave made on the immediate post-morbid speech. Many authors agree (Wepman and Jonas 1966, Servo and Levita 1971, Smith '71 and others) that a majority of the dramatic changes in aphasia, are confined to the immediate - post traumatic period. C.L. Culton (1968) in his study on 'spontaneous recovery from aphasic' states that rapid spontaneous recovery of language function is noted in the first month following the onset of aphasia and that the later improvement is not very significant. It was initially planned to study the speech samples of each subject taken everyday for the first one month after the onset of stroke but it was not possible to get the subjects for such a long period due to shortage of beds is the government hospitals. Subjects could not be kept for longer than 7-10 days. Therefore the speech samples of the subjects were studied for the entire period of their stay at the hospital. Four subjects were

observed for seven days and one for six days.

Hindi was the language under study because this is the first language of the investigator. cases using Hindi as the first language were insisted upon so that the assumption would be safe. These were cases who had had proficiency in other languages; however their relatives confirmed that Hindi could be considered the first language.

All the subjects had to pass the screening test of 'hearing' and 'vision' to exclude any peripheral involvement of these sensory organs which could otherwise complicate the study.

Finally all the selected subjects obtained "Aphasic Score" on the PICA. The overall score obtained describes the different levels at which the subject can communicate.

General Methodology:

1. "Suitable" cases for this study were selected based on the criteria laid down.
2. Information was obtained regarding their education, job, special interests etc. to obtain some idea of the subject's pre-morbid speech and language proficiency.

speech sample of one of the close relations of the subject was also recorded as a clue to pre-morbid speech.

3. Physician's reports of various investigations and examinations done for the subject were noted.

4. Any treatment given to the subject was noted.

5. Samples of the conversational speech of all the subjects was tape recorded every day.

6. Some observations of the speech of "old aphasics" were also made who ware attending the hospital Mainly for physiotherapy. This was just additional data(given in the

6. Along with the recording of "conversational speech", "a say after me" test was given every day and the responses were tape recorded. This attempt was made to ensure the occurence of all the phonemes in all phonetic positions, which may have been emitted by the subject during spontaneous speech. The list of these words is given in the appendix.

7. Analysis of each smaple was made on the following basis:

(a) Phoneme frequency distribution

(b) Distribution of phoneme errors

(c) Total error

(d) Distribution of error types

(e) Phonemic analysis

Test material:

PICA: The test is a battery of eighteen subjects utilizing responses to 10 common objects to assess the verbal, gestural and graphic Modalities of the subjects with communication disorders.

Commutation of scores: Once the 180 items (18 subtests on 10 objects) have been administered, three kinds of scores are computed, the mean score on all the 3 modalities and the mean scores for each modality separately.

(a) subtest means: Baoh subtest has 10 item scores and the mean of each subtest is computed.

(b) Modality scores: Of the eighteen subtests, four are verbal (I,IV,IX,XII) eight are gestural (II, III, V, VI, VII, VIII, X, XI) and six are graphic tests, (A,B,C,D,E,F). Modality means are computed to get an idea of patients communicative ability of the particular modality.

(c) Overall Response level: The overall score in an average of all subtest means.

(d) Recording Times: Time taken by the patient en each subtest and on completion of the whole test is noted. Scoring criteria is shown in the table.

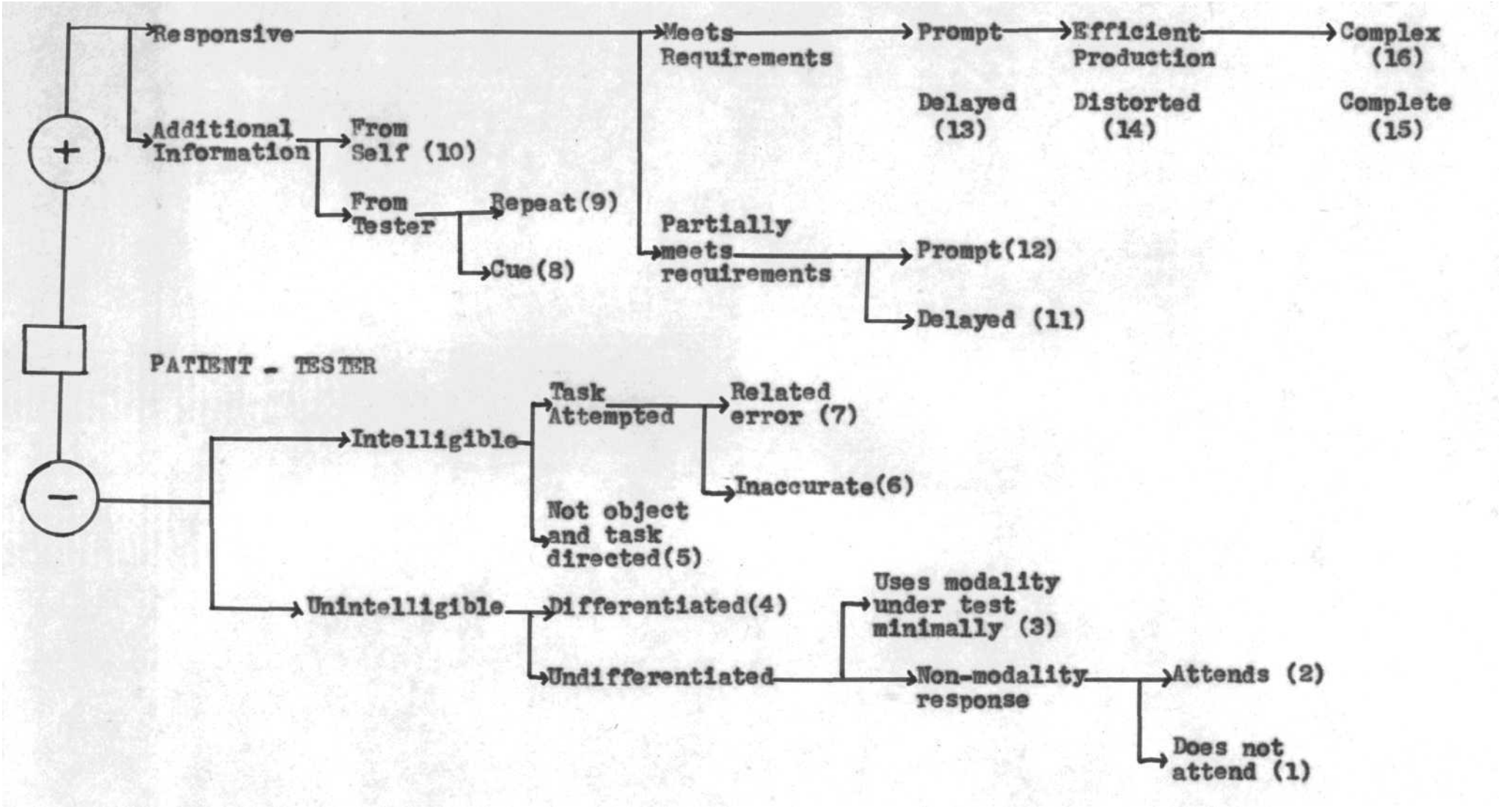
Few changes in PICA were made with the kind permission of Dr. Porch. Porty hours of training in

instructions and practice is necessary for the tester.

TABLE FOR PICA SCORING RESPONSES

Score	Category	Dimensional characteristics
16	Complex	Accurate, responsive, complex, prompt, efficient.
15	Complete	-do-
14	Distorted	-do-- distort
13	Complete delayed	-do-- delayed
12	Incomplete	-do-- incompl Promp
11	Incomplete-delayed	-do-- delayed
10	Corrected	-do- - self co rrected
9	Related	-do- after instructions are repeated
8	Cued	-do- after cue la given
7	Related	Inaccurate, almost accurate
6	Error	Inaccurate attempt at the task item
5	Intelligible	Incomprehensive but not an attempt at the task item
4	Unintelligible	Incomprehensive but differentiated
3	Minimal	Incomprenensible and undifferentiate
2	Attention	No Response, but patient attends to the tester
1	No Response	No Response, no awareness of task

MULTIDIMENSIONAL SCORING AS A BINARY CHOICE SYSTEM



as specified by him. As it was not possible to get this formal training, the investigator had made herself familiar with the adminiatration, aeoring and the interpretation of test to 8 aphasics who were attending the rehabilitation wait at the All India Institute of Medical Sciences, New Delhi. Nome of these are the subjects of thia study.

The following changes in the test were made for the purpose of this study only:

1. It was felt that some of the test objects were inappropriate for our population and they were substituted by the other more common objects.

(a) a 'spoon' was used as the test object instead of a ('fork'.
(b) a 'kitchen knife' was used inatead of 'butter knife.
(c) an Indian coin (25p.) was used inatead of a 'quarter'.

2. The subjects were given this test during the very early period of their illness. Some of the patients who could not sit up far the entire testing period were made to sit up only for the graphic subtests and the rest of the test was given when they were either lying in the bed or were propped up, supported with pillows.

3. The test was given in Hindi.

These changes however weald have limited the utility of the teat for diagnoatic purpoaea though the profiles obtained were very close to the ones obtained by Dr. Proch. The use and interpretation of this test waa limited to this study only and it is not intended that this version be used for regular diagnostic purposes without further atandardization and test training.

Recording situation and equipment:

Each subject was individually aeen in the ward, due to the non-availability of the sound treated room, a comparatively quiet conner in the ward was selected during the recording sessions. The speech samples were recorded on a "Midland" tape recorder at the speed of seven and one half inch per second.

The raw data for this study was obtained by recording the conversational speech of all the subjects. The session consisted of an open-ended conversation regarding subjects peraonal history, family history, work, hobbies etc. It was planned not to ask any questiones on the patients' illness, to avoid unpleasantness, but the present inveatigator felt that

most of the subjects preferred to talk about their illness. Questions were used only as a means of eliciting as much speech as possible.

More emphasis was given to spontaneous speech samples, as it means language in the 'Natural context'. As Schuell (1962) says free speech of aphasics way be more closely related to the speech performance of normals than is the behavior obtained on structured tests. She says,"

> "Though the diagnostic and prognostic significance of free speech measures is not yet known the approach appears heuristic and will increase our understanding of language processes

Hatfield (1972) says,

> "The more spontaneous the utterances are, the closer they approximate to the patient's real phonological system"

'A say after me' test was also recorded. However this was used only for a check.

Analysis of data:

The conversation tape icluded the investigations

atiaulus questions, comments and the subject's speech. However a lot of subject's speech was"unintelligible" because the target words were not available or could not be guessed. Proa the total speech samples, the speech of the investigator and the 'unintelligible' speech of the subject were eliminated. Misarticulated speech was included in the "intelligible" speech as long as the target word was identifiable. From the first subject's, first day's sample only 5-7 minutes speech was 'intelligible', hence an attempt was made to keep this period constant for all the samples for the purpose of comparison.

All 'intelligible' speech saaples were transcribed. The transcription was done with the help of two post-graduate students of speech pathology and audiology, having sufficient knowledge of Hindi language. The order of transcription was kept random and the transcribers did not know the day the sample was recorded. This was done to avoid any possible bias in the judges. The target word was provided to the judges when they had difficulty in guessing it. They faced this difficulty because they did not know the context.

Both the judges were Bade to listen to the tape over and over till they case to one judgement.

The transcribed data was analysed in the following manner:

(a) phoneme frequency distribution:

Randomly selected speech samples of two subjects consisting of 1000 phonemes were analyzed for the frequency of occurrence of phonemes. The frequency tabulation was based on the actual phonemes produced by the subject and not on the attempted target phonemes. This was compared with the normal phoneme frequency distribution in Hindi.

(b) Distribution of errors:

With the phonemic frequency distribution established for the aphasic speech sample, it was possible to consider the relationship between the phoneme error rate and frequency of occurence. In order to measure this relationship, a rank order correlation coefficient between the errors made on each phoneme and its actual frequency of occurence in aphasic speech was computed.

(c) Total phonemic error:

Tbtal number of uttered phonemes and target

phonemes were counted and an overall error percentage was calculated for each sample. By comparing the total error percentage of each subject through all the sessions, it was possible to get an idea of subject's linguistic recovery at the phonological level. Learning quotient was computed for each subject fo know the rate of recovery.

(d) Distribution of error types:

In order to determine the types of phonological errors made by the subject, all the phonemes were compared with the target phonemes and the deviations were categorised into!-

i) Severe distortions (D_1)
ii) Substitutions (S)
iii) Mild distortions (D_2)
iv) Omissions (0)
V) Additions (A)

The percentage of each error type was determined for each speech sample of every subject. Phonological recovery could be arrived at by comparing the error percentage of each type for each day

(e) Analysis of substituted phonemes:

Phoneme substitution errors ware analyzed in terms of distinctive features. They were classified into errors of one or more than one distinctive feature, Than each phoneme substitution error characterized by a single feature change was classified according te the direction of the error made - whether the phoneme change was from marked consonant to an unmarked or from unmarked to marked. This attempt was made to study the pattern followed by the subjects during the process of recovery.

C H A P T E R IV

Results and Discussion

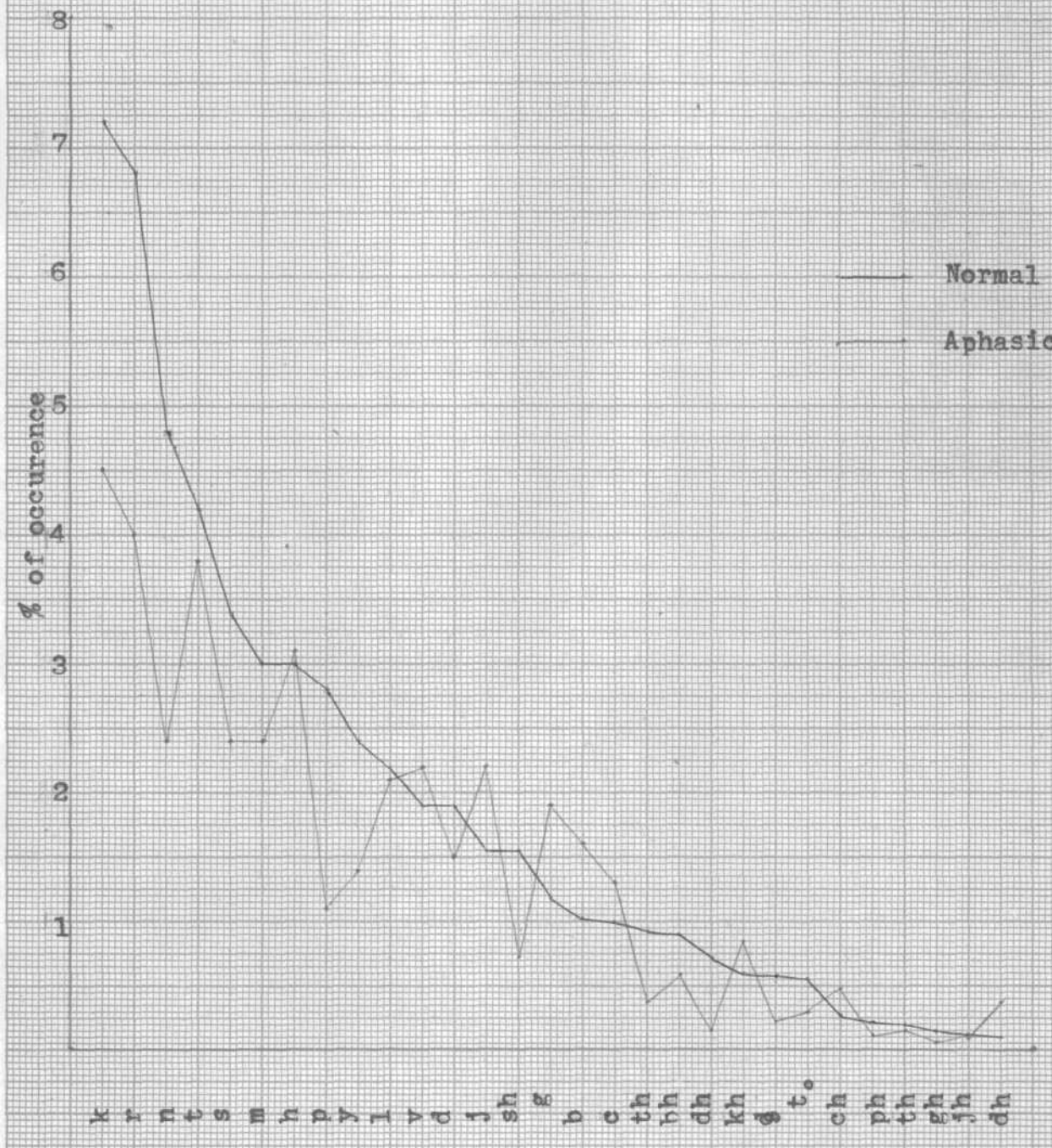
It was initially intended to discuss the results of each subject separately but as all the subjects showed a similar pattern in their phonemic disturbance and its recovery, they have hewn discussed together. However, this grouping is done for the purpose of discussion only. Analysis of the 'say after me' test showed fewer errors than errors made on spontaneous speech, but the errors were made on the same direction.

1. Table No.l shows the age, medical diagnosis, and the PICA (overall) score of each subject. The modality response summary and other details of the history of each subject are given in the appendix.

Table No. 1 - Description of cases

Subject	Age	Medical	Diagnosis	PICA	(overall	score))
A	38	yrs.	C.V.A.	3.37		
B	45	yrs.	C.V.A.	9.95		
C	38	yrs.	C.V.A.	9.53		
D	42	yrs.	C.V.A.	8.40		
E	55	yrs.	C.V.A	8.80		

GRAPH No. I - Showing frequency of Hindi phonemes in normals and aphasic subjects.



Pica Interpretation: All the subjects had obtained the scores within the range 8.00 - 10.00,

> "The patient with an overall score in this range has marked difficulty with most communication skills. Auditory input is moderately involved and often tends to fluctuate in adequacy. The patient who uses his visual input well is often mistakenly attributed by his friends, family or hospital personnel with having better auditory input than the teat reveals. Speech is not functional although imitative ability may be good." (Porch)

Although all the subjects obtained the scores in the range 8.00 - 10.00, they showed different rates of recovery from the 1st to the last day.

2. phoneme frequency distribution; The frequency of the phonemes from the speech of two aphasics selected randomly was compared to a normal distribution curve of Hindi phonemes (Ghatge). The distribution is plotted on graph No.l. A rank order correlation coefficient test was applied to measure the degree of concordance between the constant distributions reflected in aphasic and normal speech. The rank order correlation was .91, highly significant at the .01 and .05 levels of confidence.

On these results it could be concluded that the spontaneous speech of aphasic subjects does not seem to be different from that found in normal speech. This

confirms Blumstein's (1968) results who found the correlation between the phoneme frequency of aphasic and normal English speech aa .95 . She concluded.

> "This similarity of distribution is interesting in the light of obvious disturbances in phonology observed in aphasic speech. An analysis by phoneme distribution is not sen-altive enough to differentiate pathological from normal speech".

3. Distribution of errors: The relationship between errors made on each phoneme and the actual frequency of occurence of each phoneme in amphasic speech was computed. The rank order correlation coefficient was found to be statistically insignificant.

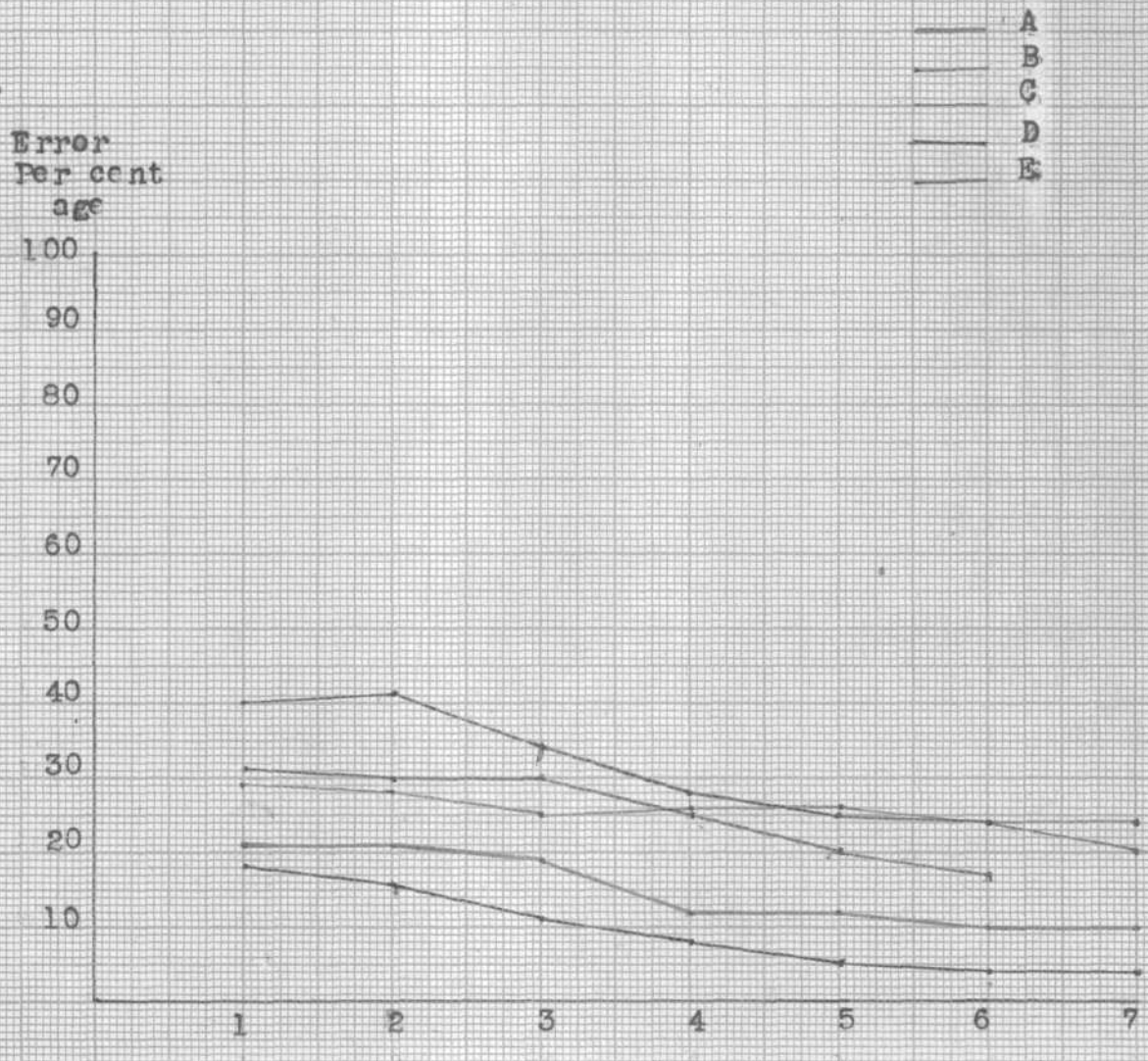
It could be then concluded that there is no relationship between the error made on each phoneme and its actual occur#nce in the aphasic speech. This result does not support Bluastein's results who found an inverse correlation between frequency of occurence of phoneme and error rate.

4. The number of 'intelligible' phonemes uttered by each subject on all the days is given in table No.2.

TABLE No.2 - Total number of 'intelligible' phonemes and the number of error (Raw Scores).

Subjects	DAYS 1	2	3	4	5	6	7
A	540	655	850	960	978	1180	1305
	(94)	(132)	(143)	(115)	(121)	(92)	(125)
B	768	930	1196	1440	1836	1908	2162
	(222)	(268)	(299)	(347)	(477)	(457)	(441)
C	870	1020	1370	1300	1575	1620	1836
	(156)	(163)	(143)	(101)	(75)	(64)	(73)
D	520	540	600	670	800	820	880
	(201	(218)	(204)	(187)	(178)	(196)	(179)
E	835	960	1040	1315	1500	1530	
	(260)	(292)	(317)	(322)	(292)	(257)	-

Errors are shown within brackets.



Graph No. II

showing the recovery from the total error of all the subjects. (A-E)

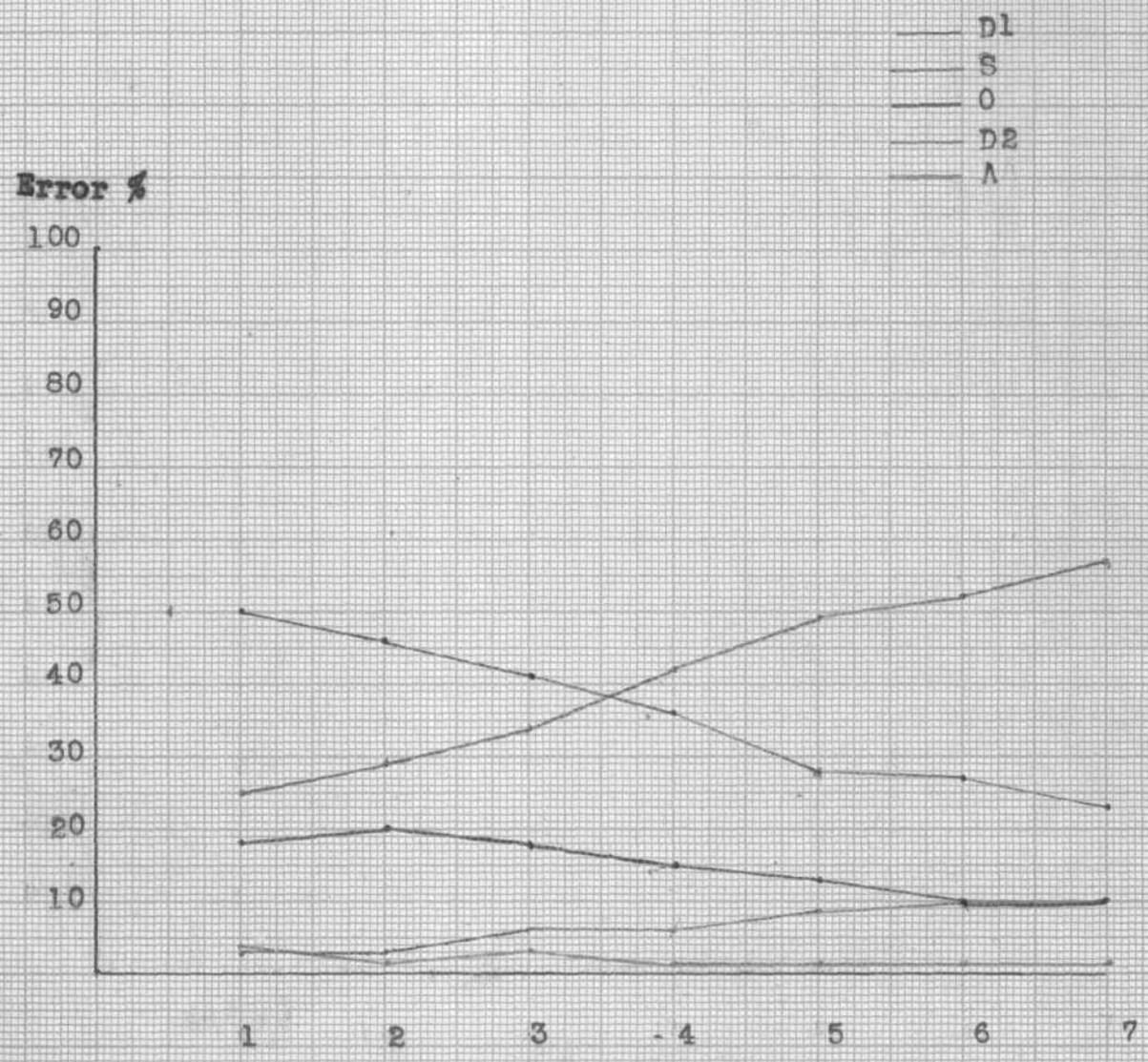
All the subjects showed a gradual improvement in terms of increase in the number of 'intelligible' phonemes from the first to the last sessions. The range of increase was from 360 to 1394 phonemes. Subject B showed tha maximum increase and subject D showed the last increase. Subjeet D - apart from this illness had been an old case of Diabetes Mallitus and hypertension.

This gradual increase in the number of phonemes each day is indicative of phonemic or phonetic recovery. Tha imintelligibility of phonemes could have been due to the neuro-muscular problem which often co-exists with aphasia. The gradual improvement from this disorder could have contributed to the increase in the number of intelligible phonemes.

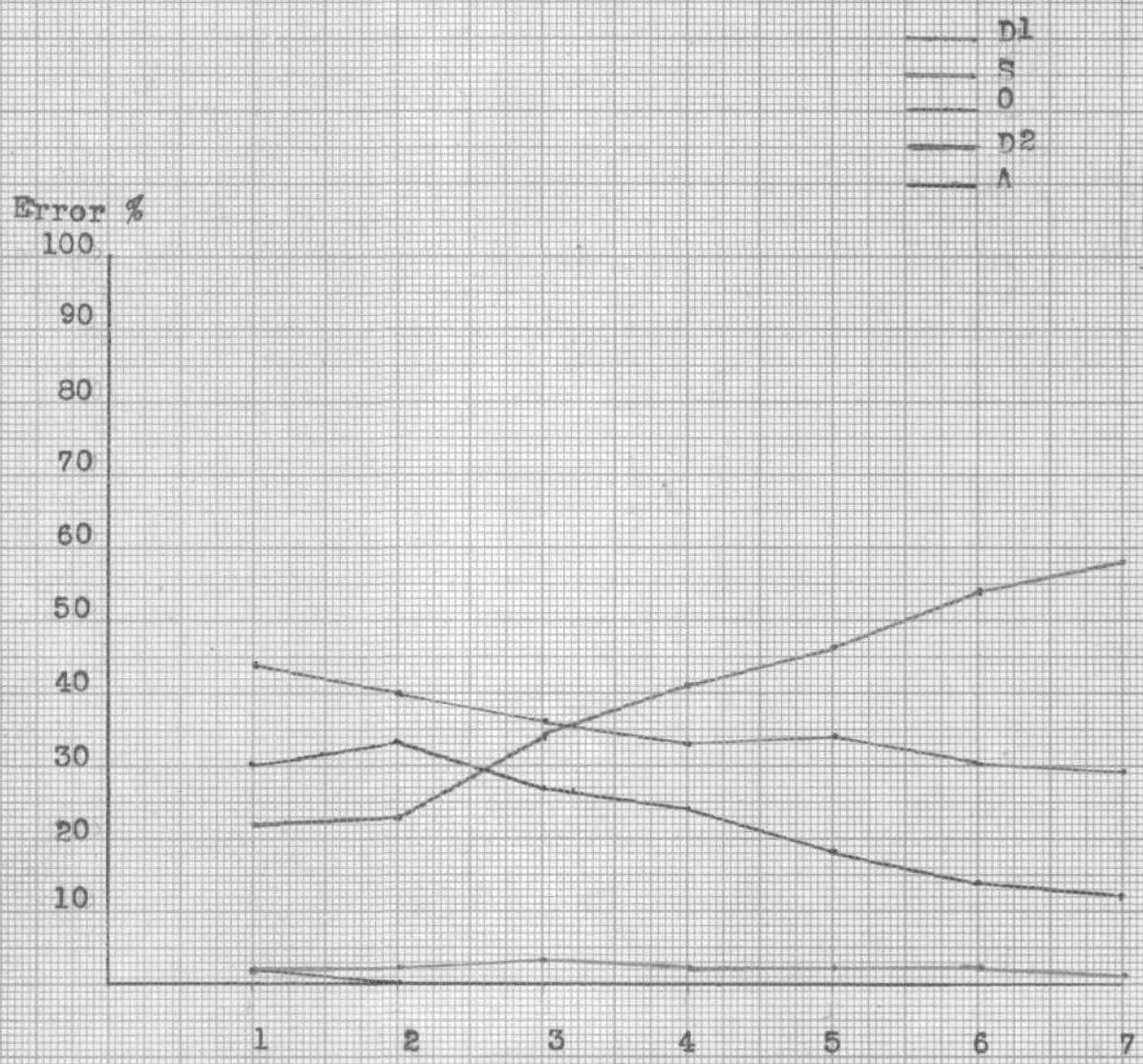
5. As ahown in the graph Ho. II, all the subjects showed a gradual reduction in the total phoneme error from the first to the last day. This pattern was common to all the subjects though there were differences in the degree of error and improvement in each subject.

Learning quotient:

Subject A - 218.7
Subject B - 142.2

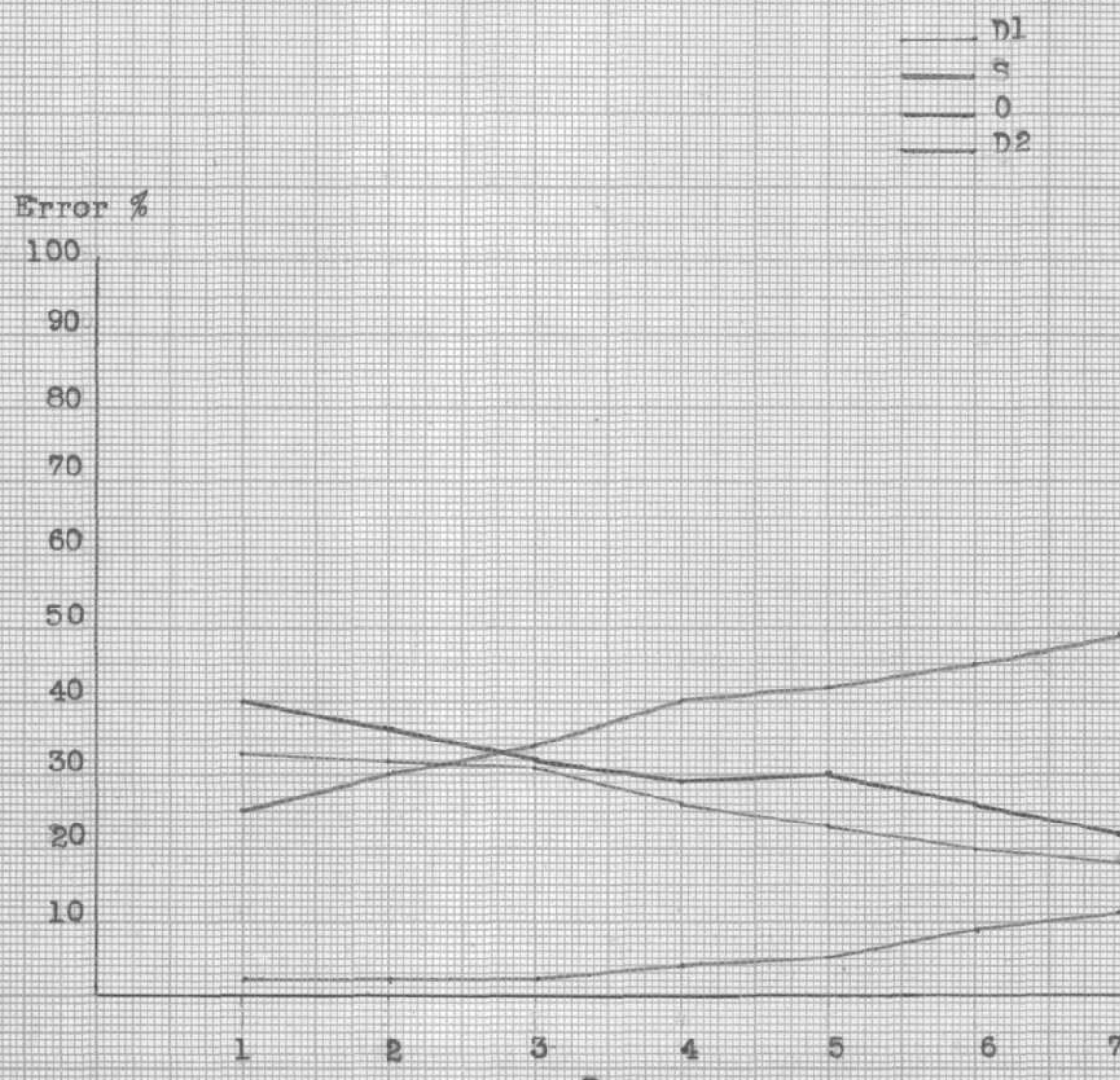


Graph No. III
showing the performance of subject - A



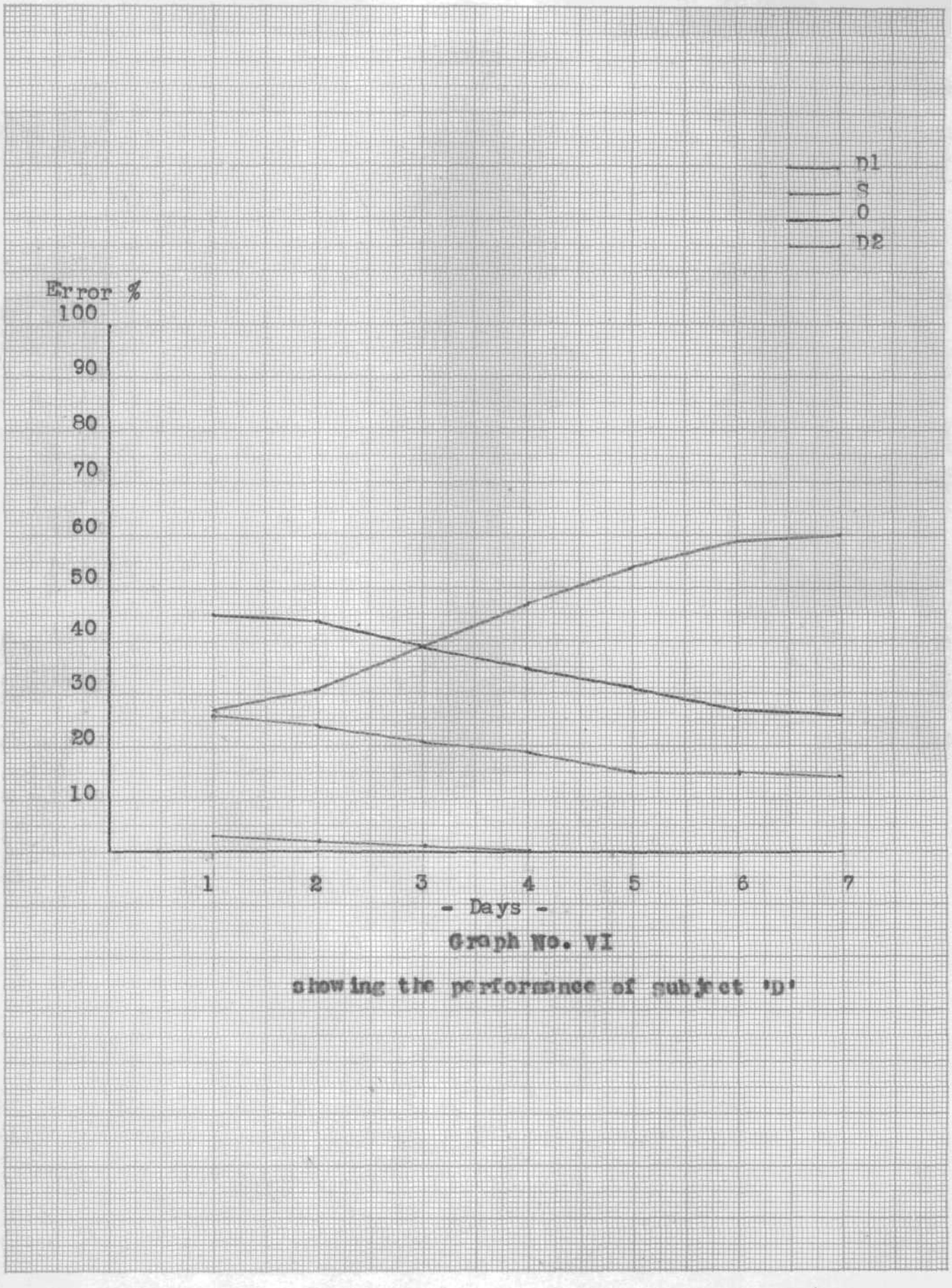
Graph No. IV

showing the performance of Subject (B)



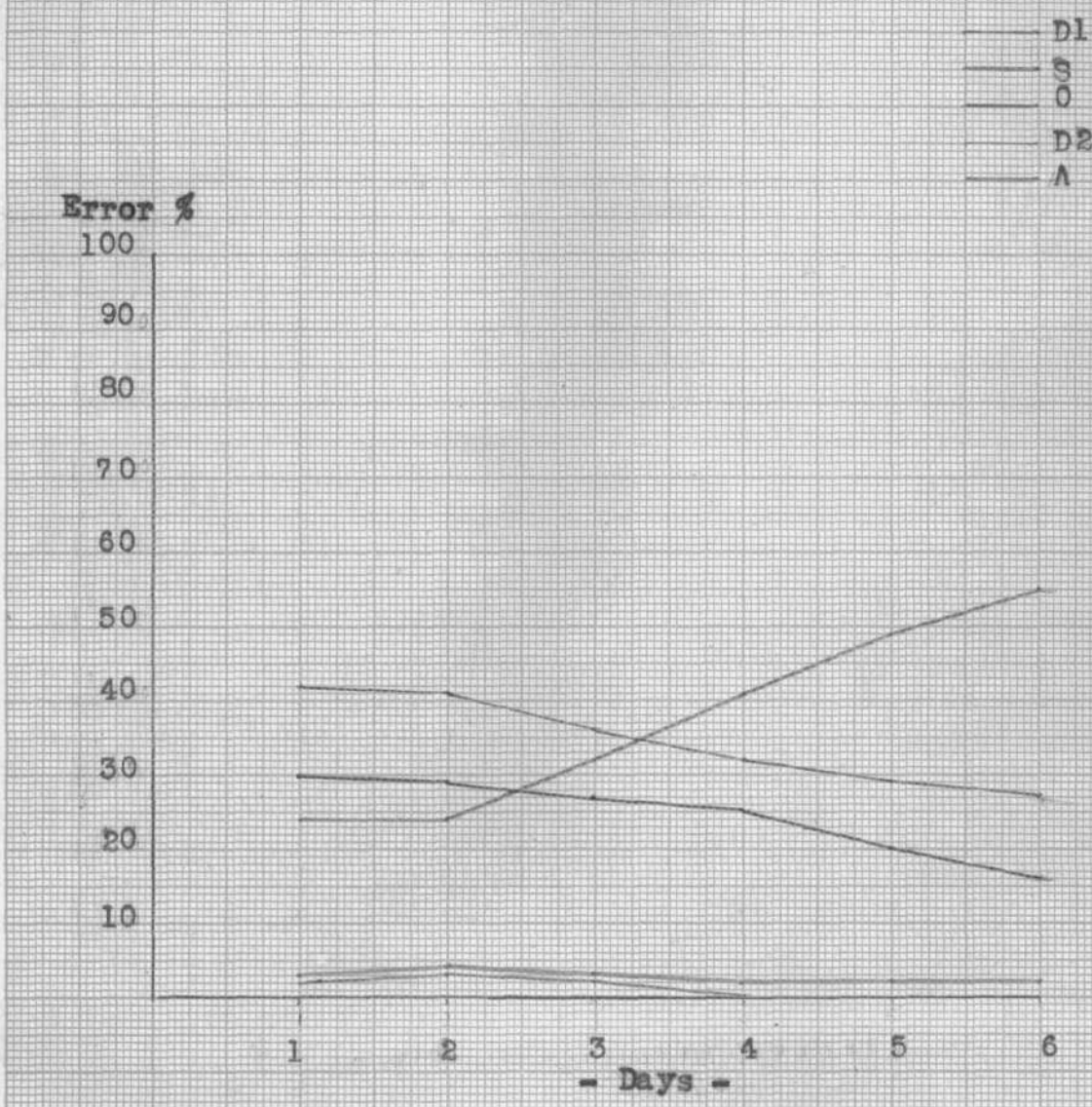
Graph No. V

showing the performance of subject 'C'



Graph No. VI

showing the performance of subject 'D'



Graph No. VII

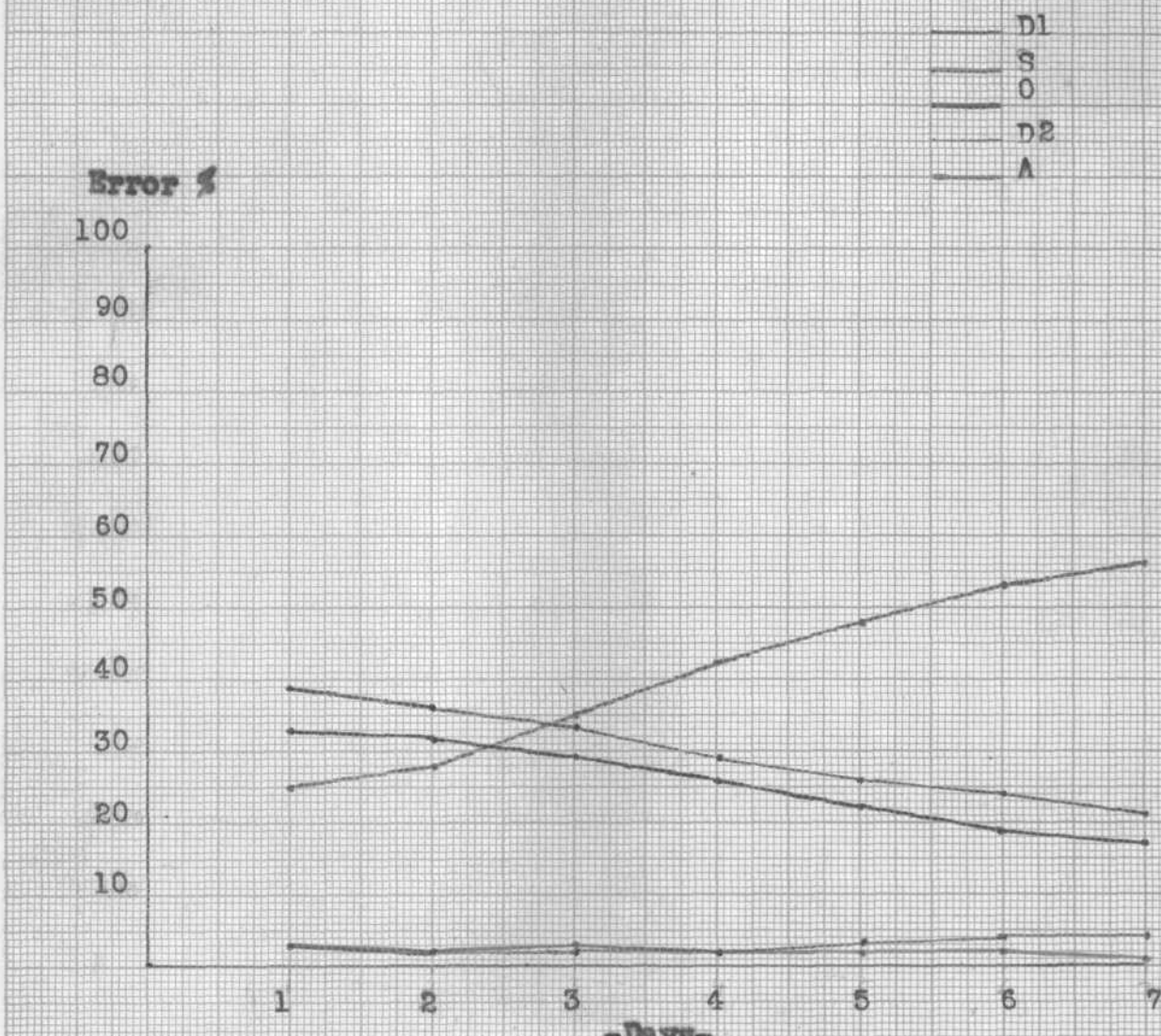
showing the performance of subject 'E'

Subject C - 450
Subject D - 165
Subjeot E - 185.8

The relevant history of subject C shows that he never lost consciousness during this illness and that the onset was abrupt. He also scored highest on PICA. In case of subject B, the onset was comparatively gradual. He first had weakness of his right side of the body and slurring of speech and after about 45 minutes he became unconscious. The learning quotient shewed most recovery in subject C and best in subject B.

6. Individual performances of the subjects are shown separately in graph Nos. III, IV, V, VI and VII. The errors made by the subjects were of the following types:

(a) Severe distortions (D_1)
(b) Substitutions (S)
(c) Omissions (0)
(d) Mild distortions (Bg)
(e) Additions (A) were seen in subject No. A,B & E



Graph No. VIII

showing mean scores of all the errors

of all the subjects

(a) As observed from the individual graphs, every subject showed a gradual reduction of severe distortions, omissions and additions from the first to the last day.

(b) There had been a gradual increase in the number of substitutions in each subject from the first to the last day.

(e) Subject He. A and C showed an increase in mild distortions While in the other Subjects this error had disappeared in the later days.

7. Mean scores on all the types of errors of all the subjects is shown in graph No.8. It was observed that all the subjects showed a general pattern of improvement during the post-morbid week.

(a) There was a gradual reduction of all other types of errors except substitutions.

(b) There was a gradual increase in the substitution.

This gradual decrease in servere distortions, omissions and additions and gradual increase in mild distortions and substitutions are evidence of phonemic recovery.

Subject C and D had more omissions and most of these omissions were on the /h/ sound which they intended to use frequently. If the error made on /h/ sound are not taken into account then they show the same pattern of errors as the other subjects did. The error of omission had gradually reduced from the first to the last day.

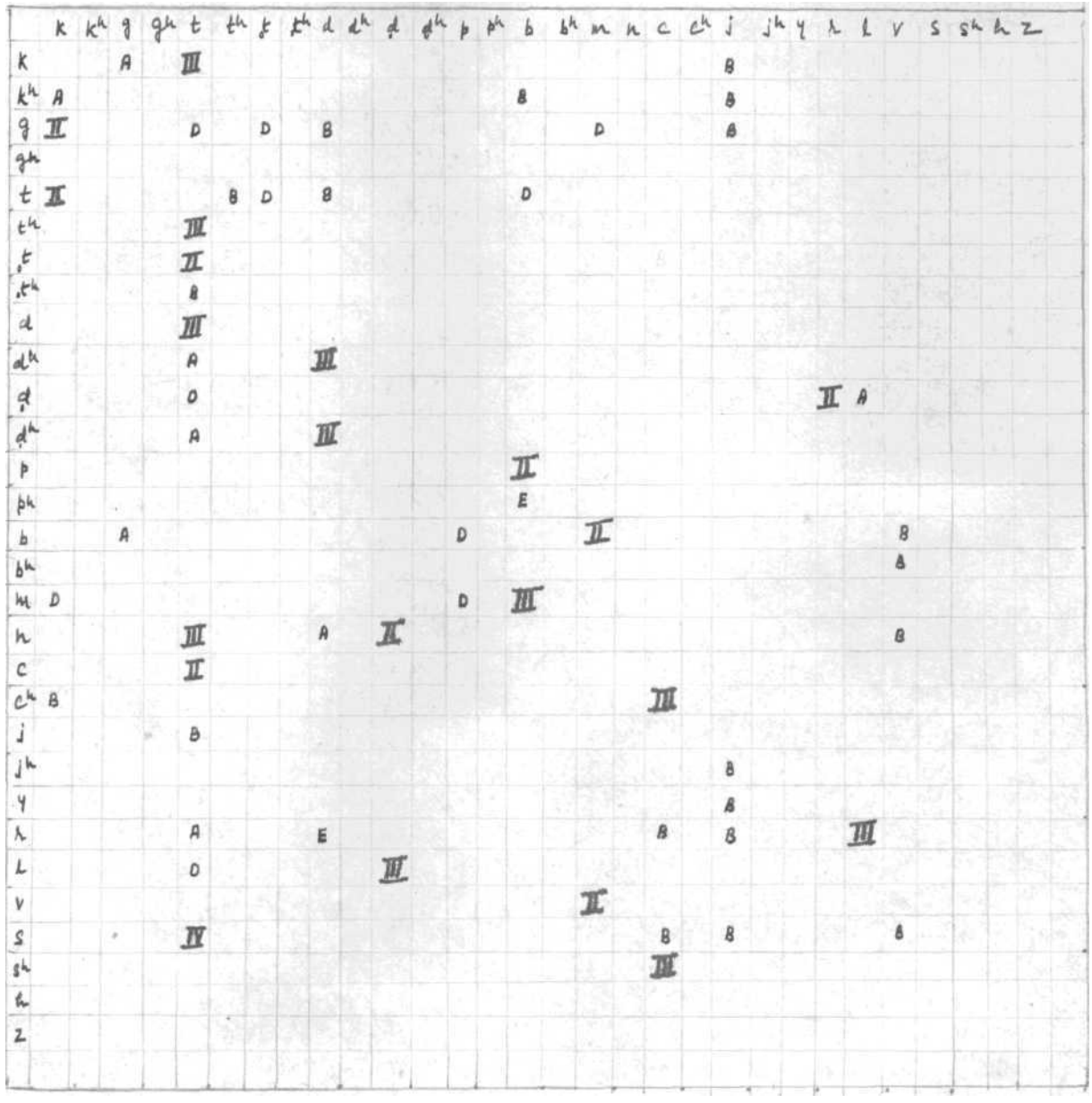
It was observed that all the subjects showed a gradual reduction of severe distortions and at the time showed a gradual increase of substitutions from the first to the last session. This consistent pattern of all the subjects shows a direction towards recovery. As the severe distortions and omissions decrease,the subjects may add some new phonemes to their phonological system which may be substituted by some other phonemes. This is phonemic recovery and can be explained by Milisen's view on articulatory errors. He says that subatitutions are always better than omissions and severe distortions.

Another possibility of the increase of the substituted sounds could be that the severely distorted sounds had been the distortions of the substituted sounds. And as the neuro muscular problem which often co-exists with aphasia improved, the clarity of the speech may have increased and the substituted phonemes were identified.

At this level of articulation the subjects may have merely made a poor attempt at the correct phoneme.

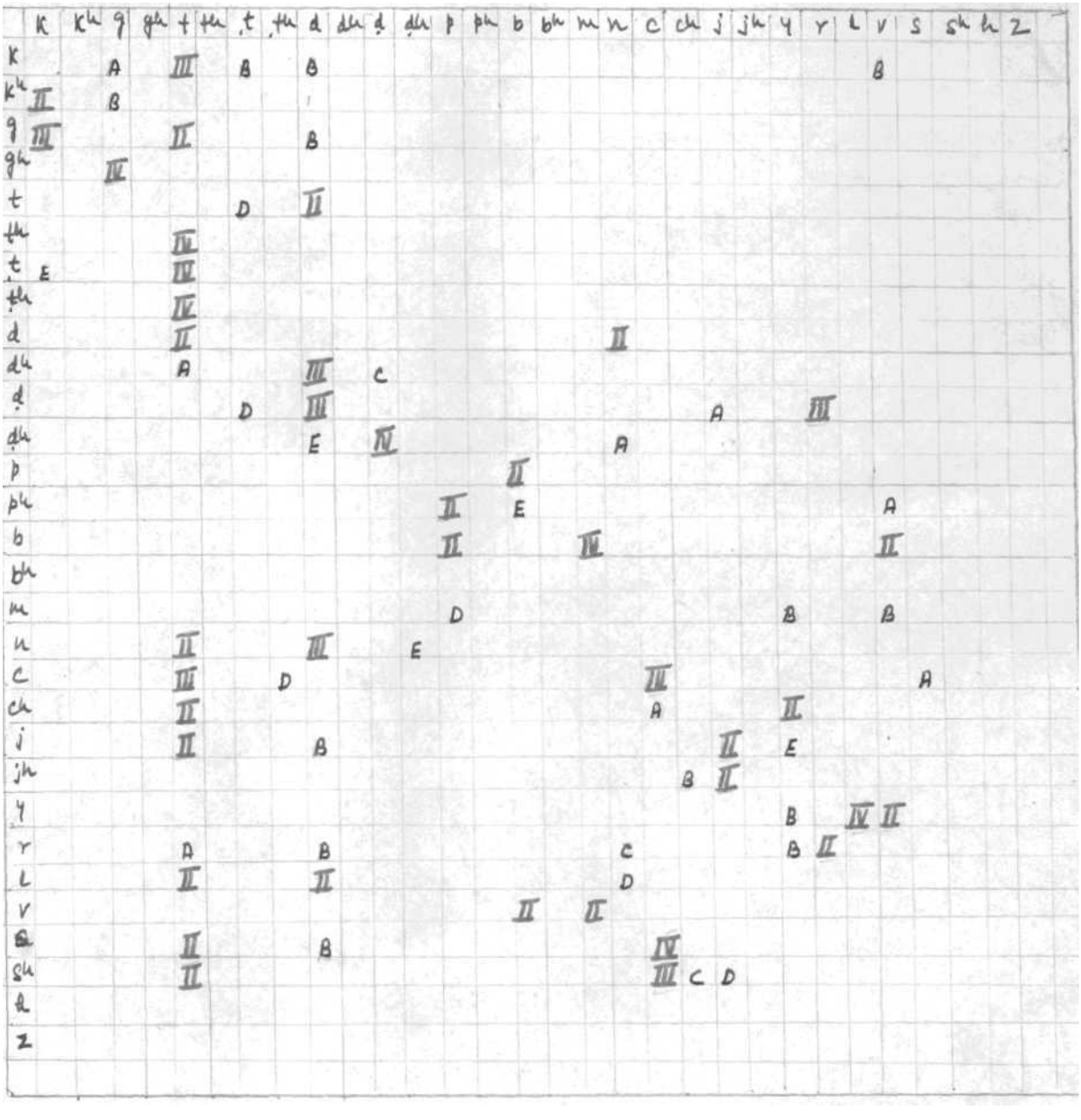
Other types of errors also showed improvement. The most consistent finding in the phonological analysis conducted was the relative uniformity of error types and error direction in each subject. Included in the speech pattern of these subject* were phonological errors of type, i.e. errors involving distinctive value of phonological system - phoneme substitution, omission, addition as well as patterns of phonetic distortion superimposed on the subject's entire speech production. This phonetic distortion decreased as the subject recovered. It may be hypothesized that this is a result of a dysarthric factor which may dominate the clinical evaluation and consequently may give the impression that the quality of phonological disintegration differs from the normally articulated but paraphasically produced speech characteristics of syndrome of phonemic disintegration.

Scatter Table I - Showing the phonemic analysis of substituted sounds of all the subjects on the first day.

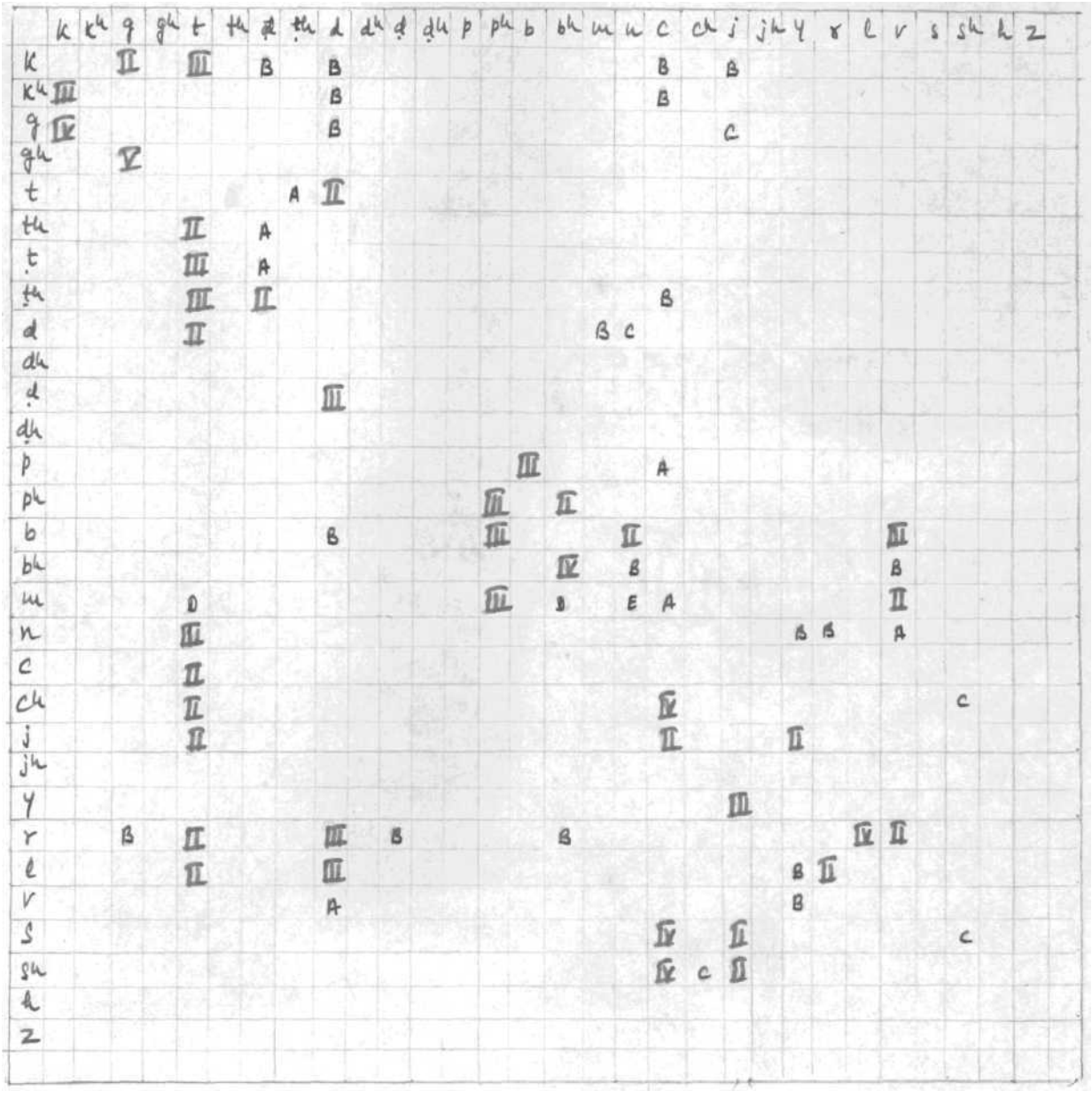


Key: Roman figurs show the total number of subjects who had the particular error.
Alphabets show the other errors made by the spceified subject

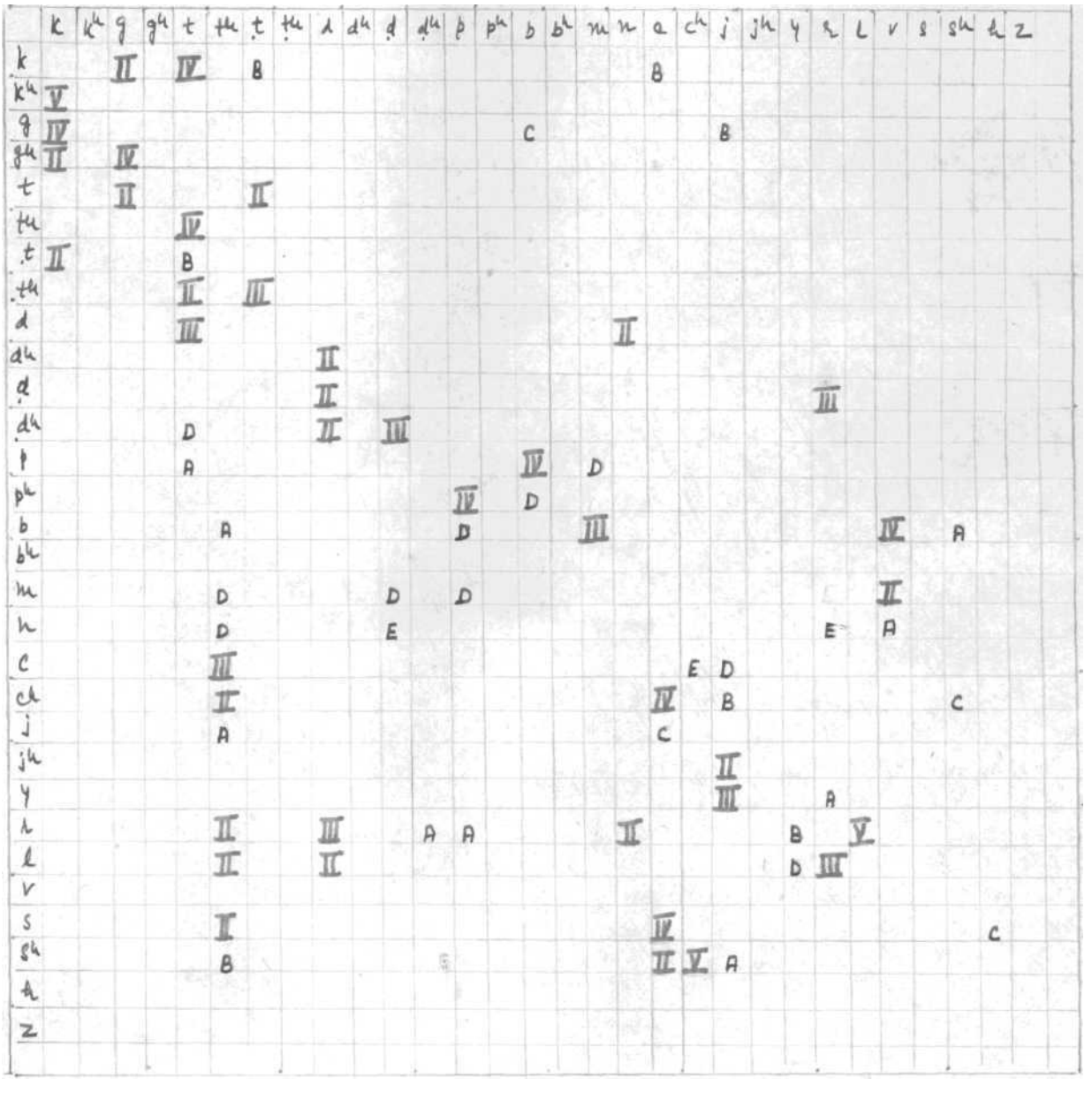
Scatter Table - 2 - Showing the phonemic analysis of substituted sounds of all the subjects on the second day.



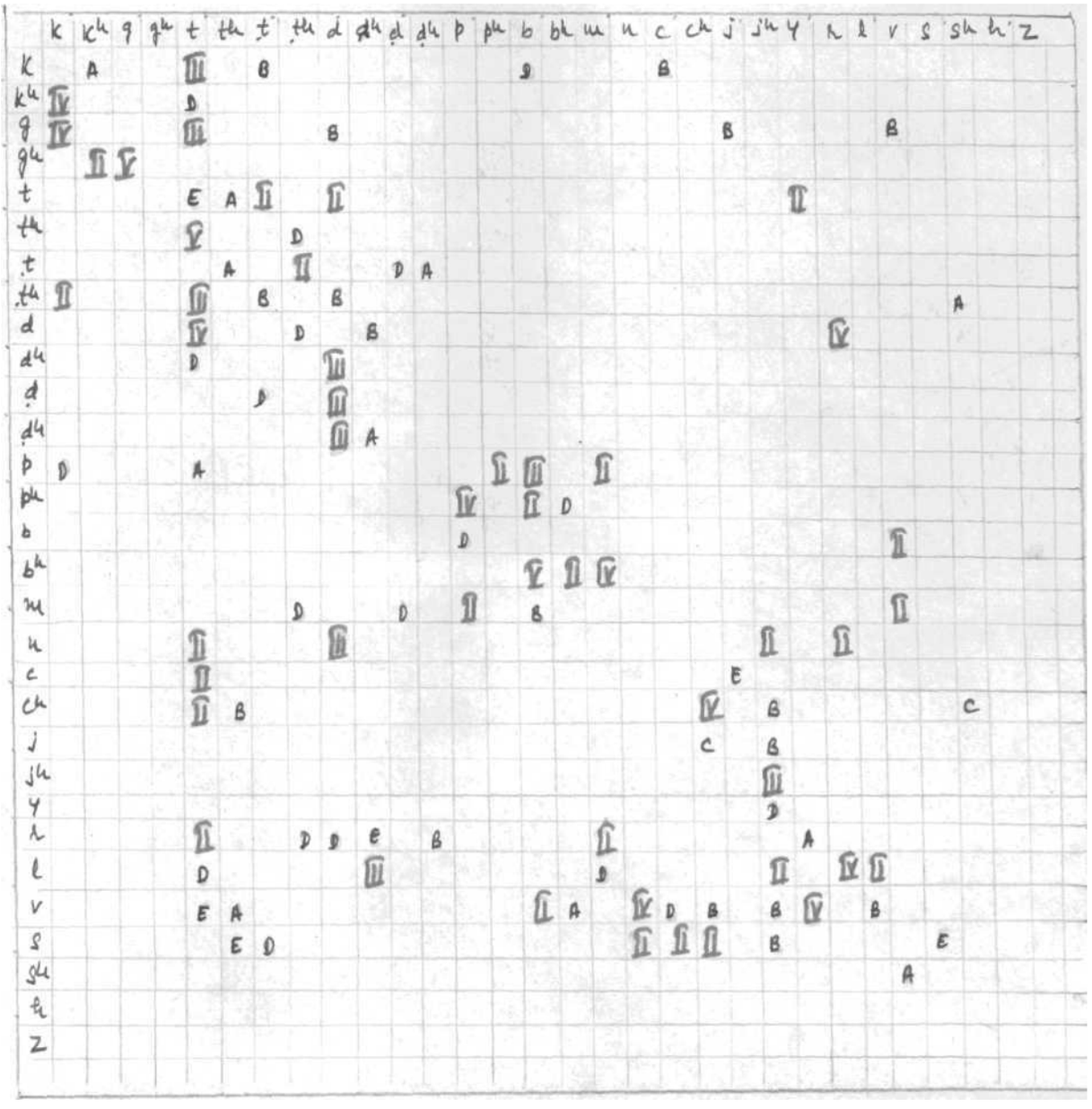
Scatter Table -3 - Showing the phonemic analysis of substituted sounds of all the subjects on the third day.



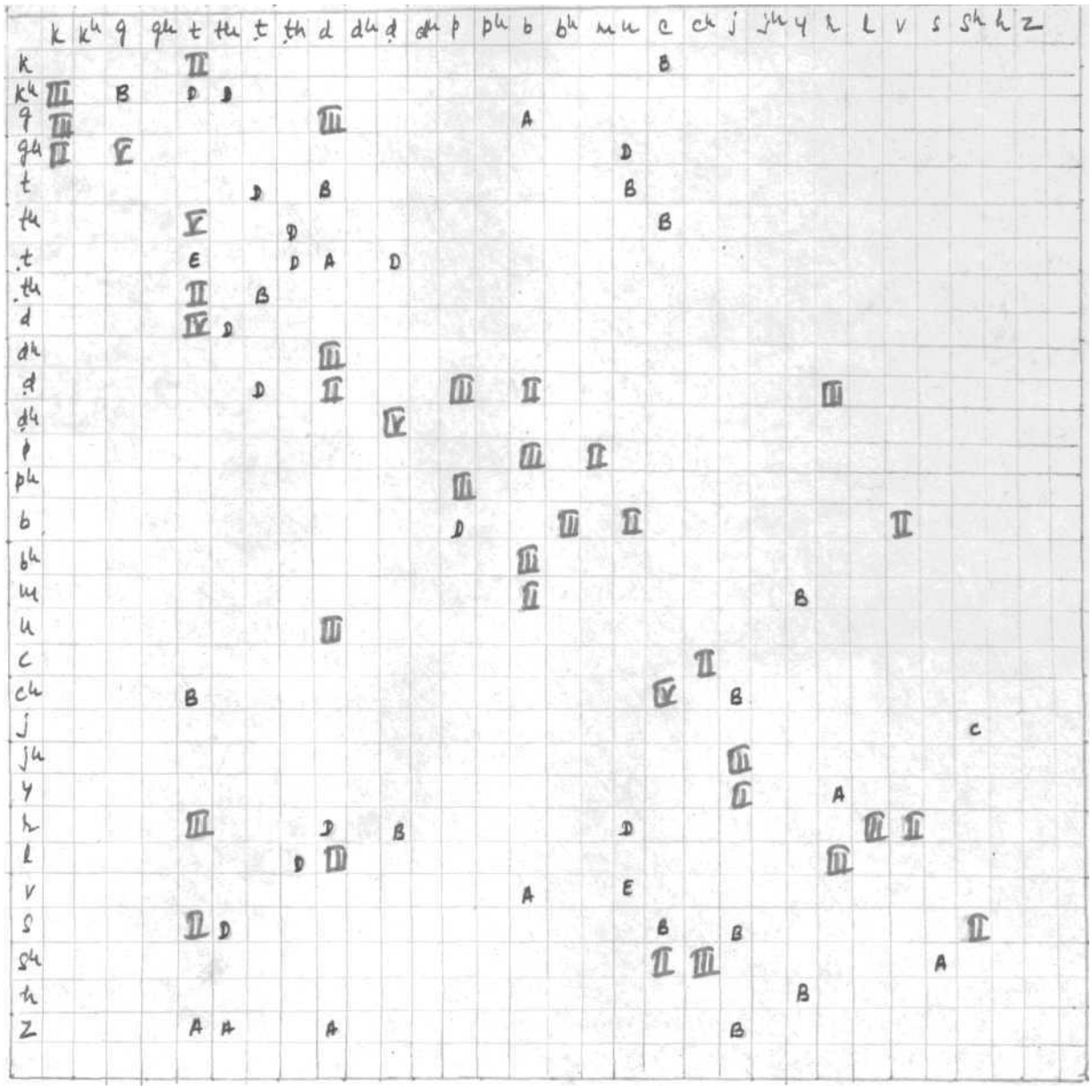
Scatter Table . 4 - Showing the phonemic analysis of substituted sounds of all the subjects on the fourth day.



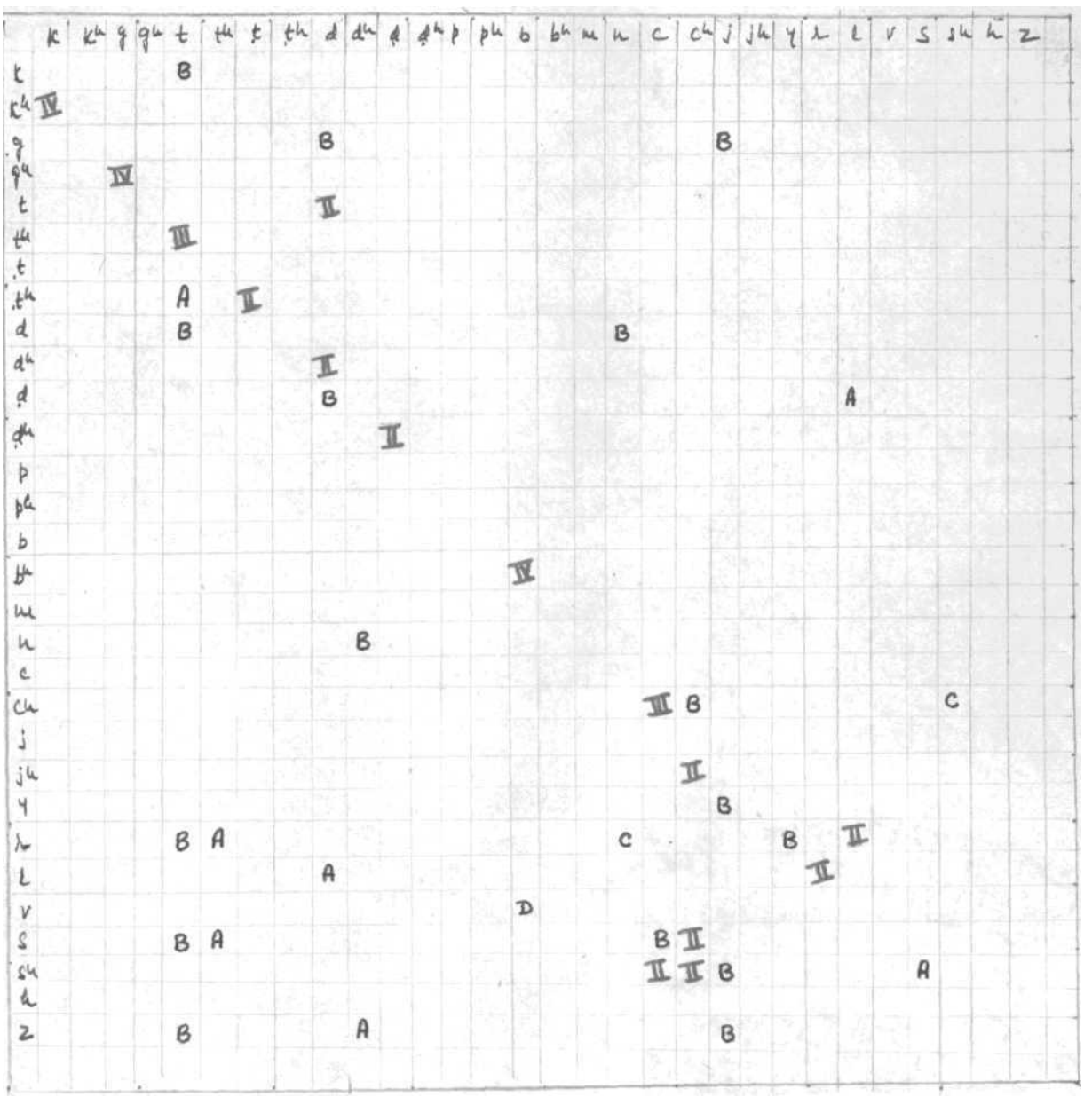
Scatter Table - 3 - Showing the phonemic analysis of substituted sounds of all the subjects on the fifth day.



Scatter Table . 6 - Shoving the phonemic analysis of substituted sounds of all the subjects on the sixth day.



Scatter Table - 7 - Showing the phonemic analysis of substituted sounds of all the subjects on the seventh day.



8. Phoneme substitution analysis of all the subjects is shown in the scatter tables for each day (1-7). Direct observations are made from these tables as it was difficult to evolve any statistical measure for this data. The following observations were made!-

(a) The distinction between /1/, /r/ and /w/ was observed to have been lost in all the subjects and no improvement was seen in this type of error till the last day.

This type of error is often observed in children as this happens to be acquired late in the child's Acquisition of language. (Menyuk and Anderson 1969).

Jakobson says that one of the first oppositions to be lost in aphasia would be that between /1/ and /r/. Ombredane's patient also showed an inability to distinguish /1/ and /r/.

However, quite often /t/ /d/ and /n/ also were substituted for these liquids.

(b) Subjects also had confusions between voiced/voiceless consonants. The most

often confused pairs were /t/ /d/ and /k/ /g/. There was a aarked reduction of this error on the seventh day.

this observation does not support Jakobson's hypothesis of 'phoneaic regression' as the children acquire this distinction very early in their language acquisition period. The subjeots showed equal tendency for the voiced consonants to change into their voiceless equivalents and the voiceless consonants to change into their voiced equivalents. Pry (19S9) says that this valve confusion which is quite common in aphasic is unknown in the children's speech. There may be much more than a failure to make the larynx work when required, is involved. The subjects were apparently unaware that they had Bade any substitutions. The fact that the subjects did not even notice most of these errors points to a genuine error made at the level of the phonemic organization of speech where the wrong unit seemed to have been selected. Alternatively there may have been a disturbance in the feedback and monitoring system.

This observation agrees with similar observations made be Bouman and Grunbaum (1925), Oabredane (1939),

Fry (1952), Blumstein (1968), Hatfield (1972) and others.

(c) The loss of distinction between nasal/oral consonants was noticed in all the subjects. It was observed that there was an equal tendency for the nasal consonants to be substituted by oral consonants and vice versa. The most often substituted sounds were - /m/b/, /p/m/, /d/n/, /r/n/, /t/n/, /m/bh/, /v/m/, /n/1/, /d/m/.

There was some improvement noticed in the last sessions. The errors were limited to few plosives only e.g. /m/b/, /b/m/, /d/n/, /r/n/, /n/d/,/m/p/. These errors were noticed till the sixth day. On the seventh day subject B made errors on /m//p/, /d/n/ and subject No. C on /r/n/.

This observation again does not support Jakobson's hypothesis as the distinction between oral/nasal consonants is one of the first ones to be acquired by children in their language acquisition. This confusion shows the selection of the wrong phonemes.

Such observations were also made by Alajouanine, Fry (1953), Blumstein (1968).

(d) The subjects had a lot of confusion between affricate - fricative, affricate-stop, continaent- stop and continuent-affricate.
eg. /c/s/, /c/sh/, /1/c/, /t/j/,/v/b/ /c/p/, /c/k/,/t/y/, /t/z/, /p/f/, /ph/f/ etc.

There was improvement in most of the subjects on the seventh day. However, subject B did not show any improvement on this error.

Similar observations were also made by Ombredane, Alajouanine, Luria A.R. (1966), Goldstein K. (1948) and Blumstein (1968). Ombredane observed that the affricates were lost first and then the fricatives. Stops substituted the aspirant consonants eg. /p/ for /f/.

(e) The distinction between aspirate/non-aspirate phonemes was observed to have been lost in all the subjects. It was observed that till the fourth session all the subjects omitted almost all the aspirated consonants and replaced them by their non-aspirate equivalent.

The aspirate was absent. The aspirate was added in the phoneme inventory only after the fourth day. However during the later days a confuaien between the two was seen. eg. /p/ph/,/b/bh/, /g/gh/, /k/kh/, /t/th/, /d/dh/, /t/th/ etc.

(f) Subjects also made a great number of errors in the place of articulation. Most often the front consonants substituted the back consonants though occasionally the observations showed a tendency for the opposite direction also. ef. /t/k/, /d/g/, /t/t/, /d/d/, /r/d/, /g/b/, /t/k/, /d/t/, k/t/, /b/k/, /s/sh/.

/t/ and /d/ were most frequently substituted for other sounds. There was a reduction of errors for other consonants towarda the later days, however /t/ and /d/ continued to be substituted for other sounds even on the later days.

This type of error is most often made by the children. Ombredane observed that velar sounds were

pronounced as /t/ and /d/. This observation is against Fry's, who observed that /t/ and /d/ were frequently replaced by velar articulations.

Bouman and Orunbaum (1935) and Blumstein (1968) observed in their patients that a consonant changed its place of articulation to one nearest the target sound.

(g) It was observed that the subjects made very inconsistent errors during the early days while there was a marked improvewent in the later days. As shown in the scatter table 7, the substituted sounds have been coning closer to the intended sound. The distinctive feature analysis for the last day demonstrates that in all the subjects significantly more errors of one distinative feature were made than errors of more than one distinctive feature.

All the observations made on the phonemic system of these subjects showed that the subjects

made very consistent errors. However, quite often the sounds were made correct also, These results do not support Jakobson's idea of 'phonemic regression', however some similarities have been seen.

Alajouanine (1939) emphasized,

> "These errors did not form rules of phonological change but rather demonstrated tendencies. Hence, it is not possible to predict when an error occurs. It will fall within certain specifiable limits. Moreover, sound changes are not consistently unidirectional, i.e. although there are statistical trends in one direction, a sound change may occur in other direction, eg. fricative stop, stop fricative (Bluastein) 1968).

This implies then that there is a confusion of phonemic oppositions rather than a loss of phonemic types.

These results support the hypothesis:

(a) Phonemic loss in aphasia is systematic.

(b) Phonemic recovery in aphasia is systematic though this is not the same as the child's acquisition of phonology.

Sequence in the phonemic recovery was observed. However it is not possible to give the steps from this data. It is possible that the crucial period from 'no speech' to first few speech sounds was missed and by the time the first speech sample was collected many sounds were present.

Some of the problems faced by the present investigator are mentioned here as it is felt that other investigators while doing the same type of work may run into same problems. In the limited time it was difficult to get the specified subjects. It was difficult to get 'fresh' aphasics as most of the patients came to hospital late and the period from 'no speech'to "first few speech sounds" had been missed and these cases could not bo included in the study. Subjects of the study could not be observed for all the 24 hours and thus the 'no speech' to 'speech' moment was missed. By the time the experimenter collected the first samples, even when this was done the day of first speech, the subjects showed a great deal of speech.

It was originally planned to record the responses on the picture articulation test. But during

the tasting situation it was found that the aphasia subjects had many problems in naming the pictures and the intended sounds could net be elicited by this method.

It was difficult to control the environmental noises in the general wards during the tape recording sessions. One of the subjects under study had cardiac involvement and the experimenter did not wish to trouble the patient very much. One patient went home on the sixth day against medical advise. The difficulty in eliciting speech from the aphasics was that of the target words not being clearly identifiable.

The non availability of adequate descriptions of normal Hindi language and its acquisition made comparisons within the Hindi language impossible.

In the population studied bilingualism and multillngualism could not be completely avoided. As the available number of patients

who could be used for the study was small it was not possible to be choosy.

C H A P T E R V

Summary and Conclusions

It has been held by Jakobson and various other investigator, that the change in the speech of an aphasic bear some relation to the developments in the speech of a child when he is learning to talk. This is, said to be the case particularly at the phonemic level of speech. The sounds which the child acquire, last are said to be the first to be affected in aphasic disturbances and further, the last to re-appear in cast. where the aphasic patient recovers his speech.

Not all aphaaiologists agree with this generalization. The data available does not give any strong theoretical basis for the phonemic loss and its recovery in aphasic speech.

Some studies have been done la European, Japanese and Chinese aphasics. No generalization can be made from them.

However, this study was the first attempt on Indian aphasies.

It was hypothesized that (a) the phonemic loss is systematic and that (b) the phonemic recovery in aphasia is systematic and sequential.

Five aphasic patients who fulfilled, the criteria laid down, wire the subjects of this study. Samples of conversational speech of all the subjects were tape recorded every day for seven days except for subject No. 3, who was seen only for 6 days. A 'say after me' test was also given and the responses were tape recorded. All the speech samples were transcribed with the help of two judges. The intended target word was also noted. The phonological errors made against the known target words were only analyzed.

Results:

1. There was a high correlation between the frequency distribution of the phonemes in aphasic speech and the normal distribution curve of Hindi phonemes.

2. There was no relationship between the acutal occurence of phonomes in aphasic speech and errors made.

3. Phonetic and phonemic errors included:

(a) Severedistortions
(b) Substitutions
(c) Omissions
(d) Additions
(e) Mid distortions

4. There was a gradual reduction ia the total error from the first to the last day.

5. There was a gradual reduction in all the types of error except substitutions from the first to the last day.

6. There was a gradual increase in substitutions from the first to the last day.

7. Phonemic analysis of substituted phonemes showed:

(a) Subjects confused between liquids. (1/, /r/, /w/).

(b) Subjects made errors on voiced and voiceless consonants.

(c) Subjects made errors on naaal/oral consonants.

(d) Aspirate sounds were included in the phonemic inventory only on the 4th day.

(e) Subjects made errors on affricates, fricatives, continuants and stops, and often substituted stops for other sounds. /t/ and /d/ were vary frequently repla-ced for other phonemes.

(f) Subjects made errors on aapirate/non-aspirate consonants.

(g) Subjects made a lot of error in the place of articulation.

(h) There was an equal tendency for the marked consonants to become unmarked and vice Versa.

8. Subjects made more errors of one distinctive feature than errors of more than one distinctive feature in the later days.

9. Subjects wre unaware of the errors made by them.

Conclusion:

The results obtained do not support the hypothesis of aphasic phonology to be considered as 'phonemic degression' to childhood.

The subjects were not even aware of the errors of substitution. It seemed that a wrong phoneme was selected. However, this confusion seemed to be within certain limits.

1. The phonemic loss in aphasia is systematic.
2. The phonemic recovery in aphasia is systematic though this is not the same as the child's acquisition of phonology.

Limitations of the study:

1. Available records and information about subjects pre-morbid language proficiency may not have been accurate.

2. The target words guessed from the context may not have been the ones intended by subjects.

3. A lot of speech sample had to be rejected because of the non availability of the target words.

4. Phonetic distortions may have been confused with phonemic substitutions.

Recommendations:

1. More research should be undertaken to study the phonological loss and its recovery in aphasia in other Indian languages.

2. Research on acquisition of phenology in Hindi speaking children should be undertaken.

3. The present study nay be repeated with more number of subjects and the recovery should be studied for a longer period.

4. Future studies should include the tests of 'phonemic hearing'also.

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A P P E N D I C E S

SUBJECT 'A'

Adm.No.339826/72

Age : 35 years

The patient had suddenly fallen unconscious while he was at his daily work. He was brought to the hospital after he had been unconscious for 3 hrs. He remained unconscious for a day after he was admitted to the hospital. Medical examination revealed Cerebro Vascular Accident with Aortic stenosis. He also had paralysis of the right side of the body. Next day, he was conscious but remained almost 'speechless'. He had some speech on the third day and was administered PICA, later his everyday's speech samples were recorded for 7 days.

Diagnosis: C.V.A. with Aortic Stenosis.

Education: 8th class Occupation: Plumber

Languages known: Hindi

On examination - C.V.S. - Both heart sounds heard normally in all the areas. Pan Systolic murmer heard in aortic area. Vesicular breath sounds plus, cardiac size enlarged.

C.N.S, - complete Aphasia
Nutrition and tone normal of Motor system
power - upper limbs R - o/5
L - 5/5
Lower limbs R - 0/5

No sensory deficit . Treatment- Fersolate,B.Complex, Equibron.

PICA: Modality response summary
Verbal subtests - 5.10
Gestural " -11.33

SUBJECT 'B'

Age:45 years Adm.NO.339920072

The patient was travelling la the train when he suddenly felt the weakness of the right aide of the body, and difficulty in speaking. After about 45 miniutes he became unconscious. He was brought to the hospital next day. Medical examinatlon revealed. Middle cerebral Artery thrombosis with arteriosclerosis. He regained consciousness en the 3rd day after the onset of illness. Ha was than administered PICA and his everyday's speech samples were recorded for 7 days.

Diagnosis! Middle cerebral artery thrombosis with arteriosclerosis.

Education: 5th class

Languages known: Hindi Occupation : Sadhu

On examination: C.V.S. normal
C.N.S. Expressive aphasia
Motor system - Rt. sided hemiplegia
tone normal
Peer - Upper limbs - R - 0/5
L - 5/5
Lower limbs R - 0/5
- L - 5/5

Treatment: Arlidine, 3. Complex, Physiotherapy

PICA: Modality Response Summary:
Verbal Subtests - 7.15
Gestural subtests - 11.75
Graphic subtests - 6.42

SUBJECT ' C '

Age: 38 years Adm. No. 381127/7

While the patient was mountaineering he suddenly felt an inability to move his right leg and arm. He also complained of slurring of speech. He was brought to the hospital on the 3rd day after the onset of illness. After his admission to the hospital he was diagnosed as a ease of C.V.A. with expressive aphasia. He was administered PICA and later his speech was recorded everyday.

Diagnosis: C.V.A. with expressive aphasia
(Rt. sided himiplegia).

Education: (Geography) Ph.D. Occupation: Reader in Collect

Languages known: Hindi, English

On examination: Expressive aphasia, Rt. sided hemiplegia
B.P. 190/130 mm. of Hg.
No sensory deficit
Deep sensations .

Treatment: Adelphane, B. Complex, Physiotherapy.

PICA! Modality Response Summary
Verbal subtest : 8.50
Gestural subtest: 12.14
Graphic subtest: 7.75

SUBJECT 'D'

Age: 42 years. Adm.no.342210/72

The patient was found unconscious by his family members in the morning while he did not complain of any discomfort the previous night before he went to bed. After the admission to the hospital he was examined and diagnosed as having left cerebral embolism with rt. side hemiplagia and aphasia. He has been an old ease of Diabetes Mallitus and Hypertension and has been under treatment for the last 4 years. He regained consciousness on the next day but remained almost 'speechless' for another day. On the 3rd day PICA was administered and later his speech was recorded every day for seven days.

Diagnosis: Lt. Cerebral Embolism with aphasia
(Rt. sided hemlplegia)

Education: M.A. (Mathematics) Occupation: Lecturer in a private college

Languages known: Hindi, English, Punjabi

B.P. 200/140 mm of Hg.

Blood sugar: 200 mg/cc

Urine!sugar: - + +

acetone - +

C.N.S. - Aphasia (espressive)

Motor system: Power - Upper limbs - R. 0/5
L. 5/5

Lower limbs - R. 0/5
L. 5/5

Treatment: Inj. Insulin, I/v fluids (for 3 days)
Antibiotis , Vitamins.
Physiotherapy

PICA : Modality Response Summary
Verbal subtest - 6.10
gestural subtest -11.33
Graphic subtest-7.12

SUBJECT 'E'

Age: 55 years Admn.No. 34271/72

Patient had sudden loss of speech and weakness of the right side of the body while driving the car. Medical examination revealed C.V.A. with Aphasia. He had had an attack of coronary thrombosis four years back and was treated for that. His speech could be recorded only 6 days as he left hospital on request.

Diagnosis; C.V.A. with aphasia
(Rt. side Hemiparesis.

Education: M.Sc Occupation: Businessman

Languages known: Hindi, Punjabi, English and Urdu

on examination: C.V.S.

B.P. 210/150 mm of hg.

Ventricular fibrillation

C.N.S. Rt. side hemiparesis,

expressive aphasia

Treatment: Adalphane, B. Complex.

Physiotherapy.

PICA:

Modality	Response Summary
Verbal subtest	- 7.15
gestural subtest	-11.60
Graphic subtest	- 7.42

ADDITIONAL DATA

1. Age: 27 years Education: B.Sc
Occupation:Mech.Engineer

Had head injury 8 months back whan ha mat with a road accident. He was unconscious for about 20 days. Parietal hematoma was aspirated. He had no speech after regaining consciousness and had difficulty in comprehending speech. Gradually the speech improved. Mow he makes confusion in phoneme sequence and also omits phonemes in his 'fluent'speech. PICA - 11.50

2. Age: 55 years Education: Ph.D Agriculture
Occupation: Scientific 0

Had aphasic attack 1½ years back. After 6 months of the onset of illness he started saying few sounds. His comprehension compared to expression is good. Says only /m/, /t/ and /a/ sounds, however can say many other sounds on imitation. Patient is taking speech therapy and physiotherapy.

PORCH INDEX OF COMMUNICATIVE ABILITY

Score Sheet

Name: Case No: Test No:

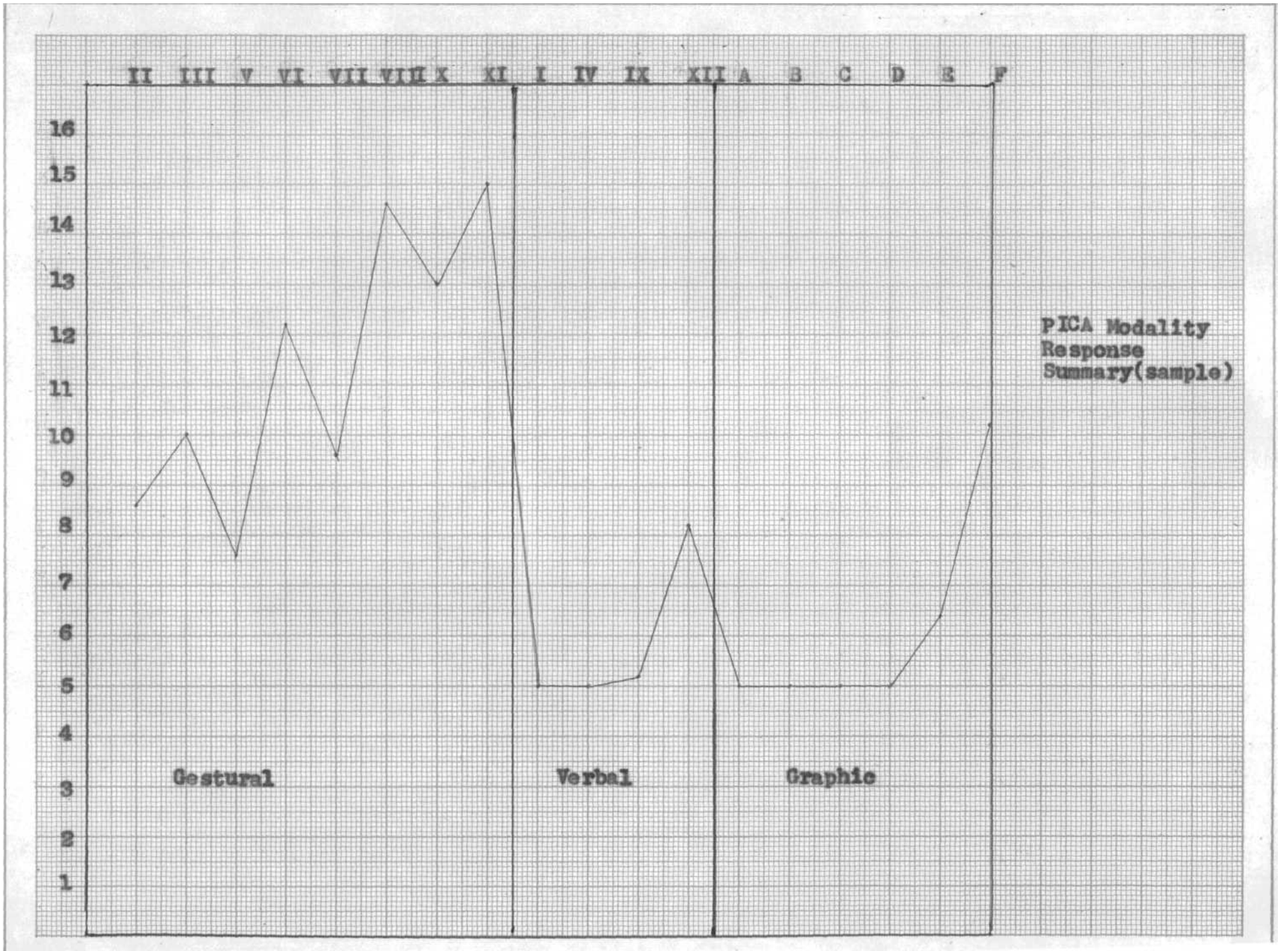
Date: By: Time: TO: Total Time:

Teat conditions: Patient's condition:

Time / Item	I	II	III	IV	V	VI	VII	VIII	IX	X	XI	XII	A	B	C	D	E	F
Tooth brush																		
Cigar-ette																		
Pen																		
Knife																		
Spoon																		
Coin																		
Pencil																		
Match Box																		
Key																		
Comb																		
Moda-lity	V	G	G	V	G	G	G	G	V	G	G	V	GH	GH	GH	GH	GH	
Minu-tes																		
Mean Score																		

Response levels: Overall . . . . Gestural.....Verbal. . . . Graphic....

V- Verbal G - Gestural Gh - Graphic


II III V VI VII VIII X XI I IV IX XII A B C D E F
16
15
14
13
12
11
10
9
8
7
6
5
4
3
2
1
Gestural
Verbal
Graphic
PICA Modality
Response
Summary(sample)

LIST OF 'SAY AFTER ME' WORDS (HINDI WORDS WRITTEN IN ROMAN SCRIPT)

Patang
Kap
Phool
Tailfon
Kitab
Hathi
Ṭokari
Gadha
Jhanḍa
Cabi
Traju
Khargosh
Sigrait
Samp
Ainak
Aam
Billi
Sher

Machli
Reech
Juta
Jiraf
Tittli
Hath
Suṭkais
Unṭ
Ḍholak
Macis
Kutta
Takhti
Jag
Pencil
Pen
Railgaṛi
Tala
Brush

Hawai jhaz
Shehnai
Bhuṭṭa
Bakari
Cita
Dia
Laṭṭo
Ḍamaru
Maiṇḍhak
Camea
Saikal
Pankha
Ghaṛi
Paise
Murga
Kar
Veeṇa
Mashin

Carpai
Pinjra
Khmbha
Tabla
Tharmos
Bandar
Dhanush
Raidio
Sixi
Chatri
Caku
Gai
Kangha
Nav
Mombati
Lomaṛi
dva

CONSONANTS ••••••

K क Kh ख g ग gh घ ṅ ङ
c च ch छ j ज jh झ ञ
ṭ ट ṭh ठ ḍ ड ḍh ढ ṇ ण
t त th थ d द dh ध n न
p प ph फ b ब bh भ m म
y य r र l ल v व
s स ś श h ह