PSYCHOLINGU1STIC APPROACH TO THE STUDY OF APHASIA

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'Speech is the best show man puts on' said Benjamin Lee Whorf. This 'best show' is one among the characteristic forms of human behaviour. In this paper an attempt is made to give a critical account of the contributions made by Psycholinguists in understanding the impaired show put up by a few persons in the clinical condition known as aphasia.

A good starting point in this context is a brief introductory remark about Psycholinguistics: its objectives and methods. Even though Psycholinguistics as a separate speciality came up only in the later fifties of this century, its 'great leap forward' is greatly felt in the fields of linguistic ontogeny, semantics and linguistic pathology.

Language is the meeting ground of scholars from a variety of different disciplines. Natural languages are systems of signs. Morris (1946, 1964) has developed a conceptual framework to explain a general science of signs. Morris considers all scientific inquiries into human languages as constituting a subfield of semiotics. He has described the domain of semiotic inquiries in the following words: 'Semiotics has for its goal a general theory of signs in all their forms and manifestations, whether in animals or men, whether normal or pathological, whether linguistic or nonlinguistic, whether personal or social. Semiotics is thus an interdisciplinary enterprise' (Morris 1964, p. 1).

A basic semiotic process consists of these three components: a sign, an interpreter and a signification. 'A given entity can be considered as a sign only by virtue of its capacity to induce, in an interpreter, a disposition to respond in certain ways toward some kind of object or state of affairs. The resultant disposition to respond is the interpretent, and the state of affairs towards which the disposition is oriented is the signification' (Rommetveit 1968, pp. 9, 10). Morris defines 'language' as a set of signs tagged together by syntactic, semantic and pragmatic rules. To put it in other words, a linguistic sign has a threefold relationship with the other signs, with the object and with the interpreter. Syntactic rules describe the ways in which words and suprasegmentai morphemes are arranged relative to each other in utterances. Semantic rules reveal the relationship between the sign and sign components on the one hand and signification on the other. Pragmatic rules reveal the relationship between sign and sign components on the one hand and signification on the other. Pragmatic rules reveal the relation of signs to the interpreters. Pragmatic inquiry of signs explores the conditions and effects of usage. Syntactic semantic and pragmatic rules of a spoken language are interwoven in subtle ways. To fully understand its

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inherent properties, the scope of inquiry has to be expanded to the extralinguistic communicative setting also. The novel field of psycholinguistic research embraces both psychological and linguistic research objectives, as the psychologists begin to inquire internal cognitive processes or the psychological factors which are operative in the language situation and the linguists direct their research interests towards rules of production and comprehension of speech. So psycholinguistics can rightly be called as the science of encoding and decoding.

The primary aim of this paper is to critically evaluate in the light of recent findings, the contributions made by Wepman annd Jones (1960, 1961, 1966) toward the study of aphasia. Their contributions were taken for critical analysis because they claim that their findings have clinical utility. Their contributions can be grouped under three broad categories to our convenience: *(a)* their research on dimensionality of aphasics' language deficit (1961), *(b)* their diagramatic representation of human communication (1960) and *(c)* their recent attempt to classify aphasics on the basis of the noun-pronoun ratio in their verbal output (1966).

Wepman and Jones (1961) are of the opinion that there are evidences for a number of specific dimensions in which we see aphasic disturbance. They believed that it may be possible to identify 'islands' of language performance which sometimes remain intact in aphasics. They developed a shortened version of their test battery, the Language Modality Test for Aphasia (LMTA). A film strip was used for presenting all visual stimuli. Auditory stimulus items were presented orally by the examiners. This test was administered to a population of one hundred and sixty eight aphasics. Jones and Wepman found six prominent factors to warrant interpretation when intercorrelation among thirty seven variables such as age, education, nouns, verbs, adjectives etc., were subjected to varimax factor solution. Four out of these six factors were taken to represent input-output transmission; Functions: Factor A, Visual to Oral transmission; Factor B, aural to oral transmission; Factor C, visual to graphic transmission and Factor D, aural to graphic. Factor E, in contrast transcends stimulus modality. And Factor E has been interpreted as representing ability to comprehend language symbols. Finally, Factor F, they felt, represented the ability to perform simple arithmetic operations. The authors opine that their findings strongly suggest that the language skills represented by these factors should be given due attention when testing for aphasia. From this alone they believe that one can assess the relative strengths and weaknesses in language performance of aphasic patients.

But Schuell and Jenkins (1964) propose a hypothesis which is diametrically opposite to that of Wepman and Jones. According to them the disturbance in the aphasic patients can be shown to distribute themselves along one line; that is the reduction of language available that crosses all language modalities. They support a general factor of deficit and determination of single quantitative subject score.

Schuell and Jenkins (1961) have critically examined the 'dimensionality approach' of Wepman and Jones. They have rightly pointed out the inefficacy

of the test battery, the LMTA, which was used to collect data from the aphasic patients. Their main criticism against the LMTA was that this battery did not include test items such as serial responses (counting to twenty, giving days of the week, months of the year) in the absence of specific cues and tests requiring formulation of oral and written responses without specific cues (for example, answering simple questions, giving autobiographical information, defining low frequency words, expressing ideas, explaining similarities, writing sentences to use given words and writing paragraph to describe a picture). These test items are of paramount importance in sampling breakdown of performance at higher levels. While these tests are generally difficult for aphasic subjects, they were considered important in wide range appraisal of language deficit. The lack of such tests in LMTA tends to minimise general factors.

Subjects in the Jones and Wepman test were selected by means of an interview and by use of a screening test which required performance at a given level. So they did not include subjects at both ends of the continum.

Jones and Wepman think that a wide range of difficulty indicates that the test is poorly discriminating. Schuell and Jenkins do not think this is true. In fact, such a wide range of difficulty is essential since it discriminates sharply.

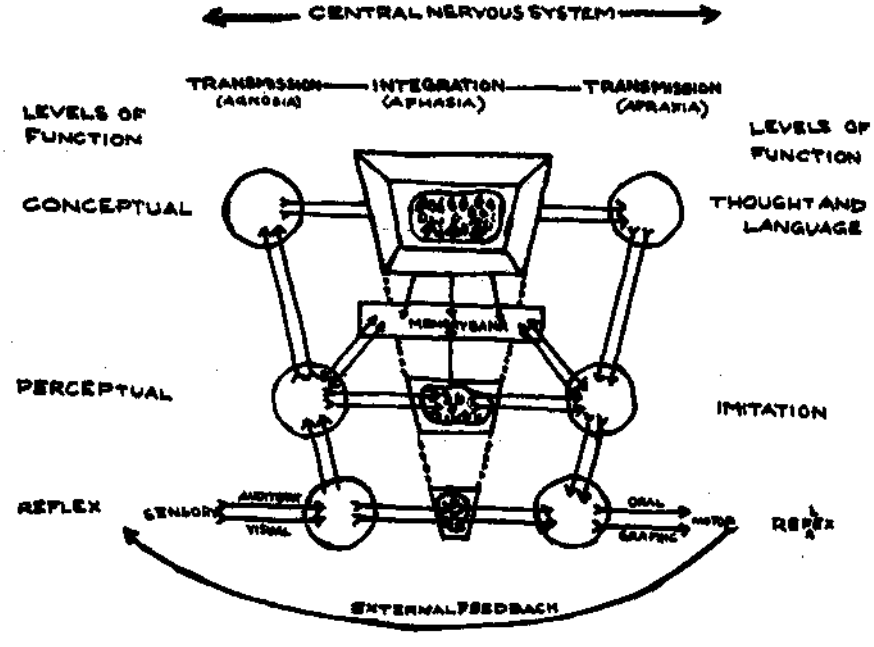
Schuell and Jenkins find support for their hypothesis from Jones-Wepman analysis. The sizeable correlations among factors which led to difficulties of interpretation in their study are a reflection of general language reduction across modalities.

In their recent study of the language deficit in aphasia, Schuell *et al.* (1969) have confirmed their early stands. In their new study they found that psycholinguistic methods can contribute insights into the nature of the language deficit in aphasia which may prove useful in the evaluation and treatment of aphasic patients. Results are interpreted to show that aphasic subjects have reduced lexical and semantic options and operate under restrictions of length of unit that can be processed. Triesman's (1965) study also yielded similar results.

To put it in a nutshell, Jones-Wepman hypothesis has been found untenable and many research findings are in contradiction to his 'dimensionality' hypothesis. A few of these research studies are discussed in the later part of this paper.

Now let us turn to Wepman's 'operational diagram of language functions in man' (1960). This diagram is a complex of binary alternatives, simple communication system and feed back loops. The model presented was meant to suggest a trial of language function: input transmission leading to integration leading to output transmission. Input and output are seen as being modality bound. Integration has modality linkage to some degree, but not bound by it. This diagram shows a three level, i.e., reflex, perceptual and conceptual level operational paradigm for language in the central Nervous System. Pursuing Gsgoods terms, Wepman reports that at every level there exists a hierarchy of alternatives. If the stimulus is directed across the lower line, reflex behaviour ensues. Reflex action leaves no trace on the memory bank. When the stimulus

is shunted to the next higher level it is seen to be found to the original receptive modality. Transmission across the system at this stage is considered as the capacity of the organism to transmit percepts which leave their trace on the memory bank, but have no meaning to the individual. Imitative behaviour ensues across the bridge. When the incoming stimulus is shunted to the next higher level i.e., the conceptual level, the modality bound stimulus seems to have its effect both upon the memory bank for the arousal of associations and upon the integrative process where incoming stimuli are thought to combine with the associations from the past to form a state of meaningfulness. Language behaviour ensues at this stage only. Selection of language symbols may be called the semantic process; articulation of language symbols is expression, the syntactic process. The specific form of expression follows the specific form of modality selected—speech, writing or gesture.



Aphasia is seen as a disruption of the integrative process after the stimulus is free of its input modality. Apraxia and agnosia are considered as disorders in transmission and nonsymbolic in nature.

It can be pointed out that Wepman *et al* describe only the visual and auditory forms of sensory information. There is hardly any reason to omit tactual and Kinesthetic feed-backs. Further, Wepman *et al* assumed that an incoming stimulus may shunt to the higher level or it may result in reflex behaviour. It is questionable whether there exists any such 'hierarchy of alternatives'.

Current research studies throw more light on the role of various feed backs in acquiring and maintaining speech. Mysak (1966) has quoted the findings of a few research workers who worked on the sensory feedback and their effects on speech when they are altered. McCrosky (1958) conducted two experiments, parts of which involved disturbing tactile and kinesthetic feedback during speech production. By anesthetizing the articulators he found that a significant disturbance in articulation could be produced. He concluded that auditory feedback was essential in monitoring the duration and rate of speech, while tactile-kinesthetic feedback was essential in monitoring articulatory accuracy and intelligibility. Klein (1963) in a similar study found that disturbance of tactile feedback by using topical anesthesia caused articulatory changes. Ringel and Steer (1963) investigated the effects of the disruption of tactile feedback in the oral region, in isolation or in integration, with auditory feedback disturbances on speech performance. One finding revealed that anesthetizing the articulators resulted in a greater degree of articulatory disturbance than did auditory masking. To summarise, these findings support the hypothesis that automatic control over the articulators will be disturbed when tactile and kinesthetic feedbacks are either eliminated or reduced in intensity. Zinkin (1968) had confirmed this view.

A. R. Luria (1966) has stated that the kinesthetic feedback not only monitors articulatory accuracy and intelligibility, but also facilitates learning to write in early stages. Articulatory movements play an active part in the analysis of sound comprehension. Luria has drawn attention to the experiments of Nazarova (1952) in which it was shown that when articulation was not permitted the number of mistakes in writing made by pupils in the first and second grades was increased five to six times. Since there is active participation of articulation in writing Luria concluded that the disturbance of the system of articulemes due to lesions of the post central cortical divisions may make writing difficult or even impossible.

Further, Teuber (1964) opined that the rough agreement among theorists like Osgood, Wepman, Weinrich and others in their model making might simply be due to uniformities in the ways their tests were conducted. Pribram thinks that this model making will over simplify the errors of association pathways, transcortical reflexes and the like. He has questioned the very need for model making.

Jones and Wepman (1966) have offered a threefold classification of aphasics based on the noun-pronoun ratio in the speech of aphasics. On the presumption that normal speakers of a speech community show similarity in what words are used, Jones and Wepman have taken a bold step to analyse and classify the aphasic speech to point out in what way they differ from the 'homogenous' speech patterns of normal speakers. Also they opined that aphasia can be considered as a regressive phenomenon wherein severity could be judged by the level of linguistic process available to the subject following his trauma. A similar classification has already been made by Davis (1964). They have made use of Zipf's principle

(1949) which is based upon the concept of word, frequency. The concept of word frequency states that the frequencies with which words occur in large samples of language are remarkably stable for an individual or even for different individuals from the same language community. Conceptually the word frequency represents the resultant sum of a large number of word selections from the potential vocabulary of the speaker. The proportion of language sample is constituted of words occurring 1, 2, 3,. . . . .n times in that sample. The word frequency distribution assigns weights to the various different words in the vocabulary in proportion to the number of times they are used. 'Zipf's Law' thus states a rule governing the weighted vocabulary. The number of different words appearing in a sample is the reciprocal of the average word frequency and this is easily calculated from the word frequency distribution. So all individual differences must reflect shifts in one or other of the parameters of this equation. Often we see aphasics with word finding difficulties. Such a difficulty is essentially a disturbance of word selection either in its accuracy or in its speed. So the concept of word frequency is of immense value in the study of the verbal output of the aphasic cases.

Wepman and Jones were inspired both by Zipf's principles and Morris' theory of human language. Morris' conceptual framework of human language was explained in the introductory part of this paper.

The spontaneous speech of fifty four normals and twenty four aphasics have been analysed. Global and jargan aphasics were screened out by using LMTA, in the selection of aphasics. To get the base line data each subject was given twenty TAT cards. Relative frequency of words have been calculated from the recorded speech of normals. Words have been classified into parts of speech and the relative frequency of occurrence of these parts of speech have been calculated. Further they found out the mean productivity, mean number of different words used and the mean type token ratio (i.e., number of different words used divided by the total number of words used) of both normals and aphasics.

It was assumed that patients would suffer in the use of substantive versus function words. Nouns are called content or substantive words and pronouns, function words. In the spoken language each thought expressed contains either a noun or pronoun, regardless of the presence of other parts of speech. So they have taken the noun-pronoun ratio as their criterion. An apparent distinction in the use of nouns and pronouns was found in the data. A summary of their findings is given below. In the total productivity, the aphasics spoke more but had fewer different words. Both aphasics and normal females spoke more than males; but the type token ratio of the female aphasics was very low. Age seemed to play no important role in productivity among the aphasic speakers. They also found the socioeconomic/education level of the aphasics was not systematically related to productivity.

Considering the noun-pronoun ratio in the speech of aphasics, Wepman and Jones have grouped the twenty four aphasic cases under three groups.

Group I. (Semantic Aphasia. No. of patients 16)

Semantic aphasia, according to Wepman and Jones is a disorder of symbol formation in which the patient has difficulty in attaching a meaningful verbal sign to previously acquired concept, impairment of the ability to recall and use previously acquired verbal forms applicable to such a concept. So the semantic aphasic would be expected to use relatively fewer nouns than pronouns since he lacks specificity. Here, in group I nouns were used less than pronouns. Of the total word usage Nouns—8.48 per cent and Pronouns=20.24 per cent. So this group has been christened as semantic aphasics.

Group II. (Syntactic Aphasia. No. of patients 4)

Syntactic aphasia is defined as disorder of symbol formation in which the patient is unable to use his previously acquired grammatical structures. Often aphasics of this category omit function words and their speech is telegraphic. In group II, one can notice that nouns were used more often than pronouns. (Nouns—18.31 per cent and Pronouns—9.95 per cent).

Group III. (Pragmatic Aphasia. No. of patients 4)

Pragmatic aphasia is a disorder of comprehension of symbols in which the patient fails to associate incoming signs with appropriate concepts. In group III nouns were used roughly as often as pronouns (Nouns—15.44 per cent and Pronouns: 16.14 per cent).

TABLE 1

Means of productivity, No. of Different words and type token ratio for three types of aphasics

	N	Mean Productivity	Mean of diff. words	Mean type token ratio
Gp. **I**	16	3,560	448	.134
Gp. **II**	4	1,644	402	.241
Gp. **III**	4	1,744	407	.231

The last two types (or groups) look alike (Table. 1). They have limited productivity, more different words to use in ratio terms, but less actually in their spontaneous speech. Jones and Wepman say that if a more refined analysis shows the same relationship between the last two types, a number of factors may contribute to this. They are: first, the number of patients in each category were few and may not be representative of a larger population. Second, the two categories may differ in ways in which it is not possible to detect in terms of this parameters of this study. Third, the two types may be different facets of a single type of aphasia.

Apart from these three factors, it can also be said that the existing confusion regarding parts of speech and the classification of words into substantive (content) versus function words might have played their respective roles in adding complexity to the problem of classification of aphasic speech on the basis of noun-pronoun ratio.

Further the word frequency approach was criticised by Roman Jakobson (1964). He commented that it is a difficult approach to obtain exact and fruitful results because this approach pays no attention to phonological and morphological properties and syntactic functions of the counted words. Jakobson is of the opinion that phonological and grammatical analysis will help us to have a precise classification of aphasia.

Contrary to the prevailing trend of classifying words in modern linguistics Wepman and Jones have accepted the outmoded and orthodox method of classifying words into eight parts of speech in the English language. Traditional definitions of parts of speech are overlapping and cumbersome in nature. Gleason (1968) actually says that'. . . the traditional definitions are unworkable' (p. 93).

Wepman and Jones think of binary classification of lexemes into substantive and function words. Unfortunately there is no complete agreement among linguists on such a binary classification of words. Many investigators have recognized difficulties in having a binary classification. In Miller's opinion, function words are those forms which are frequently repeated. They are generally introduced when simpler sentence structures are expanded and elaborated. He points out that these words do not normally occur in free utterances in the beginning but can occur at points wherefrom the utterance is continued. Function words do not have lexical meanings. Long (1961) points out that the classification of words cannot be justified on formalistic grounds, as according to him all words have grammatical and semantic value. And Fries (1940, 1952) thinks that content words constitute the major part of the vocabulary but the frequency of function words will be more in the language. The prepositions, articles and conjunctions in English are undoubtedly function words for all linguists who have written about this classification. Regarding certain other items there exists some differences of opinion. For example Maclay and Osgood (1959) suggested that pronouns also operate like function words. It is to be noted that some forms in Tamil have a status in between free forms and bound forms. For example/pati/in/appati/and/ippati/can be treated as a bound form in one sense. But since we get /ullapati/also it seems that the items have got more freedom than a bound morpheme. According to Remmetveit (1968) words in English such as the copula ('is') conjunction ('and', 'if-then', 'because', 'but' etc) and prepositions ('in', 'on') constitute an as yet not very well understood group of function words or formators.

The validity of LMTA was questioned by Schuell and Jenkins (1961). The questionable validity of the measuring device might also have contaminated their test results.

Regarding the group I (Semantic aphasia) it is interesting to note the remark made by Rochford and Williams (1966). They are of the opinion that nominal dysphasia (which is equivalent to Wepman and Jones' semantic aphasia) is not just an inability to name objects or find nouns as was originaily believed. Nouns are not relatively harder to find than are verbs or adjectives and the name can often be found in one context when it cannot in another. The teeth in the mouth are more easily named than teeth of a comb. The naming difficulty shown by dysphasic patients seems to lie mainly in the absence of cues which are provided on a simple object naming task which brings out the difficulty more readily than any other.

The inefficacy of Wepman and Jones' earlier five way classification and the present one, can further be pointed out by quoting the findings of Goodglass and Berko (1960). They have made a study concerning the impairment of morphological structure in twenty one aphasics. By means of a sentence completion test the subjects were asked to supply correct inflectional endings for nouns, verbs and adjectives. One of the conclusions they arrived at is that in some aphasics syntactic and inflectional (morphological) aspects of grammar may be impaired independently of each other. An aphasic with such difficulties, that is, difficulties in producing correct inflectional endings alone and not in the arrangements of words finds his place in none of the categories of Wepman and Jones five way classification or the present three way classification. If 'Syntactic aphasia' as described by Wepman and Jones includes any disability in using the already acquired grammatical features, then the name they proposed is misleading. Then it should be called grammatic aphasia. Syntax deals with the ways in which words and suprasegmental morphemes are arranged relative to each other; and morphology which describes the morphemes, the allomorphs of each morpheme and how each is distributed. If their 'Syntactic aphasia' does, not include disabilities in using morphological items, which the patients have already acquired, they should find one more category to take into account patients with such difficulties alone.

The foregoing discussion clearly reveals that the findings of current research studies do not support the dimensionality hypothesis of Jones and Wepman. Rather they point out that although the linguistic abilities of dysphasic patients are impoverished the speech they retain follows the same laws as that of normal people (Williams 1968). High frequencv words are more readily uttered and understood than low frequency words. Comprehension is usually better retained than evocation (Schuell 1966). The ease with which a word is understood depends on its context, verbal and nonverbal context (Rochford and Williams 1966). In their word finding performance aphasics seem to reply mainly on the 'deblocking' or talking around (Weigl 1961) effect of transitional probabilities and contextual cues. For example if an aphasic is unable to find the word 'comb' when asked to say the article he uses in combing his hair, he may be able to **say** the word 'comb'. Comprehension is better retained in the majority of dysphasic

patients than omission. But some patients seem to have difficulties in comprehension. Triesman's (1965) studies on two channel listening and especially the two factors of filtering and chunking cast light on the thus far less understood problem of the comprehension defect. Chunking is a process of grouping. The immediate result of such chunking is a dramatic expansion of the immediate memory span. Miller (1956) reports that chunking allows a person to repeat back correctly a string of forty binary digits. Phonemes are chunked into morphemes or words. Morphemes may be conceived of as rules of vocal-perceptual chunking of minimal discrete articulatory-auditory elements. Triesman says that when a normal person tries to follow a conversation, first he picks out important sounds and waits till the speaker finishes and deals with what has been uttered as a whole. In decoding we filter off all the little or connecting words and concentrate on keywords. If we try to deal with each word in a sentence and each sound in a word separately we will be at a loss. Williams (1968) thinks that a person with a comprehension defect is just doing this. It means that the brain injured adult has lost the ability to deal with large chunks of data. The mechanism by which the processes of sorting and rejecting are carried out, remains a not well explored frontier.

Wepman *et al's* contributions to the study of aphasia were critically reviewed. We find that their dimensionality hypothesis is untenable in the light of recent findings. Further his model of human communication was found inadequate. His recent three way classification and the earlier five way classification were also found misleading.

Future research may be concentrated on the psychological factors which underlie the speech of aphasics.

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