SYNTACTIC DEFICITS IN APHASICS

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Dissertation submitted as part fulfilment for Final Year M.Sc, (Speech and Hearing), submitted to University of Mysore, Mysore.

ALL INDIA INSTITUTE OF SPEECH AND HEARING, MYSORE

MAY 2000

वागर्थाविव संपृक्तौ वागर्थः प्रतिपत्तये ।
जगतः पितरौ वंदे पार्वतीपरमेश्वरौ ।।

DEDICATED TO

Teddy, Mummy and Willy

you three make my existence complete.

Your trust in me keep me going

through all the obstacles I face.

AND

Shyamala ma'm

you have been a constant source

of inspiration from my J.C. to ISHA

paper and now Dissertation.

I do not have enough words to

express my gratitude.

J

CERTIFICATE

This is to certify that this Dissertation entitled : **SYNTACTIC DEFICITS IN APHASICS** is the bonafide work in part fulfilment for the degree of Master of Science (Speech and Hearing) of the student with Register No.M9818.

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CERTIFICATE

This is to certify that this Dissertation entitled : **SYNTACTIC DEFICITS IN APHASICS** has been prepared under my supervision and guidance.

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ACKNOWLEDGEMENT

I thank Dr.Shyamala Chengappa. for her valuable guidance throughout my dissertation. Ma'm you have really encouraged me and aroused interest in me to search for unknown mysteries of language disorders.

I thank Dr.Nikam, for letting me carryout this dissertation. Ma'm you have been a constant source of inspiration and we are lucks to have you as our Director.

Thanks for my subjects and their ttherapists(Anita, Neha, Kripa) for the help they have rendered in data collection.

Savitha, I thank you for all that you have done for me at every step of my dissertation. This is why it is said that "A friend in need is a friend indeed". And thank you for providing me a home away from home.

Archana, Prakash, Shivprasad, Anne. Amit Gupta, Satisha. Goswami Sir, you all have helped me in your own small ways. You may not remember how and when, but I will never forget.

Babi, you mean a lot to me and whatever I am, is because of your shower of unending blessings.

Suhasini, Unatti, Saristha, the supreme happiness of life is the conviction that we are loved; loved for ourselves or rather, loved inspite of ourselves.

Archu, Smita, I miss you both much and wish that all your dreams come true.

Kala, Manju; your presence makes me feel so good. I wish we had/have more time together.

This goes to unending list of friends ...Subir, Tina (Manju)^2, Padma. Being with you guys has always been fun and a great pleasure. I hope we have more fun filled days to spent together in future.

Uma, Krithika, you both have been such nice friends. I am glad we lived to the best in two years we spent together.

Dear II B.Sc, girls, it has been nice knowing you and I am surely going to miss you all. Keep working hard otherwise... remember.... a list of instructions.

Mini (mere samne wali khidki mein): Friendship is not an intentional act, it just happens. I thank our J.C. lots for having got to know a nice person like you.

Last but not least, lam glad to have been in AIISH for 5 years. I thank everybody who has helped me to grow and learn.

Akka, thank you for giving shape to my work.

TABLE OF CONTENTS

LIST OF TABLES

LIST OF BAR GRAPHS

INTRODUCTION

"Aphasia is an impairment of language functioning of persons who have incurred localised cerebral damage that results in a reduced likelihood that an individual involved in a communicative situation will understand or produce appropriate verbal formulations" (Eisenson, 1973).

The above description of Aphasia states that there may be impairment in the comprehension as well as expression. This impairment may be at phonological, semantic, syntactic or pragmatic level. Impairment at syntactic level leads to a major deficit in the smooth process of communication.

'Syntax' refers to the study of the principles and processes by which sentences are constructed in particular langauge. It also refers to body of rules which governs the way in which words are arranged to construct sentences (Shapiro, 1997).

There are a lot of findings regarding the syntactic deficits in aphasics. These host of findings are intimately tied to linguistic theories. Most of studies have focussed on specific syntactic structures and have taken into account only comprehension or production of these structures.

Most of the linguistic investigations have been done in Broca's, aphasics. They are seen to have particular difficulties comprehending syntactically complex structures (Blumstein, et al. 1998).

They are supposed to have problems in processing or representing the thematic relationships of moved noun phrase (NP) arguments to their predicates through abstract markers called traces (Grodzinsky, 1989). Broca's Aphasic patients are even seen to have an impairment in the construction of normal syntactic structures. Data by Zurif and Caramazza (1970), Saffran et al. (1980 b) indicated that Broca's Aphasics show impairment in production of specific sentence types.

Studies regarding the syntactic impairment in Wernicke's Aphasics are quite limited. Blumstein et al. (1998) showed trace-deletion phonemena in Wemicke's aphasics as well, Goodglass (1976) stated that fluent aphasics did not show much reduction in use of grammatical structures. But they are shown to have an inherent difficulty in attempting to isolate syntactic and semantic levels of speech.

A study by Stark and Wytek (1978) showed that Global aphasics showed most errors but also showed no preference for a particular type of error. Increase in syntactic complexity playjan important role in number of errors made. This role was however, much less accentuated, in global aphasics than in other aphasic types. The degree of the aphasia seems to be a determining factor.

Studies concerning other aphasic syndromes and their performance on syntactic tests have been limited. According to a study by Stark and Wytek (1978),transcrotical motor aphasics show similar kind of errors as shown by severely impaired Broca's aphasics on tests of sentence comprehension. They concluded that sentence

comprehension deficits of anterior aphasics may reflect the same underlying impairment in processing of grammatical markers. It is important not only to study major aphasic syndrome but also to include such small group of aphasics. These kind of studies would allow for a comparison, for example of anterior versus posterior aphasics pattern of performance in broader contexts.

Need for the Study

Such a study would help us to compare the performance among different aphasic syndrome. And this would help in the descriptive aspects of diagnostic assessment as well. Apart from that, this study would give general outline regarding how therapeutic intervention could be planned keeping in mind the clients with syntactic deficits. There are very few Indian studies regarding these aspects so far. So this study would be a step in this direction to get extensive knowledge about syntactic deficits in aphasics in an Indian context.

The performance of aphasics on the tests of syntactic comprehension and production would provide a knowledge about the structures which are more difficult.

Aims of the Study

This study aims at comparing the performance of aphasics on tests of syntactic production and comprehension.

This study highlights on the kind of syntactic deficits and the grammatical structures particularly difficult for aphasics.

The relation between syntactic comprehension and production would be sought for. This would lead to an effective tool for judging syntactic capacities of aphasics.

The results would suggest the main factors to be considered while remediating the clients with syntactic problems and kind of intervention strategies to be adopted.

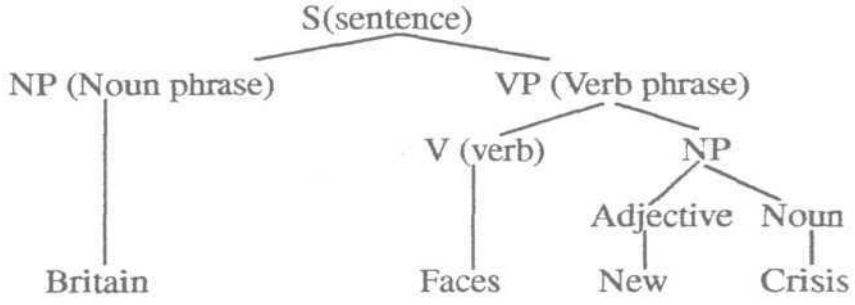
REVIEW OF LITERATURE

Language is not a uniform mass from which any one sample is as good as any other of the same size. But most elementary acquaintance with linguistics makes it clear that language differs along other dimensions besides length. Language has a structure, a structure which is hierarchial in nature and from which structure systems can be derived in forms of basis but abstract units (such as distinctive features, phonemes and morphemes). The linguistically oriented study of aphasia would analyze the difficulties in terms of the structures and systemic features which are disrupted or retained.

Language can be described in terms of different levels of organisation. It is through these levels that linguistics provides a basic framework for analysis of language. The three main levels are level of the systems of the sounds of speech (phonology), the level of system of meaning (semantics) and the level of the structural arrangement of sentences (syntax). Syntactic descriptions focus on structures, morphology as well as realisation of the structure through grammatical inflections. In syntax, generative transformational grammarians have aimed at being explanatory as well as descriptive. They have stimulated hypothesis about the mental organisation underlying language and have had a greater appeal in aphasiology. They give a centrality to syntax so according to them syntactic component provides the input for semantic components. Thus syntax is major part of the linguistic analysis in aphasics.

Componential Model for Comprehension Based on Syntax

Marcus (1982) assumed that the incoming word stream is the input to a parser called syntax, which analyses the syntactic structure of the input. The syntactic structure that is the output of syntax may be in the form of a tree structure. Eg. tree diagram for the sentence "Britain faces new crises".



This syntactic representation serves as input to the semantic processor. The syntax component may be by-passed if either the syntax produces only fragmentary information or as an interim procedure for associated analysis by semantics while waiting for the syntactic analysis. The semantic component produces some meaningful representation that is logically compatible with input structures. The meaning obtained from semantics goes into word knowledge of individual. So syntax is central to comprehension.

Tools For Evaluating Syntax

Investigations at syntactic level often rely on spontaneous speech to provide data for analysis. Indeed, spontaneous speech provides difficulties inherent in assessing a patient's abilities in syntactic comprehension.

1. Spontaneous Speech

Goodglass and Blumstein's (1973) collection of papers on studies of syntax on aphasia include an amount of studies where examination of speech of agrammatic patients has been used as a tool of investigation.

Lebrun (1967) also described two patients both speakers of French with aphasia and talked about their speech output. Voineseu (1971) used Jacobson's theory in the analysis of interview of twenty aphasic speakers. The first 100 sentences spoken were analysed according to whether they were simple, complex or elliptical. They were further classified according to number of verbs qualifiers and noun attributes they contained and ratio was calculated for the proportion of nouns and 'substitutes', the later category including pronouns, adverbs, adjectives and numerals. He observed that aphasics could be classified in terms of syntactic complexity according to noun/substitute ratio, elaboration of sentences used, complexity of sentences.

To elicit samples of spontaneous speech from 107 French speaking aphasics, Wagenar et al. (1975) used three conversational questions "what do you usually spend your day doing?". "How did your speech problem start?" and 'Tell me something about the place you live in?". They used thirty measures to analyses the samples, which included such aspects as number of words produced in six minutes, number of complex utterances as a percentage of total number of utterances etc. six factors emerged to distinguish different types of aphasias;-

Fluency, telegraphic speech, grammatical errors, articulation, verbal (i.e. semantic) paraphasias and empty speech.

Spreen and Wachal (1973) has reported on some of their results. Aphasic speakers when compared to normals needed more responses and prompts and other variables which distinguished them are vocal gestures, mispronounced words, neologisms,pause filters and parasyntactic words.

2. **Elicited Speech**

Some investigators have used formal materials designed to elicit specific constructions or words of certain syntactic classes so that patient's rates of success on various tasks can be compared.

Two useful methods of eliciting structured samples of speech are to give the patient lead in sentence (something referring to picture or real life action) so designed that there is high probability of normal

speakers producing a certain structure. Another method is to give the sentence to the patient and to ask him to repeat it. Barrett (1961) used the former method, giving a set of pictures to elicit nine sentence constructions and nine grammatical morphemes. He found it was most difficult to elicit wh-questions eg. Ask me the reason for being sleepy etc and easiest to elicit structures like noun phrase and link verb and adjective by asking"How are these trees different?"

Bliss et al. (1976) used repetition technique with their aphasic patients. They found that aphasics have greater difficulty in repeating ungrammatical than grammatical sentences. The ungrammatical sentences represented four kinds of violations of grammatical rules : violations of phrase structure, categories of strict sub-categorisation, of selectional restrictions and of morphological inflections. About half of the patients repetitions were incorrect with more errors on ungrammatical sentences. They formulated that these errors resulted primarily from a reduced retention span and articulation difficulties aphasics displayed in this task greater residual syntactic and semantic knowledge.

3. **Investigating Syntax Without Speech**

Most often the method used is picture - choice or following directions to test some of the aspects of syntactic comprehension.

Picture choice is clinically attractive method as it requires little speech and little coordination of gestures. It has limitation that test is restricted to what can be unambiguously illustrated by pictures and in that it does depend to some extent on visual interpretative abilities.

Smith (1974a) looked particularly at the comprehension of prepositions in a task in which aphasic men were asked to arrange objeas in specified places are to a sentence they were given. The relationships of objects were described in sentences which used the words on, under, in beside, with and or by, from, before, after, over, in front of, behind, off, about, only, upside down, and next to. Ten common objectives were used and sentences spoken were something like "Put the coin in the bowl". Smith's study showed that some aphasic patients whose speech showed absence of relational words or errors with them were also markedly impaired in their comprehension of these words.

4. **Event Related Potentials**

Some times the comprehension deficits in aphasics may be a direct evidence of deficit in processing. In this case auditory evoked potentials could be used which provide specific information regarding auditory processing. There are different Event Response Potential (ERPs). According to a study by Keurs et al. (1995) three ERP components had strong correlation with syntactic first pass parsing processes i.e. early left anterior negativity (ELAN), a centroparietal negativity seen in correlation with processes of lexical semantic integration (N400) and a late centroparietal positivity observed in correlation with secondary syntactic processes of reanalysis (P600). Findings from ERP suggest that first pass passing and secondary processes are subserved by distinct brain systems.

Keurs, et al. (1995) did a study to examine ERPs of function and content words in agrammatic aphasics and to explore if

comprehension deficits in agrammatics was related to deficits in processing of function words. Thus ERP responses to function and content words were compared. There was marked difference between function and content words. It suggests that these subjects are particularly impaired in integrating lexical and syntactic information into a sentence context. The analysis can range from whole vocabulary to recognised constituent word also to individual lexical item analysis.

In another study by Osterhout (1997) ERPs were recorded from thirteen scalp locations while subjects read sentences containing a syntactically or a semantically anamolous word. Semantically anamolous words elicited an enhanced N400 component. Syntactically anamolous closed class words elicited a widely distributed late positive wave (P600) regardless of words position and a small negative going effect position. The response to syntactically anamolous open class words revealed striking qualitative individual differences. These words elicited a P600 response in the majority of subjects and an N400 response in others. The proportion of subjects exhibiting the N400 response was greater when anomaly occurred in sentence final position. Thus results show that semantic and syntactic anamolies elicit distinct brain potentials. Wassenaar et al. (1998) showed that Broca's aphasics used compensatory semantic strategy for sentence comprehension.

5. **Regional Cerebral Blood Flow Measurments (rcBF)**

These measurements would reveal information regarding the cerebral areas involved in particular kind of processing. Thus one can predict the effect of any brain pathology on the language processing.

Stromsworld et al. (1996) reported of using PET scan to determine regional cerebral blood flow (rcBF) when eight normal right handed males read and made acceptability judgement. rcBF was greater in Broca's area (pars opercularis) when subjects judged the semantic plausibility of syntactically more complex sentences as compared to syntactically to complex sentences. Semantic plausibility judgement revealed increased rcBF in left perisylvian lobe. Overall sentence processing lead in increased rcBF in regions of left perisylvian association cortex.

rcBF could also be successfully used with aphasics to account for semantic, syntactic processing.

Individuals with aphasia, regardless of type, frequently display difficulty processing syntax. Next section deals with these :

Syntactic Comprehension Deficits in Aphasics

One of the earliest studies was done by Laskey et al. (1976) on fifteen adult aphasics. This was done by altering the rate of speech presentation and varying the pause time between the major phrases within sentences of increasing grammatical complexity. Performance was seen to vary with varying syntactic complexity. Comprehension was better with slow rate and addition of interphrase interval.

Goodglass and Baker (1976) came to a conclusion that although Broca's aphasics seem able to infer meaning directly from the major

lexical items in a sentence, they are unable to appreciate syntactic indications to meaning relations. Thus production and comprehension in Broca's aphasics is less separate than clinically suggested.

Just as they are agrammatic speakers, they can be viewed as agrammatic listeners. Actually it is seen that in such speakers their attention is shifted from what sentence means to the form of sentence itself. Gardner et al. (1975) demonstrated that aphasics readily recognise "semantic" aberration but have difficulty detecting errors involving closed class items whether inflections or free standing functors.

Performance of Broca's aphasics was evaluated by Zurif and Caramazza (1976) on within sentences word relatedness sorting tasks. They were found to be unable to integrate normally closed class items. Control group judged articles and nouns (auxiliaries and main verbs) as closely related, and Broca's aphasics related only content words of a sentences, either ignoring or in appropriately grouping the functors. They thus violated language unity of noun and verb phrase.

Broca's aphasics were seen to be sensitive to semantic pragmatic values of articles by Goodenough et al. (1977). But this phenomenon is depicted only when real time processing demands are minimised as when written sentences are used and left in view. But when same experiments are done in normally spoken situation none of Broca's aphasics process articles.

Comparing the sentence comprehension in Amnesics, Brocas, Wernicke's, mixed and global aphasics a study was done by Penser and

Schieffers in 1980. Results revealed decrease of comprehension in the order Amnesic, Broca's, Wernicke's, mixed and global results revealed a good correspondence between disorders of expression and reception.

Patients with good comprehension for single words have difficulty in sentence picture matching in which (a) sentences to be understood cannot be interpreted simply by mapping knowledge of content word meaning on to knowledge of the real world and (b) where the distractor items display plausible interpretation that might be given to sentences if patient failed to comprehend the structural information in the sentence. Caramazza and Zurif (1976) demonstrated that Broca's and conduction aphasics had difficulty in a sentence picture matching task when presented with centre-embedded relative clause sentences such as "The cat that the dog is bitting is black" and the distractor showing a cat biting the dog. They found that Wernicke's aphasics were less impaired on the task of picture choice test but it is usual to find they fare worse on tests of syntactic comprehension. So single word comprehension alone would not be sufficient to validate syntactic comprehension deficit.

Goodglass, et al. (1970) investigated the performance of aphasics (Broca's, Wernicke's, Anomic, conduction and global patients) compared with control subjects (adults and children) on four tasks of auditory comprehensions. Word comprehension, sequence pointing span, comprehension of directional prepositions and recognition of the correct use of prepositions in metalinguistic judgement task. Performance patterns among aphasics of different types displayed significant difference

in employed tasks (excluding the most severely impaired global subjects). In these comparisons differentiation among the four other diagnostic groups were observed:

1. In word comprehension, the anomics were most impaired.
2. On the preposition preference test the Wernickes aphasics were most impaired.
3. Results from sequence pointing span task distinguished the Broca's aphasics to have greatest impairment,,

Function I (low pointing span score relative to high preposition preference score) separated the Broca's, conduction aphasics from Wernicke's aphasics.

Function II Low Peabody picture vocabulary (PPVT) scores relative to high pointing score distinguished anomic from Broca's and conduction subgroups.

Function III Low directional prepositional score in contrast to high preposition preference score separated conduction from Broca's aphasics.

Cannito and Pierce (1986) assessed the aphasic patients sensitivity to a given new structure within *sentence* is facilitative of syntactic processing in the absence of semantic constraints. Subjects were divided into four groups i.e. low and high comprehension level while other two were low and high fluency level. Results revealed that fluency did not influence the performance of aphasics. But lower level comprehension

subjects were able to utilise the thematic antecedant verbal informant for comprehending sentences in connected discourse even when the discourse were not semantically productive of the underlying meaning of the sentence. The high comprehension group did not present any condition.

A study about factors which affect single word comprehension in aphasics was done by Pierce et al (1990). The variables were - the number of pictures displayed, the relationship among the pictures and presence of the situational context. The results indicated that when the pictures were unrelated, increasing the number of pictures did not affect actually until eight pictures were presented. When the pictures were related based on a common situational theme, increasing the number impaired performance when eight or six pictures were presented. These scores showed a significant correlation with scores from word discrimination subtest of BDAE but not from the recognising common words subtest of MTDDA or token test. Five native speakers of Serbo-croation, who presented a clinical picture of Broca's aphasia with agramatism were tested by Miera et al. (1998). Subjects'sensitivity to traces and their knowledge of the inflectional and determiner system was investigated using a grammaticality judgement paradigm. The processing load was further minimized by use of short sentences, that unequivocally exemplified different syntactic violations. These steps led to significant improvement in the performance of agrammatic aphasics, a result that is incompatible with the claim that the content of non-lexical elements is lost in agrammatism. Thus again giving contradictory results regarding agrammatic comprehension.

Linebarger (1995) summarised the constructions on which agrammatics performed well in grammaticality judgement tasks (1-10) and those on which the patients made errors (11-18). These are listed below:

1. **Subject - auxiliary inversion**
   a) Was the girl enjoying the show?
   b) *Was the girl enjoy the show?

2. **Passive**
   a) John finally kissed Louise
   b) *John was finally kissed Louise

3. **Incomplete extractions**
   a) How many birds did you see in the park?
   b) *How many did you see birds in the park?

4. **Empty elements**
   a) Frank thought he was going to get the job.
   b) *Frank thought was going no get the job.
   c) Who thought he was going to get job?
   d) *Who thought was going to get the job?

5. **Gapless relatives**
   a) Bill dropped a plate that was loo hot.
   b) *Bill dropped a plate that stove was too hot.

6. Wh-moved subcategorisation.

a) Why did the principal frown?

b) *Who did the principal frown?

c) What did the furniture company send?

d) *Why did the furniture company send?

7. **Particle movement**

a) They stood in the line very patiently.

b) They stood in the line in very patiently.

c) We broke in the engine very patiently.

d) *We broke in the engine in very patiently.

8. **Phrase structure (mostly case violations)**

a) The photograph of my mother was very nice.

b) The photograph my mother was very nice.

9. **Subcategorisation**

a) The man sat on the new sofa.

b) *The man sat the new sofa.

10. Pronoun case

a) John gave her a new dress.

b) *John gave she a new dress

11. **Reflexives**

a) The girl fixed herself a sandwich.

b) The girl fixed himself a sandwich.

12. Flagged reflexives

a) Pouring himself coffee, the old man sat down.

b) *Pouring herself coffee, the old man sat **down.**

13. **Tag questions : Pronouns**

a) The blonde woman laughed, didn't she?

b) *The blonde woman laughed didn't it?

14. **Wh-head agreement**

a) The pencil which you bought is nice.

b) *The pencil who you bought is nice.

15. **VP ellipsis**

a) John is here and so is Bill

b) *John is here and so does Bill

16. **Tag questions : auxiliaries**

a) John is tall, isn't he?

b) *John is very tall, doesn't he?

17. **Negative polarity :Complex**

a) No one who we met knew any French

b) *The people who we met knew any French.

c) T h e people who we didn't meet knew any French.

d) The people who we didn't meet knew French

18. Quantifier Float

a) The boys will all be here.

b) * The boy will all be here.

In an Indian study conducted on seven adult aphasics by Goswami (1996) sentence comprehension was evaluated. WAB, LPT and RTT were used and results indicated a significant difference between experimental and control group. Comprehension of anomics was better than conduction aphasics followed by transcortical sensory. Global aphasics had poorest comprehension. Aphasic patients performed better on phonology, followed by semantics and poorest on syntactic levels.

Blumstein et al. (1998) conducted a study to verify the hypothesis that Broca's aphasics have particular difficulty comprehending syntactically complex structures which involve long-distance dependencies. Two experiments were conducted exploring on line processing of filler-gap constructions in aphasics. An auditory-auditory lexical decision paradigm was used to investigate whether Broca's and Wernicke's aphasic patients show reactivation of the filler at gap sites. The results of these experiments showed that Broca's aphasics performed as well as normals. In addition, their performance was unaffected by the presence or absence of relative pronouns. This suggests that Broca's aphasics do not have an impairment in processing or representing thematic relationship of noun phrase arguments to predicates or relating traces to their antecedents.

But considering above study, authors could not come to a conclusion as what causes syntactic deficits in aphasics. They proposed

certain causes. One proposal is that Broca's aphasics have a deficit in processing morphological aspects of language including function words and inflectional affixes (Bastiaanse and Zonneveld, 1998). Another proposal challenges the view that the deficit is a selective syntactic or morphological one, but rather suggests that the syntactic comprehension of these patients reflects a decrement in overall processing capacity relating to global cognitive resources (Blackwell and Bates, 1995). And we can conclude from above study that there have been controversial results with most of studies showing syntactic deficits in aphasics.

Syntactic Production Deficits

Aphasic patients show production deficits in syntax as well. And the major category is occupied by agrammatic patients. Agrammatic spontaneous speech has traditionally been characterised by the following symptoms :

1. Lack of function words like auxiliaries pronouns, etc.
2. Predominant use of non-functional lexical categories such as nouns and verbs.
3. Systematic use of non-finite constructions like participles etc.
4. Lack of inflectional morphemes.
5. Telegraphic style

6. Over use of stereotypes.

Previous Views of Agrammatism

Pick (1913) is generally credited with being the first aphasiologist to make an effort to explain agrammatism as a specific

disorder. He distinguished between motor agrammatism and the paragrammatism of sensory aphasia, calling the latter pseudo-agrammatism. Pick viewed agrammatism as a break down in a middle phase of the development of a sentence. According to him, this development starts with a preverbal awareness of the general intent of the sentence, followed by a schematization of the sentence. This schema includes a vague sense of the melody and word order, although the precise, choice of words is not yet made. At the next stage, the actual verbal content is adapted or grammatized to fit the sentence schema. The damaged organism, however, is governed by a "law of economy" that forces the use of "emergency language" in which all the redundant elements, such as connectives and inflections, are dropped. Thus, for Pick, the economy of telegraphic speech is almost literally the same as that which dictates the abridged wording of a telegraph.

Isserlin (1922) supports the view of Pick, holding that the abbreviated utterance of the agrammatic follows from his difficulty in uttering words which, in turn, brings about a basic change in his attitude toward expression. The result is the primitization of speech, to a form resembling that of the young child, or the adult under great stress. Kleist (1934) is the investigator responsible for introducing the term paragrammatism, in contrast to agrammatism. Kleist noted that the patient with motor output disorder could say the names of concepts but could not link them into sentences with connecting words. His term "sentence muteness" was synonymous with the usual agrammatism. The contrasting form of disorder, or paragrammatism, was marked by confusions in the choice and ordering of words and of grammatical forms.

Goldstein (1948) described agrammatism as a regular feature of motor aphasia, referring to the tendency of the motor aphasic to revert to the exclusive use of nouns and verbs. In inflected languages, like German, the verbs tend to be spoken in the infinitive form. Goldstein recognizes that some agrammatic patients cannot find (or even read or repeat) the small grammatical words pronouns and prepositions, despite concentrated effort. He accepted the Pick-Isserlin's view as valid for a certain number of patients i.e. that the patient concentrates on the words that the essential for carrying the meaning of the message. Luria (1970) shared the view of agrammatism described by the preceding observers that this disorder is primarily associated with injury to the anterior speech zone, appearing in the context of efferent motor aphasia. (This is the precise equivalent of Broca's area). His interpretation of agrammatism, however, introduced the linguistic opposition between nominative and predictive uses of language. Luria suggested that the motor agrammatics had a disturbance affecting the dynamic context of language, which prevented the arousal of the "dynamic schemata of sentences", even after the patient had recovered the ability to pronounce individual words. The linguistic units that are aroused during the patient's effort to speak are isolated words, used in their static, nominative function. The predicative use of language drops out Consequently, the structure of agrammatic speech is in the form of a string of unrelated words-chiefly substantives, with few, if any, verbs. This difficulty appeared even when the patient attempts to repeat sentences spoken for him by an examiner. Luria's formulation goes well beyond the simplistic idea that agrammatism represents an economy of effort and talks about the type of structures more difficult to produce.

Jakobson (1956) was the first linguist to have written extensively on aphasia and to have contributed influential ideas on the nature of agrammatism. Like Luria, Jakobson pointed to a fundamental opposition between two components of language -the paradigmatic and the syntagmatic. The former relates to the evocation of verbal symbols for specific referents (cf. the "nominative" use of language referred to previous); the latter refers to the sequential aspect of language, manifested in grammatical relationships: A breakdown in the word finding (paradigmatic) aspect of langauge is referred to as similarity disorder, while a breakdown of the grammatical sequencing (syntagmatic) aspect is referred to as contiguity disorder. Thus the motor agrammatic has a contiguity disorder. Contiguity disorder is defined, however, in a sweeping and, probably, over inclusive fashion to include all acts of sequential programming of linguistic units, from the level of the phoneme upwards. In this way, Jakobson suggests, one can reconcile the difficulty that the motor agrammatic has in stringing phonemes to other into words and stringing words together into grammatical units.

Goodglass (1968) listed out some of the grammatical difficulties in aphasics. They are :

1. Omission and within category interchangeability of articles, prepositions and personal pronouns.
2. Substitution of verb stem or infinitive for inflected form.
3. Loss of coordinating and subordinating syntactic constructions.
4. Loss of speech melody as an indicator of segmentation
5. Use of incomplete sentences or mixing of grammatically in compatible sequences.

Meyerson and Goodglass (1972) reported following hierarchy of difficulty :

a) The noun phrase was better preserved than verb phrase.
b) Within the noun phrase the best preserved marker was the plural, if the determiner was used the best preserved determiner was 'the'.
c) Within the verb phrase, the -ing form was the best preserved marker, the patient who omitted 'be' as an auxiliary verb, also omitted it as main verb.
d) Adverbials were also retained.
e) The use of intonation to express emotion appeared to be independent of the ability to use syntax to express ideas.

The most handicapped patient showed no examples of negative expressed other than by including 'no' in the sentence. If a patient's speech showed more complicated structures it would necessarily show more simpler structures.

All the syntactic structures are not equally impaired in aphasic speech production. So here is an account of differential impairment of syntactic structures :

a) Substantive words : When large group studies are under taken it is seen that nouns are easier to recognise, read aloud or repeat than are verbs and adjectives. Siegal (1959) reported that aphasic speakers made more errors in reading out adjectives than in reading out verbs or nouns, though his word list had been selected with out regard to frequency. Using words of controlled frequency Halpern (1965 a)

found more errors with verbs and adjectives than nouns. It was found that among all aphasics there was particular difficulty with reading adverbial phrases which included prepositions.

b) Grammatical words : Effect of grammatical class of the stimulus words on ability of 'Semantic' and 'Syntactic' aphasics to give associative responses (Carter, 1968).

Class	Number of words	Percentage of words for which most popular response was no	
		Semantic	Syntactic
Nouns	27	67	37
Pronouns	5	80	60
Verbs (Substantive)	10	80	80
Auxiliary verb	4	100	100
Adjectives	15	67	33
Adverbs	15	67	33
Determiners	4	100	100
Prepositions	6	100	83
Conjunctions	4	100	100

Goodglass (1976) described paragrammatism nonfluent aphasic, patients as involving not so much the reduction of grammatical structures, as the juxtaposition of 'unacceptable sentences', confusion of verb tense, error in pronoun case and gender and incorrect choice of prepositions. Examination of syntactic abilities of fluent paragrammatic speakers reflect the inherent difficulties in attempting to isolate syntactic and semantic levels of speech. In some Wernicke's aphasics, syntactic information seems to be restricted to simple grammatical structure.

Some other authors like LaPointe (1983) tried to explain omissions by arguing that more complex fragments would be more difficult to gain access to. In other attempt, Caramazza and Hillis (1989) focussed on the performance of a single patient who omitted some grammatical morphemes and also committed word order errors in spoken and written sentences. They suggested that there are different levels of information specified at the functional level that interail with different subprocesses in the formation of a fully specified positional level. Assuming that all or any of these subprocesses could be selectively impaired in aphasia such an elaborated model might provide a means of accommodating the variety of forms that sentence production deficits can take. Structural simplification seen may result from a deficit at message level is patients might not be able to use the discourse information to constraint their conceptual acts into stable prepositions.

Back (1987a) presented another possible source of structural simplification that might be dissociable from grammatical morpheme omissions. Most aphasic patients suffer some degree of lexical or lexical phonological impairment deficits that have been considered to be largely independent of sentence structural problems. There are several points in the sentence production process at which the factors influencing selection of a lexical item can affect the form that a syntactic structures will take. These influences are relatively subtle ones e.g. more accessible words are substituted for a less accessible words.

Even incorrect word order for subject and object nouns is seen. Saffran et al. (1980a) reported that a group of agrammatic speakers had

difficulty starting with subject nouns in transitive and locative sentences when asked to describe pictures showing two nouns that are semantically reversible. Patients have been seen to produce utterance by directly mapping from conceptual information at the message level to lexical retrieval to surface noun-verb-noun form without benefits of predicate arguement structures, or thematic relations, that distinguish agents from patients, themes goals and so forth. Zingeser and Berndt (1990) report of several studies which revealed that poor verb retrieval was a characteristic of agrammatic aphasics even in naming tasks where as other types of patients (anomic aphasics) are better able to produce verbs than nouns.

In an Indian study by Usharani (1985) on Broca's aphasics it was found that all subjects could repeat the plural forms as they didn't need transformational rules. Accusative and instrumental cases were found to be most difficult to recover. Time adverbials were deleted by all in repeating sentences. They could not correct constructions with ungrammatical tense and gender markers but could do so for case and number distinctions. All subjects made errors in repeating complex and compound sentences. Performance was poor in syntax as compared to phonology and morphology. This indicates effect of syntactic structure on producing those structures.

Martin and Blossom-Stach (1986) examined the syntactic abilities of Wernicke's aphasics in both production and comprehension tasks. During the production of speech, the number of errors were few, but the range of syntactic forms was limited. They had poor ability to use syntactic knowledge both in comprehension and production.

Regularities have been observed in the pattern of omission of bound grammatical morphemes. The past tense marker 'ed' is rarely retained, while the present participle 'ing' and the plural's' are retained relatively frequently (Caramazza and Berndt, 1985). The plural marker is omitted or substituted depending on the language (Grodzinsky, 1990). Miceli et al. (1984) on the other hand noticed that there was not any systematic patterns in the distribution of errors for different grammatical morphemes, and in the distribution of omission versus substitution. They concluded agrammatism and paragrammatism may co-exist in patients and agrammatic are not a homogenous group.

Bates et al. (1991) concluded that the over use of SVO word order was noted only in languages that permitted pragmatic word-order variations. It could not be detected in rigid word-order languages like English. The extent to which non- canonical word order patterns were impaired depended on the frequency with which these forms appeared in the normal language. They found verbs with single root to be frequently used in the present tenses used with two roots over were often used in the infinitive prepositions. Tesak (1994) studied the errors of preposition in the spontaneous speech of eight German agrammatic patients. Governed and ungoverned prepositions were deleted equally often (82.% and 70.2%) respectively. Some other authors reported similar results.

Li and Williams (1990) studied repetitions in ninety five aphasic subjects (thirty two conduction, thirty eight Broca's, twenty five Wemicke's aphasics) who were asked to repeat phrases from BDAE. Conduction aphasics exhibited a greater number of phonemic attempts, word revisions, word and phrase repetitions. Broca's aphasics

demonstrated more phonemic errors and omissions. Wemicke's aphasics showed more unrelated words and jargon. They scored errors according to a description to put them in different error categories. There are two types of nouns : Mass and Count nouns. Mass nouns unlike count nouns cannot take plural categories, cannot to be in definite articles and cannot take quantifiers like another etc. Brain damage individuals may show specific deficits in these.

Investigating pronoun production specifically in agrammatic speakers Kohn et al. (1997) conducted a study. The normal speakers tend to use pronouns as pre verb noun phrases and specific lexical items as post verb noun phrases. Those performance which were two standard deviations or more from the normal mean were judged to be abnormal. All but one aphasic subject departed from the normal data. The remaining aphasics fell into three deficit groups. Increased use of general nouns was associated with severe avoidance of pronouns, while an increased use of specific noun phrase was associated with milder pronoun avoidance. The tendency for aphasic subjects to produce anamolous sentences provided additional insight into the mechanisms underlying the response to pronouns in each deficit group.

Ability of aphasic patients to produce words from the grammatical classes of nouns and verbs was investigated by Berndt et al. (1997). Eleven chronic aphasic patients produced nouns and verbs in pictures naming, video tapes scene making, sentence completion, naming from definition and oral reading. Five patients demonstrated significantly more difficulty with producing verbs than nouns, two patients were more impaired in producing nouns than verbs, remaining four didn't show

any difference. Selective verb impairments were found both in Broca's and Wernicke's aphasics. There are many reasons to expect verbs as a class to be more difficult than nouns and more susceptible to disruption when brain is damaged verbs are acquired later than nouns by normal children, have greater range of meanings and are more variable in meaning than nouns across languages. Kim and Thompson (1998) also reported that agrammatic aphasic speakers show more difficulty naming verbs. There were statistically significant differences in comprehension and production of nouns and verbs. Comprehension of both nouns and verbs was intact, whereas verb naming was impaired as compared to intact noun naming.

The interaction of preserved pragmatics and impaired syntax in Japanese and English aphasic speakers was studied by Menn et al. (1998). He reported that occasional reversal errors could be explained in terms of a conflict between the normal encoding of the emphatic characteristics of an event and the syntactic limitations imposed by impaired production process. To account for these findings, a model of production for making pragmatic choices among syntactic forms.

In a recent study by Robert and Kolk (1998), speech was elicited from twelve Broca's aphasics and twelve control subjects in three different conditions: Spontaneous speech, picture description and picture description with priming. The main findings were that a) Broca's aphasics showed stronger syntactic priming effects than controls (b) The effect was automatic than strategic (c) In priming conditions, Broca's aphasics produce relatively complex sentences (eg. passive).

These study provide an account of syntactic deficits seen in production of aphasic. These deficits are related to grammatical category of words, some of them are retained in aphasic production and some are not

A gramma **tism Versus Paragrammatism**

Goodglass et al. (1967) drew attention to the similarities between agrammatism and paragrammatism. Goodglass and Menn claimed that instead of assuming that the usual approach treatment of the similarities as surface responses to different underlying causes is correct, the following approach might be more fruitful: "Perhaps the grammatical similarities of anterior and posterior aphasias are underlying and the differences are due to particular processing (for example, sentence initiation difficulties) that are not grammatical, and to compensatory strategies arising in response to these problems" (Goodglass and Menn, 1985). Thus attributing syntactic deficits to non- grammatical causes.

Agrammatic - Inhibition of automatic processing in specific language tasks, especially in those requiring integration of controlled and automatic processing.

Paragrammatic - Disinhibition of automatic processes and simultaneous impairment of controlled processing.

In paragrammatism the interaction between automatic and controlled processing is differentially affected, that is, qualitatively different from the interaction between these two in agrammatism. The

fluent paragrammatic's automatic processing is disinhibited, the spread of activation at times being even excessive, perhaps due to the action of interfering stimuli, whereas voluntary, controlled processing the interaction between a set of production stored in long-term memory and the blackboard (working memory and external sensory channels) - is impaired. In Wernicke's aphasia, impaired controlled processing results in (or is an expression of) a combination of auditory/graphic comprehension deficits, lexical retrieval, and phonological processing deficits).

Syntactic Processing in Aphasics Theoretical Accounts:

Before going to disordered population one should know about syntactical structures in detail.

Phrasal Categories and Phrase Structures

Categories such as nouns, verbs, and prepositions are not just arranged in a one-level left-to-right serial order, instead, evidence suggests that they form phrasal categories, and both lexical, functional, and phrasal categories are arranged in a hierarchical structure to form clauses and sentences, much like a house is built with a foundation, walls, beams, and a roof.

Phrases are organized into hierarchical structures and that there will be cases where more than one structure can be assigned to a particular phrase. Thus, "the mechanic fixed the car in the garage" can be assigned two different structures. The two structures can be viewed in different

ways. For example, an approximation of the two structures can be viewed by different labeled bracketing :

1. ([S [NP The mechanic] [VP fixed [NPl [NP2 the ear] [PP in the garage]
2. [S [NP The mechanic] [VP fixed [NP the ear] [PP in the garage]}]]

In (1), the prepositional phrase (PP) "in the garage" modifies the noun phrase (NP2) "the car"; thus, there is one larger NP (NPl), the car in the garage. In (2) the PP "in the garage" modifies the entire verb phrase (VP) "fixed the car". Another method of showing phrasal geometry is through the phrase structure tree (phrases marker).

Viewing just the verb phrase (VP) the PP "in the garage" modifies the noun phrase "the car" and thus attaches to the "higher" NPl node, forming an NP "the car in the garage" the PP in the garage modifies the VP and thus attaches to the "higher" VP1 node, forming the "higher" VP fixed the car in the garage. So, the structure of the sentences of a language can be captured by phrase structure representations, where each structure suggests a specific interpretation.

Some generalisation about sentence structure are given below:

The Head Principle : Every phrasal category contains a head; the head and its phrasal counterparts share the same properties.

An NP must contain an N, which is the head of the NP, a VP must contain a V, and so on; the head and its phrase shares properties.

For example, if a head noun is plural, so too is the entire NP (e.g. The boys are wild). This principle serves as an important constraint on phrase structure representations; if there were no such constraint, phrase structures would allow the generation of impossible structures (e.g. an NP containing a V).

NP - (DET) N :[NP [DET The]] [N mechanic]]

A verb phrase consists of at least a verb, and potentially many other optional elements, including another NP, a PP, or even another Sentence (clause), (3) contains examples of some of these possibilities :

3. VP - V [VP [V slept]]
   V NP : [VP [V fixed] [NP the car]]
   V NP PP : [VP [V sent] [NP the letter] [PP to his mother]]
   VS : [VP [V discovered] [S that the manuscript was stolen]].

A prepositional phrase may include a preposition followed by an NP as in :

4. PP - P NP; [PP [P in] [NP the garage]

Finally, there is one important constraint on phrase structures that has been left out. Consider :

5. S - NPVP
   VP-VNP

To generate a sentence given a particular structure of phrase structures, lexical items are inserted into the category slots via lexical insertion. A grammatical sentence corresponding to (5) might be :

6. Joelle kicked the door.

Where Joelle is lexically inserted into the N slot of the subject NP, kick into the V slot of the VP, and the door into the direct object Np. But what about the following?

7. * Joelle thinks the door

Sentence (7) has the same structure as (6), can fit into the phrase structure representation described in (5).

What makes (6) different from (7)? The only difference lexically between the two sentences, is, of course, the verb. If the verb kick is inserted in the phrase structure of (4), the sentence is well formed; if the verb think is inserted, the sentence is ill formed. So, the theory of grammar as it stands now is simply too powerful; it generates ungrammatical as well as grammatical sentences. The theory, therefore, must have a way to restrict the output of phrase structure representations like those in (4) to generate only the well-formed instances of our language.

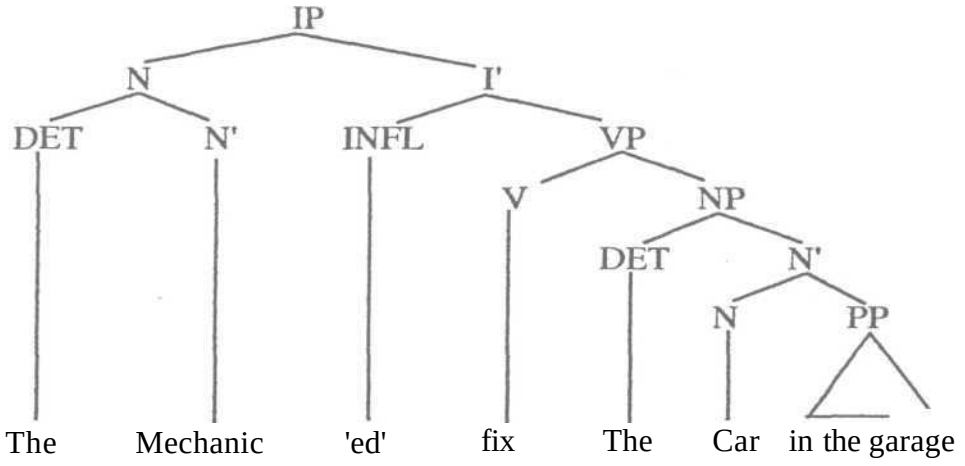
X-Bar Theory

X-bar theory is a formal way of characterizing what is common about phrase structures. Each phrasal category must contain a head.

For NPs, the head is the N, for VPs, the V, and so on. Sentences have inflection; they are inflected for tense (TNS) and agreement (AGR). At first it might appear that it is not the sentence that has tense, but, instead, the VP. For example, in the sentence, The mechanic fixed the car in the garage, it appears that the VP is past tense, since the head of the VP (the V) has past tense morphology (-ed). But consider that the past tense can be separated from the VP, as in What the mechanic did was fix the car, where the past tense is now part of the auxiliary did and is no longer "attached" to the verb itself. Also consider that overt, non-affix tense markers like will, for example (eg.). The mechanic will fix the car), are separated from the VP. For these and the reasons, it is now considered that tense has to be represented separately from the verb and verb phrase, forming what is called an Inflection Phrase (IP). The head of IP is the functional category INFL or I (for Inflection).

Consider again (8)

8. The mechanic fixed the car in the garage.



First, note the following terms : branching means that a node splits into other nodes, dominates means that a given node is "higher up in the tree" than another nodes, and immediately dominates means that a given node is directly above another node in the tree, with no other nodes intervening between them. In (8), the S node is now replaced by an IP (Inflectional Phrase) that dominates all other nodes of the tree. The IP branches and immediately dominates an NP and an intermediate structure (called I-bar; written as I') whose head is INFL (which, in this case, is past tense). The subject NP branches and immediately dominates DET (determiner) and an intermediate category, N' N' immediately dominates the head N. The I also has a VP attached "to the right". This schema thus retains the generalization that all phrases must have head while accepting our intuitions that sentences have inflections that are independent from verbs and verb phrase.

Example (8) has several other generalizations. Note that the V hs as its complement an NP (the car in the garage). And note that the head V (fix) falls "to the left" of its complement. If we were to draw out the PP, we would also note that the head P (in) also falls to the left of its NP complement the garage. The same holds true for the INFL node (-ed), which falls to the left of its complement, the VP (fix the car in the garage). So it seems that one generalization about (8) and indeed all phrase structure (PS) rules of English - is that the head occurs to the left of its complements. This particular order of heads and their complements is not a universal property of all languages; languages generally fall into two camps, head-first or head-last.

Another generalization is that the determiner modifies or specifies the NP; the NP can be definite, indefinite, quantified, personalized, and so forth. So, for example, we could have a mechanic, the mechanic, some mechanic, all mechanics, and so forth. We will assume that the subject NP inhabits a functional category position called Spec (for Specifier): I will continue, however, to fill this Spec position with an NP.

Instead of using node labels like NP1 and NP2, now XP and X' (where XP stands for NP, VP, PP, etc) are being using. This X-bar notation captures the generalization that all phrase structure representations have the same form.

Consider now the structure of clauses:

9. Joelle wondered whether the boy ate

The lexical item 'whether' is a complementizer (as are that, if, and for in English) that often signals an embedded clause. Because each phrasal type has a head that shares the properties of the phrase, the Complementizer whether heads a Complementizer Phrase (a CP).

All phrase structures have the same form: An XP (maximal projection), X'(s) (intermediate projections), a head X (a lexical category), a complement (NP) of the head that is on the same phrasal level as the head, a Specifier position, and, perhaps, an adjunct phrase (modifier, YP) that can attach above the head.

X-bar schema : the head (X, sometimes referred to as Xo) is an atomic element (a category) drawn from the lexicon. Phrase markers are projected from the head to intermediate levels (e.g. N\ V, etc) and to a maximal projection (e.g. NP, VP, etc). The complement of the head is often classed its argument, which is syntactically on the same phrasal level as the head (the head and its arguments are therefore said to be "sister")- The specifier is immediately dominated by the maximal projection and is a sister to the X' level, and the adjunct is often immediately dominated by an intermediate projection. Importantly, the terms specifier, argument, and adjunct are not formal category terms Qike NP, N' etc) but are, instead, relational terms so that we speak of the argument of X, the specifier of XP, and soon. For example, a subject NP is the specifier of IP, a direct object NP is an argument of the verb, and so forth.

Because all phrase structures conform to the X-bar schema in, the acquisition of the phrasal geometry of sentences becomes a matter of acquiring the order in which the specifier, head, and adjuncts fall.

Argument Structure

Most sentences can be considered representations of relations between a predicate and its arguments, hence the term argument structure. An NP or a CP can be an argument of a verb if it occupies what is called an argument position (i.e. subject and complement positions). Unlike subcategorization information, argument structure is not concerned with the syntactic form of the phrasal categories a verb allows, but instead is concerned with the number of participants described by the verb. Eg.

The transitive verb kiss requires two participants a "kisser" and a "kissee", thus, it selects for two arguments and hence a two-place argument structure. The verb put requires three participants and thus entails a three-place argument structure.

Consider the following sentences:

(a) Joelle melted the wax.

(b) The wax melted

First, notice that the NP (the wax) appears to play the object role of the verb melted in (a), yet plays a subject role of melted in. (b) Second, although the NPs in the two sentences each serve a different role to the verb, they nevertheless seem to have something in common: Then in both cases reflects an entity undergoing some sort of transformation ("Melting). In a sense, then, the NP seems to be playing a similar role in both sentences. Consider also:

(c) The wax was melted by Joelle

(d) It was Joelle who melted the wax

(e) It was the wax that was melted by Joelle.

Although the arguments of the verb melted (Joelle, the wax) occur in different positions in (c) (d), they also seem to play a similar role. In each case Joelle appears to be the agent of the melting, and in each case the wax appears to be the Theme of the melting. The generalization that arguments can play similar roles while appearing in different syntactic positions rationalizes, in part, the notion of the sort that answers the question "who did what to whom". Each argument, then, takes on a certain thematic role (e.g. Agent, Experience, Theme,

Patient, Goal, Benefactive, etc). Each verb selects sets of thematic roles assigned to its arguments; each set of roles is called a thematic grid. Like both subcategorization and argument structure thematic properties are written in to the representation of the head (e.g., the Verb) as part of the lexical entry.

Thematic roles are assigned to arguments in the sentence, usually by the head, which has the property of being a theta-assigner. Theta-assigners are typically the lexical categories of verb, preposition, noun, and adjective (in contrast to functional categories, which are not theta-assigners). For example, the verb kiss requires a two-place argument structure (xy) and assigns to each argument a thematic role taken from its thematic grid; the preposition in is also a theta-assigner.

f) Kiss V (agent patient) in P (location) (Dillion Agent) Kissed (Joelle Patient) in [the park location].

As (f) shows, the verb kiss assigns its thematic roles of Agent and patient to the subject and direct object positions, respectively (technically, the Agent role is assigned by the VP, that is, the entire VP. Of course, the properties of the VP depend on the properties of the head V, so for present purposes we will assume that the V assigns a role to the external as well as internal arguments). Theta Theory states that the predicate assigns its associated thematic roles to particular grammatical positions. A transitive verb like kiss will have two thematic roles to assign, one associated with the subject position and one associated with the object position (in the Principles and Parameters approach, object position is internal to the VP, whereas subject position falls outside the

VP. Within the PP (in the park), the preposition is in the head of the PP and assigns the role of Location to its argument (the park).

Two important principles constrain assignment of thematic roles in the syntax : the Projection Principle and the Theta Criterion:

Theta Criterion : Every argument (e.g. NP) in a sentence must receive, one and only one thematic role, each thematic role associated with a theta-assigner must be assigned to one and only one argument

The Thera-Criterion, much like the Projection Principle, ensures that a verb's (and a preposition's) thematic properties specified in a lexical entry will be assigned one-to-one to the arguments represented in the syntax. The syntax of a sentence, then, is determined to a large extent by the lexical properties of the head of each phrase. For example, if the verb requires one argument, only that argument should be observed in the sentence. If a verb requires two arguments, both arguments must be observed, and the same holds for three argument verbs. Importantly, then, the Projection Principle can now be revised to not only include subcategorization information, but, crucially, argument structure and thematic information as well. Because the verb kiss, for example, requires a two-place argument structure, the thematic roles written into the verb's thematic grid must be "projected" to the syntax.

Trace-Theory and Move-Alpha

Consider now the following sentences, and how they fit into the theory thus far:

1. Dillon kissed Joelle (active)
2. Joelle was kissed - by Dillon (passive)
3. It was Joelle who Dillon kissed - (object cleft)
4. Who did Dillon kiss ..? (wh-question)

Despite appearing in different grammatical positions, Dillon seems to be the agent and Joelle seems to be the Patient in (1) - (4) in (4), Joelle is replaced by the NPWho). The Projection Principle and the lexical entry for kiss require that kiss have a direct object argument position be assigned a thematic role represented in the verb's thematic grid. But it appears that (2) - (4) should be ruled out (ruled as ungrammatical) by both principles since there doesn't seem to be a direct object position, as shown by the "gap". However, these sentences are grammatical. But, how can they be grammatical if there doesn't seem to be an argument position to which to assign the Patient role.

One possibility is that there is, indeed, a direct object position to which the role of Patient is assigned, and this position is just in the place where we expect it to be, immediately after the verb. According to the theory under consideration, it turns out that there is such a position in (2, (4), just as there is in (1). However, in the former the positions are said to be lexically unfilled (or "empty").

Assume that the direct object (Joelle in the examples above) originates in the canonical post-verb direct object position and moves to a pre-verb position. The Projection Principle ensures proper thematic role assignment by requiring insertion of an empty category or trace into the position from which the category has moved. A trace is like a

"ghost" that is left behind when the NP moves; it is a lexically unfilled position acting as a "place holder". The trace is then linked or coindexed with the moved category, forming a co-reference relation between the two positions. The thematic role-in this case, the Patient - is assigned to the (original, direct object) position occupied by the trace, and the moved category, called the antecedent to the trace, inherits the thematic role. Specifically, the trace of the movement and the NP that moved form a chain. Briefly, a chain may consist of two or more members that are co-indexed; each chain is considered a single argument (there are one-member chains as well, those NPs that do not co-refer with anything, like the NP Dillon in (3) (4). The theta-criterion can now be revised to include chains :

Theta-criterion: Thematic roles in a lexical entry are assigned to chains, and each chain receives one and only one thematic role.

Principles Governing Processing in Aphasics

Individuals with aphasics, regardless of type, frequently display difficulty processing syntax. The nature of this syntactic deficit, remains controversial. Some researchers have proposed that syntactic processing deficits in aphasia are reflective of a loss of syntactic or procedural knowledge (Berndt, 1983). The major theoretical accounts have been put forward for agrammatism. There are three main accounts of agrammatism which differs in the extent to which they invoke representational failure as source of the comprehension difficulties in these patients. These are described here :

a) Grodzinsky's Trace-Deletion Hypothesis :

Grodzinsky (1986, 1989, 1990) proposes that agrammatic comprehension pattern derives from two sources : A representational deficit involving traces and an extra grammatical leuristic which applies obligatorily, and often counter productively to associate noun phrases with thematic roles in the event that they are not grammatically theta-marked. Under the Trace-deletion hypothesis, actives do not involve syntactic movement and so present no problem to agrammatics. However, both subject and object gap sentences contain only one moved element under the linguistic assumptions, so an additional mechanism is required to differentiate them. Eg.

a) The boy kissed the girl (simple passive)

b) It was the boy who (NP) kissed the girl (subject gap)

c) It was girl who the boy kissed (NP) (object gap)

d) The girl was kissed (NP) by boy (full passive)

e) The girl was kissed (NP) (Truncated passive)

Agrammatic patients would comprehend (a), (c) but would have problem in comprehending (b), (d), (e). Thus the traces are under represented in syntactic representations constructed by these subjects. There is an underlying default principle. The default principle comes into play whenever a noun phrase which has not been assigned a thematic role is encountered. Thus theta marked noun phrase is assigned the canonical role with the position it occupies. Subject gaps and full passives trigger such strategies and result in incorrect comprehension.

b) Hickok's revised trace-deletion hypothesis (RTDH):

Hickok, et al.'s (1993) differs from the TDH in how it claims sentences are represented in normals. In this the only lexical noun phrase that gets a theta role insitu is an unmoved direct object or other internal argument. The asterisk represents unassigned arguments; elements following the semicolon represent noun phrases which are available as arguments of that predicate.

Thematic assigned representation (TAR) for simple active (a) and ambedded clause of subject gap (b) kiss (*(girl); boy.

They say that agrammatics' good performance on subject gaps and actives despite the disruption of the subject trace attributes to these patient's ability to make reasonable inferences based upon the under specified TAR in conjunction with lexical semantic information. Thus allows for relatively unimpaired performance as long as the TAR is unambiguous, as long as there is only one unfilled slot and one unassigned noun phrase (NP).

c) **Mauner et al's (1993) double dependency hypothesis (DDH)**

It entirely depends upon a representational deficit. According to them agrammatics are able to establish chains but are impaired in appreciating or enforcing the obligatory coindexation between the links of the chain and between other elements linked together in the sentence. DDH like RTDH accounts for poor performance on the object gaps on basis of the disconnection of both subject and object noun phrases from the feet of the irrespective chains.

d) Mapping hypothesis (Saffran, Schwartz and Martin, 1980a)

A mapping hypothesis claims that asyntactic comprehension arises not from a failure to compute syntactic structure but from a failure to exploit it. It assumes a large number of heterogenous conjectives about the possible antecendents for such a failure. These may be loss of lexical knowledge about predicate argument structure, damage to the psychological mechanism(s) responsible for assigning thematic roles and non-specific resource limitation affecting later interpretive processes more severely than early parsing operations. But this theory is grossly unspecified.

e) **Trade-off hypothesis**

Mapping hypothesis is insensitive to the theta criterion. So it is inferred that agrammatic subjects simply apply verb-specific mapping rules (Frazier and Friederice, 1991). It is possible that parsing operations such as establishment of gaps or enforcement of subcategorisation conditions are psychologically distinct from the thematic interpretation of same structures. The structures which form longer inferential chains will suffer greater degradation than structures involving shorter inferential chains. In assigning a thematic role one must thus decide which sense of verb is appropriate, if verb has multiple senses, and whether the hypothesized argument satisfies all the semantic and possibly pragmatic constraints associated with this role. A single decision requires ruling out of innumerable other possibilities.

f) Resource deficit model

According to this view, aphasic individuals retain grammatical knowledge and their syntactic comprehension problems reflect a reduced capacity of resources, inefficient allocation of resources or both (Caplan, 1985). There is an underlying limited pool of activation energy or operational resources that support language comprehension via both information computation and maintenance functions. Slow or impaired comprehension occurs when task demands exceed the available pool of resources or when resources are in effectively allocated to processing and storage operations. Thus poorer syntactic performance is expected for tasks or stimuli that place greater demands upon the finite pool of resources.

According to this model, complex sentences are at greater risk for inaccurate interpretation by aphasic individuals given that processing and storing such sentences is more difficult. Results from several studies have confirmed this interaction between structural complexity and probability of syntactic processing problems (Linebarger, 1995). If this model is correct, aphasic individuals should perform similarly to the control subjects during the least demanding tasks.

g) **Syntactic processing model based on neurocognitive data**

A review of the neuropsychological findings suggest that, those anterior parts of left hemisphere usually lesioned in Broca's aphasia, subserve the fast and early structuring processes necessary to build up syntactic structures including traces of elements moved on line. The

alternations of lexical processes often coincides with lesions in the posterior parts of left hemisphere. Patients with lesions in posterior part of the left hemisphere are far worse in judging a sentences grammaticality than those with lesions in the anterior parts of the left hemisphere (Friederici, 1988; Linebarger, etal. 1995).

Combined findings from neuropsychological and electrophysiological studies suggest a language comprehension model with three phases, two of which are primarily syntactic in nature. A first syntactic processing phase reflected by early left anterior negativity correlated with a first pass-pass defined as the assignment of the initial phrase structure including traces of moved elements. A second phrase reflected by negativities around 400 msec, seems to represent the phase during which lexical bound semantic and syntactic information is proposed to achieve the thematic role assignment. The differential scalp distribution of these two negative components around 400 msec, suggests that the processing of subcategorizing information. The third phase reflected by the broadly distributed late positivity appears to be related to processes of structural reanalysis which may become necessary when initially build syntactic structure cannot be successfully mapped on to semantic information and verb argument information provided by the lexical elements. The combined findings from ERP data suggest that on-line structuring processing is subserved by brain systems located in the anterior part of the left hemisphere whereas processes of structural reanalysis seem to involve different brain systems.

Thus explanation vary from grammatical to psychological to neurophysiological. But none of them explain different syntactic processing deficits seen in different types of aphasics.

Syntactic production in aphasics - Theories

As for syntactic comprehension, there are not any specific theories regarding syntactic production in aphasics. But there are just a few hypothesis and opinions put forward by different researchers after intense observation.

Agrammatic speakers produce halting, effortful attempts at communication that frequently result in incomplete fragmented sentences in which syntactic complexity is reduced from normal levels. The content words (especially nouns) are produced more frequently than are grammatical words (articles, pronouns, auxiliary verbs and some prepositions). Paragrammatics produce sentences, including grammatical elements- fluently with apparent ease although often incorrectly. Content words (especially nouns) are frequently the source of phonemes error and grammatical words and inflections may be in appropriately substituted for one another. Omission of grammatical words in sentence production could be explained through operation of phonological principles (Goodglass et al. 1967).

According to Zurif and Caramazza (1976) when syntactic features are absent on the level of spontaneous speech, they are unlikely to be preserved at other levels of language. Thus while articulatory problems are undoubtedly important determinant of non-fluency in anterior aphasia, the concomitant agrammatism, does not appear to reflect the result of an economy of effort. Thus agrammatism appears to reflect a true language limitation. Broca's aphasics seem to plan speech in

supra-lexical units. Wernicke's aphasics are less capable than neurologically intact patients of processing relative clause constructions.

Berndt et al. (1987) stated that although patterns of noun/verb productions were not entirely predictable from patient's clinical classification, they were found to be significantly correlated with several structural indices of sentence production and with failure to comprehend semantically reversible sentences. Noun/verb retrieval patterns are not strongly correlated with speech fluency and nor with the morphological characteristics of sentence production. Patients with relative impairment in production of verbs were found to rely on high frequency, semantically empty "light" verbs when producing sentences and to favour simple syntactic structures in which verbs would not require inflection. When forced to produce substantive verbs, verb retrieval continued to undermine the production of well formed sentences for the verb-impaired patients. Some of their patients showed some evidence of poor realisation of noun argument for the verbs they could not produce.

In their neurolinguistic analysis of jargonaphasia and jargonagraphia Lecours and Rouillon (1976) comment that paragrammatism can usually be traced to substantive word finding difficulty. Aborted sentences and repetitions of prepositions which result in distorted syntax are infact secondary to the main phenomenon of word finding difficulties. Verbal substitutions of one grammatical word for another are frequent, but they too are in same category of lexical selection difficulties because of the grammatical class is observed. Pronouns are replaced by an incorrect pronoun not by a different grammatical word. Paragrammatism can also result from compounded transformations in

which two syntagms become telescoped. This is seen to be more marked in writing. On the whole therefore examinations of the syntactic abilities of fluent paragrammatic speakers reflect the inherent difficulties in attempting to isolate syntactic and semantic levels of speech.

From the review it is clear that aphasics show a variety of syntactic production as well as comprehension deficits. Even among anterior or posterior aphasics the syntactic patterns are varied. So it is important to know the syntactic deficits in aphasics as this would help to differentiate them into different categories. Apart from this it would help in explaining these deficits and planning the remediatory strategies for aphasics.

METHODOLOGY

I Subjects:

Seven subjects (five males and two females) were selected as subjects for the present study. The selection criteria was as follows :

a) **Type of Aphasia** : Different aphasic syndromes were considered (five Broca's, one Anomic and one Transcotical sensory). This was decided on the basis of clinical observation and western aphasia test battery findings (Kertesz and Poole, 1977). The subjects were to have some amount of speech output however, in order to be selected for the study..

b) Subjects has Kannada as their second language and were efficient users of Kannada. Subjects age ranged from 26 to 65 years.

c) Subjects with any auditory or visual deficit were excluded from the study.

II Procedures

Subjects were seated comfortably. Through casual talking, the subjects were made to feel at ease and the procedure was explained before evaluation and recording began.

Environment was made as distraction free as possible by carrying out the procedure in a quiet room and by removal of any potential

visual distractor. The duration of the entire procedure lasted from 45 minutes to one hour. The entire verbal interaction with the subjects was recorded. The extra-verbal behaviors were also noted-

Testing : The subject's syntactic abilities were evaluated for following aspects:

a) **Syntactic production**

i) <u>Conversation and Spontaneous Speech</u> - The desired responses were elicited by using questions like "How are you today?" Apart from that even open ended questions were asked. The format for this was taken from Boston Diagnostic Aphasia Battery (Kaplan and Goodglass, 1972, [Appendix-A],

ii) **<u>Picture Description</u>** - The coloured version of the picture in Western Aphasia Battery (Kertesz and Poole, 1974) was used to elicit speech. Subjects were asked to describe whatever was happening in the picture [Appendix-B]. They were also asked specific questions which were the same for all subjects.

iii) **<u>Sentence Repetition</u>** - The subjects were presented with twenty sentences taken from Chengappa (1991), Gayathri andThirumalai (1988). The clinician read it out clearly and subjects were expected to repeat these sentences. All the responses from the patient to above sections were audio-recorded (Appendix C).

b) Syntactic Comprehension - This was done by administering syntax section of Linguistic Profile Test (Karanth, 1980) to the subjects (Appendix D). This section contains 130 test items sampling a wide range of basic syntactic forms of the language which are tested in 11 sub-sections. Out of these 130 items, 65 are incorrect and 65 syntactically correct. These randomly arranged correct and incorrect test items are presented auditorily and the subjects are required to judge the utterance for grammatical acceptability.

III Analysis - The utterances of the subject were broadly transcribed using IPA with some modifications. For the syntactical productions:- (i) The length, type of production, word order, the correct usage and complexity were evaluated, (ii) The mean length of utterances was also assessed using Brown's rules (Brown, 1970) which were modified for Kannada (Appendix E). The repetitions were scored using a checklist by Li and Williams (1990) (Appendix F). (iv) The spontaneous speech and picture description utterances were analysed using quantitative description of aphasic production by Saffran, et al. (1989) (Appendix G).

For syntactical comprehension

(i) The response of the subjects to the items in syntax section of LPT was recorded and judged for correctness or incorrectness of grammatical acceptability.

Grammatical productions were analysed using Schiffman's grammar of spoken Kannada (1979). Then relation between syntactic comprehension and production was also studied.

RESULTS AND DISCUSSION

The data was collected from seven aphasics regarding their performance on tests of syntactic comprehension and production. Picture description, repetition and conversation samples were taken for production. Repetitions were analysed using profile by Li and Williams (1990). Picture description and spontaneous speech sample were analysed using quantitative profile given by Saffran et al. (1989) and MLU was also calculated from the sample. LPT scores gave information regarding syntactic comprehension and were analysed for correctness or appropriateness.

The demographic details of the subjects are given in Table 1.

Table-1: Demographic details of subjects

SI.	Name	Age/Sex	Type of Aphasia	Educational Level
1.	B	56years/M	Broca's	SSLC
2.	N	56 years/M	Broca's	B.Sc,
3.	R	38 years/M	Broca's	SSLC
4.	S	30 years/M	Broca's	SSLC
5.	V	27 years/F	Broca's	SSLC
6.	T	35 years/M	Anomia	B.A., LL.B
7.	S	38 years/F	Transcortical	SSLC

The description of each subjects performance is given below:

1) **Syntactic Production**

Table below gives the details regarding MLU and sentence typei for each subject.

SL	Name	Type of Aphasia	MLU	Sentence Type
1.	B	Broca's	2	Noun+main verb
2.	N	Broca's	3	Noun+adjective+ main verb
3.	R	Broca's	2	Noun+main verb
4.	S	Broca's	2	Noun+main verb
5.	V	Broca's	2	Noun+main verb
6.	T	Anomia	3.5-4	Noun/pronoun+ adjective + main verbs
7.	S	Transcortical Sensory	3	Noun+adjective+verb

a) Broca's **Aphasics**

The mean length of utterance was calculated for each subject's samples on analysing Mr.B's production his MLU was 2. The repetitions of Mr.B were analysed using Li and William's Scale (1990). He showed phonemic errors. Phonemic attempts and perseveration were present for tense markers. Eg. After repeating 'na:le' (tomorrow) in one sentence,

he inserted the same in second sentence where actually he was supposed to say "ninne" (yesterday). Word additions, phrase interjections, word omissions, word repetitions and inadequate responses were seen. He showed difficulty in repeating animate nouns like "pa:pu" (baby) and sometimes omitted these in his repetitions. It was seen that he would change the tense marker from past tense to future tense eg. for 'monne' he said 'na:le'. More difficulty was evidenced for complex sentences like "idakinta:a: mara doḍḍadu" (that tree is taller than this). In spontaneous speech and picture description it was noticed that basic sentence type used by Mr.B. was noun + main verb, Eg. "ʧappali ide" (chappal is there). The majority of words were open class words and mainly nouns. The sample contained very few verbs and pronouns. There were no inflected verbs, auxiliaries and prepositions.

Mr.N's MLU was 3. His repetitions showed phonemic errors, paraphasias (semantic). Eg. for the word "o:didre" (if he reads^he said "adu ma:ḍidre", (if he does that), "pustaka ma:ḍidre" (does that with book), but did not say the "o:didre".

His repetitions contained incomplete phonemic attempts, word interjections, word omissions and inadequate attempts. In grammatical category errors he was seen to change the structure of past tense markers to present tense markers,as was seen in case of Mr.B. Complex sentences were found to be more difficult for him to repeat.

The main sentence structure produced by Mr.N was noun + adjective + main verbs eg. "a:va:gaʧnna:gi ma:ḍide" (that time Idid it properly)". Pronominals were present like "adu" (that) in his sentence.

Noun modifiers were also present. His utterances contained pronouns and verbs as well but the nouns dominated. Inflected verbs were produced rarely. Embedded structures were absent. Semantic perservations and semantically empty words in his utterances could be attributed to presence of word finding problems. This could be attributed to deteriorated semantic field with affected naming abilities.

Mean length of utterance for Mr.R was 2. His repetitions showed phonemic errors, phonemic attempts eg. for "nanage" (me) he would say "nanna" (mine). Grammatical errors like change of tense markers was also evidenced. Sound interjections, word omissions, word repetitions, inadequate responseswere observed. Complex sentences were more difficult to repeat. His sentence structure consisted only of noun + main verb eg. "u:ṭa ma:ḍu" (eat food). The productions were dominated by nouns with absence of pronouns, auxiliaries, prepositions. There were very few verbs but absence of inflected verbs was noticed. He produced syntactically incomplete sentences, eg. "mane matte ka:ru..." (house and car).

Mr.S had a MLU of 2. Phonemic errors, incomplete attempts, sound interjections, phrase omissions were seen in repetitions. Again grammatical errors were noticed as in earlier subjects. The productions were dominated by nouns and open class words. Pronouns like "avaru" (those) and verbs like "ma:ḍu" (do) were rarely present with absence of inflected verbs. Other structures like prepositions, auxiliaries were absent. Thus his utterances were not syntactically well formed eg.'nainu madu..." (I do).

Mrs.V had a MLU of 2. Again she showed phonemic errors and related words eg. for "kappu" (cup) she said "tatte" (saucer). She showed sound interjections, phrase omissions, and inadequate responses for repetition of sentences. She omitted pronouns and inflected verbs. Again showed a difficulty in repeating complex sentences. Her primary sentence structure was that of noun + main verb and showed dominance of nouns, eg. "vinuta hogi..." (vinuta go). Instead of saying T she said her name and this revealed difficulty in production of pronouns. Again nouns dominated the productions with non-inflected verbs and other structures rarely being present.

Thus when summing up the results seen in Broca's Aphasics, it was seen that their MLU ranged from 2-3. And in general, while repeating, phonemic errors, omissions, interjections were observed. All of them showed grammatical error of changing the past tense marker to present tense marker.

The basic sentence structure seen was that of noun + main verb. When MLU was more, the structure was noun + adjective + main verb. When MLU was less the main grammatical structures were nouns with very few verbs. There was dearth of other structures like inflected verbs, prepositions, auxiliaries. But in one subject whose MLU was more, he produced more variety of grammatical structures like inflected verbs, adjectives etc. So we can conclude that there is correlation between MLU and the complexity of syntactic structures an aphasic produces i.e. more the MLU, more complex sentence, aphasic would produce. But, as a group, Broca's aphasics showed abundance of nouns in their

utterances with reduction of other syntactic structures. Another observation was that use of intonation to express emotion was preserved in spite of reduced syntactic complexity.

The above finding of, nouns being easier to produce for Broca's aphasics has been reported earlier by many investigators like Meyerson and Goodglass (1972), Carter (1968), Saffranet al. (1980 b), Tesak (1994) etc. All of them even report that other structures like verbs, prepositions, auxiliaries etc. are more difficult to produce for Broca's aphasics. This may be attributed to Broca's aphasics' lack of access to such syntactic structures. They even suffer some degree of lexical impairment which could also affect their ability to produce these more complex syntactic structures. Thus they might have word finding problems which lead to difficulty in production of such words.

Another reason for less complex utterances could be compensation for the motoric disability. It would be easier to use only content words to convey the message rather than have even function words in the sentence. This has been earlier referred to as "law of economy" (Meyerson and Goodglass, 1972). Here the person uses telegraphic speech to transmit a message because of motoric disability as a result of lesion.

Inflected verbs, prepositions and auxiliaries have been seen to be more difficult to access to. This could be related to less frequent usage of these words. According to Lapointe (1983) these inflected and transformed morphemes have "elevated thresholds" and are less

accessible. They stated that such words have higher thresholds and activation for these words is difficult. Nouns are seen to have lower thresholds so are frequently present in aphasic production.

b) **Anomic Aphasic**

In anomic aphasic subject, Mr.T,the MLU ranged from 3.5-4. He was able to repeat all the sentences. But he changed the past tense marker to present tense marker in one instance.

Eg. He said "ivattu" (today) for "ninne" (yesterday).

His basic sentence structure was noun/pronoun+adjective+verb

Eg. "avanu doḍḍa huḍuga" (He is a big boy).

Again sentences contained more of nouns but his sentences were more well formed than those seen in Broca's aphasics. His productions contained more open class words with inflected verbs and even auxiliaries being present. But he did not produce any embedded structures. Adjectives were more abundant than prepositions. His utterances rarely contained first person pronouns and adverbs.

Thus on comparing his productions with those of Broca's aphasic, he used more variety of structures. As his MLU was more, he showed increased complexity of syntactic structures. But his sentences showed presence of semantic paraphrasia like for "kurʧi" (chair) he said "adu kuḷitukoḷḷokke" (for sitting)". This could be attributed toword finding problem in this anomic subject.

Similar results have been showed by Saffran et al. (1984) and Berndt et al. (1997). It has been seen in those studies, that anomics produced more variety of syntactic structures. They are again seen to have more difficulty producing verbs, preposition as compared to nouns. As a word class, adjectives are seen to be more preserved in anomic aphasics than prepositions (Carter, 1968) and this result is similar to what is seen in the above anomic case.

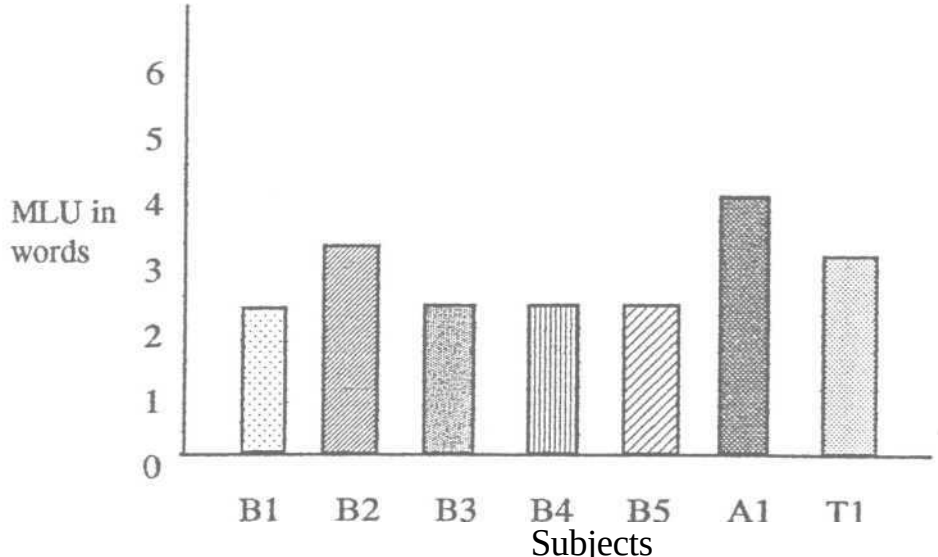
c) **Transcortical Sensory Aphasic**

Mrs.S, the transcortical sensory aphasic had a MLU of 3. Her repetitions did not show any errors. Her sentence structure was that of Noun+adjective+verb. Eg. "avaḷu sariya:gi ma:ḍutta:ḷe" (She does properly). Again open class words like nouns were abundant in her production. Her production showed verbs but inflections were rarely present. Again MLU correlated well with the variety of structures present. These kinds of findings support the findings of studies by Carter (1968), Saffran et al. (1984). But compared to anomics the variety of syntactic structures was reduced. Anomic aphasic showed presence of pronouns and adverbs but these structures were absent in Transcortical sensory subject.

Now if the aphasics have to be put in a hierarchy of complexity of syntactic production it would be Broca's, transcortical sensory and Anomic aphasic. Broca's aphasics produced least complex structure followed by transcortical sensory which was followed by Anomic. Anomic subject's MLU was highest and his productions showed more

variety of syntactic structures. Picture description and spontaneous speech samples turned out to be more useful toolsfor data collection. MLU was a measure which correlated significantly with the syntactic complexity of utterances. More the MLU, more was the variety and complexity of syntactic structures produced by subjects.

Inspite of the type of aphasia, grammatical error of changing past tense marker to present or future tense was noticed. Thus past tense marker was seen to be less accessible. This could be attributed to lexical structure of the word, because future tense "nale" (tomorrow) and present tense "ivattu" (today) are more complex in structure than "ninne" which is past tense marker. It could lead to support the hypothesis of "elevated threshold" of some structures i.e. activation of some structures in difficult (Lapointe, 1983). And all the Broca's aphasic subjects showed agrammatic, telegraphic speech. The MLU of all subjects is compared in bar graph 1.



B1-B5 Broca's Aphasics; Al Anomic;Tl Transcortical sensory aphasic.

Bar Graph-1 : MLU for different aphasic subjects.

While the anomic aphasic has the longest MLU,Broca's aphasics have the least. As the graphs reveals the franscortical sensory apahsics fall in between. In terms of the grammatical structures nouns were most accessible. But auxiliaries, inflected verbs, adjectives and adverbs were the least accessible. This is quite evident by considering the frequency with which each structure is produced.

II Syntactic Comprehension

The score of each subject in differeut subsets of LPT is given in Table 3.

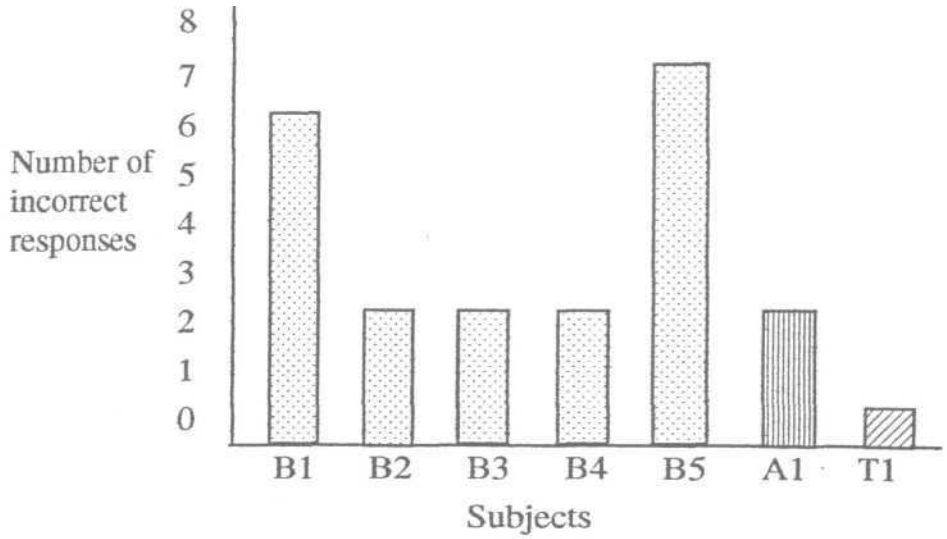
Table 3: Scores of subjects on LPT subsets

SI. No.	Name	Scores on LPT subsets (wrong responses)										
		MP	PL	T	PNG	CM	TIC	ST	P	CCQ	CC	PC
1.	B	6	3	4	4	3	3	4	4	3	3	4
2,	N	2	2	2	4	3	2	1	1	4	2	2
3,	R	2	2	5	4	3	3	5	2	1	5	4
4,	S	2	2	2	6	4	3	2	1	4	3	3
5,	V	7	1	2	4	3	4	5	4	3	3	6
6,	T	2	1	1	4	2	0	0	0	0	0	0
7,	S	0	1	3	2	3	1	1	0	3	3	3

MP Morphophonemic structures; PL Plural markers; T Tense markers; PNG PNG markers; CM Case markers; TIC Transitives, intransitive, causative; ST Sentence type; P Predicate; CCQ Conjuctions, comparatives, quotatives; CC Conditional clause; PC Participal clause

a) Broca's Aphasics

As is seen from the table 3, most of the Broca's aphasics show more errors in comprehension of syntactic structures. As evident from table 3 more errors are seen on morphophonemic structures, tenses, PNG markers, sentence types, case markers, conjunction, comparatives and quotatives, conditional clause and participal clauses. Table-1 shows performance of subjects on morphophonemic structures. In morphophonemic structures, structures with glide insertion, consonant substitution and consonant addition are seen to be difficult. More errors are shown in these structures, in plural forms, usual plural form of "gaḷu" is correctly identified. But they are not able to comprehend the mass nouns and accepted the forms like "ni:rugaḷu" (water) as correct. In tenses/uture and past tenses were difficult to recognize. This is because generally irregular future tense markers are seen in Kannada which are more difficult to access.



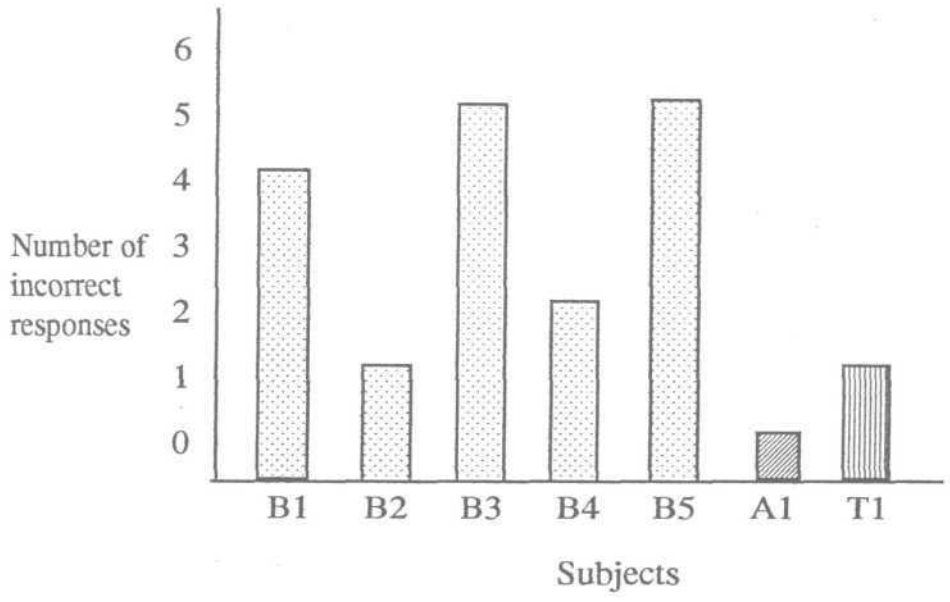
B1 - B5 Broca's Aphasics; A1 Anomic; T1 Transcortical Sensory Aphasic

Bar Graph 2 : Incorrect responses for morphophonemic structures

In PNG markers, Broca's aphasics had difficulty to judge agreement between person and number/gender. The showed more problem in comprehending singular masculine markers.

The structures which were more difficult for Broca's aphasics to comprehend were ablatives, acquisitive and dative case markers, eg. "angadiyinda (from the shop), pennina (of the pen), melakke" (to the top).

In next section causatives were seen to be more difficult to comprehend. Eg. maguvannu ma:lagisu" (put the child to sleep). In sentence types "yes-no questions" were compratively more easy to comprehend than affirmative and negation sentence types. Bar graph-3 compares performance for this aspect.



B1-B5 Broca's Apahsics; A1 Anomic; T1 Transcortical Sensory Aphasics

Bar Graph 3 : Incorrect responses for sentence types

In predicates, pronominal constructions like "i:pustaka nannadu" (this book is mine),were difficult to comprehend than adjectival constructions like "avara na:ji doḍḍadu" (their dog is bigger). In next section, quotatives and comparatives were more difficult than conjuctions. In conditional clauses, complex conditional clause and modal were difficult for them to comprehend. In participal clause, negative relative and relative participles were seen to be difficult to comprehend.

The results support the previous findings that agrammatic speakers have comprehension deficits as well, as reported by Zurif and Caramazza(1976),Goodenough et al.(1977),Pierce etal. (1990). From the present study, it can be concluded that agrammatic listeners are unable to make full use of the function words present in sentence to comprehend the sentence. It can be seen that they violate the unity between noun and verb phrases. That is they are not able to utilise information provided by different grammatical markers and they just use key words in a sentence to understand the sentence.

b) **Anomic Aphasic**

In Mr.T, anomic aphasic, it was seen that the number of errors were lesser compared to Broca's aphasic group. The more number of errors were seen in PNG marker, morphophonemic markers, case markers, plural markers, tense markers. These are again categories which contribute to the meaning of the sentence they could not appreciate the relation between these and content words in the sentence which leads to

an incorrect interpretation. Above findings are in accordance with those of Goodglass et al. (1970). They found that anomic aphasics were severely impaired on the task of word comprehension but when it came to sentence comprehension, anomics did better than Broca's aphasics. This may be attributed to phonological lexical impairment in anomics which affected word comprehension. It is generally seen that anomics have problem in comprehending single words due to lexical impairment. But when it comes to sentences, anomics show better comprehension than on words.

c) **Transcortical Aphasic**

The subject with transcortical sensory aphasia i.e. Mrs.S. showed fewer errors when compared to Broca's subject but more errors as compared to anomic subject. She showed more errors in tenses, case markers, conditional and participal clause. Again she was seen to follow same strategy as anomics in comprehension. Similar results have been shown by Goodenough et al. (1977) and Goswami (1996). They also found that the comprehension of transcortical sensory aphasic is not as good as that of anomics. This could be attributed to more generalised damage in such subjects compared to anomics in terms of major language areas.

This suggests a trend in comprehension from poorest to best in the aphasic group i.e. Broca's, Transcortical sensory, Anomic. Thus Broca's having poorest comprehension followed by transcortical sensory and then by anomic. In comprehension there was not any specific pattern

production of single words followed by inclusion of these words in phrases and sentences. This may not help the aphasics in improving syntactic skills while specific syntactically oriented approaches would be of more help.

Thus to summarise the results of this study, one can draw following conclusions :

a) In production, MLU correlated well with the structural complexity of sentences produced by aphasics, i.e. the greater the syntactic complexity, the longer was the MLU and vice-versa. MLU was least for Broca's aphasic followed by transcortical sensory aphasic and highest for anomic patient.

b) In terms of comprehension, similar trend was seen. Here also anomics got more scores followed by transcortical sensory aphasics while Broca's aphasics got least Usually case markers, morphophonemic structures conditional clause, sentence type were very difficult to comprehend for all types of aphasics.

c) There was no qualitative distinction (i.e. types of errors) between comprehension errors seen in different types of aphasics. They just differed quantitatevely (the number of errors).

d) There was a correlation between syntactic production and comprehension as the trend was same in both. Subjects with reduced MLU had poor comprehension compared to subjects with better MLU. MLU turned out to be a good predictor of syntactic comprehension as well.

SUMMARY AND CONCLUSION

The present study aimed at obtaining a clinical picture of syntactic abilities of aphasics. This was done in order to explore and identify the syntactic deficits which could lead to differentiation of different aphasic syndromes.

The study aimed at getting information on: /

1) The kind and nature of syntactic deficits seen in aphasics.
2) The relation between syntactic comprehension and production in aphasics.
3) Underlying processes which may lead to failure in syntactic comprehension and production.
4) The insight into the remediation procedures specifically for such syntactic deficits.

The subjects taken up for the study were seven aphasics (five Broca's, one anomic, one transcortical sensory) in age range of twenty six to sixty five years. Five of the subjects were males and two were females. None of the subjects had any auditory or visual problems. Syntactic production was evaluated for sentence repetition (Chengappa, 1991, Gayathri and Thirumalai, 1988), picture description of colour version of WAB picture (Kertesz and Poole, 1974) and conversational and spontaneous speech sample using BDAE format (Kaplan and Goodglass, 1972). The mean length of utterance (Brown, 1970) and the nature of syntactic structures produced were evaluated. Repetition was evaluated using a format by Li and Williams (1990). Spontaneous speech

and picture description was analysed quantitatively using format by Saffran et al. 1989; syntactic comprehension was evaluated using syntax section of LPT (Karanth, 1980, 1984). The responses were evaluated for correctness.

Results revealed the following :

i) Aphasics showed specific pattern in production errors with Broca's having more errors, transcortical sensory less and anomics the least. The MLU also showed similar trend. Most of aphasic utterances contained nouns in abundance with lack of inflected verbs, auxiliaries, adverbs and prepositions. As MLU increased syntactic complexity of a sentence increased and variety of syntactic structures used also increased.

ii) In comprehension too, similar pattern was seen. The case markers, sentence types and morphophonemic structure were seen to be difficult for most of aphasics.

iii) The aphasic groups, on comprehension tests differed in terms of only quantity of errors. There was no specific pattern of errors for specific aphasia types with respect to syntactic comprehension. These however, need to be further explored.

iv) MLU correlated with syntactic comprehension as well. There was correlation between comprehension and production of syntax. Subjects with longer MLU comprehended complex utterances and vice versa.

v) These results highlight the importance of therapy techniques specifically for syntactic deficits in aphasics. So therapy techniques like Mapping Therapy (Schwartz, 1994) would help in remediating these specific syntactic errors.

Future Implications for Research

Some more aphasia types could be included in order to get more information.

The syntactic processing in aphasics could be evaluated using more objective tools like auditory evoked potentials.

Assessment material can be developed to quantitatively evaluate the syntactic production in Indian languages.

The syntactic performance could be compared in native and non- native languages used by aphasics.

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GLOSSARY

Ambiguity : It refers to a word or sentence which expresses more than one meaning An analysis which demonstrates the ambiguity in a sentence is said to disambiguate the sentence.

Animate *A* term used in grammar, used to refer to a subclass whose reference is to persons and animals, as opposed to inanimate entities and concepts.

Antecedent Used for a linguistic unit to which a later unit in the sentence refers. In particular, personal and relative pronouns are said to refer back to their antecedents.

Argument *A* term used to refer to the relationship of a name to the simple preposition of which it is a part. The boy is naughty, the boy is an argument of the preposition.

Blends *A* process found in the analysis of grammatical and lexical constructions, in which two elements which don6t normally co-occur, according to the rules of language, come together within a single linguistic unit.
Eg.BrHnch - breakfast and lunch.

Bound *A* term used as part of the classification of morphemes opposed to free.

Branch(ing) *A* term used in linguistics to refer to the descending linear connections which constitute the identity of "tree diagram.

Case grammar An approach to grammatical analysis in which sentences are explained on basis of deep structures.

Clause Units of grammatical organization smaller than a sentence.

Cleft Sentence *A* construction where a single clause has been divided into two separate section, each with its own verb.

Diacritic markers These are used in order to specify particular phonemes in I.P.A. eg. for a long/a/ it is written as /a:/ in IPA.

Embed/ding,-ded Here one sentence is included in another.

Functor Term used for words and bound morphemes which are largely of grammatical use eg. articles, prepositions etc.

Gap Refers to absence of a linguistic unit at a place in a pattern of relationships where one might have been expected.

Immediate constituent Term which refers to major divisions that can be made within a syntactic construction at any level.

Inflection Inflectional affixes signal grammatical relationships, such as plural, past tense and possession and donnt change grammatical class of stems to which they are attached.

Locative This term refers to the form taken by a word, usually a noun or pronoun, when it typically expresses the idea of location of an action.

Mean Length of utterance A measure introduced by Roger Brown (1952) which computes the length of an utterance in terms of morphemes.

Parsing This term refers to exercise of labelling grammatical elements of single sentences.

Phmrasal verb A type of verb consisting of a sequence of a lexical element plus one or more particles, eg. come in, get up.

Trace It refers to a formal means of marking the place a constituent once held in a derivation, before it was moved to another position by transformational operation.

Tree A two dimensional diagram used as a convenient means of displaying the internal hierarchial structure of sentences as generated by a set of rules.

APPENDIX-A

CONVERSATIONAI AND EXPOSTIORY SPEECH

Conduct informal exchange, incorporating suggested questions, to elicit as many of the desired responses as possible. Record verbatim. Tape record, if possible.

a. Response to greeting. (Q. "HOW ARE YOU TODAY?" or equivalent):

b. Response with "yes" or "no." (Q. "HAVE YOU EVER BEEN IN THIS HOSPITAL BEFORE?" or "HAVE I TESTED YOU BEFORE?"):

c. Response with "1 think so," or equivalent. (Q. "DO YOU THINK WE CAN HELP YOU?" or ". . . HAVE HELPED YOU?"):

d. Response with "I don'l know" or equivalent. (Q. "WHEN ARE YOUR TREATMENTS GOING TO BE FINISHED?"):

e. Response with "I hope so" or equivalent. (Q. "BEFORE TOO LONG LETS HOPE. WHAT DO YOU SAY?"):

f. "What is your full name?":

g. "What is your full address?" (Accept as correct any response that includes street and number or street and city.):

h. *Open-ended conversation:* In order to elicit as much free conversation as possible, it is suggested that examiner start with familiar topics such as, "What kind of work were you doing before you became ill?" and "Tell me what happened to bring you to the hospital." Encourage patient to speak for at least *10 minutes*, if possible. (Minimize use of "yes"-"no" questions and probing for specific facts.) If tape recording is not used, record as much as possible verbatim.

i. Presentation of picture. Show I he lest pic line and Icll palirnl: "Tell everything you see going on in lliis picture." I'oinl to neglected features of the picture and ask for elaboration if patient's response is skimpier than his apparent potential. A minute is usually enough lime.

Cookie Thef! (Card I)

APPENDIX-B

APPENDIX C

Sentence Repetition

1. kamala barutta:le.
2. Avaru o:didaru.
3. Rama ho:gutta:ne.
4. Hasugalu malagidave.
5. Ninu barutti:ya?
6. Bekku no:duttade.
7. Na:nu barutte:ne.
8. Avaru na:le barutta:re.
9. Sankara ninne banda.
10. Si:la monne bandalu.
11. Maguvannu malagisu.
12. Pensil mattu ha:le kodu.
13. Ra:dha o:dilla.
14. Ivanu doḍḍa huduga.
15. Lata tirugi u:ta ma:dta:le.
16. Pa:pa a:ta adbahudu.
17. Nanage hoṭṭe hasiva:gtade.
18. Gouri o:didre pa:sa:gta:le.
19. Idakkinta a: mara doḍḍadu.
20. Na:vibbaru ho:gi avalannu no:do:na.

B. Plural Forms

Sl. No.	Test Item	Stimulus Modality Verbal	Graphic	Subject's Response Verbal	Graphic	Gestural	Accuracy of Response
1.	ಹುಡುಗಿಯರು.						
2.	ಅಜ್ಜಗಳು						
3.	ಅನ್ನ.						
4.	ವನರು.						
5.	ಮುರಗಳು.						
6.	ನೀರುಗಳು.						
7.	ಗಂಡಸರು.						
8.	ಪುಸ್ತಕರು.						
9.	ಹೆಂಗಸಂದಿರು.						
10.	ಅಕ್ಕಂದಿರು.						

Maximum Score 5
Patient's Score———

C. Tenses

Sl. No.	Test Item	Stimulus Modality Verbal	Graphic	Subject's Response Verbal	Graphic	Gestural	Accuracy of Response
1.	ನೀವು ಬರುತ್ತಾ ಇರಿ.						
2.	ಅವರು ನಾಳೆ ಬಂದರು.						
3.	ಶಂಕರ ನಿನ್ನೆ ಹೋದ.						
4.	ನೀನು ಈಗ ತಾನೇ ಬರುವೆ.						
5.	ಅಮ್ಮ ನಾಳೆ ಇಷ್ಟು ಹೊತ್ತಿಗೆ ಬಂದಿದ್ದರು.						
6.	ನಾನು ಸ್ಕೂಲಲ್ಲಿ ಇದ್ದೇನೆ.						
7.	ಅವನು ಕಳೆದ ವಾರ ಬಂದಿದ್ದ						
8.	ಸೀತೆ ಮೊನ್ನೆ ಬರುತ್ತಾಳೆ.						
9.	ನಾನು ಸ್ಕೂಲಲ್ಲಿ ಇರುತ್ತಾ ಇರುತ್ತೇನೆ.						
10.	ನಾನು ನಾಳೆ ಮನೆಯಲ್ಲಿ ಇರುತ್ತೇನೆ.						

Maximum Score 5
Patient's Score———

APPENDIX-D

SECTION II : Syntax

Instructions : Instruct the subject that the following list of words and sentences contains both correct and incorrect forms. Ask the subject to listen carefully and indicate whether each item is correct or not. Illustrate with one or two examples if need be. Read the items in the list one by one. Repeat once if necessary. If the subject fails to respond; give him the test items in the written form. Accept correction once. Score for each accurate response in subsections A, B, C and D and 1 for each accurate response in subsections E, F, G, H, I, J and K. Make a note of the stimulus modality used, and also the modality in which the subject responds.

A. Morphophonemic Structures :

Sl. No.	Test Item	Stimulus Modality		Subject's Response			Accuracy of Response
		Verbal	Graphic	Verbal	Graphic	Gestural	
1.	ಎಡಗೈ						
2.	ಪೈಸೆಯಲ್ಲಿ						
3.	ಹುಡುಗನಲ್ಲಿ						
4.	ದಾರೀಲಿ						
5.	ನಿಜಾಯಾ						
6.	ಕಲ್ಲುವನ್ನು						
7.	ಮನೆಯಲ್ಲಿ						
8.	ಕಾಡುಗೆ						
9.	ಬೀದಲ್ಲಿ						
10.	ನೀರಲ್ಲಿ						
11.	ಮಗುವನ್ನು						
12.	ಊರುವಲ್ಲಿ						
13.	ಕೆಳಗುಟಿ						
14.	ಬಲದಿವಿ						
15.	ಮರಲ್ಲಿ						
16.	ನಿಜವಾ						
17.	ಆಜ್ಞಲ್ಲಿ						
18.	ಊರಲ್ಲಿ						
19.	ಕೆಳದುಟಿ						
20.	ಪುಸ್ತಕವಲ್ಲಿ						

Maximum Score 10
Patient's Score———

B. Plural Forms

Sl. No.	Test Item	Stimulus Modality Verbal	Stimulus Modality Graphic	Subject's Response Verbal	Subject's Response Graphic	Subject's Response Gestural	Accuracy of Response
1.	ಹುಡುಗಿಯರು.						
2.	ಅಜ್ಜಗಳು						
3.	ಅನ್ನ.						
4.	ವನರು.						
5.	ಮುರಗಳು.						
6.	ನೀರುಗಳು.						
7.	ಗಂಡಸರು.						
8.	ಪುಸ್ತಕರು.						
9.	ಹೆಂಗಸಂದಿರು.						
10.	ಅಕ್ಕಂದಿರು.						

Maximum Score 5
Patient's Score———

C. Tenses

Sl. No.	Test Item	Stimulus Modality Verbal	Stimulus Modality Graphic	Subject's Response Verbal	Subject's Response Graphic	Subject's Response Gestural	Accuracy of Response
1.	ನೀವು ಬರುತ್ತಾ ಇರಿ.						
2.	ಅವರು ನಾಳೆ ಬಂದರು.						
3.	ಶಂಕರ ನಿನ್ನೆ ಹೋದ.						
4.	ನೀನು ಈಗ ತಾನೇ ಬರುವೆ.						
5.	ಅಮ್ಮ ನಾಳೆ ಇಷ್ಟು ಹೊತ್ತಿಗೆ ಬಂದಿದ್ದರು.						
6.	ನಾನು ಸ್ಕೂಲಲ್ಲಿ ಇದ್ದೇನೆ.						
7.	ಅವನು ಕಳೆದ ವಾರ ಬಂದಿದ್ದ						
8.	ಸೀತೆ ಮೊನ್ನೆ ಬರುತ್ತಾಳೆ.						
9.	ನಾನು ಸ್ಕೂಲಲ್ಲಿ ಇರುತ್ತಾ ಇರುತ್ತೇನೆ.						
10.	ನಾನು ನಾಳೆ ಮನೆಯಲ್ಲಿ ಇರುತ್ತೇನೆ.						

Maximum Score 5
Patient's Score———

D. PNG Markers

Sl. No.	Test Item	Stimulus Modality Verbal	Stimulus Modality Graphic	Subject's Response Verbal	Subject's Response Graphic	Subject's Response Gestural	Accuracy of Response
1.	ನೀನು ಮಲಗುವೆ.						
2.	ಕಮಲ ಬರುತ್ತಾಳೆ.						
3.	ಅವರು ಓದಿವ.						
4.	ಪಸು ಬರುತ್ತಾನೆ.						
5.	ಅವ್ಳ ಮಲಗಿದ್ದಪ್ಪ.						
6.	ನಾವ್ಳ ನೋಡುವಳು.						
7.	ಅವರು ಹೋಗುತ್ತಾರೆ.						
8.	ನೀನು ಬರುತ್ತಾನೆ.						
9.	ಅವು ಮಲಗಿತು.						
10.	ಗಣೇಶ ಓಡಿದಳು.						
11.	ಅವ್ಳ ಹೋಗುತ್ತೀರಿ.						
12.	ನೀವ್ಳ ನೋಡುವರು.						
13.	ನೀನು ಓಡಿದೆ.						
14.	ನಾವ್ಳ ಮಲಗಿರಿ.						
15.	ನೀವ್ಳ ಹೋಗುತ್ತೀಯೆ ?						
16.	ಸೀತೆ ಓಡಿದಳು.						
17.	ಅವು ನೋಡುವ್ದು.						
18.	ನಾನು ಬರುತ್ತೇನೆ.						
19.	ನಾವ್ಳ ಹೋಗುತ್ತೇವೆ.						
20.	ಸೀತೆ ನೋಡುವನು.						

Maximum Score 10
Patient's Score———

E. Case Markers

Sl. No.	Test Item	Stimulus Modality Verbal	Stimulus Modality Graphic	Subject's Response Verbal	Subject's Response Graphic	Subject's Response Gestural	Accuracy of Response
1.	ಮುಮುಗನಿಗೆ ಹೇಳಿದೆ.						
2.	ಮೇಳಕ್ಕೆ ಗೊಬೆ.						
3.	ಮ್ನಿನ ಕಾಗದ ಬರಿ.						
4.	ಅಂಗಡಿಯಿಂದ ತಂದದ್ದು.						
5.	ಕೆಲಸದ ಹುಡುಗ.						
6.	ಇಚ್ಛೆಯಿಂದ ಮನೆಯಲ್ಲಿ ಕಟ್ಟಿಸಿದರು.						
7.	ಪುಸ್ತಕ ಅಣ್ಣನನ್ನು ಕೊಟ್ಟೆ.						
8.	ಮರವನ್ನು ಉರುಳಿಸು.						
9.	ಟೀನಿನಲ್ಲಿ ಇದ್ದೆ.						
10.	ಬಸ್ಸಿನಿಂದ ಹೋದೆ.						

Maximum Score 10

Patient's Score———

F. Transitives, Intransitives and Causatives

Sl. No.	Test Item	Stimulus Modality		Subject's Response			Accuracy of Response
		Verbal	Graphic	Verbal	Graphic	Gestural	
1.	ಹಾಲಿಗೆ ನೀರು ಬೆರಸಬೇಡ						
2.	ಅಕ್ಕಸಾಲಿ ಮಾಡುತ್ತಾನೆ						
3.	ಹುಡುಗಿ ಓದುತ್ತಾಳೆ						
4.	ನಾನು ಹಣ್ಣನ್ನು ತಿನ್ನುತ್ತೇನೆ						
5.	ಅಜ್ಜಿ ಕಡೆಯುತ್ತಾಳೆ						
6.	ಮನು ನಿದ್ದೆ ಮಲಗುತ್ತದೆ						
7.	ಅವರು ನಮ್ಮಿಂದ ಕೆಲಸ ಮಾಡುತ್ತಾರೆ						
8.	ಮಗುವನ್ನು ಮಲಗಿಸು						
9.	ನಾವು ನಿಮ್ಮಿಂದ ಪಾಠ ಓದಿಸುತ್ತೇವೆ						
10.	ಅವನು ಮಗುವಿಗೆ ತಿನ್ನುತ್ತಾನೆ						

Maximum Score 10
Patient's Score———

G. Sentence Types

Sl. No.	Test Item	Stimulus Modality		Subject's Response			Accuracy of Response
		Verbal	Graphic	Verbal	Graphic	Gestural	
1.	ಇದು ಬೆಂಗಳೂರು ಅಲ್ಲಾ						
2.	ಅವರ ಜವಾಬ್ದಾರಿ ನಾವೇ ತೋಡಿಕೊಳ್ಳುತ್ತಾರೆ						
3.	ಅವನು ಸಿನಿಮಾಗೆ ಹೋಗೋಣ						
4.	ಇದು ನನ್ನ ಶಾಲೆ						
5.	ನೀನು ಆ ಕೆಲಸ ಮಾಡಬಾರದು						
6.	ನಾವು ಹಾಡು ಹೇಳಲಿ						
7.	ಅವಳು ಕೋತಿಯನ್ನು ನೋಡಿ ನಕ್ಕಳು						
8.	ಬಾವಿಯಲ್ಲಿ ನೀರು ಇಲ್ಲವಾ ?						
9.	ನಿಮಗೆ ಕನ್ನಡ ಗೊತ್ತಾ ?						
10.	ಅವನು ಕಾಫಿ ಕುಡಿ						

Maximum Score 10
Patient's Score———

H. Predicates

Sl. No.	Test Item	Stimulus Modality Verbal	Stimulus Modality Graphic	Subject's Response Verbal	Subject's Response Graphic	Subject's Response Gestural	Accuracy of Response
1.	ಈ ಪುಸ್ತಕ ನನ್ನದು						
2.	ಈ ಲಂಗ ಕಮಲ						
3.	ನಿನ್ನ ಕೋಣೆ ಯಾವ ?						
4.	ಅವರ ನಾಯಿ ದೊಡ್ಡದು						
5.	ಆ ಪೆನ್ನು ಅವನ						
6.	ಜೋರಾಗಿ ಓಡಿ ಅವರ ಕುದುರೆ						
7.	ನಿನ್ನೆ ಹಾಡಿದ್ದು ನನ್ನ ತಂಗಿ						
8.	ಅವರ ಮನೆ ಯಾವುದು ?						
9.	ಆ ಬೆಕ್ಕು ಚಿಕ್ಕ						
10.	ಆ ಸೀರೆ ಅಮ್ಮನದು						

Maximum Score 10
Patient's Score———

I. Conjunctions, Comparatives and Quotatives

Sl. No.	Test Item	Stimulus Modality Verbal	Stimulus Modality Graphic	Subject's Response Verbal	Subject's Response Graphic	Subject's Response Gestural	Accuracy of Response
1.	ರಾಮನೂ ಶಂಕರನೂ ಸ್ಕೂಲಿಗೆ ಹೋದರು						
2.	ನನ್ನ ಅಣ್ಣ ಮಕ್ಕಳು ಬಂದರು						
3.	ಗಣೇಶ ಮತ್ತು ರಮೇಶ ಹೋದಾಗ ಸೀತೆಯು ಕರಕೊಂಡು ಹೋದರು						
4.	ಪೆನ್ಸಿಲ್ ಅಥವಾ ಪೆನ್ನು ಕೊಡು						
5.	ಗಿರೀಶ ಸುರೇಶನಿಗಿಂತ ಚಿಕ್ಕವನು						
6.	ಸುಧಾಗೆ ಲಲಿತ ಉದ್ದವಾಗಿದ್ದಾಳೆ						
7.	ಮೇಷ್ಟ್ರು ಪಾಠ ಮಾಡುತ್ತೇನೆ ಅಂತ ಹೇಳಿದರು						
8.	ಈ ರಾಜ್ಯಕ್ಕೆ ಮೈಸೂರು ಪೆನಿತ್ತು						
9.	ಭಾರತಿ ಸಂಜೆ ಮಳೆ ಬರುತ್ತದೆ ಹೇಳಿದಳು						
10.	ಲಕ್ಷ್ಮಿ ಎಂಬುವಳು ಬಂದಿದ್ದಳು						

Maximum Score 10
Patient's Score———

J. Conditional Clauses

Sl. No.	Test Item	Stimulus Modality Verbal	Graphic	Subject's Response Verbal	Graphic	Gestural	Accuracy of Response
1.	ನೀನು ಬೇಗ ಹೋದರೂ ಬಸ್ಸು ಸಿಗುತ್ತಿರಲಿಲ್ಲ						
2.	ನೀನು ತಿನ್ನ ಇದ್ದರೆ ದೊಡ್ಡವನಾಗುವುದಿಲ್ಲ						
3.	ಅವನು ಮನೆಗೆ ಬಂದರೆ ದುಡ್ಡು ಕೊಡುತ್ತೇನೆ						
4.	ಅಂಗಡಿಯವನಿಗೆ ಹಣ ಕೊಟ್ಟು ಅವನು ಪುಸ್ತಕ ಕೊಡುತ್ತಾನೆ						
5.	ನೀವು ಹೇಳಿದರೆ ಅವರು ಮಾಡಿದರು						
6.	ಇವತ್ತು ದುಡ್ಡು ಸಿಕ್ಕಿದರೆ ನಾವು ಮಾರ್ಕೆಟ್ಟಿಗೆ ಹೋಗುತ್ತೇವೆ						
7.	ಅವರು ಮೊದಲೇ ಹೇಳಿದ್ದರೆ ಮಾಡುಬಹುದಿತ್ತು						
8.	ನೀನು ಮನೆಗೆ ಬಂದ ಹಣ್ಣು ಕೊಡುತ್ತಿದೆ						
9.	ನಾನು ಬೇಲೂರಿಗೆ ಹೋದ ಶಿಲಾಬಾಲಿಕೆಯನ್ನು ನೋಡಲಿಲ್ಲ						
10.	ಭಾರತಿ ಬರದೆ ಇದ್ದರೆ ನಾನು ಬೆಂಗಳೂರಿಗೆ ಹೋಗುವುದಿಲ್ಲ						

Maximum Score 10
Patient's Score———

K. Participial Constructions

Sl. No.	Test Item	Stimulus Modality Verbal	Graphic	Subject's Response Verbal	Graphic	Gestural	Accuracy of Response
1.	ನಿನ್ನನ್ನು ನೋಡಲೆ ಬಹಳ ದಿನವಾಯಿತು						
2.	ನೀನು ಛೇರಾಗವ ಹುಡುಗನಾ ?						
3.	ಚಟ್ಟೆ ಬಿಗಿಯು ಆಗದ						
4.	ನಾನು ಇವತ್ತು ಕಾಫಿ ಕುಡಿ ತಿಂಡಿ ತಿಂದೆ						
5.	ಇದು ನಾನು ಓದೂ ಸ್ಕೂಲು						
6.	ವೀಣಾಯ ಮಾಡುವವರು ರೈತರು						
7.	ಅವಳು ಮೈಸೂರಿಗೆ ಬಂದು ಕನ್ನಡ ಕಲಿಯುತ್ತಾಳೆ						
8.	ಔಷಧಿ ಕುಡಿದೆ ಜ್ವರ ಹೋಗುವುದಿಲ್ಲ						
9.	ನಾನು ಇಷ್ಟಪಟ್ಟ ಸಿನೇಮಾ ಶಂಕರಾಭರಣ						
10.	ರಾಮಣ್ಣ ಯಾವತ್ತಾ ಬಂದವನು ಇವತ್ತು ಯಾಕೆ ಬಂದ ?						

Maximum Score 10
Patient's Score———

APPENDIX-E

RULES FOR COMPUTATION OF MEAN LENGTH OF UTTERANCE (MLU)

(1) The first 100 utterances were transcribed . Utterance during story narration was mandatorily included in the count.

(2) Unintelligible or partially intelligible utterances were omitted from the count.

(3) Stutterings (hark by repeated effort) at a single word) and all repetitions were counted as one word. Repetition for emphasis should be counted as two words.

(4) Fillers such as mm or oh are not counted, but no, yes etc. were counted as words.

(5) All compound words were counted as two words if the child used the constituent morphemes separately in two different linguistic context - Eg.Birthday.

(6) All inflections (possession, plural, tenses) were counted as separate morphemes.

(7) Imitations and elliptical answers to questions which gave the impression that the utterance would have been more complete if there had been no eliciting questions (Eg. What is that? 'My box[1]
were counted.

(B) Rote passages such as nursery rhymes, songs or prose passages which have been memorized and which may not be fully processed linguistically by the child were omitted.

(9) All partial utterances which are interrupted by outside events or shift in child's focus were excluded.

(10) MLU was calculated using the following formula:

$$\text{MLU (W/M)} = \frac{\text{Number of words/morphemes}}{100}$$

APPENDIX-F

Description of Repetition Error Categories

Word substitution errors

1. Phonemic error—approximations to the target words with one or more phonemes in error (smail/*snail*).
2. Related words—word is semantically related to the target word (chair/*stool*).
3. Unrelated word—word bears no obvious phonological or semantic resemblance to the target word (clothes/*hands*).
4. Neologism—utterances are neither real words nor phonemic approximations of the target words (stoploggit/*bicycle*).
5. Phonemic attempt—phonemic or syllabic attempt at the target word (bi . . ./*bicycle*).
6. Semantic–phonemic error—real word bears phonemic resemblance to the target word (stair/*chair*).
7. Grammatical error—response deviates from normal only by alteration of grammatical form (girls/*girl*).
8. Perseveration—inappropriate repetition of previous whole word utterances.

Addition errors

9. Word addition—add a single word within target sentence.
10. Phrase addition—add two or more words within the target sentence.
11. Sound interjection—an extraneous sound is added (*uh*).
12. Word interjection—an extraneous word such as *well* is added which is distinct from the words associated with the fluent text.
13. Phrase interjection—an extraneous, parenthetical remark such as *you know* is added, which is distinct from the words associated with the fluent text.

Omission errors

14. Word omission—one word is omitted within the target sentence.
15. Phrase omission—two or more words are omitted within the target sentence.
16. Word transposition—one word is switched with another or out of order in the target sentence.

Revision errors

17. Word revision—correct or incorrect revision at the word level (birth/earth).
18. Phrase revision—the content of the phrase is modified (They say/They heard him).
19. Word repetition—repetitions of single words (I I-I).
20. Phrase repetition—repetitions of two or more words. (They say/They say).

Jargon

21. Real word jargon—string of words which do not resemble the target sentence in content or grammatical structure (makes him money/*down-to-earth*).
22. Neologistic jargon—jargon is composed primarily of neologisms (slingshores forgim/*down-to-earth*).

Paraphrase error

23. Paraphrase—the content is similar to the target but the grammatical structure is drastically altered. (I left work and came home/*I get home from work.*)

Inadequate response

24. Inadequate response—the subject refused to respond.

APPENDIX G
Instructions for Use of the Quantitative System for Scoring Sentence Production

I. Eliciting the sample

A. The target for analysis is a corpus of (minimally) *150 words* that represents the narrative core of patients' attempts to tell a well-known story. Many words spoken by a patient will be excluded from the analysis (see Section III below); thus, it is important to record a relatively extensive sample of speech. Nonfluent patients may require as much as 10–15 min of sustained speaking to achieve this goal.

B. Common *fairytales* or other well-known stories, TV shows, or movie plots are used to elicit the speech samples. These samples provide recognizable targets for analysis and are usually known to the patients. When patients claim not to know a story, they can be reminded using a picture book of the story, from which the printed words have been deleted. Although examiner and patient should talk about

the pictures illustrating the story, the examiner should avoid providing verbal structures for the patient to imitate. The sample should *not* be recorded while the patient is looking at the pictures. After the book has been removed, the patient should be encouraged to tell the story in his/her own words.

C. Examiner's interruptions should be kept to a minimum, and should be limited to general encouragement. ("What happens next?" "Go on.") The use of specific questions that can be answered with a single word should be avoided.

II. Transcription of speech sample

A. English orthography should be used, with the following exceptions:

1. Phonemic paraphasias and neologisms should be transcribed phonetically, except in cases where the patient has a consistent problem with articulation. In such cases, recognizable though misarticulated words should be transcribed as their well-formed equivalents.

2. Interpretable phonemic paraphasias should be given an English gloss, entered below the phonetic transcription, e.g.,

"the /s ɛ p/sisters did not like /sIndI ɝ /"
stepsisters Cinderella

B. Pauses of one second or more should be marked in the text, e.g.,

"Cinderella *2 sec* washed um the *9 sec* floor"

C. Comments and questions by the examiner should be included in the transcript on a new line and clearly marked as examiner's speech.

D. *Punctuation* (including capitalization of sentence-initial words) should *not* be used.

E. *Prosodic contours* should be marked in the text so that they can aid in determining utterance boundaries. Upward-sloping lines are used to indicate rising pitch; downward-sloping lines to indicate falling pitch; and straight lines to indicate no change in pitch. For example, the prosodic markers on the sample

"Cinderella went ball dance prince ask Cinderella dance" suggest that it should be segmented as follows:

"Cinderella went ball / dance / prince ask Cinderella dance" (see Section IV.B. below).

F. *Interpreting "uh."* In many instances, /ə/ is ambiguous. It could represent a nonlinguistic filler ("uh"), or it could represent the determiner "a." Transcribe ambiguous instances conservatively, that is, as "uh"; transcribe as "a" only where the temporal characteristics of the speech pattern contraindicate "uh" (e.g., there is no pause between /c/ and the following N). General characteristics of the patient's speech pattern should be taken into account in making this judgment.

G. The total *time*, including pauses (in minutes), of the speech sample should be recorded, with the time taken by examiner's comments subtracted out. The *number of complete words* spoken by the patient, including recognizable paraphasias, should be counted. Contractions (e.g., "can't", "gotta") should be counted as two words. False starts that result in partial words (e.g., *Cin* Cinderella) should not be counted.

III. Extraction of "narrative words"

All further analysis is based on a corpus ("narrative words") that is assumed to represent the propositional speech that the patient produces *as part of the story*. Excluded from this corpus (crossed out on the transcript) are the following:

A. Neologisms

B. All utterances that appear to be *direct responses* to a specific question by the examiner. The patient's response in the following exchange is *omitted:*

EX: "What did the fairy godmother do with the pumpkin?"
PT: "The fairy godmother turned the pumpkin into a coach."

While the patient's response in the following exchange should be *retained:*

EX: "What happened next?"
PT: "The fairy godmother turned the pumpkin into a coach."

C. All *comments* that the patient makes *on the narrative*, or on the task, e.g., "I can't think of it;" "this is hard."

D. All "*starters*" that the patient uses *habitually* (e.g., "All right . . ."; "all of a sudden . . ."; "and then. . . ."

E. All *conjunctions* (e.g., "and," "but") when they join utterances that are scored as separate Sentences (see Section V.B.1, below). For example, omit *and* from the narrative word count in:

"Cinderella washed the floor *and* she did the laundry"

but retain *and* in

"Cinderella washed the floor *and* did the laundry"

F. All direct discourse markers, such as "*He said*, X", "*The prince said*, Y." (This material will not enter into the analysis.) These words should NOT be omitted when they are integrated into a sentence, as in "*She said* she wanted to go to the ball."

G. All material that is subsequently repaired. Categories of repairs are as follows:

1. *repetitions*—eliminate all but the final occurrence of a repeated word, fragment or sentence, except where repetition is used for emphasis. ([Brackets] indicate material to be omitted):

"[Cinderella wanted] Cinderella wanted"

but

"Cinderella said please please please let me go"

2. *interruptions*—score the completed clause or the more complete fragment:

"[father hates Romeo's] father hates Romeo's father"

3. *amendments*—score amendment only:

"father hates [Romeo's mother] Romeo's father"

4. *elaborations*—score elaborated version only:

"father hates [father] Romeo's father"

H. After all of the items listed in A through G have been removed from the corpus (crossed off on the transcript), the remaining narrative words should be counted. The analysis is based on a corpus of 150 consecutive narrative words, + or − 10 in cases where that number is reached in midutterance.

IV. Segmentation of narrative words into utterances

Words that appear to form a coherent unit are bracketed in the transcript and treated as individual "utterances" for further analysis. In segmenting the sample into utterances, the following factors should be considered:

A. *Syntactic indicators:* Unless there are strong indications to the contrary (e.g., strong prosodic contraindications), a well-formed sentence should be taken to be an utterance.

B. *Prosodic* indicators: Falling intonation suggests (though not invariably) the end of an utterance.

C. *Pauses* may not be a reliable guide to utterance boundaries in patients who produce pauses habitually in what otherwise appears to be the middle of an utterance.

D. *Semantic* criteria cannot be stringently applied in marking the utterance boundaries of aphasic patients' speech, especially when patients appear to misselect lexical items frequently.

All of these factors may be used in segmenting a particular sample. Although primary weight is given to A and B above, the overall pattern of a patient's productions (e.g., pausal patterns, semantic paraphasias) must be considered when bracketing utterances. In all cases, however, utterance boundaries should be drawn conservatively: when in doubt, place boundaries to create shorter rather than longer utterances. For example:

"[Cinderella dropped slipper] *5 sec* [made o'glass]"

V. Scoring procedures (use score sheet, Appendix B)

A. *Utterances* (narrative words only) should be entered onto the score sheet (one to a line) and numbered consecutively.

B. *Utterance types* are designated as follows:

1. "*Sentences*." Utterances scored as sentences, for the purpose of this analysis, must conform to one of the following structural types:

a. *Noun + Main Verb*. These structures need not be semantically coherent: violations of strict subcategorization and selection restrictions should be ignored:

"Cinderella rode the house"
"Cinderella put"

b. *Noun + Copula + Adjective*

"Cinderella is beautiful"

but *not*

"Cinderella beautiful"

c. *Noun + Copula + Prepositional Phrase*

The PP must contain minimally (P NP), in addition to the NV requirement described above, in order for the utterance to qualify as a sentence.

"Cinderella is at the prince"

but *not*

"Cinderella is with"
"Cinderella with the prince"

d. Embedded S's do not count as separate sentences.

2. *Topic-comment structures*. Other proposition-bearing structures that do not meet the above criteria for S will be scored as topic/comment structures. Most of these will be utterances that would qualify as sentences on prosodic and semantic grounds but for the omission of the copula or main verb. Examples of topic-comment types:

"Cinderella very pretty"
"Cinderella in the house"
"Cinderella washerwoman"
"dancing Cinderella and prince"
"party over"

That is, NP-ADJ, NP-PP, NP-NP, NP-adv, and V-NP utterances are potential (not mandatory) candidates for this scoring category. NOTE: Topic-Comment structures are not to be confused with *appositives*, like "Toto the dog," which are typically prosodically marked as such.

3. *Other utterances categories*. NP, VP, etc. (although the prevalence of other sub-sentence fragments was not tabulated in this paper, listing of these structures provides a means of assessing patients' production patterns when sentences are rarely produced).

C. *Word counts* are performed separately for each utterance and entered into the appropriate column on the score sheet. The following word scores are included in the current version of the analysis, and these can be expanded to meet individual needs:

1. *Number of narrative words*. Count the number of words in the utterance, giving one point for each individual word, with the following exception: lexical compounds, like *hot dog*, *bus stop*, *fairy tale*, should be scored as a single word. When in doubt as to the status of a familiar word combination, consult a dictionary. For example, *flower child* qualifies as a lexical compound because it is listed as an entry in *Webster's New Collegiate Dictionary*, but *flower shop*, which is not listed, does not. (Of particular relevance to "Cinderella" samples, *fairy godmother* is not listed in the dictionary, and should be counted as two words.) Contractions, such as "can't," are scored as two words.

2. *Number of Open Class Words*. Sum of nouns, verbs, adjectives, and adverbs, with the following exceptions and inclusions:
   a. Degree and quantificational adverbs without -ly, such as *very, some, seldom, somewhere, all, most*, etc. are classified as closed class words.
   b. Verb particles (e.g., stand *up*) are classified as closed class.
   c. Numerals are considered open class words for the purpose of this analysis. The only exception is *one* when used as a pronoun (e.g., "I saw *one* on the table"). Note that *one*, when modified by a determiner, is counted as open class: "Cinderella was *the one*."
   d. "Be," "do," "have" count as *open class* when they occur as main verb. "Going to," "have to," etc., count as *closed class* when used as AUX as a substitute for "will" and "must," respectively (see 12c, below).
3. *Number of Nouns*. Count all occurrences per utterance (see 8, below).
4. *Number of Nouns Requiring Determiners (NRD)*
   a. Enter number of nouns that *require* determiners for each utterance. Proper nouns, like Cinderella, and plurals in some contexts do not require determiners, e.g., "She had sisters but no brothers." (But note that determiners are required with plural nouns in some contexts: "The sisters got dressed for the ball").
   b. In ambiguous cases (e.g., "sisters" occurring in isolation), do not consider a determiner obligatory. Exclude from this count nouns with *open class* determiners (e.g., *three* girls, *Cinderella's* slipper).
   c. For compound NP's where there is only a single determiner (e.g., "The King and queen"), assume that the second noun in the phrase does not require a determiner.
5. *Number of nouns requiring determiners, with determiners*. Enter the number of nouns requiring determiners (from 4) that occur with a determiner.
6. *Number of Pronouns*. For this score, count personal pronouns only (e.g., "he," "they," "her," "them," "my," "their," "it," "itself," "themselves"). Pronouns that serve a syntactic function, such as "that," "who," "where" introducing a relative clause, should not be counted. However, "that" should be counted when it is used in place of a noun (e.g., "give me that").
7. *Number of Verbs*. Include all verb forms (e.g., infinitive, gerundive), not just main verb. Include "be" as copula, but not as aux:
   "Cinderella *is* in the kitchen" (1 verb)
   and
   "Cinderella *is sitting* in the kitchen" (1 verb)
8. Cases of *ambiguous form class* are resolved as follows:
   a. N vs. V: uninflected morphemes of ambiguous form class, such as *dance*, which occur in isolation, should be interpreted as the most frequently occurring form (e.g., *dance* as a V) unless contraindicated by the context. The criterion for form class frequency is, for the present purpose, order of occurrence in a standard dictionary (e.g., if the first definition is for *dance* (v.) classify *dance* as a verb; if for *dance* (n.), as a noun). Cases where *-ing* forms occur in isolation should be scored as verbs.
   b. V vs. ADJ: ambiguous instances of adjective/passive verb (often with -ed) should be scored as Adj where the context suggests this is appropriate; e.g., "I am *finished*" (adj), "he got *done*" (adj); but "Cinderella is *invited*" (v).
9. *Number of Inflectable Verbs*. Count all verbs, including those occurring outside of sentential or phrasal contexts, which could be inflected. Omit from this count verbs that occur in syntactic contexts which *require* uninflected forms (e.g.; "to—", "did—", "can—", "should—", imperative forms: "clean the floor, Cinderella", etc.) and irregular verb forms which cannot be inflected. The latter include *be* (as main verb) and past tense forms of irregular verbs (e.g., *went, brought*, etc.); however, potentially inflectable tokens of irregular verbs (e.g., *I go; they bring*), as well as inflected tokens of such verbs (e.g., *going, bringing*), are included.

10. *Number of Inflectable Verbs Inflected*. Count number of the above which *DO* occur in inflected form (—s, -ies, -ed, -ied, -ing). Note that the *appropriateness* of a particular inflected form in context is *not* relevant to this count.
11. *Number of Matrix Verbs*. This number will be used as the base for the AUX score. Count main verbs in matrix sentences only. Only in conjoined cases will there be more than one matrix verb.
    "The children were *shouting* and *jumping* when the teacher saw them."
    (Matrix V = 2; *saw* belongs to subordinate clause and is not counted.)
12. *AUX score*. Each AUX element of the matrix verb is assigned a score of +1 point. The total is tabulated as an index of the morphological complexity of the matrix verb. Points are assigned as follows:
    a. *Uninflected main verb*. Assign one point for base form, unchanged from what would occur in the infinitive form (e.g., "they leave"; "he leave"). EXCEPTION: where "be" is used as the main verb, consider "is" to be a base form, along with "be."
    b. *Inflected main verb*. Add one point for any change from base form. No credit is given for agreement, where agreement requires no change from the base form, and no penalty is assigned for failures of agreement:
       "he left" = +2 (+1 main V, +1 tense)
       "he leaves" = +2
       "he leaving" = +2
       "they leave" = +1
    c. *Auxiliary*.
       (1) Each element = +1: Modal (+1) "not" (+1), "have" (+1), tense marker on "have" (+1), "do" (+1), tense marker on "do" (+1), "going to" and "have to" (when equivalent to "will," and "must," respectively, +1), inflection on main verb, *including irregular forms* (+1).
       (2) When there is conjoining of verbs with a single AUX (e.g., "Cinderella was cleaning and cooking and washing."), credit each main verb for the AUX (i.e., as if the sentence produced were "Cinderella was cleaning and was cooking and was washing").
       (3) Modals ("can," "could," "shall," "should," "will," "would") are considered equivalent (that is, they are all base form) and receive +1 each.
       (4) Where "be" is the auxiliary, consider "is" to be the base form, as well as "be." Both count (+1).
       (5) "Get" will be considered a main verb except in "get" passives (e.g., he *got killed*) where it should be treated as an AUX and scored analogously to "be" passives.
       (6) Examples of AUX scoring are as follows:
           they have(+1) left(+2) = +3
           he have(+1) left(+2) = +3
           he has(+2) been(+2) leaving (+2) = +6
           he will(+1) not(+1) have (+1) left (+2) = +5
           he did(+2) leave(+1) = +3
           he can(+1) leave(+1) = +2
           he can't(+2) leave(+1) = +3

he is(+1) leaving(+2) = +3
he was(+2) leaving(+2) = +4
he won't(−2) leave(+1) = +3
he could(+1) leave(+1) = +2
he must(+1) leave(+1) = +2
he is(+1) going to(+1) leave (+1) = +3
they have to(+1) leave(+1) = +2
he has to(−2) leave(+1) = +3.

13. *AUX token.* Enter AUX token (e.g., "will." "is." "was." "has been." ". ing." "-s." "-ed." etc.) for all cases in which AUX contains any element in addition to the main verb. If an irregular verb is tensed, enter IRR. V + T.
"The prince *is riding* there" = is, -ing.
"Cinderella *lost* her slipper" = Irr. v + tense
Where "be" is used as a copula, it is not entered as an AUX token (e.g., "Cinderella was happy"). AUX tokens are tabulated informally to convey the quality of patients' morphological productions.

D. *Structural Measures.* The following categories are scored only on utterances that have been designated as sentences.

1. *Number of embeddings.* Enter the number of embedded clauses per sentence (0 for single-clause sentences).
"The prince waited *while Cinderella tried on the shoe*" = +1
"The girl *he loves* has decided *whom she will marry*" = +2.
For *verb complements* (e.g., He wants *to marry* her) to count as embeddings there must be some evidence of nested predication relationships, that is, an overt NP after the main verb (e.g.,
"Mary wants *Bill to go*" = +1; "Mary wants *to go*" = 0).
Under this analysis, the underlined portion of
"They didn't have *her invited to the ball*"
is scored as an embedded S. (This criterion was adopted, despite its limitations, because of the difficulty of interpreting consistently the appearance of subordinate clauses in agrammatic speech.)
A verb is also required in order to give credit for an embedded clause; thus, "He made Bill cry" = 1; "He made Bill sad" = 0. Other examples of embedded S's:
"Her fairy godmother said *certain things have to be done before 12 o'clock.*"
"They came to find out *who lost the slipper.*"
"The stepmother *when it was her turn* didn't make it."
Examples where no embedding credit is given because there is no overt NP after the main V:
"She disappeared without saying goodbye."
"The stepmother said not to go out."

2. *S well formed?* Enter "+" if sentence is syntactically well-formed, and "−" if any syntactic violation occurs. Syntactically well-formed but semantically anomalous sentences are scored as well-formed. Omission of obligatory arguments renders a sentence ill-formed, but violation of selectional restrictions does not.

3. *Constituents within sentences.* Enter the number of open class words plus pronouns (those that are being used in place of nouns, *not* determiners, i.e., "*her* dress") in each of the following constituents:
a. *SNP*—Subject NP (may be complex, containing PP or clause). For imperatives, where there is no overt SNP, enter a (1) on the score sheet and count in total for SNP column e.g., "clean the kitchen" SNP = (1).

NOTE: Though an adverbial phrase may precede the subject noun (e.g., "*That evening,* Cinderella went to the ball"), it is *not* part of the SNP.

b. *VP*—Verb phrase (exclude AUX from count). The following constraints apply to counting words as part of the VP:
(1) An adverbial phrase should be included in the VP only if it is clearly modifying the VP as in "Cinderella *ran quickly down the steps,*" as opposed to the whole S: "Cinderella *danced* at the ball."
This is often a difficult matter to decide. One criterion that can be used is whether or not the S sounds natural when the post-verbal phrase is moved to the beginning, as in
"Cinderella *left the ball* just before midnight."→
"Just before midnight, Cinderella *left the ball.*"
If it can, assume that the adverbial phrase modifies S and do not count it in the VP elaboration measure. When unsure, be conservative and exclude the material from the VP (though it is, of course, included in the sentence length measure). Further examples, with entire VP underlined, include: "Cinderella *danced with the prince* at the ball." "The prince *rode around the city* looking everywhere for the lovely girl."
(2) Include embedded clauses in SNP or VP.
"*Cinderella who was dressed in red* went to the ball."
SNP

c. Total elaboration score. The number of words produced in subject NP and in VP are combined to yield an overall index of elaboration (see Appendix C).

VI. Production analysis (use Production Analysis Summary Sheet, Appendix C)

A. *Tabulation of scoring categories:*
1. Words per minute (see Section II.G, above) should be entered on the analysis summary sheet.
2. Number of narrative words (column 2, scoring sheet, Appendix B) should be calculated to assure that 150 narrative words are included in the sample to be analyzed. Additional material beyond this number may be included, but normative data are based on 150-word samples. Enter number of narrative words analyzed in item (A) of analysis sheet.
3. Lexical content: enter sums from the appropriate columns in the score sheet in items (B) through (L) of the analysis sheet and perform calculation as specified.

B. *Structural analysis:* Number of "sentences" in the sample should be determined from the "utterance type" column of the score sheet, and entered in item (M) of the analysis sheet. Items (N) through (V) should be filled in from the appropriate columns of the score sheet. Calculations for the structural analysis are specified on the analysis sheet.

APPENDIX B

PRODUCTION ANALYSIS WORKSHEET - Page

Name .....
Narrative ..... Date .....

Utterance Type	No. Narr. Words	No. Open Class	No. Open Class Words	No. Nouns req. [I] (Verbs)	No. NrDs w. [I]	No. Pro	No. Verbs	No. Inflectable Verbs (IVs)	No. IVs Inflected	No. Flatrix Verbs	AUX Score	AUX Token	No. Embeds	S Well-formed (+ or -)	No. Open Class Wds and Pronouns Stgh	VP
UTTERANCES																
No. Sentences TOTAL																

APPENDIX C

PRODUCTION ANALYSIS SUMMARY SHEET

Name..... Date.....
Age..... Education..... Occupation.....
Story Told.....

(A) NO. NARR. WDS..... TIME (WDS/MIN).....

LEXICAL CONTENT

Enter from analysis sheet:

(B) NO. OPEN CLASS WDS.....

Compute:

NO. CLOSED CLASS WDS. (A-B).....
PROP. CLOSED CLASS WDS. ([A-B]/A).....

(C) NO. NOUNS.....
(D) NO. NOUNS REQUIRING DET (NrDs).....
(E) NO. NrDs WITH DETS.....
(F) NO. PRONOUNS.....

DET INDEX (E/D).....
NO. NOUNS/NO. PRONOUNS (C/F).....

(G) NO. VERBS.....

NO. NOUNS/NO. VERBS (C/G).....

(H) NO. INFLECTABLE VERBS.....
(J) NO. INFLECTABLE VERBS INFLECTED.....

INFLECTION INDEX (J/H).....

AUX ANALYSIS

(K) NO. MATRIX VERBS.....
(L) TOTAL AUX SCORE.....

AUX COMPLEXITY INDEX ([L/K]-1).....

STRUCTURAL ANALYSIS

(M) NO. "S's".....
(N) NO. WDs IN "S's".....
(P) NO. WDs IN TC's.....

PROP. WDs IN "S's" (N/A).....
PROP. WDS IN "S's" + TC's ([N+P]/A).....
MEAN "S" LENGTH (N/M).....
PROP. W-F "S's" (Q/M).....

(Q) NO. WELL-FORMED "S's".....
(R) NO. SNPs.....
(S) NO. WDs IN SNPs.....

MEAN SNP LENGTH (S/R).....
(a) SNP ELABORATION INDEX ([S/R]-1).....

(T) NO. VPs.....
(U) NO. WDS IN VPs.....

MEAN VP LENGTH (U/T).....
(b) VP ELABORATION INDEX ([U/T]-1).....
"S" ELABORATION INDEX (a+b).....

(V) NO. EMBEDDINGS.....

EMBEDDING INDEX (V/M).....

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