Syntactic Analysis of Simple Sentences in Telugu: A Psycho-Neurolinguistic Perspective

Dr.C.S.Swathi,
Research Associate, IIAS, Shimla (May 2022 Batch)
Assistant Professor, UCASS, Osmania University, Hyderabad.

Abstract

With nearly 82 million speakers as per the 2011 census, Telugu is the fourth most used language in India after Hindi, Bengali and Marathi. Telugu belongs to the South-Central group of Dravidian Language family. The basic word order in Telugu is Subject-Object-Verb and is flexible to indicate emphasis. Aphasia, resulting from brain damage to language areas in the brain, can be of different types. The aim of this paper is to provide a descriptive analyzes of Syntactic deficits seen in Telugu speaking Broca's aphasics (a type of Aphasia) in the production of simple sentence structures. The analyses revealed errors as: a) Productions of verbs in verbless constructions. b)Among the omission errors subject omission was the most frequent phenomenon followed by verb omission and followed by object omission. c) Agreement errors were more in terms of person and number than gender and d) Demonstrative pronouns were omitted in most of the responses. Two fold conclusions can be drawn. Firstly, as seen in literature, syntactic errors occur when damage to Broca's area is seen, thus reiterating the fact that Broca's area is involved in syntactic processing of language cross-linguistically and the secondly some language specific features could be seen.

1. Introduction

Human communication and socialization happen through language to a large extent. Language in turn involves the comprehension and production of various sentence structures. Although communication is possible if a speaker uses single words, fragments of speech and phrases; without well-formed sentences, communication becomes limited. In any or in every language, a sentence is a sequence of words but not every sequence of words forms a sentence.

The abilities to formulate, construct and use spoken or written languages are located in different areas of the brain (most times in the left side/hemisphere). When one of these areas or the connection between them is damaged due to cerebro-vascular accidents (CVA or brain strokes), traumas, tumors etc., the language production and comprehension gets affected. The language impairment resulting from brain damage is known as 'Aphasia', based on the site, size and nature of brain damage different types of aphasias can be seen. This research is based on one such type known as the Broca's Aphasia. This aphasia is marked by dysarthria/ apraxia (errors in articulation of sounds), paraphasias (phonological errors), morphological errors and/ or agrammatism (syntactic deficits), keeping the comprehension of language almost intact.

As per the 2011 census, Telugu is the fourth most used language in India after Hindi, Bengali and Marathi, with nearly 82 million speakers. Telugu is spoken mainly in the states of Telangana, Andhra Pradesh, Madhya Pradesh, and Orissa. It belongs to the South-Central group of Dravidian Language family, having flexible basic word order as Subject-Object-Verb. The syntactic complexity of the sentences in Telugu can be at simple, compound and complex levels based on the number of clauses and verbs being used. Verbless, tenseless, intransitive construction or constructions with one verb paradigm have been usually referred to as simple constructions. When two phrases or clauses are joined together, coordination occurs and they usually form compounds sentences. When one clause (embedded clause) is embedded in another clause (matrix clause) subordination occurs and such structures give rise to complex sentence constructions. Simple sentence constructions are the focus of the current paper.

Thus, the aim of this paper is to provide a descriptive analyzes of Syntactic deficits seen in Telugu speaking Broca's aphasics, in terms of simple sentence constructions. In the first section, a note on Telugu grammar in relation to simple sentence constructions is presented. Then, a review on syntactic errors seen in different languages occurring in Broca's aphasia will be discussed. The methodology section will discuss the details of participants of the study along with the tasks and procedure used. Analyses of the data will be presented in the following section. The final section, will discuss the findings in light to theoretical and clinical implications.

2. Simple Sentence Constructions in Telugu

Telugu is a verb final language. It is a nominative-accusative language and hence, the verb agrees with the argument in the nominative case. It is a pro-drop language. The basic word order is S-O-V and is flexible. The complexity of the sentences can be at simple, compound and complex levels based on the number of clauses and number of verbs used. Verbless, tenseless, intransitive construction or constructions with one verb paradigm have been usually referred to as simple constructions.

A simple sentence has a single clause consisting minimally of a subject and a predicate. The subject is normally a noun phrase (NP) with a noun or pronoun in the nominative case as the subject of the construction. A noun may be preceded by one or more adjectives (adj). The predicate is the verb and its compliments. Simple sentences can exist as verbless constructions or constructions with verbs.
In the present study, the following simple constructions have been elicited:

(i) Verbless sentences
(ii) Sentences with verbs
    a. Intransitives
    b. Transitives

Verbless Constructions

In Telugu, the verbless sentences comprise of two nominals juxtaposed, they are also referred to as equational sentences. Here, the noun phrase which occurs in the predicate position has the nominative case, agreeing with the subject in number, gender and person. The two parts of the sentence, subject and predicate are co-referential. Some of the examples and explanation presented here are taken from Krishnamuthy and Gwynn, (1985).

The following examples are illustrative. Example denote verbless construction with (i) a demonstrative pronoun, (ii) an adjective and (iii) two nominals juxtaposed.

E.g. (i) *idi illu* 'This is a house.'
this house

(ii) *itanu manci vaaDu* 'He is a good person.'
he good person

(iii) *raamuDu DaakTaru* 'Ramu is a doctor.'
ramu doctor

All the above sentences do not show verb forms and have no time reference as well. In the current study the nominals used to construct verbless sentences have been elicited in two forms singular and plural. Hence, only number agreement could be studied.

Intransitive Constructions

An intransitive verb does not involve the combination of agent and object. In Telugu, it agrees with the subject in terms of person, number and gender (PNG).
For example:

E.g. (iv). *waaDu well-EE-Du* 'He went.'
he went-past-2p,sg,mas

(v). *papa eeDustun-di* 'The Girl is crying.'
girl crying-3p,sg,neu

In the above constructions, PNG match can be seen.

Transitive Constructions with One Verb Paradigm

In the current study, Monotransitive (one object) and Ditransitive (two objects) verbs were considered. The use of a transitive verb as a predicate in a sentence potentially entails two arguments in the form of noun phrases: (1) agent (animate actor or force), (2) object (the affected or experiencer).

Eg. (vi). *waaDu annam tin-aa-Du* 'He ate food.'
he food eat-past-3p,sg,mas

(vii). *kamala paaTa-nu paaD-in-di* 'Kamala sang a song .'
kamala song-Acc song-Part-3p,sg,neu

(viii). r*aamayya Sarma-nu pilic-EE-Du* 'Ramayya called Sarma.'
ramayya Sarma-Acc call-Past-3p,sg,mas

All the above examples illustrate monotransitive verbs. Direct object is marked by accusative marker –nu. It is obligatory with animate nouns and optional with inanimate nouns. A verb in Telugu, can also take two objects i.e. indirect and direct object. Such verbs are called ditransitive verbs.

E.g. (ix). *aame paapa-ki paanDu icc-in-di*
she baby-Dat fruuT give-Past-3p,sg,neu
'She gave a fruit to the baby.'

In the above example 'icc' forms a ditransitive verb taking the direct object '*paanDu*' – fruit, and the indirect object '*paapa'* with the dative marker 'ki'.

In the current study, all the above constructions were presented to Telugu speaking persons with Broca's aphasia and their responses were elicited.

Syntactic Processing by the Brain

Sentence production in brief involves, the thought the speaker wishes to express, which is then converted into lexical items retrieved from the person's mental dictionary. Subsequently, these lexemes are converted into the form in which they will be pronounced, with syllable and sound information of each word, adapted for its context (Butterworth, 1994).

In early studies on aphasias, patients with lesions to Broca's area in the left hemisphere were observed to be impaired in speech production, especially in the omissions or misuse of inflections and other closed-class morphemes, but seemingly intact in speech comprehension. This led to the view that the Broca's area handled expressive as opposed to receptive language processing. And two main areas in the brain have emerged as the site of language production (Broca's area) and comprehension (Wernicke's area), in association with other areas.

Findings of Indefrey et al, (2001), Suzuki and Sakai, (2003) and Grodzinsky and Friederici**,** **(**2006) provided a direct evidence of a syntactic specialization for Broca's area and established

the existence of distinct modules for language. More recently, with the use of neuroimaging techniques, these areas could further be established. However, the exact correlation between cortical language areas and subcomponents of the linguistic systems has still not been established and much needs to be explored.

3. Review of Literature

Scientific study of the relationship between brain regions and their language functions has been the focus of psycho-neurolinguistic research for many decades. To correlate between brain areas responsible for different components of language is very complicated and complex. Traditionally, these have been studied by Lesion methods. A method in which the damage to a particular area in the brain is associated with that language functions, if that particular language function gets affected. However, with the advent of neuro-imaging techniques (around 1970s), it has now become possible to document the different regions of brain activation during language production and comprehension. Both these methods have their pros and cons. However, both these methods have shown that the left Broca's area was markedly involved in syntactic processing cross linguistically.

Language Breakdown in Broca's Aphasia

Different aspects of syntactic processing may be impaired in Broca's aphasics. Deficits have been seen both in sentence comprehension (Zurif, Swinney, Prather, Solomon and Bushell, 1993; Grodzinsky, 1995; Swinney and Zurif, 1995) and production (Friedmann and Grodzinsky, 1997). With respect to production, a syntactic deficit may lead to the production of incomplete or incorrect sentences. Firstly, the processing of the semantic and syntactic lemma information may be disturbed. When this happens, syntactic complements or arguments may be omitted, resulting in incomplete or short sentences. Also, mapping of thematic roles onto the arguments or the syntactic complements may be problematic. Further, Broca's aphasics may have problems with syntactic movement, which may cause difficulties with verb inflection. Finally, it is possible that case marking, and the coding of morphological markers for tense and number may be disturbed, or that there may be no coding at all, leading to the substitution or omission of grammatical morphemes.

Bastiaanse and Zonneveld (1998) reported the use of both the stem and the infinitive forms of a verb in Dutch agrammatics. It was noted that the infinitive form was preferred over the stem. Kean (1977) noted that bare verbs resulted due to phonological characteristics of the non-stressed morphemes. It was argued that phonological words are preserved in agrammatic output, while clitics are omitted.

Bradley et al (1980) attribute use of bare forms to lexical deficit. The 'closed class lexicon' was said to be impaired in agrammatism as the inflections were part of this lexicon. Grodzinsky

(1984) noted that such forms resulted due to inflectional substitutions. He observed that these were preferred substitutions to zero morphemes.

Noting the errors in using the plural marker (number agreement) Bhatnagar (1990) observed that Hindi speaking Broca's aphasics produced 33% errors. And most of the time it was substituted by the singular form. The reason he quoted was that the noun underwent a phonological change, which the aphasics could not do.

Indefrey et al (2001) used positron emission tomography to investigate the cortical activations during spoken language production that are related to the syntactic encoding process. In the paradigm of restrictive scene description, utterances varying in complexity of syntactic encoding were elicited. Results provided evidence that the left rolandic operculum, caudally adjacent to Broca's area, is involved in both sentence-level and local (phrase-level) syntactic encoding during speaking.

Fiebach et al (2005) investigated hemodynamic responses elicited while participants processed German indirect wh-questions. Activation increases were observed in left BA 44 together with superior temporal areas and right hemispheric homologues for sentences with noncanonical word order, in which a verb argument was dislocated from its canonical position over a relatively long distance. In these sentences, syntactic working memory load was assumed to be greatest. In contrast, no activation increases was elicited by object-initial as opposed to subject-initial sentences that did not differ with respect to working memory costs but with respect to syntactic integration costs. These data strongly suggest that Broca's area plays a critical role in syntactic working memory during online sentence comprehension.

In another study, Druks and Carroll (2005) studied an aphasic patient whose spontaneous speech contained very few lexical verbs. Instead of sentences with lexical verbs, the patient produced many (grammatical) copular constructions. Although this resulted in ungrammatical utterances, by doing so, a resemblance of sentence structure and a degree of grammaticality of his utterances were preserved. They noted that such performance resulted due to unavailability of tense features.

Grodzinsky and Friederici (2006) noted that syntax is neurologically segregated, and its component parts are housed in several distinct cerebral loci that extend beyond the traditional ones- Broca's and Wernicke's regions in the left hemisphere. They also noted in particular that, the new brain map for syntax implicates portions of the right cerebral hemisphere.

Some studies have also been conducted on Telugu aphasics. In general, these studies have looked at the comprehension and production deficits in Broca's aphasics.

Usha Rani (1985) conducted a study on language disturbances in aphasics with reference to Telugu language. There was variation among the patients on performance on different tasks. The major findings related to syntactic disturbances were: (1) all subjects could reproduce the plural forms correctly. (2) large number of errors tended to occur in the area of phonology when compared to morphology and syntax. (3) there was a tendency to change 3 person singular suffixes to 1st person singular suffixes. (4) all simple sentences were repeated correctly while the subjects made errors in repeating compound and complex sentences. (5) the subjects could correct most of the ungrammatical constructions given for case and number distinctions but could not correct constructions with ungrammatical tense and gender markers.

Jaganmohan (1992) conducted a study on morphological disturbances in Telugu speaking agrammatics and concluded the following:
(1) Pronouns were retained by the aphasics when compare to other morphological categories. (2) In plural formation it was observed that plurals were correctly supplied in simple marker by /-lu/ but they were either substituted or omitted when the morphophonemic changes were required. (3) Tense and case system were impaired in all the aphasics. (4) The subjects used simplest possible structure of the language.

Usha Rani and Shastry (1996) observed that the grammatical deficits in Broca's aphasia involve a selective impairment of the patient's ability to process grammatical morphemes and other aspects of syntax structure, mainly word order, are left intact. They attribute this phenomenon to the acquisition of syntax, where the word order is acquired much earlier than the other inflectional markers. Hence the aphasics also retain the word order in spite of losing the other inflectional categories.

Usha Rani (1999) studied the conjoined and simple structures in aphasics using imitation task. The results showed that the problem was with the conjoined structures with three nouns where the verb has to agree with first person plural subject compared to the simple structure. The reason she attributes is that this may be due to the length of the sentence which is always a problem for aphasics to process and the complexity involved in the verb to agree with the first person plural subject. This finding was substantiated by developmental data reported by Sailaja (1997) which shows first person plural agreement marker was always acquired late by Telugu speaking children.

Usha Rani (1999) also studied the comprehension deficits in these aphasics. It was noted that the subjects did not correct the structure where the verb had to agree with the pronominal subject which was across the constituent, whereas they corrected some structures where the noun agrees with the quantifier which was within the constituent. Agreement within the constituent was more intact compared to across the constituent. The reason she quotes for such performance is that in Telugu lexical items may have existence independent of inflections which might be the reason

for disturbed agreement in Telugu speaking aphasics. In the same study it was noted that the time adverbials were deleted by all the Telugu aphasics. This may be because they are redundant in the language. Another finding was repetition of imperatives and negative structures by Telugu speaking aphasics did not show any distortion, which was attributed to the non agreement in these structures.

Sailaja and Usha Rani (2002) studied the production of subject in child language acquisition and aphasics. They concluded that children pay attention to (i) the order of words in a sentence (ii) overt production of subject category in the early sentence to perceive syntactic, semantic and pragmatic aspects of the language. Aphasic's speech supports the necessity for retention of subject in a sentence as the inflectional markers are lost.

It can be observed that during the process of sentence production the syntactic deficits can occur at various stages and accordingly the breakdown. Research has also shown that these errors can also vary from language to language based on the sentence structures. The knowledge of the structure of language offered a deeper understanding of how the different linguistic levels (phonology, morphology, syntax, and semantics) could be independently impaired due to brain damage (Prins and Bastiaanse, 2004). Studies on aphasia and specifically of agrammatism thus formed the main basis for theories about morphology and syntax in neurolinguistics.

Most studies on the grammatical aspects of production in Broca's aphasia are in English, which is not the most suitable language for research on various languages, because the inflectional paradigm is very limited and there is little variation in the position of the verb (Halliwell, 2000). Hence, the need for the current study.

4. Methodology

Bock (1986) noted the higher level mechanism of sentence production has received scant attention in psycholinguistic and cognitive psychology, in part because of the problems in examining these mechanisms in an experimental context. Moreover, the Language breakdown affects several linguistic levels – Phonological, Semantic, Syntactic and Pragmatic and/ or in combinations. Hence, it is very important to analyze these errors with care.

The aim of the current study was to note the type of errors seen in productions of Simple Sentence Constructions by Telugu speaking Broca's aphasic individuals and compare their response with age, education and gender matched normal individuals. Picture description task was used to elicit the responses. A descriptive analyses of the data was done. Errors were analysed in terms of PNG agreement, word order, and omission of subject, object or verb.

5. Data Analysis

Descriptive analyses of the data, obtained from picture description and repetition tasks were done. All the responses of the aphasics were noted and transcribed. They were compared to the expected target responses.

Analysis of Verbless Sentence Constructions

In all the participants (both in the aphasics and the control group) verb productions were seen in response to verbless constructions, even though it was not warranted. It can be noted that, controls produced 60% verbs in verbless constructions while individuals with aphasia produced almost 40% verbs in verbless constructions in the cued condition. A closer look at the type of verb produced revealed that almost 40% of these were the copula productions i.e. – *'undi'* and in the rest of them related verbs were produced. The verbs produced by aphasics also showed errors in number agreement. In the following example these aspects can be seen.

For e.g : (x) Expected Resp : *idi skuuTaru*
(Simple, Verbless) this scooter 'This is a scooter.'
Aph Resp: draiv cesedanu
drive do
Aph Resp: *laiT Tiivi (sku) TaaTar*
light T.V (TVS)

(xi) Expected Resp : *idi kukka* 'This is a dog'
this dog
Aph Resp: *cuu cuu cuu cuu (ku) baw baw*
choo choo choo choo baw baw
Aph Resp: *baw baw (ku) kukka*
baw baw dog

(xii) Expected Resp: *iwi paawuraalu* 'These are pigeons'
these pigeons
Aph Resp: paavurama okaTi ronDu muuDu naalugu undi
Pigeon(sg) one two three four is

From the above and other responses of aphasics (Aph), it can be noted that aphasics produced verb in verbless constructions, in some onomatopoeic responses could be seen. In example (xii) the target was production of plural marker and to give its number agreement. It can be noted that quantification of the plural maker was done instead of the marker and then it was matched with the produced singular form.

Sentences with Intransitives Verbs

A verb paradigm for verbs in Telugu consists of – the bare form + tense marker + is (copula) + PNG marker. The following sentence illustrates the breakdown in verb paradigm, where for example, the base form of the verb 'nawwu' is coupled with 'undi' the copula to complete the

sentence. It however, shows the agreement with the subject. In some of the responses, omission of subject errors was also observed.

For e.g : (xiii) Expected Resp: *papa nawwutun-di* 'The girl is laughing.'
(InTrans) girl laughing-3p,sg,neu
Aph Resp: *paapa nawwu nawwu undi*
girl laugh laugh 3p,sg,neu

Sentences with MonoTransitives Verbs

For e.g : (xiv) Expected Resp: *ammayi bukku caduwtun-di*
(MonoTrans Verbs) girl book reading - 3p,sg,neu
'The girl is reading a book.'
Aph Resp: *bukku bukku bukku (ca) ca ca un-di*
book book book is-3p,sg,neu

Sentences with DiTransitive Verbs

For e.g : (xv) Expected Resp: *pillalu baal aaDutunaa-ru*
children ball playing - 3p,pl
'Children are playing with the ball.'
Aph Resp: *okaTi okaru okaru (pi) pillaa*
one(numeral) one(human) one(human) girl
(ba) baalu (aDu) aaDutunaa-nu
ball playing - Ip,sg,neu

In sentences with verbs errors were in terms of agreement with respect to person, number and gender. It can also be noted that for both transitive and intransitive verbs were substituted by copula. Bare verbs were produced for intransitive and not for transitive (except for once). Bare verb with copula i.e. without tense marking were seen more for transitive but not for intransitive (except for twice) verbs. In some of the responses English equivalent nominals were also used.

Discussion

Responses from the control participants were consistent with the expected targets while the aphasics made many errors in sentence construction. Comparison of overall performances of the aphasics and controls showed marked differences. Such responses could have resulted as at the discourse level the verbless constructions were possibly having an underlying verb which was not overtly expressed whereas in isolation or in the context of spontaneous production the speaker tended to provide the verb. Speakers are at ease to provide a verb very spontaneously in spite of the existence of verbless sentences in the language.

The errors in verbs production were exhibited as: (i) bare verb, (ii) bare verb with copula, (iii) noun form of the verb with copula and (iv) substituted by copula. Use of English equivalents in some of the responses was observed, due to the bilingualism of the participants. These words

were also the frequently occurring English words in Telugu; hence code mixing and code switching were very much possible in spontaneous speech just like normal speakers. In the current study it was observed that the word order was preserved in many utterances.

The relation between sentence structure and grammaticality came out very clearly in the present study. The complexity of the structure and the error rate were directly related.

This is in accordance with the findings of Shapiro and colleagues (Shapiro, Brookins, Gordon, and Nagel, 1991; Shapiro, Zurif, and Grimshaw, 1987) who found that as the verb becomes more complex in terms of the number of different argument structure arrangement possible, the grammatical morphemes are deleted in most of the sentence constructions. Also, Studies done by Lee and Thompson (1992); Thompson, Lange, Schneider, and Shapiro, (1997) and Thompson (2005) had similar findings. They are also in accordance with some of the studies done in Indian languages like, Sapna (2000) and Usha Rani (1985) and Bhatnagar (1990).

Taken together, the grammar was not selectively lost in adult aphasics, leaving the morphology intact. Instead, grammar and morphology tended to break down together, although they differed in different construction levels. Thus, the syntactic deficits in Telugu are more of morpho-syntactic origin rather than purely syntactic or purely morphological , at least in the aphasics of the current study.

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