**Syntactic Deficits in Agrammatic Aphasia**

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**Abstract**

# Research on the comprehension and production deficits of agrammatic aphasia has been conducted extensively. This paper briefly presents and compares several influenced hypotheses which were put forward to explain the underlying reason for agrammatism and provides a personal perspective on the research on this issue.

# *Keywords:* agrammatic aphasia, asyntactic comprehension, agrammatic production

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**Introduction**

Agrammatic aphasia is a language deficit reflected both in ill comprehension and production. The spontaneous speech of patients with agrammatic aphasia is non-fluent and syntactically simplified, with little involvement of embedded clauses. Moreover, patients have difficulty with grammatical verbs, that they often omit the inflectional endings when the root of the word is a legal word without the suffix, rendering their speech “telegraphic style”.  
 The underlying reason for asyntactic comprehension is different from that for ill production, which is proved by studies in which many patients with agrammatic production were described with flawless sentence comprehension (Kolk et al., 1985; Miceli et al., 1983). Thus the content of the current paper is divided into the agrammatic deficits in comprehension and production.

## Asyntactic Comprehension

The comprehension of language requires that the brain provides access to several different kinds of knowledge, including the meaning of words and the syntactic rules, which enable words to combine in an understandable manner. The patients with agrammatic aphasia, however, are unable to understand certain types of sentences due to their lack of access to the syntactic constraints. According to the electrophysiological evidence provided by Hagoort et al. (2003), the patients didn’t show syntax-related ERP effect to sentences with grammatical violations as subjects with unimpaired comprehension did, indicating their disability in processing sentences at a syntactic level. Though many representational models of comprehension deficits have been put forward, researchers haven’t yet reached a consensus since each of the hypotheses has a group of non-conforming subjects that is hard to be explained. Thus it gives rise to fierce controversies between several influencing theories.

An initial hypothesis holds that agrammatic aphasia patients have difficulty in processing noncanonical sentences--the sentences differ from the basic, most frequent word order patterns, such as SVO order in English. Such a hypothesis is called “canonical order models” and was supported by Caplan et al. (1985). Though the claim in this hypothesis was widely agreed upon, a more specific model that can predict patients’ performance in each type of noncanonical sentence has been pursued. Moreover, the development in syntactic theory, such as the VP-internal Subject Hypothesis, provided theoretical support for more specific representational patterns for comprehension deficits.

Traces are the original position of a moved constituent. Two hypotheses attribute the comprehension disability to the problematic processing of traces. One of these hypotheses is Trace-Deletion Hypothesis (TDH), which was first proposed by Grodzinsky (1984), and argues that the agrammatism in comprehension results from NP- or wh-movement. With the new empirical findings and the development in the theory of syntax, the TDH theory has experienced several revisions. According to Grodzinsky’s updated argument, The traces of syntactic movements are absent from the syntactic representations of Broca’s aphasics (Grodzinsky, 2000). However, its prediction that Broca’s aphasia was associated with a single pattern of sentence comprehension impairment has been challenged. In a study by Caramazza et al. (2001), they claimed patients with Broca’s aphasia may have several different performance patterns on canonical and noncanonical sentences with statistical analysis. Furthermore, a German study also contradicted the TDH hypothesis since its result revealed that only half of the experiment subjects performed in consistent with this hypothesis (Burchert & De Bleser, 2004). In addition, a study involving eye-tracking also elicited a contradictory conclusion against TDH, suggesting that impaired passive comprehension may stem from lexical processing deficits (Meyer et al., 2012).

Another trace-based hypothesis is the Double-Dependency Hypothesis (DDH) proposed by Mauner et al. (1993). It claims that the deficits underlying the asyntactic comprehension affect the processing of syntactic referential dependencies, namely the relation between a referential expression and its antecedent. Based on the VP-internal Subject Hypothesis and a theory of passive construction proposed by Baker et al. (2018), the sentences with active voice have only one referential dependency relation, while passives such as object-relatives involve two such relations. The DDH theory suggests the sentences with only one referential dependency result in unambiguous syntactic representation, while the sentences with two such referential dependencies lead to semantic ambiguity since it’s unclear “which NP is co-indexed with what” (Beretta & Campbell, 2001), rendering patients with asyntactic comprehension unable to process such kind of noncanonical sentences.

Empirical studies have been conducted to test the two trace-based theories. A study by Beretta and Campbell (2001) evaluated the hypotheses by examining the performance of Broca’s aphasia on sentences with psychological verbs of two different classes, and the result buttressed the DDH theory and was against TDH. While evidence from a Mandarin study reached the reverse conclusion that supported TDH and rejected DDH (Su et al., 2007).

Apart from the theories above, there are other hypotheses based on different linguistic knowledge and empirical data. The Isomorphic Mapping Hypothesis proposed by O'Grady and Lee (2005) argues that individuals with agrammatic aphasia tend to have difficulty comprehending sentences in which the NPs’ order is inconsistent with the structure of the corresponding events. Besides, some studies claim that none of the theories put forward fits the performance of all patients with agrammatic aphasia in that there are always non-conforming subjects whose comprehension patterns are incompatible with the predicted model (Caramazza et al., 2001; Hickok & Avrutin, 1995)

**Agrammatic Production**

The language production of patients with agrammatic aphasia also conforms to the rules observed in comprehension, that patients have difficulty in producing noncanonical sentences and thus involve more canonical sentences in their utterances. This has been proved in a study by Burchert et al. (2005), in which most of the eight German-speaking agrammatic patients produced significantly more canonical (SVO) sentences than noncanonical (XVS) sentences. Some other studies reflected a reduction in syntactic complexity in the utterances of agrammatic patients (Bates et al., 1988). In addition, researchers noted most problems in production involve syntactic movements and that the NP- and wh-movements are processed separately, which was proved by the fact revealed by Thompson et al. (1997) that the recovery of patients in their production of NP- and wh-movement is consistent with the particular movement they’ve trained to produce.

Several hypotheses were raised to explain the deficits underlying agrammatic production. Tree-Pruning Hypothesis (TPH) was put forward by Friedmann and Grodzinsky (1997). It associates the hierarchical organization of syntactic nodes within syntactic structures with the pattern of agrammatic production and claims the deficits in language production are due to the impairment or inaccessibility of the top several nodes in syntactic structures. It proposes that nodes in a higher position are more likely to be impaired than those in the lower position. The experiment ingeniously chose Hebrew, Arabic and English speakers as subjects, for the different movement parameters involved in the former two languages and English (i.e. in English a subject-auxiliary inversion occurs in yes/no question while in Arabic and Hebrew there isn’t) forms an ideal comparison through which the failure in the production of English yes/no question can be attributed to the impairment in Complementizer Phrase (CP), while the preserved ability to produce yes/no question in Arabic and Hebrew can be explained as no movement to the impaired CP is involved. From my perspective, this experiment can be extended to include languages involving Wh *in situ*, such as Mandarin and Japanese for in these languages wh-movements occurs as covert movement, which forms a comparison with the overt wh-movements involved in English, Arabic and Hebrew and thus can buttress or reject the TPH theory according to the performance of speakers in these languages.

While the TPH argues that the deficits in agrammatism can be predicted by the position that certain structures occupy in a syntactic tree, another hypothesis raised by Bastiaanse and Van Zonneveld (1998) claims that agrammatic production is associated with the movement of finite verbs. According to the performance of Dutch speakers’ in spontaneous speech and an elicitation task, researchers found the problem with finite verb production is related to the application of verb movement. This experiment was extended by Bastiaanse and Thompson (2003) in another study that includes cross-linguistic data supporting this hypothesis. Specifically, they used the discrepancy in English and Dutch grammar to prove that verb movement is the critical factor of agrammatic deficits.

Despite the ingenious experiment design in both two hypotheses, they are unable to account for the agrammatic production of every patient. The two hypotheses have been assessed in a study by Burchert et al. (2005), in which researchers demonstrated their experiment data were hard to be explained by either of the hypotheses.

### Conclusion

In spite of the numerous hypotheses proposed and researches conducted, an overarching model that can explain the pattern of syntactic deficits in agrammatic aphasia across languages is still impossible to be reached. It is the diverse patterns of deficits that give rise to the fierce controversy and the lack of a perfect theory on this issue. However, through the academic disputes between different hypotheses and the revisions made by researchers, we’ve become more closely to the underlying reason for agrammatism than ever. Moreover, the research on aphasia also promotes the development of syntax, as the deficiency of patients in syntactic structure provides contrast for researchers to hypothesize and verify how a brain with intact functions processes sentences, opening a new gate for us to understand our brain as well as the languages.

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