Quantification Therapy?

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The Background

Broca's aphasia is a term that refers to language disturbance characterized by halting, disfluent, effortful speech. Historically, this type of impairment is associated with damage to the superior frontal convolutions of the left temporal lobe. This area is generally described as Broca's area, after Pierre Broca, who first associated this language impairment with damage to the left temporal lobe. Broca's research was first presented to the French Academy of Anthropology in 1861. Subsequent to Broca's early descriptions it was reported, first by the Pitres (1898), that there was a type of Broca's aphasia in which parts of speech were selectively omitted. In this condition, in addition to effortful, disfluent speech, verbs are almost always uttered in progressive form with no apparent use of inflectional morphology, derivational morphology appears to be retained but only in nominal or adjectival form, and functional elements -determiners, complementizers, modals, prepositions and quantifiers - are noticeably lacking. This style of speech was described as agrammatic or telegrammatic because the utterances seem to be formed without regard to the niceties of the grammar and are reminiscent of the economy of style used in telegrams. The term 'agrammatism' has come to be associated with this condition.

It was generally believed that while speech production in agrammatic Broca's aphasics was impaired, their comprehension of speech was intact, although in 1914 Salomon proposed a comprehension disorder coincident to the expressive disorder generally recognized at the time. In research reported in 1976, Caramazza and Zurif investigated comprehension deficits associated with agrammatism. They reported that the Broca's aphasic subjects they tested could not understand thematically reversible object relative constructions on a sentence picture verification paradigm. That is, reversible object relatives of the form 'the girl the boy is chasing is tall' were incorrectly associated with pictures that corresponded to 'the girl who is chasing the boy is tall'. Non-reversible object relatives, on the other hand, were correctly comprehended. Thus sentences like 'the dog the boy is patting is brown' were correctly identified.

On the basis of this performance, Caramazza and Zurif proposed that these individuals were 'asyntactic'. They did not generate a syntactic representation associated with the sentence they heard at all but rather relied on extra linguistic heuristic devices, such as canonical word order and plausibility, to guess at the meaning of sentences. In the case of reversible object relatives, the application of heuristics resulted in incorrect comprehension. The canonical word order approach determined that the first mentioned NP would be the agent and, as plausibility did not contradict this conclusion, they misinterpreted the sentences. In the case of the non-reversible object relatives, the canonical word order approach would assign agent to the first mentioned NP, 'the dog' in the above example, but the implausibility of a dog doing the patting rather than being patted overrode the canonical word order and a correct interpretation resulted. This proposed account of a comprehension deficit in agrammatic patients set the tone for many subsequent approaches. The comprehension deficit is explained in terms of an impaired, in this case non-existent, syntactic representation.

Further research demonstrated what appeared to be a correspondence between the lack of functional terms in the speech of agrammatic patients and their comprehension deficits. Heilman and Scholes (1976) demonstrated that agrammatics could not distinguish between sentences of the type 'Mary showed her the baby pictures' and 'Mary showed her baby the pictures'. Since the distinction between the two sentences is marked by the position of the determiner 'the', the impaired ability to distinguish between these two sentences suggested that the lack of determiners in the agrammatic's speech was accompanied by an inability to attend to determiners in comprehension. It was further demonstrated that, along with their problems in interpreting relative constructions, agrammatics also had difficulty with reversible passive constructions. Various proposals to account for the comprehension deficits

were advanced. Safron et al. (1980) proposed that agrammatics do not map thematic roles onto word order. Bradly, Garrett and Zurif (1980) suggested that the normal access route to the functional vocabulary might be absent in the agrammatic. Caplan (1983) suggested that the syntactic representation generated by agrammatics was impaired and that the use of a complex heuristic that was sensitive to thematic role assignment could account for the pattern of impaired comprehension. Caplan and Futter (1986) took a similar approach. They suggested that the syntactic representation constructed by agrammatics might consist only of projections of lexical heads.

The major difficulty encountered by most of these approaches is that they predict uniform performance on the part of the brain damaged individuals. If no functional elements are represented then all reversible passives should be consistently interpreted as active. This is because the agrammatics understanding of 'the boy was kissed by the girl' will be ' the boy.....kissed....the girl'. The canonical word order heuristic will always determine that the first NP is agent. However, the actual agrammatic performance on these constructions is generally chance. Similarly, the interpretation of object relatives is predicted to be systematically incorrect: 'the boy who the girl kissed held a book' becomes 'the boy ....the girl...kissed held a book'. Once again, the canonical word order heuristic will always determine that the first NP is agent whereas the actual agrammatic performance is chance.

Grodzinsky (1984) and subsequent work offers a different angle on the problem of accounting for comprehension deficits in agrammatism. Grodzinsky notes that the constructions that agrammatics have difficulty understanding all involve moved constituents. Grodzinsky proposes an account that relies on the traces of movement being lacking from the linguistic representation available to the agrammatics. This approach does not exploit the open class/closed class distinction apparent in English agrammatic behavior but rather asserts that the agrammatic is incapable of representing the antecedent-trace relation. If this is so, he argues, then the thematic roles transmitted from the trace to its moved antecedent will not be retrievable by the agrammatic.

Grodzinsky invokes a heuristic to account for the thematic roles that are assigned. He suggests that thematic roles are available in hierarchical order - agent, patient, theme, goal - and that when an agrammatic encounters a linguistic representation in which a referring expression is not associated with a thematic role, then he provides it a default interpretation by assigning a thematic role, taken in order, from the hierarchy. Grodzinsky's account of passive interpretation is as follows. The sentence 'the boy was kissed by the girl' encodes the displacement of the object via a movement chain: 'the boy$_i$ was kissed t$_i$ by the girl'

However, for the agrammatic, the antecedent trace relation is not represented. The agrammatic has access to 'the boy was kissed ... by the girl'

The agrammatic's representation and grammar are otherwise intact. Since the first NP, 'the boy', is not associated with a thematic position, the heuristic provides a thematic role, agent, from the top of the list. The next NP is 'the girl'. However, the preposition 'by' is recognized as assigning agent theta to its complement so 'the girl' is assigned agent. Now the agrammatic has a problem. There is one representation with two agent theta roles. How can this be interpreted? Grodzinsky suggests that it cannot, and so the agrammatic must guess at the correct interpretation. This results in chance performance for tests of comprehension of reversible passives.

Other approaches that tie the agrammatic comprehension deficits to modification of their derived syntactic representations include the tree pruning hypothesis advanced by Naama Friedman (2005) and the complexity approach advanced by Herman Kolk (2000).

The puzzle

In the late 1980's other researchers became interested in the proposal that syntactic representations could be impaired and asked how non-thematic aspects of meaning like scope were handled by agrammatics. The agrammatic's systematic problem of comprehending passive and other constructions containing displaced constituents would seem to be, at root, a problem of complexity of

processing. It was therefore expected that agrammatics would have access to only one of the potential readings associated with common existential-universal interaction. However, investigations into agrammatic interpretation of sentences like 'a boy photographed every girl' showed that agrammatics easily retrieved both potential readings. Subsequent investigations into the interpretation of quantified expressions and Wh dependencies revealed that these were generally retained (Saddy 1992, Hickok and Avrutin 1995, Saddy 1995). Such results were difficult to explain for the approaches outlined above. More problematic, however, was the observation that when universally quantified NPs were substituted into the simple reversible passive constructions, comprehension performance improved from chance in constructions like (a) to normal in constructions like (b) and (c).

(a) a boy was kissed by a girl → (b) every boy was kissed by a girl or (c) a boy was kissed by every girl

That is, not only did the agrammatic understand that there was both wide and narrow scope readings available in (b) and (c), the agrammatic also no longer showed any confusion about the thematic interpretation of the reversible passive.

This observation suggests that an account of agrammatic comprehension based purely upon syntactic representation is unlikely to succeed. From the psycho- and neuro-linguistic perspectives this observation raises many questions about the relation between syntactic and semantic representations and the mechanisms of comprehension available to speakers of English and similar languages. It appears that, in these cases, the use of universal quantifiers may be therapeutic! Why this might be true remains elusive.

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