

Sensitivity to grammatical structure in agrammatic aphasics: A reply to Linebarger, Schwartz and Saffran*

EDGAR ZURIF

*Boston University School of Medicine and
Boston V.A. Medical Center*

YOSEF GRODZINSKY

Brandeis University

Linebarger, Schwartz and Saffran (1983) have recently reported that four agrammatic aphasic patients performed well on a task requiring sentence acceptability judgments—remarkably well, given that on a picture-pointing measure of sentence comprehension, these same patients could not reliably assign semantic roles consistent with syntactic structure. Linebarger *et al.* have concluded from their findings that the comprehension limitation in agrammatic patients ‘does not reflect a loss of the capacity to recover syntactic structure.’ There are a number of virtues to their account; at the least, it compels consideration of the possibility that the processing antecedents of agrammatism are partially the result of a disruption of non-linguistic functional systems. However, there are also some problems with their view. We will dwell mainly upon the latter. We will examine what we think to be a potentially misleading claim of theirs concerning what is spared in agrammatic aphasia. And we will enter a different linguistic perspective on their findings.

Our major concern has to do with the kinds of conclusions that are reached from performances on judgment tasks. This issue first surfaces in relation to the fact that the Linebarger *et al.* account is at odds with many, if not most, other recent analyses of grammatical ‘knowledge’ in agrammatic aphasic patients (see Berndt and Caramazza, 1980, for a review). Admittedly, of these other analyses, many have made use of a written format. And to express Linebarger *et al.*’s view, this minimizes their relevance to the question of whether or not, or to what degree, agrammatic aphasic patients are capable of constructing syntactic representations of spoken sentences. But even if an auditory format is indicated, why choose an auditory *judgment* task? *A priori*,

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what is there about such a task that isolates devices geared to on-line syntactic analysis—devices that normally operate in the service of utterance interpretation? Rather, given the luxury of conscious reflection permitted by acceptability judgments, one might expect not to tap normal on-line processes. If any task allowed agrammatic patients to use processing routes other than those by which structural information is *normally made available at the appropriate time for interpretation*, it would be of the sort Linebarger *et al.* used.

In fact, Linebarger *et al.*, themselves, indirectly enter the possibility that the syntactic processing on their task is not normal. Thus, in an attempt to explain what they take to be a conflict between their data and those previously collected, Linebarger *et al.* suggest, as one possibility, that the poor performance charted by the other investigators may have arisen as the result of these others having mixed grammatical judgments with judgments of truth and plausibility, that the errors, in consequence, reflected attentional or response biases rather than the integrity of parsing operations. Granting the reasonableness of their suggestion, how ought we to view the relation between the syntactic representations constructed on a task that minimizes attentional biases, namely theirs, and those representations that are *normally* constructed—that is, those that depend upon parsing operations not being susceptible to such influences?

It is in the context of this question that we wish to examine their interpretation of their data. At issue is (1) their claim that their data provide strong counterevidence to any available syntactic theory of agrammatism that explains the comprehension failure 'in terms of the inability of such patients to parse sentences', and (2) their concluding statement that their data make clear that 'the comprehension deficit in agrammatism does not reflect loss of the capacity to analyze syntactic structure.' We think that these claims invite an incorrect interpretation on a very central point: namely, that the skills they have charted on their judgment task reveal parsing operations equivalent to those normally involved in sentence comprehension.

Our indictment of this position, as will be seen directly below, also brings into focus the initial source of the confusion—that emanating from the 'syntactic' account, without Linebarger *et al.*, arguably, might not have entered their claim.

Some explanation. In the 1970s, a number of reports appearing around the same time on sentence-picture matching performance and of performances on various metalinguistic tasks converged on the notion that the disruptive effects of left anterior brain damage are not limited to output, but rather are reflected in all linguistic activities. In particular, it was claimed that patients who tend to omit closed class items in speech, tend also to be unable to interpret sentences in which the critical cues to relational meaning are pro-

vided by these items (see Berndt and Caramazza, 1980, for a review). In the context of this broadly stated claim, the evidence presented by Bradley *et al.* (1980) for the normal existence of separate lexical access systems for open and closed class items, and for the inability of agrammatic patients to exploit the special closed class device, served to provide a *processing* account of the comprehension limitation. That is, under the hypothesis that the closed class route functions as input to a parser, the agrammatic comprehension became readily understandable as a reflection of the failure of this access and parsing system, and of an attendant failure to assign syntactic analyses to input strings.¹

The interpretation that Linebarger *et al.* seem to have taken from this account is that disruption to the closed class route forecloses syntactic analyses in all circumstances. And since some versions of the Bradley *et al.* position do, indeed, suggest such a conclusion (e.g., Zurif, 1980; but see Zurif, 1982), the Linebarger *et al.* data serve as an important corrective. Clearly, in the light of their data, the closed-class parsing explanation cannot any longer be taken in any straightforward fashion to account also for acceptability judgments.

Even so, however, it does not necessarily follow, as Linebarger *et al.* would have it, that their data also provide counterevidence to the parsing explanation of agrammatic *comprehension*. Whatever operations were used in their judgment task to achieve 'a full parse' of the input, they do not seem to us to be those that figure in the normal parsing capacity. Normal parsing systems ought not to flourish only when sentence interpretation is not also at stake. Nor, to recall our earlier point, should parsing be influenced by attentional biases. In short, and contrary to one of the Linebarger *et al.* claims, parsing does not appear to be just slowed down or rendered less efficient by focal brain damage; rather, it appears to be put on a different basis. And this parsing difference, in our view, still serves to account for the agrammatic comprehension limitation.

The quirkiness of the agrammatic patients' parsing capacity leads us to raise yet another possibility: namely, that the completeness of the patients'

¹We are not intending to claim in this discussion that the Bradley *et al.* account is problem-free. In fact, their finding that the two recognition devices—the open and the closed class access mechanisms—are differentiated in terms of frequency sensitivity has been challenged by a number of investigators (Gordon and Caramazza, 1982; Segui *et al.*, 1982). Still, there is other evidence to suggest that this distinction between vocabulary classes is exploited at an early stage of processing—evidence comprised of patterns of interference on a lexical decision task (Bradley *et al.*, 1980), of performance patterns on a letter cancellation task (Rosenberg *et al.*, 1982), and more recently, of patterns observed on a task requiring the processing of spoken sentences (Salasoo and Pisoni, 1983).

syntactic representations—even in the judgment task—is illusory, and that in many of the conditions provided by Linebarger *et al.*, the patients could form correct judgments on the basis of *incomplete* representations.

To establish the likelihood of this possibility, some background needs to be entered concerning a recent structural characterization of agrammatism offered by Grodzinsky (1982). Before doing so, however, we must emphasize that we do not intend the following account to bear upon *comprehension* failures in agrammatism. Rather, we seek only to provide an upper bound on the structural representations available to agrammatic patients, and thereby, to bear directly upon the domain of inquiry set out by Linebarger *et al.*: the basis of acceptability judgments.

Grodzinsky's characterization, motivated initially to account for cross-linguistic patterns in agrammatic production, depends upon the elaboration of S-structure in terms of labelled constituents, some of which have lexical features—that is, are lexically specified—and some of which are represented by grammatical features, such as + tense, + agreement, and the like (Chomsky, 1981). Grodzinsky's characterization maintains, roughly, that although a complete labelled bracketing may be available to the agrammatic patient, certain terminal nodes at the syntactic level are left either unspecified or assigned zero phonological value. In particular, the unspecified terminal nodes are those that are immediately dominated by DET, AUX, INFL, COMP (and possibly others) which, it should be emphasized, directly involve the closed class items; the zero nodes are those immediately dominated by P (preposition), under certain conditions.²

On this account, violations of syntactic structure are permissible in agrammatism (that is, not noticed by the patient), only to the extent that they are either errors involving inflections, auxiliaries and determiners, or omissions of prepositions. Equally to the point, violations involving change of position of these elements within a structure, or any deformation of the structure itself, are *not* permissible. Thus, while a patient may accept an incorrect substitution of *be* for *do*, as in

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

he or she will not accept a violation of structure such as

*The man his car is washing.

²The nullified prepositions are either in noun phrases (e.g., 'of', in 'the destruction of the city'), or are heads of phrases that figure in the subcategorization patterns of verbs (e.g., 'for', in 'looked for the cat'). The level at which these and other grammatical formatives are unspecified must be S-structure in order to inform—or misinform—such matters as Case assignment (Chomsky, 1981).

The relevant difference here is that the first deformation turns on a substitution involving only a closed class terminal node, to which, by hypothesis, the agrammatic patients are insensitive; the second contains a violation of a phrase structure rule implicating the expansion of tree structures. This, we claim, is not permissible in the agrammatic system, and is therefore likely to be detected by the patient, at least in other than on-line situations.

This hypothesis allows us to divide their experimental conditions into three categories. They are: (1) violations of tree structure which, on our theoretical account are expected to be noticed by the patients, and which indeed are; (2) violations involving only substitution of a closed class terminal node which are hypothesized not to be noticed, and in fact are not; and (3) one condition that seems to involve violations that draw both from (1) and (2) and which we cannot, therefore, evaluate.

A listing of the Linebarger *et al.* experimental conditions comprising each of these three groups and some sample analyses should make our point clearer.

Consider, first, the structural deformations (Group 1). Here we place six of their experimental conditions: Strict subcategorization, Particle movement, Empty elements, Left branch, Gapless relative clauses, and Phrase structure rules. In this context, consider a violation of the following type:

*How many did you see birds in the park? (p. 371)

The representation for the terminal node *did*, on Grodzinsky's view, will not be specified for the agrammatic patient at the syntactic level. The node immediately dominating it—AUX—will be specified, however. Further, since the left branch condition applies to structures and not to terminal nodes, there is no reason why agrammatic patients should be expected to fail to detect the violation. And indeed, Linebarger *et al.* confirm this.

In our second group—those that involve closed class substitution—we can place three of the Linebarger *et al.* conditions: Reflexives, Tag questions: subject copying, Tag questions: aux copying. So, for example, in the sentence

*The little boy fell down, didn't it?, (p. 371)

the selection of an inappropriate pronoun involves only a terminal node at the syntactic representation—a node which we claim to be unspecified for the agrammatic patient. And, as noted, Linebarger *et al.* found poor performance on this condition.

The third group consists of only one condition: namely, Subject-aux inversion, which we find hard to evaluate. It is formulated such that, in some instances, tree structures are deformed, as in

*Is the boy is having a good time?, (p. 370)

while in other instances, only terminal nodes at the syntactic level are implicated, as in

***Did the old man enjoying the view? (p. 370)**

In summary, even if the patients were responding to syntactic structure alone,³ the adequacy of the patients' judgments cannot be taken to sustain Linebarger *et al.*'s conclusion that '... the comprehension deficit in agrammatism does not reflect loss of the capacity to analyze syntactic structure.' The strategy of maintaining this claim by viewing the comprehension limitation to be the result of a 'less efficient' parsing capacity, fails on important particulars—particulars that, as we have tried to show, suggest that 'less efficient' be changed to 'different'—and different in such a way as to limit full structural representations, even at the level of acceptability judgments. But most importantly, there is nothing in the Linebarger *et al.* data to blunt the force of any account of agrammatic *comprehension* that turns on a disrupted parser.

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³It should be noted here that we cannot be sure that Linebarger *et al.*'s data attest to a syntactic capacity. That is, it is entirely possible that patients in their study responded, not to sentence ungrammaticality, but to anomalous intonation. Although as reported, the investigators expended considerable effort in their attempt to read each ungrammatical sentence with an intonation contour appropriate to a well-formed sentence, this may not have been achieved. It is not so easy to speak normally ungrammatical sentences, to make them sound other than funny. In short, nothing is certain in this respect, and clearly their intentions concerning normal sounding intonation need to be replaced by the products of available technology, by the electronic matching of normal contours and ungrammatical sequences.

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