

NOTES AND DISCUSSION

How “Regular” Is Sentence Comprehension in Broca’s Aphasia? It Depends on How You Select the Patients

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Grodzinsky, Piñango, Zurif, and Draï (1999) argue that a statistical analysis of pooled sentence comprehension data from published studies of Broca’s aphasic patients supports the dominance of a differential pattern of performance on active and passive voice structures. They argue that these results counter a previous study in which individual patient data from published studies were analyzed. However, Grodzinsky et al. have not carried out a true test of their hypothesis, but have biased the outcome by selecting samples for analysis that support their claims. © 1999

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One of the most often studied symptoms of aphasia is failure of sentence comprehension in the context of spared comprehension of isolated words. Many types of aphasic patients, including the classical types labeled “Broca” and “conduction,” appear to understand conversational speech without difficulty and score normally on tests of word comprehension (Goodglass & Kaplan, 1983). Nonetheless, such patients often have difficulty understanding simple declarative sentences when the task precludes reliance on word meaning alone, i.e., when either of two nouns named in the sentences could logically assume the thematic role of agent of the action (Caramazza & Zurif, 1976). This “asyntactic” comprehension pattern is frequently diagnosed using sentence/picture-matching tasks in which the

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patient hears a sentence (in either active or passive voice) and must choose between two pictures showing a correct depiction of the sentence and a distractor picture in which the thematic roles of the participants named in the sentence are reversed (Schwartz, Saffran, & Marin, 1980).

Grodzinsky and colleagues have made two claims regarding this failure to understand “reversible” sentences: First, that the pattern is necessarily related to the characteristics of sentence production found in agrammatic Broca’s aphasia, and second, that comprehension failure is limited to specific sentence types. The claim is that agrammatic aphasic patients perform normally (at above-chance levels) on sentence/picture-matching tests with active voice sentences, but select pictures at random when given passive voice sentences. For some years and across numerous publications, Grodzinsky and colleagues have maintained that this pattern of relative performance on active and passive voice structures is a *general* finding among Broca’s aphasic patients with agrammatic speech (Grodzinsky, 1986, 1990; Grodzinsky, Pearce, & Malakovitz, 1991), with the implication that both the comprehension pattern and the production impairment arise from the same syntactic impairment.

This claim was challenged by a review of 15 studies of the issue published between 1980 and 1993 showing that only about one-third of the agrammatic sample demonstrated the predicted pattern (Berndt, Mitchum, & Haendiges, 1996). The criteria used to select studies for that review required (1) that the authors of the study described the patients tested as nonfluent agrammatic aphasics, (2) that active and passive voice sentences were tested and the results reported for each structure, and (3) that the task employed a sentence/picture-matching paradigm in which the probability of performing correctly by chance was .50. Data from 42 agrammatic patients were individually analyzed using the Binomial Test to determine whether or not performance on active and passive structures differed from what would be expected by chance. In addition to the data sets that conformed to Grodzinsky’s predictions, approximately one-third of the sample performed poorly on both types of sentences; the remainder performed well on both types of sentences.

Grodzinsky, Piñango, Zurif, and Drai (1999) have criticized this review on a number of grounds, focusing primarily on its failure to combine the data from individual patients and analyze the outcome across the entire group. These authors present a group analysis of published comprehension data from agrammatic aphasic patients that (they argue) supports their assumption of relative active/passive performance (along with a similar argument regarding sentences containing relative clauses). This new analysis includes data from papers published between 1980 and 1996 and presents a statistical analysis of the pooled data on the active/passive performance of 42 patients. This comment focuses on a comparison of this new analysis with the earlier study of Berndt et al. (1996) in an attempt to elucidate how two analyses of published results could reach such different conclusions. (For

a more detailed discussion of the statistical, methodological, and theoretical claims made by Grodzinsky et al. about the single-case versus group studies issue, see Capitani, Caramazza, & Berndt, in preparation.)

The most important difference between the two studies involves the selection of data samples for analysis. Although there was some overlap among the samples considered in the two analyses, the two studies did not consider the same sets of data. There are two ways in which the sample analyzed by Grodzinsky and colleagues differs from that of Berndt et al. (1996): (1) Data included in the original study were deleted from the later analysis, and (2) new data sets were added. We will consider the consequences of each of these differences between the samples.

Grodzinsky et al. excluded data from 21 patients that had been analyzed by Berndt et al. (1996). This exclusion was justified on the grounds that the samples had come from patients who were not truly Broca's aphasics, a classification that is argued to require testing on a standardized aphasia battery (Footnote 4). Two of the excluded patients ("Roe" of Kolk & VanGrunsven, 1985, and EA of Haendiges, Berndt, & Mitchum, 1996) differed from the classic Broca's profile because their comprehension was generally poorer than required for that classification. Since both of these patients also deviated from the predicted pattern because active voice comprehension was poor, their exclusion from consideration appears justified.

The reason for the exclusion of data from the other 19 patients is unclear. Since basic comprehension abilities do not seem to be the problem with these patients, their exclusion was presumably related to characteristics of their production. The authors of the excluded studies frequently went to some length to justify the assertion that the patients they described were "agrammatic," a characterization that cannot be inferred from performance on a standard battery. These measures included detailed analyses of the structural characteristics of the patients' sentence production (Martin, Wetzel, Blossom-Stach, & Feher, 1989) or the provision of transcribed speech samples documenting the patients' grammatical disturbances (Druks & Marshall, 1991; Martin, 1987). In all cases, it is not clear in what ways the excluded patients differed from the prototypical picture of "agrammatic Broca's aphasia," or from the patients whose data were selected for inclusion in Grodzinsky et al.'s sample. In fact, the primary difference between the excluded and included samples appears to be that the descriptions of the production characteristics of the former were considerably more detailed than descriptions of the latter.

This is most clearly true for the study of Kolk and VanGrunsven (1985), which had contributed 11 patients to the sample of Berndt et al., but which contributed only two patients to the analysis of Grodzinsky and colleagues. Kolk and VanGrunsven presented each patient's speech rating scale, in its entirety, from the Boston Diagnostic Aphasia Examination (Goodglass & Kaplan, 1983). This information, which is far more detailed than is typically

included in publications to support classification, shows that although all patients demonstrated most of the characteristics associated with Broca's aphasia, few patients produced all of them. For example, two patients had better articulatory abilities than is typical of Broca's aphasia, although both showed all of the other relevant characteristics, including disturbances of phrase length, grammatical form, and melodic line. It is worth noting that these distinctions among characteristics of speech production are not made when classifying patients using the Western Aphasia Battery (Kertesz, 1979), a test used to justify inclusion of five new patients in the sample of Grodzinsky et al.

It is not clear which (if any) of the numerous, intercorrelated speech characteristics found in Broca's aphasia might be importantly related to predicted comprehension patterns. What *is* clear is that this selective exclusion of data on the basis of production characteristics with unspecified relationship to the comprehension predictions resulted in the exclusion of many data points that did not conform to the predicted pattern: Of the 19 patients who were excluded from consideration because of characteristics of their *production*, 14 demonstrated a performance pattern different from that predicted.

The second source of the differences between the data sets analyzed by Grodzinsky et al. (1999) and by Berndt et al. (1996) involve data that had not been included in the earlier study. Results from 21 new patients were added to the 21 data sets remaining in the Berndt et al. sample after the exclusions discussed above. Two of those samples will not be considered here, because the data either are unpublished or were generated from an experimental paradigm other than sentence/picture matching. *All* of the remaining 19 data sets demonstrated the predicted pattern: For all patients, performance was above chance on the active voice trials, and at chance on passive voice. This is not a surprising finding, since in every case the patients were chosen for study in the original paper *because* they showed this "syntactically principled deficit" (Grodzinsky et al., 1991, p. 437). It is explicitly stated in all five papers that patients were selected because they demonstrated above chance performance on active and at chance performance on passive voice structures (Baretta, Hartford, Patterson & Piñango, 1996, p. 739; Grodzinsky, 1995, p. 488; Grodzinsky et al., 1991, p. 437; Hicock & Avrutin, 1995, p. 12; Hagiwara, 1993, p. 327). It is not clear how difficult it was for these authors to identify such patients, although Hagiwara (1993, p. 327) selected 10 subjects after screening 70 aphasic patients. The inclusion of the same English-speaking patients in several of these studies suggests that the pattern at issue may not be particularly common. However, if any Broca's aphasic patients were tested whose comprehension did not conform to the predicted pattern, they are not mentioned (let alone enumerated) in these publications.

Because of this clear selection bias, the analysis presented by Grodzinsky et al. (in press) does not address the question it pretends to address. The

authors stated that their predicted pattern should dominate group performance for “patients that are selected on independent grounds,” but they did not select patients independently of the expected outcome. Fully half of the patients who contributed data to their analysis were chosen specifically because they demonstrated the pattern of performance that conformed to their prediction. This fact undermines *any* subsequent analysis of these samples to determine the prevalence of the predicted pattern, whether conducted on the group as a whole or on the individual data. In light of this selection bias, the results couldn’t turn out any other way.

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