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Patients with Lesions in Broca's Area Can Produce Syntactically-Complex Sentences

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Introduction

Historically, patients with lesions in Broca's area have been characterized as having "telegraphic" speech output and concomitant deficits in the comprehension of syntactically-complex sentences. Later research has shown that a much larger lesion is required to produce this disorder – neighbouring parts of the frontal and superior temporal lobes, as well as underlying structures and white matter – and that Broca's area need not necessarily be involved. To further examine the syntactic output potential of patients with lesions to Broca's area, we examined the oral productive speech in patients who, despite a lesion in Broca's area, were able to produce complex syntactic structures in their oral speech. We questioned the extent to which these patients could produce these structures and what types of constructions they were able to use.

Methods

Video recordings of seven aphasic participants with lesions involving Broca's area but whose speech could not be described as telegraphic were analysed. All had suffered aphasia due to a single left hemisphere stroke and all were native English speakers. All were assessed with the Western Aphasia Battery including the description of a picnic scene picture, and had at least 10 minutes of additional recorded conversational speech. We also elicited narrative speech using the sixteen-page wordless book, *Frog where are you?* by Mercer Mayer by having participants describe the book's storyline. A linguistic inventory of the grammatically-correct sentences they produced was then compiled, allowing for a closer examination of the types of clauses produced. For each utterance, we considered every clause that expressed a single action. Phrases that included an infinitive, participle, or modal verb were considered as eligible sentences as well as those with a double verb but single subject. Narrative expressions ("Once upon a time") were considered to be attached to the main clause. Subordinate clauses were of particular interest due to the complexity of their construction.

Results and Discussion

Results showed that a lesion in Broca's area may not necessarily affect the formulation of sophisticated grammatical structures. All of the patients were able to produce proper verb phrase (VP) clauses either with finite verbs, auxiliaries or modals (e.g., "The dog, he looks he might get hit."). The use of the *-ing* form was preserved in all subjects (e.g., "The frog is getting out of the jar"). Of note, were subjects who could produce sentences with complex clauses such as "The gopher is wondering why they are looking", or "The boy, he is picking up the dog because he broke the jar, and he looks kinda mad, but the dog is kissing him".

In sum, the ability to use complex structures in English can be spared in patients with a lesion in Broca's area. This

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confirms earlier findings, but also provides a linguistic inventory of the types of clauses that can be produced. Given the complexity of the clauses, despite the lesion in Broca's area, we can assume that the production of these clauses is not dependent solely on this region.