Comprehension deficits of Broca's aphasics provide no evidence for traces

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ABSTRACT

The data provided by Grodzinsky which demonstrate a syntactic comprehension deficit in Broca's patients provide no evidence for the theoretical concepts of movement, trace or 'trace deletion'. The comprehension deficit data can be more economically accounted for with traditional grammatical concepts that are less theory-internal and more empirically based.

All of the comprehension data which Grodzinsky (G) presents can be accounted for without reference to movement, traces or 'trace-deletion'. The issue is significant because, despite the essential role of movement and traces in orthodox transformational grammar (Chomsky 1981, 1986, 1995), there exists substantial evidence that movement and traces are linguistically unnecessary (Ades and Steedman 1982, Gazdar et al. 1984, Kaplan and Zaenen 1989, Pollard and Sag 1994 chapter 9, Sag and Fodor 1994, Kay and Fillmore 1999, Sag 1999) and psycholinguistically unjustified (Pickering and Barry 1991, Sag and Fodor 1994). The pattern of G's comprehension data can be economically formulated without reference to movement or traces, let alone trace-deletion, using only the traditional notions of argument and logical subject.

The concept of logical subject is illustrated in examples (i): the logical subject of the verb *drive* appears in **bold type** and co-arguments of the logical subject appear in *italics*.

(i) a **Leslie** drove *my car*.

b *My car* was driven by **Leslie**.

c *My car* has been driven too much lately.

d It was **Leslie** who drove *my car* that day.

e It was *my car* that **Leslie** drove that day.

f *My car* drives like a Model T with square wheels.

g *My car*, **Leslie** drives whenever possible.

Pretheoretically, there is something uncomplicated about a simple, active, declarative clause like (i)a. The semantic argument of the verb which is realized as syntactic subject in such a clause is traditionally called the logical subject. (Actually 'logical' is a misnomer. Logic has nothing to do with the matter.) In Chomsky's early formulation of transformational grammar (1957), the deep structure subject was a formal incarnation of the traditional notion of logical subject. Sentences like (i)a were licensed by a set of context free phrase structure rules augmented by a set of obligatory transformations and were called 'kernel sentences.' Sentences like (i)b-f were derived from kernel sentence by the application of optional transformations.[1]

The concept of logical subject is closely related to the predominant clause type of a language. English is considered a Subject-Verb-Object (SVO) language because of the favored status of sentences like (i)a. Chinese is also an SVO language. Japanese is an SOV language. So, by happenstance, these three languages share the property of having the subject come first in the canonical clause. Consequently the interpretive strategy employed by the English-, Chinese- and Japanese-speaking Broca's patients may be formulated as follows, where the initials LSF stand for 'Logical Subject First'.

(ii) LSF: A logical subject precedes its coarguments.

G's comprehension data are tabulated in full in Table 1, where logical subjects are shown in **boldface** and nominal coarguments of logical subjects in *italics*. (The numbering is G's.) The words 'success' and 'failure' in the third column indicate whether or not G's subjects did better than chance at interpreting the sentence type in question.[2] According to the LSF strategy, failure of comprehension by the Broca's patient should occur if and only if a NP in italics precedes a NP in bold face within a clause.

– INSERT TABLE 1 –

Examples 4a,b illustrate the active/passive alternation in English, in which only the former has the logical subject first, as required by LSF, and is successfully interpreted by the Broca's patients. In 5a,b the clause in question is the bracketed relative clause. Again, LSF makes the correct predictions. Example 6 has the same structure as example 4b and LSF again makes the correct prediction of failure.

Examples 1c and 1d are to be contrasted with examples 2c and 2d. In the former case the relative clause has the preferred **bold** > *italic* order: success is predicted by LSF and is observed. In the latter case, the dispreferred *italic* > **bold** order occurs in the relative clause and failure of the Broca's subjects is correctly predicted by LSF. Examples 1e and 1f illustrate adjectival predications, where the (raised) logical subjects of the adjectives *interested* and *uninspired* appear as the initial NPs of their clauses and are correctly interpreted. Despite superficial similarity to 1f, 2e represents, not a copula-plus-adjective construction, but a true passive, with the logical subject realized in a *by*-phrase. (*The man unmasked the woman* is well formed, while **The man uninspired the woman* is not.) Again in 2e, failure is correctly predicted by the LSF strategy.

Turning now to the Japanese examples, 7-8, the so-called unscrambled and scrambled examples, 7a and 7b respectively, present an analogue to the English active/passive alternation, 4a and 4b: when the logical subject precedes its co-argument(s) (7a), Broca's patients interpret successfully, as predicted by LSF. When the order is reversed in 7b, unsuccessful interpretation occurs, again predicted by LSF. The *-rare*-passive in 8a behaves like the English passive: precedence of a non-logical-subject argument produces unsuccesful interpretation as predicted by LSF. The analysis of 8b is slightly more complex. *Okassan* ('mother') is not the logical subject of *hik-* 'catch', but it is not an argument of *hik-* at all. The fact that *okassan-ga* precedes the logical subject of *hik-are-ta*, namely **musuku-ni** ('son-accusative'), does not therefore constitute a violation of LSF. The appearance of **musuku-ni** to the left of *kaze-o* 'cold-accusative' correctly predicts the observed absence of difficulty for Broca's patients in interpreting sentences of this type.[3]

The Chinese examples in 10a,b are intransitive sentences containing transtitive relative clauses. The relative clause has a cat chasing a dog and the main clause describes the size of one of these animals. The facts of relevance are the relative orders of the logical subject **mau** 'cat' (of *zhuei* 'chase') and its coargument (*gou* 'dog'). In (10)a *gou* precedes **mau** and LSF correctly predicts failure. In (10)b **mau** precedes *gou* and LSF correctly predicts success.

G's comprehension data show a pattern of syntactic deficit in Broca's aphasics, but they do not furnish evidence for the reality of movement or traces.[4] More generally, the data presented in this paper suggest that Broca's aphasics may rely on a small number of parsing strategies based on the most frequent construction types of their languages.

(4)a	**The boy** pushed *the girl*.	success
b	*The girl* was pushed by **the boy**.	failure
(5)a	The boy [**who** pushed *the girl*] was tall.	success
b	The boy [*who* **the girl** pushed] was tall.	failure
(6)	*The girl* was admired by **the boy**.	failure
(1)c	Show me the girl [**who** pushed *the boy*].	success
d	It is the girl [**who** pushed *the boy*].	success
e	**The boy** was interested in *the girl*.	success
f	**The woman** was uninspired by *the man*	success
(2)c	Show me the boy [*who* **the girl** pushed].	failure
d	It is the boy [*who* **the girl** pushed].	failure
e	*The woman* was unmasked by **the man**.	failure
(7)a	**Taro-ga** *Hanako-ni* nagutta.	success
	Taro Hanako hit	-
	Taro hit Hanako.	-
b	*Hanako-o* **Taro-ga** nagutta.	failure
	Hanako Taro hit	-
	Taro hit Hanako.	-
(8)a	*Taro-ga* **Hanako-ni** nagu-rare-ta.	failure
	Taro Hanako hit-pas-past	-
	Taro was hit by Hanako.	-
b	Okaasan-ga [**musuku-ni** *kaze-o* hik-are-ta].	success
	mother-nom [son-by cold-acc catch-pas-past]	-
	A mother had her son catch a cold on her.	-
(10)a	zhuei *gou* de **mau** hen da	failure
	chase dog that cat very big	-
	A/the cat that chased a/the dog was very big.	-
b	**mau** zhuei de *gou* hen xiao	success
	cat chase that dog very small	-
	The dog that the cat chased was very small.	-

Table 1. G's comprehension data, showing linear order of **logical subject** and *non-logical-subject* arguments

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Notes

[1]Without, however, leaving traces, which did not exist in early TG. It is possible that early transformational grammar, lacking traces, would have been capable of describing G's comprehension facts in terms of the degree to which a clause fit the pattern of 'kernel' sentences.

[2] To simplify the discussion and because G's example's 1a,b and 2a,b are repeated (with trivial interchange of *girl* and *boy*) in his 4a,b and 5a,b, I have listed examples 4, 5 and 6 before 1 and 2 in Table 1 and eliminated examples 1a,b and 2a,b. Similarly, G's examples (11)a,b have been eliminated from Table 1 because they are structurally identical to his examples (5)a,b and yield the same results.

[3]To be sure, the Japanese Broca's patient is going to need something beyond the LSF strategy to successfully process this type of sentence. Limitation of space prohibits further discussion of this point.

[4]G states that "... the presentation here is compatible with ... the Minimalist Program (Chomsky 1995)" [ms. p. 11]. This is not obvious.   According to the Minimalist Program, all NPs and all verbs must move from their original location to the neighborhood of an appropriate functional head to get their features 'checked'. Hence every sentence contains traces. The trace-deletion hypothesis for Broca's aphasics combined with a Minimalist grammar would appear to predict that Broca's aphasics would not have intact syntactic comprehension for any sentence.