

## The Passive Puzzle in Broca's Region

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Broca's region is implicated in some intra-sentential dependencies, but not in others. While this talk focuses on the Passive Puzzle – a striking cross linguistic contrast in the performance of Broca's aphasics – it begins with a review of the highly selective role of Broca's region in the computation of dependency relations. Relevant facts come from experiments on the receptive abilities of Broca's aphasics, and from fMRI in health. These facts divide into 4 classes:

### CLASS I – Movement dependencies related to Broca's region:

- (1) A'-movement (in wh-questions, relative clauses, left dislocation, Topicalization) activates it in fMRI, and is impaired in Broca's aphasia.
- (2) Scrambling activates it in fMRI, and is impaired in Broca's aphasia.
- (3) One instance of A-movement (passive) is impaired in Broca's aphasia in several languages (English, Spanish, Hebrew).

### CLASS II – Movement dependencies unrelated to Broca's region:

- (4) One instance of A-movement (passive in German and Dutch) is known to be intact in Broca's aphasia.

### CLASS III – non-Movement dependencies unrelated to Broca's region:

- (5) Anaphor-antecedent dependencies are intact in Broca's aphasia, and do not activate Broca's region in fMRI.

Beginning with the general picture (1)-(3), I will present new Class III results which exclude a simple memory-based account of the role of Broca's region in sentence analysis (5). Then, I will move on to the Passive Puzzle: why is performance on active sentences universally intact in Broca's aphasia, whereas patients' performance on passive splits cross-linguistically (3)-(4)? Building on recent work on Scope Freezing in German, I will examine the interaction between these phenomena and passive, and try to elucidate one part of the Passive Puzzle: Looking at Scope Freezing, we should expect German and Dutch speaking Broca's aphasics to exhibit the same performance level on active and passive.

Yet this is not enough to explain the Passive Puzzle, because at issue is not only why German/Dutch Broca's aphasic patients treat active and passive in the same way. Rather, we must understand why they are above-chance in comprehending both constructions, while at the same time English, Hebrew, and Spanish speaking patients are above-chance on active sentences, but at chance level on passive. I will move on to discuss the Passive Puzzle in the context of the Trace-Deletion Hypothesis. I will argue that all the results follow from the TDH, modulo an additional difference between the language groups: while German and Dutch and verb-final, English, Hebrew and Spanish are verb-initial.

Finally, I will discuss additional data that further complicate the picture. Specifically, Japanese and Korean are like German in all relevant respects – they are verb final, have Scrambling (which is impaired in Broca's aphasia), and seem to exhibit the same scopal properties. Yet, although the comprehension patterns evinced by Japanese and Korean Broca's aphasics in active and passive should be similar to German, they are not:

### CLASS IV – potential mysteries:

- (6) Japanese/Korean Broca's aphasics are at chance in passive comprehension.

No account I know can handle (3), (4) and (6) at the same time. I will explore possible directions toward an explanation of this mystery, mainly through an investigation of syntactic properties that set German/Dutch and Japanese/Korean apart in a sense germane to my proposal.

Background reading:

Grodzinsky, in Grodzinsky & Amunts, in press; Drai & Grodzinsky, *Brain & Language*, in press a, b; the above are all downloadable from <http://freud.tau.ac.il/~yosef1>. Sauerland, Uli. On QR in German. Unpublished ms. 2001. Downloadable from: <http://www.zas.gwz-berlin.de/mitarb/homepage/sauerland/downloads.html>.