Looking at language

August 4 2009

The study of the neural basis of language has largely focused on regions in the cortex - the outer brain layers thought by many researchers to have expanded during human evolution. Research at Brown University's Department of Cognitive and Linguistic Sciences, reported in the September Issue of *Cortex*, published by Elsevier, adds to evidence that deeper, subcortical regions are also critical by pinpointing when Parkinson's disease patients have difficulty while processing grammatically complex sentences. In Parkinson's disease, degeneration of subcortical dopamine-secreting neurons leads not only to motor symptoms but often also to cognitive deficits.

Jesse Hochstadt recorded eye movements of Parkinson's patients as they listened to sentences containing restrictive relative clauses ("The queen who was kicking the cook was fat") and tried to choose matching pictures. Patients who made more errors were slower to stop looking at pictures ruled out by the relative clause (a cook kicking a queen) when they had heard only as far as that clause's verb ("The queen who was kicking"). But at the ends of sentences, they were not slower to rule out pictures (such as a thin queen kicking a fat cook) that disagreed with the main clause ("The queen … was fat"), despite the memory demands imposed by the intervening relative clause. These patients again showed poor relative-clause and good main-clause processing when relative clauses were at the ends of sentences ("The queen was kicking the cook who was thin").

Patients with such syntax processing difficulty also had difficulty switching between making choices based on size or shape in a non-

linguistic task. This association, Hochstadt proposes, may indicate that processing relative clauses requires structural "switching away" from main clauses; alternatively, because restrictive relative clauses generally refer to facts already mentioned, processing them may involve shifting attention to this "background" information from main-clause "foreground" information.

These joint effects of subcortical neurodegeneration on syntax and "set-switching" are consistent with widely publicized research indicating that mutations in the human FOXP2 gene cause deficits in language and cognition by affecting development of subcortical structures, and that evolution of modern Homo sapiens involved modification of this gene.

More information: The article is "Set-shifting and the on-line processing of relative clauses in Parkinson's Disease: Results from a novel eye-tracking method" by Jesse Hochstadt and appears in *Cortex*, Volume 45, Issue 8 (September 2009), published by Elsevier. cortex" target="_blank">www.elsevier.com/locate/cortex

Source: Elsevier