Working memory and syntax interact in Broca's area

By ayeletb
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By ayeletb May 14, 2014


Abstract:

Comprehension of filler-gap dependency relations (as in this is the man who the woman is touching?) is supported by Broca's area. There are two views regarding the processing role of this brain region in comprehending these dependencies. Specificists hold that Broca's area plays a specific syntactic role in processing filler-gaps. Generalists maintain that as the on-line linking of fillers and gaps taxes Working Memory (WM) resources, Broca's area supports a domain general WM. The current fMRI study tested these two views in a grammaticality judgment task, where participants were presented with two syntactically distinct dependency relations: (a) Filler-Gap and (b) Reflexive Binding. The distance between the dependent elements within each of the constructions was varied, to parametrically vary WM demands. The Generalists would expect parametric variation of distance in both dependencies to lead to a linear increase in activation of Broca's area. Our results support the specificists' view, however: the left inferior frontal gyrus demonstrated an interaction between distance and dependency type with a positive linear effect only for Filler-Gaps. A positive linear effect of distance across both dependencies was only found in the bilateral parahippocampal/ fusiform gyri. Therefore the role of Broca's area in WM is syntactically specific to filler-gap relations.

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