

The neural mechanisms of word selection: an fMRI study

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In a typical everyday scene, we are presented with a multitude of stimuli in all modalities, only part of which ever reach our awareness. This holds for all sensory input but also for language. We rarely, if ever, encounter a situation in which only one source of language stimuli is present. Somehow our brain manages to disentangle this web of stimuli, and select some for further processing, while ignoring others.

Years of work in the visual domain suggests attention as the mechanism selecting a target among competing stimuli. In a recent fMRI study, we found evidence that attention biased the competition that arose when multiple visual stimuli were presented within the same receptive fields.

Furthermore, in another fMRI study, we collected data suggesting that a similar “biased competition” mechanism might be at work in language production. Subjects saw 4 simultaneously presented pictures of common objects which had names that were either phonologically related to each other or unrelated. Subjects either made a phonological judgment on one of the pictures (attend picture), or performed a discrimination on the fixation-cross (ignore pictures).

Adapting a biased competition approach for word selection, we reasoned that in the case of phonologically unrelated items, compared to related ones, there is less overlap in information and stimuli will suppress each other’s representations more successfully in areas associated with phonological encoding.

A preliminary data analysis suggests such suppression effects in Broca’s area (BA44) and in the inferior temporal cortex (BA 37), where BOLD-signal change was smaller for unrelated than for related items.

Interestingly, this effect was larger for ignore compared to attend conditions. I.e. it seems that attention was able to resolve (at least partly) the competition that arose between unrelated items.

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