The processing of focus alternatives: Evidence from neuroimaging

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Introduction

Linguistic focus (evoked by, e.g., contrastive intonation) activates alternatives to the focused element in a listener's mind. These alternatives are more readily available, for example in a lexical decision task (e.g., [1], [2]).

Carsten picked [CHERRIES]$_F$.
Focus semantic value (cf. [3]): {pick(Carsten, x) | x ε E}
Alternative set: {apples, cherries, peaches, pears, plums, …}

[CARSTEN]$_F$ picked cherries.
Focus semantic value: {pick(x, cherries) | x ε E}
Alternative set: {Aaron, Birgit, Carsten, Dorrit, Edward,…}

Research question

What is the neural signature of focus alternatives?

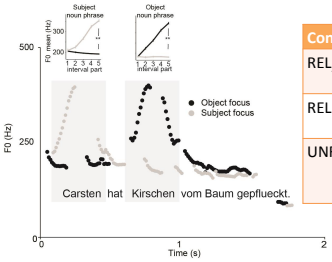
Hypothesis 1: Processing focus alternatives is alike to (deepened) semantic priming -> involvement of bilateral medial temporal gyrus/ superior temporal gyrus (cf. [4], [5]).
Hypothesis 2: Processing focus alternatives is part of establishing discourse coherence -> involvement of precuneus and fronto-median wall (e.g., [6], [7]).

Contrasts

(1) (REL$_{ALT}$ + REL$_{NO\text{-}ALT}$) − UNR: semantic priming
(2) REL$_{ALT}$ − REL$_{NO\text{-}ALT}$: alternative processing

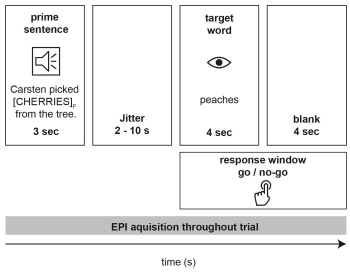
Methods

Participants: 26 right-handed native speakers of German (7 men).
Items: 72 spoken sentences and written probe words. Sentences were produced with either subject or object focus.



Condition	Prime	Target
REL$_{ALT}$	Carsten picked [CHERRIES]$_F$ from the tree.	PEACHES
REL$_{NO\text{-}ALT}$	[CARSTEN]$_F$ picked cherries from the tree.	PEACHES
UNR	Susan/ [SUSAN]$_F$ tuned the [VIOLINS]$_F$ / violins before the concert.	PEACHES

Procedure:

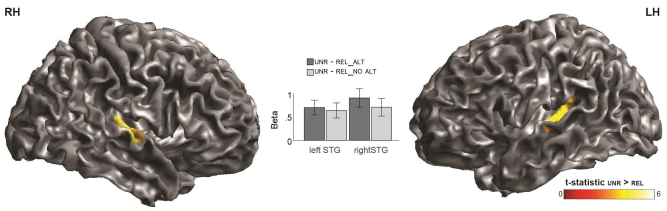


Participants had to press a button if the word had occurred in the sentence. This happened rarely (on filler trials).

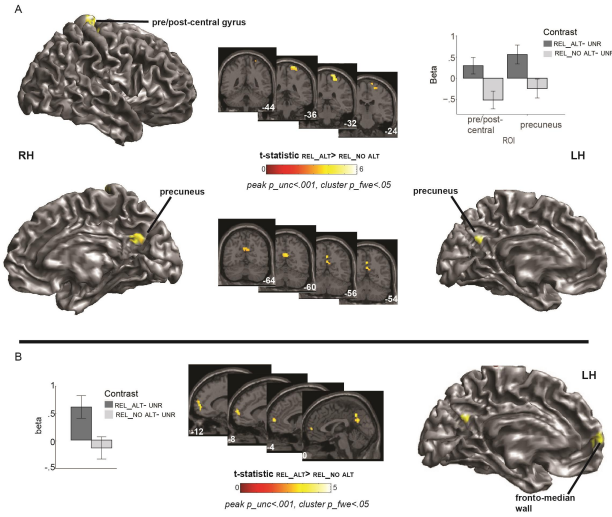
MR-methods: Functional event-related MRI, analysis of blood oxygenation level differences (BOLD) with SPM12 (Wellcome Trust Centre for Neuroimaging, UCL) aligned to the presentation of the target word. Significance-threshold: voxel: $p < .001$ (unc.), cluster: $p < .05$ (FWE).

Results

1. Semantic priming



2. Alternative processing



Discussion

If a probe word is related to a sentence's meaning, it is primed, independent of the sentence's focus structure.

Whether or not the probe word is a focus alternative is distinguished in the precuneus and fronto-median cortex, suggesting that focus structure contributes to coherence-building.

The effect in the pre-/postcentral gyrus is most likely a response-preparation effect.

Focus alternative status is encoded during coherence-building.

References

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