

Neural correlates of compositional conceptual processing

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In this talk we will present work from project C03 investigating the neural correlates of compositional conceptual processing in general and of concept type shifts (CT shifts) in particular.

In a comprehensive meta-analysis of neuroimaging studies on sentence processing, we were able to show that the comprehension of sentence-level semantics, including certain types of conceptual shifts (metonymy, metaphor, irony,) involves a neural substrate in Broca's area that is distinct from the neural substrate of grammatical processing. In addition the posterior temporal cortex and a region known to be involved in theory-of-mind processing is recruited for some types of conceptual shifts.

Our behavioral work on CT-shifts in phase 1 had shown a facilitatory CT congruence effect ('the police' is processed faster than 'his police'). We had been able to rule out a lexical retrieval advantage for the word 'police' preceded by congruent determination and had found no evidence for a 'shift operation', that is extra costs for incongruent determination. Based on these results we assumed that the effect is due to a facilitation of post-lexical NP construction.

Based on our meta-analytic findings we predicted, therefore, that there should be a neural CT-congruence effect in Broca's area. We confirmed this prediction in an fMRI study.

Based on our behavioral findings we also predicted that CT incongruence should not be perceived as a syntactic or semantic violation. We tested this prediction in an ERP study using syntactic and semantic violations in control conditions. Whereas the control conditions yielded classic electrophysiological violation responses (N400, P600), CT-incongruences, as predicted, did not. Instead they showed a novel response pattern that needs to be further investigated.

In sum, our findings so far suggest that the difference between CT-congruent and CT-incongruent determination is not so much that the latter are processed as a kind of violation that needs to be repaired but that it is easier to build up and interpret a CT-congruent NP.