

Objects, meaning, and the brain : neuroimaging studies on the impact of semantics on cortical integrative processing

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Objects, meaning, and the brain

Neuroimaging studies on cortical integrative processing

Oliver Döhrmann

1. Complex and meaningful sounds such as animal vocalizations are preferentially processed in the left superior temporal gyrus.
2. The differentiation of object-related sounds into categories is accomplished by the non-primary auditory cortex of the superior temporal gyrus on the basis of the respective physical stimulus properties.
3. The posterior middle temporal gyrus forms part of a cortical network which integrates sounds with action-related cortical representations, with information from other sensory modalities, and with conceptual information.
4. Congruent and incongruent object sounds and images are preferentially processed in temporal and fronto-parietal regions, respectively.
5. After learning of novel audio-visual associations, similar cortical processing sites could be detected for both familiar and previously unfamiliar stimuli.
6. Cortical regions previously regarded as unisensory auditory or visual are sensitive to changes in the respective other sensory modality.
7. Processing of semantic incongruity particularly engages the inferior frontal cortex and is likely to involve a multitude of different cognitive processes which need to be further characterized by future research.
8. Using stimuli with semantic content demonstrates that integration occurs not only within and across sensory modalities, but also across the domains of perception and cognition.
9. In neuroscience – as in every natural science – conceptual and technical advances go hand in hand to unravel mechanisms at work.
10. Sometimes things are so much easier in soccer than in the brain: “Zum Glück habe ich nur eine Struktur” (“Fortunately, I only have a structure”; Thorsten Legat).