

Object perception by ear and eye: fMRI studies on multisensory processes in human cerebral cortex

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Object perception by ear and eye

fMRI studies on multisensory processes in human cerebral cortex

Marcus J. Naumer

1. Auditory, visual, and tactile information about objects can activate cortical regions that were once believed to be modality-specific.
2. The recruitment and location of multisensory convergence zones varies depending on the information content and the modality that provides the most reliable sensory input.
3. Multisensory integration critically depends on temporal, spatial, and semantic congruency.
4. Whenever a spatial incongruency is detected in multisensory regions (such as the IPS), processing resources are re-directed to low-level visual areas to resolve the perceived incongruency thus utilizing the superior spatial resolution of the visual system.
5. Ventral occipito-temporal (VOT) regions show an object category preference not only during unimodal visual stimulation but also during unimodal auditory stimulation employing natural sounds. This reflects learned associations between frequently co-occurring visual and auditory features of common objects.
6. Object-related activations of superior and lateral temporal regions (STG/STS/MTG) are modulated by semantic congruency.
7. Posterior STS and IFC show overlapping integration effects for natural and artificial material. Such independence of stimulus familiarity emphasizes the essential role these regions play during object-related audio-visual integration.
8. Networks of neurons in auditory association cortex that respond to an auditory object are also linked to visual, tactile, and motor information about the very same object represented in temporal, parietal, and frontal regions, thus being part of a cortical network in which semantic knowledge about objects is represented in a distributed fashion.
9. In order to facilitate disambiguation processes during person recognition, I strongly recommend not to focus too strictly on visual input such as height or hairstyle.
10. On a larger scale, integration in terms of work-life balance is substantially enhanced by using energy-saving inventions such as *BVQX standalone dongles* and the *BahnCard 100*.
11. The successful integration of diverse sensory inputs is one prerequisite for rich experiences of sensuality that clearly exceed what would be predicted from the simple coexistence (or the linear sum) of the respective individuals.