

Conceptual object representations in the sensory and motor systems

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It is debated whether conceptual knowledge is represented in a modality-specific or in an abstract format. Modality-specific theories of conceptual knowledge propose functionally and neuroanatomically distinct subsystems that store features derived from a particular sensory or motor channel. Evidence suggestive for modality-specific conceptual representations comes from neuroimaging studies, in which category-related brain activation was obtained in visual and motor areas for objects from natural (e.g., animals) and artifactual (e.g., tools) categories, respectively. It has been suggested that visual features are more relevant for representing natural objects whereas action-related features are more relevant for representing artifacts. We assessed the specificity of category-related brain activation as an index of modality-specific conceptual representations by investigating the effects of task demands, stimulus format and priming on category-related brain activity. The neurophysiological correlates of conceptual object representations for natural and artifactual categories were determined in space and time using event-related potentials (ERPs). Natural categories elicited greater activity in visual brain areas and artifacts greater activity in motor areas for both picture and word stimuli. This category-related activity was specifically reduced by repetition priming. It was strongest and started as early as 160 ms after stimulus onset when the conceptual features relevant for a given category were also task-relevant. Most notably, we observed comparable category-related brain activation in a training study with novel objects in which visual and action-related knowledge was acquired under controlled conditions. These results substantiate category-related brain activity as an index for conceptual processes and strengthen the notion of modality-specific conceptual representations.