

Olfactory cortex

The formation of an odor percept in humans is strongly associated with visual information. However, much less is known about the roles of learning and memory in shaping the multisensory nature of odor representations in the brain. **METHOD:** The dynamics of odor and visual association in olfaction was investigated using three functional magnetic resonance imaging (fMRI) paradigms. In two paradigms, a visual cue was paired with an odor. In the third, the same visual cue was never paired with an odor. In this experimental design, if the visual cue was not influenced by odor-visual pairing, then the blood-oxygen-level-dependent (BOLD) signal elicited by subsequent visual cues should be similar across all three paradigms. Additionally, intensity, a major dimension of odor perception, was used as a modulator of associative learning which was characterized in terms of the spatiotemporal behavior of the BOLD signal in olfactory structures. **RESULTS:** A single odor-visual pairing cue could subsequently induce primary olfactory cortex activity when only the visual cue was presented. This activity was intensity dependent and was also detected in secondary olfactory structures and hippocampus. **CONCLUSION:** This study provides evidence for a rapid learning response in the olfactory system by a visual cue following odor and visual cue pairing. The novel data and paradigms suggest new avenues to explore the dynamics of odor learning and multisensory representations that contribute to the construction of a unified odor percept in the human brain ¹⁾.

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Karunanayaka PR, Wilson DA, Vasavada M, Wang J, Martinez B, Tobia MJ, Kong L, Eslinger P, Yang QX. Rapidly acquired multisensory association in the olfactory cortex. *Brain Behav.* 2015 Oct 14;5(11):e00390. eCollection 2015 Nov. PubMed PMID: 26664785.

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