Nanosymposium

125. Multisensory Interactions

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Title: A brain region consisting of neurons with moderate sensitivity for voices

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Abstract: A region of 'voice' clusters has recently been identified in the macaque auditory cortex with functional magnetic-resonance imaging (fMRI). These clusters show a strong fMRI activity preference for the voice of conspecifics and appear to functionally correspond to those from the known human voice region. In the *visual* system fMRI has been used to guide electrophysiological recordings from neurons in the monkey brain that were shown to be highly selective for faces [1]. We investigated whether fMRI-guided electrophysiology would reveal comparable levels of selectivity in one of the recently identified monkey voice clusters [2]. During fMRI acquisition and electrophysiological recordings, three categories of 12 sounds were used for stimulation: macaque vocalizations (MVocs), other animal vocalizations (AVocs), and natural sounds (NSnds). The sound categories were comparable in their low-level acoustical features, having been selected for this from a large set of sounds. We first used the stimuli during fMRI, as we have previously done, to identify the clusters with a strong activity preference for MVocs. Then electrophysiological responses to the auditory stimuli were recorded from the

anterior voice cluster in two awake macaques (total of 193 responsive single- and multi-units, from 125 sites). Both monkeys showed moderate neuronal response preferences for MVocs over the other sound categories (respectively, 41% and 29% preference for MVocs in the unit activity of each animal), even if the analysis focused on the focal cluster in each animal with maximal selectivity for MVocs (respectively, 72% and 73% preference for MVocs). Our results suggest that a strong fMRI activity preference need not result from a large proportion of highly selective neurons. This is the case even if methodological differences may have somewhat affected the neuronal selectivity differences observed between our study and the previous macaque work on face processing, which resulted in 96% and 84% selectivity for faces in two animals [1]. In all cases, our results may reflect evolutionary differences that have affected voice and face selectivity. Namely, the visual system appears to have specialized during vertebrate evolution to represent canonical facial features (e.g., two eyes, a nose and a mouth). By contrast, the auditory system could have had less opportunity to specialize, given that many animals modify the acoustics of their vocalizations to be distinct from those of other animals and to circumvent environmental noise.

[1] Tsao, D.Y., et al. (2006) Science 311,670-74.
[2] Petkov, C.I., et al. (2008) Nat Neurosci 11:367-74.

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