This Week in The Journal

Nonauditory Cortical Projections to Inferior Colliculus

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(see pages 8916–8928)

The inferior colliculus is an important hub in the ascending auditory pathway. Its central nucleus receives converging input from multiple brainstem auditory nuclei and sends integrated output to the thalamus. The central nucleus also receives input from the surrounding shell nuclei of the inferior colliculus, which receive descending input from the auditory cortex, as well as other cortical and subcortical structures.

Although lesion studies performed more than 40 years ago suggested that the inferior colliculus receives input from nonauditory cortical areas, these projections were not systematically investigated before now. Olthof et al. did this by first injecting retrograde tracers into the inferior colliculus. Consistent with the previous lesion work, the tracers were carried both ipsilaterally and contralaterally to numerous cortical areas, including auditory, visual, motor, somatosensory, and even prefrontal areas. The existence of projections from each of these cortical areas to the inferior colliculus was confirmed with anterograde tracers. Surprisingly, these experiments revealed that each of the cortical areas projected to multiple inferior collicular nuclei—including the central nucleus, which was previously thought to receive input primarily from ascending fibers. Finally, immunolabeling indicated that projections from each cortical region terminated near the somata of both GABAergic and glutamatergic inferior collicular neurons.

These results reveal that the inferior colliculus, especially the central nucleus, receives much more input from nonauditory cortical areas than was previously appreciated. Although the function of these

projections remains to be determined, they likely shape ascending auditory information, perhaps to potentiate the effects of auditory stimuli associated with expected rewards, goals, and other salient sensory stimuli, and/or to dampen the transmission of auditory stimuli generated by self-movement.

An anterograde tracer injected into the prefrontal cortex labels terminals in the central nucleus of the inferior colliculus. See Olthof et al. for details.

Congruent Visual Cortex Activation by Stories in Blind People

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(see pages 8940–8948)

Listening to stories and watching dramatic performances allows people to share experiences. Brain imaging has shown that such performances, usually movie clips, evoke patterns of cortical activity that are correlated across individuals. These correlations are present not only in primary auditory and visual cortices, but also in higher multisensory and language areas, suggesting that they are not solely the result of similar sensory input. Indeed, movies with narrative structure evoke greater intersubject correlations than stimuli without such structure, and, in higher brain areas, scrambling the order of short movie segments reduces correlations.

Such findings have led to the hypotheses that higher cortical areas represent narrative meanings that unfold over time, and that this information is encoded similarly across individuals. Therefore, examining temporal activation patterns during movie watching might provide insight into how information processing is altered in clinical populations and whether such alterations are consistent across patients (Hasson et al., 2010, *Trends Cogn Sci* 14:40–48).

Loiotile et al. used this approach to determine how visual cortical areas are repurposed in congenitally blind people. The authors used fMRI to measure cortical activity as blind and sighted people listened to audio clips from three movies, a person narrating a story, and scrambled and backward versions of the story. As expected, activity patterns evoked in the auditory cortex and in several higher cortical areas (lateral temporal, precuneus, and prefrontal areas) were correlated both within and between groups. Correlations were also evoked in visual cortical areas of both groups, but the correlations were much stronger within the blind group than in the sighted group. Notably, each of the forward clips evoked a similar pattern of activity in the visual cortex of blind people, but activity evoked by backward speech was not significantly correlated across individuals.

These results suggest that visual cortical areas, which normally represent low-level sensory information, are repurposed to represent higher-level narrative information that unfolds over time. Importantly, the information is represented in similar patterns regardless of the specific content of the narrative. Moreover, the repurposing occurs in the same way across individuals. This suggests that even when being rewired to serve nonvisual functions, the occipital cortex is restricted in what type of information it can represent.

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