

Brain center for 'sound space' identified

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While the visual regions of the brain have been intensively mapped, many important regions for auditory processing remain terra incognita. Now, researchers have identified the region responsible for a key auditory process—perceiving “sound space,” the location of sounds. The findings settle a controversy in earlier studies that failed to establish the auditory region, called the planum temporale, as responsible for perceiving auditory space.

Leon Y. Deouell and colleagues published their findings in the September 20, 2007 issue of the journal *Neuron*.

Studies by other researchers had shown that the planum temporale was activated when people were asked to perform tasks in which they located sounds in space. However, many researchers believed that the region was responsible only for intentional processing of such information. And in fact, previous studies had failed to establish that the planum temporale was responsible for automatic, nonintentional representation of spatial location.

However, Deouell and colleagues used an improved experimental design that enabled them to more sensitively determine the brain’s auditory spatial location center. For example, they presented their human subjects with sounds against a background of silence, used headphones that more accurately reproduced sound location, used noise with a rich spectrum which has been shown to be more readily locatable in space, and created an individually tailored sound space for each subject by using sounds previously recorded directly from the subjects’ own ears.

In their experiments, they presented bursts of the noise to the volunteers wearing the headphones while the subjects' brains were scanned by functional magnetic resonance imaging. In this widely used brain-scanning technique, harmless magnetic fields and radio waves are used to image blood flow in brain regions, which reflects brain activity in those locations.

The subjects were instructed to ignore the sounds. And, to divert their attention, they either watched a movie with the sound turned off or were given a simple button-pushing task.

When the position of the noise bursts was varied in space, the researchers found that the planum temporale in the subjects' brain was, indeed, activated. What's more, the greater the number of distinct sound locations subjects heard during test runs, the greater the activity in the planum temporale.

The researchers concluded that their experiments “suggest that neurons in this region represent, in a nonintentional or preattentive fashion, the location of sound sources in the environment.” They wrote that “Space representation in this region may provide the neural substrate needed for an orientation response to critical auditory events and for linking auditory information with information acquired through other modalities.”

Source: Cell Press

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