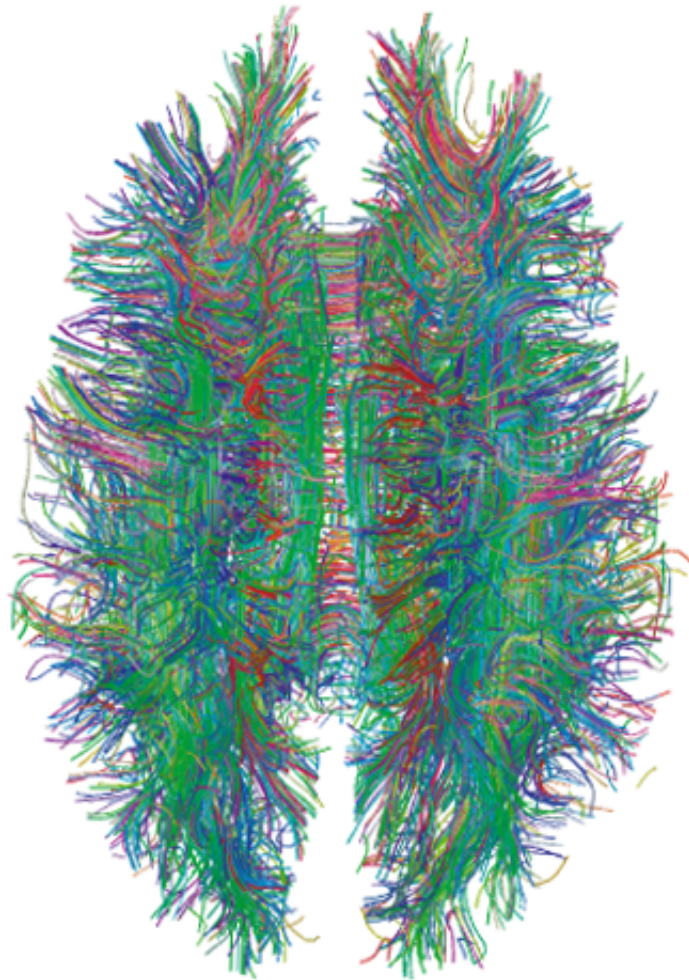


MRI study shows consistency in how the brain rewires itself due to deafness

January 18 2017, by Bob Yirka



MRI image of white matter tracts. Credit: *PLoS ONE* 3(12): e4006.
doi:10.1371/journal.pone.0004006

(Medical Xpress)—A team of researchers with affiliations to several institutions in Poland has found that the brains of people born with congenital deafness rewire themselves to repurpose the part of the brain normally used for hearing. They have published a paper in the *Proceedings of the National Academy of Sciences* documenting their findings and its impact on brain research.

Prior research has shown that animal brains tend to rewire themselves when unusual circumstances occur such as being born without the ability to hear. In this new effort, the researchers sought to learn more about this process, specifically about whether this occurs consistently for a given condition.

To better understand how the [brain](#) responds when a person is born without the ability to hear, the researchers enlisted the assistance of 15 hearing volunteers and 15 congenitally deaf people who agreed to undergo fMRI scans while engaging in hearing and vision tests.

Suspecting that the brain likely repurposes unused brain regions to process other activities that are similar in nature, the researchers focused on the parts of the brain that are involved in processing rhythm, both aurally and visually. Would the brain, they wondered, rewire itself in a way that allowed it to make use of the part of the brain that was no longer used for processing sounds by causing it to process something else—like rhythmic flashes of light? And if so, would it do it the same way for all people that are born deaf?

To find out, the researchers played rhythmic sounds to hearing volunteers and also subjected them to flashing lights while recording brain activity in an fMRI machine. The deaf volunteers were only shown the flashing lights.

After studying the scans, the researchers found that those people born

deaf did, indeed, use their auditory cortices for processing rhythmic light flashes, though they also used the parts normally used for processing light flashes, as demonstrated by comparing them with the hearing volunteers. In addition, when the [auditory cortex](#) was used to process rhythmic light, it did so in ways very similar to the way that normally occurs in vision processing parts of the brain in people who can hear. The researchers also found an overlap of approximately 80 percent when comparing the degree of light processing in the auditory cortex between the deaf volunteers.

The results of the study suggest that animal brains do rewire themselves in consistent ways when faced with the same unusual conditions, though much more work will be required to see if such results are consistent under varying circumstances.

More information: Łukasz Bola et al. Task-specific reorganization of the auditory cortex in deaf humans, *Proceedings of the National Academy of Sciences* (2017). [DOI: 10.1073/pnas.1609000114](https://doi.org/10.1073/pnas.1609000114)

Abstract

The principles that guide large-scale cortical reorganization remain unclear. In the blind, several visual regions preserve their task specificity; ventral visual areas, for example, become engaged in auditory and tactile object-recognition tasks. It remains open whether task-specific reorganization is unique to the visual cortex or, alternatively, whether this kind of plasticity is a general principle applying to other cortical areas. Auditory areas can become recruited for visual and tactile input in the deaf. Although nonhuman data suggest that this reorganization might be task specific, human evidence has been lacking. Here we enrolled 15 deaf and 15 hearing adults into an functional MRI experiment during which they discriminated between temporally complex sequences of stimuli (rhythms). Both deaf and hearing subjects performed the task visually, in the central visual field.

In addition, hearing subjects performed the same task in the auditory modality. We found that the visual task robustly activated the auditory cortex in deaf subjects, peaking in the posterior–lateral part of high-level auditory areas. This activation pattern was strikingly similar to the pattern found in hearing subjects performing the auditory version of the task. Although performing the visual task in deaf subjects induced an increase in functional connectivity between the auditory cortex and the dorsal visual cortex, no such effect was found in hearing subjects. We conclude that in deaf humans the high-level auditory cortex switches its input modality from sound to vision but preserves its task-specific activation pattern independent of input modality. Task-specific reorganization thus might be a general principle that guides cortical plasticity in the brain.

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