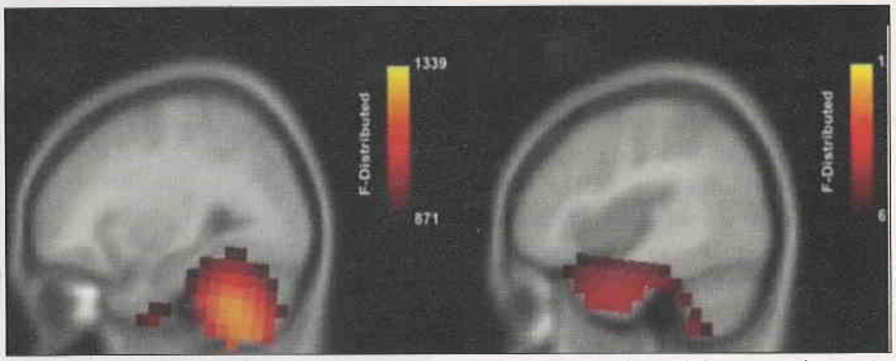

Adults with mild age-related hearing loss (right) show brain reorganization in hearing portions of brain, which are recruited for processing visual patterns. This is not seen in age-matched adults with normal hearing (left).

Researchers Discover Brain Reorganizes after Hearing Loss

Researchers exploring the ways in which our brains respond to hearing loss have found that the brain reorganizes, which may be related to a link between age-related hearing loss and dementia. According to a presentation at the 169th Meeting of the Acoustical Society of America (ASA) held May 18-22 in Pittsburgh, Pa, researchers suggest that the portion of the brain devoted to hearing can be reassigned to other functions, even with early-stage hearing loss, and may play a role in cognitive decline.

Anu Sharma, PhD, a researcher in the Department of Speech Language and Hearing Science at University of Colorado, applied fundamental principles of neuroplasticity to determine how the brain adapts to hearing loss, and the consequences of those changes.

Sharma and colleagues in the Brain and Behavior Laboratory used electroencephalographic (EEG) recordings of adults and children with deafness and lesser hearing loss to gain insights into the ways their brains respond differently from those with normal hearing.

The EEG recordings involve placing multiple tiny sensors on the scalp, allowing researchers to measure brain activity in response to sound simulation. For the study, sound simulation, such as recorded speech syllables, was delivered via speakers to elicit a response in the form of "brain waves" that originate in the auditory cortex—the most important center for processing speech and language—and other areas of the brain.

"We can examine certain biomarkers of cortical functioning, which tell us how the hearing portion of a deaf person's brain is functioning compared to a person with normal hearing," Sharma said.

Sharma and other researchers have recently discovered that the areas of the brain responsible for processing vision or touch can recruit areas in which hearing is normally processed, but which receive little or no stimulation in deafness. This is called "cross-modal" cortical reorganization and reflects a fundamental property of the brain to compensate in response to its environment.

Studies conducted by Sharma and colleagues have also included cochlear implant patients. "We find that this kind of compensatory adaptation may significantly decrease the brain's available resources for processing sound and can affect a deaf patient's ability to effectively perceive speech with their cochlear implants," said Sharma.

Sharma's group demonstrated that charting brain functioning in patients with cochlear implants is a valuable tool to help predict their outcomes. "If a deaf child shows cross-modal reorganization—by vision, for example—it allows us to determine the optimal rehabilitation strategy for that particular child," she said.

The team discovered that cross-modal recruitment of the hearing portion of the brain by vision and touch is also apparent in adult patients with only a mild degree of hearing loss. The findings have clinical implications for developing early screening programs for hearing loss, and suggest that age-related hearing loss must be taken seriously, even in its earliest stages.