

Do increased ear asymmetries in dichotic listening tasks reflect reduced brain connectivity in normal aging and Alzheimer's disease?

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Dichotic listening (DL) is one of the most frequently used methods in experimental and clinical neuropsychology to study language laterality and interhemispheric interactions. In DL, competing stimuli are presented simultaneously to the left and right ear. DL is a complex task relying on various cognitive functions including speech perception, spatial attention, memory, and executive control. Numerous studies have shown that verbal stimuli are recognized more accurately in the right ear in subjects with (normal) left hemisphere-dominance for language processing. This right ear advantage may be explained by the finding that right ear auditory stimuli are projected directly to the left hemisphere, whereas information from the left ear is transferred indirectly - via the right hemisphere and the corpus callosum - to the left hemisphere. Although early studies primarily emphasized the role of the temporal brain regions and the corpus callosum in mediating DL performance, recent brain-imaging studies showed that DL also activates parietal and prefrontal brain regions, particularly under focused attention conditions. In several aging studies, we found increased ear asymmetries in older subjects, indicating that with increasing age DL performance of the left ear declines more strongly than performance of the right ear. Compared to healthy elderly, increased ear asymmetry was also found in patients with Alzheimer's disease (AD), suggesting that AD patients specifically have difficulties to pay attention to the left ear compared to the right ear. Since aging effects and AD are reflected not only by grey matter pathology, but also by white matter pathology and loss of synaptic connectivity in various brain regions, we employed DL tasks as a method for exploring functional inter- and intrahemispheric connectivity in healthy elderly subjects and AD patients. Recent data of these studies will be presented and discussed in the light of neuropsychological theories of aging and Alzheimer's disease.

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