

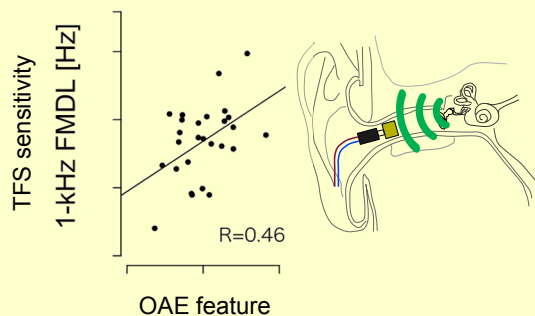
What determines a person's hearing performance?

~Exploring sources of inter-individual variation~

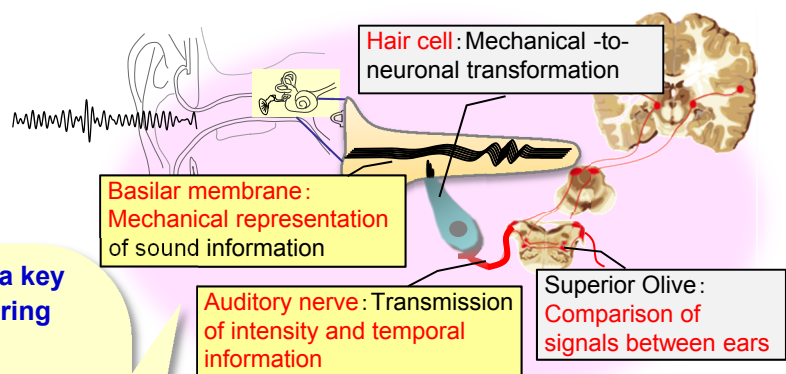
Abstract

Our research group has investigated the degree of inter-individual variability in basic auditory abilities and has explored the sources of its variation. We confirmed marked variability even among a clinically “normal” population of listeners. We also found that the variability reflects differences in mechanisms at processing levels lower than widely believed. The results of these studies should have significant implications in the medical field, particularly for diagnosing and treating people with difficulties in hearing in daily life. The study should also contribute to improving hearing-aid performance, designing auditory signals, and developing training methods for better hearing.

Ear's mechanical property is a key factor for better selective hearing

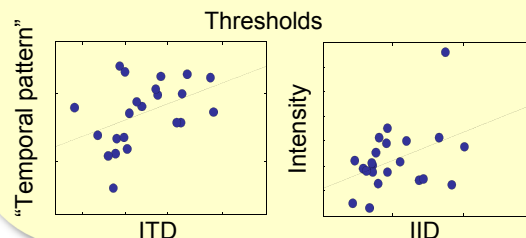


The inter-individual variation in sensitivities to the **temporal fine structure** of a sound (**TFS**; a cue for selective listening) has been believed to reflect differences in mechanisms at and above the **hair cell / auditory nerve** level. Through investigations of the **oto-acoustic emission (OAE)**, this study revealed that a large proportion of the variation could be accounted for by the **mechanical properties of the basilar membrane** at a lower level.



The performance of one ear is a key factor for better sound localization

Sensitivities to **interaural intensity and level differences (IIDs & ITDs)** (cues for sound localization) also vary among individuals. IIDs and ITDs are processed by mechanisms that **compare signals between the two ears**. This study indicated that the inter-individual variability can be accounted for by not only this binaural mechanism, but also by **lower-level mechanisms that encode stimulus intensity and temporal pattern**.



Related work

- [1] S. Otsuka, S. Furukawa, S. Yamagishi, K. Hirota, M. Kashino, “Inter-individual variation of sensitivity to frequency modulation: Its relation with click-evoked and distortion-product otoacoustic emissions,” *J. Assoc. Res. Otolaryngol.*, Vol. 15, pp. 175-186, 2014.
- [2] A. Ochi, T. Yamasoba, S. Furukawa, “Factors that account for inter-individual variability of lateralization performance revealed by correlations of performance among multiple psychoacoustical tasks,” *Front. Neurosci.*, doi. 10.3389/fnins.2014.00027, 2014.

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