

Abstract

This project deals with objective measurements of the auditory function, that is, independent of any behavioral response. Specifically, the project aims to improve methods for measuring the ear-canal reflectance, which represents the proportion of incident sound reflected in the ear canal. Such measurements characterize the ability of the middle ear to conduct sound across the auditory frequency spectrum, can identify middle-ear pathologies, and increase the reliability of measurements of evoked or spontaneous responses from the cochlea. The project further aims to reproduce measurements using an alternative, fundamentally different measurement technique.

Ear-canal reflectance measurements are usually conducted using an ear probe, consisting of a speaker and microphone, inserted into and sealed to the ear canal. However, complex acoustic phenomena introduce uncertainties into such ear-canal measurements. These phenomena are related to the transition of sound from narrow tubes in the ear probe and the sealing rubber ear tip to the ear canal. Some sources of error in ear-canal reflectance have been explored previously, however the measurement accuracy of existing methods remains largely unknown.

The project proposes improved calibration and measurement methods using an ear probe that enable identifying and compensating for these acoustic phenomena. The project further assesses the measurement reproducibility of existing and proposed methods in an ideal laboratory setup, and reproduces measurements in a population of adult ear canals using an ear probe and a two-microphone probe. The results demonstrate an increased reproducibility of the proposed measurement methods. The project may stimulate and facilitate further research into the auditory system and lead the way for more accurate clinical diagnoses.