

A NORMATIVE STUDY ON WIDEBAND TYMPANOMETRY AND ENERGY REFLECTANCE IN HUMAN EARS: EFFECTS OF REPETITIVE MEASUREMENTS

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The middle ear transforms airborne sounds into mechanical vibration and helps improve sound transmission into the fluid-filled inner ear. This is an imperfect process. Part of the sound energy is reflected back to the ear canal due to acoustic impedance mismatch. A new technique—wideband energy reflectance (ER), has been developed to evaluate the middle-ear function. It determines the proportion of reflected energy and gives information for a broad frequency range, an advantage over the conventional single-frequency tympanometry in audiology. ER can be measured at the ambient pressure (aER) and expressed in energy absorbance ($EA = 1 - ER$). Wideband tympanometry has been introduced to measure EA with the air pressure varied in the ear canal. Previous studies observed that repeated testing of low-frequency tympanometry altered outcomes. The object of the present study was to investigate the effect of repetitive measurements of wideband tympanometry on EA. Seventeen adults with normal hearing and middle-ear function were recruited. Eight wideband tympanometry tests were consecutively performed in between two aER tests. Data revealed that successive testing of wideband tympanometry resulted in a frequency-specific change of EA. The EA increased below 1.5 kHz, decreased from 1.5 to 3 kHz, and decreased again at 5 to 6 kHz. This study has shown, for the first time, a statistically significant effect of repeated tympanometry on EA. Results suggest that this effect should be taken into account, or be minimized, to increase validity when repetitive wideband tympanometry is required in applications, for instance, in test-retest reliability studies.