Image-based and self-controlled test procedure for assessing pure-tone thresholds in children

Schirkonyer V.¹, Bohnert A.², Thodi C.³, Niedermeyer H.-P.¹, Keilmann A.², Janssen T.¹

¹ ENT Department, Klinikum rechts der Isar, Technische Universität München
² Department for Oto-Rhino-Laryngology, Division for Communication Disorders, Medical Center of the Johannes Gutenberg-University Mainz
³ Cyprus Audiology Center, Nicosia

Conditioned play-audiometry is a well established method in pediatric audiology. However, the task (usually placing a peg in a pegboard) is varied only little and thus can result in a less reliable threshold determination. In order to enhance the child’s attentiveness an image-based touch-screen controlled test procedure (MAGIC) was developed.

Different animals represent different frequencies (cow 250 Hz, bear 500 Hz, elephant 1 kHz, cat 2 kHz, sheep 3 kHz, mouse 4 kHz, bird 6 kHz, dolphin 8 kHz). Each animal was present in three variants: neutral to start the sound presentation, healthy and sick for indicating the two conditions ’heard’ and ’not heard’. Before measurement, a story was told such that the child was instructed that healthy animals will make sounds and sick animals are not able to. The test procedure progress was visualized by a shelf from which the current test animal was selected. The test was performed in 108 children aged between 3;6–11;11 years. For comparison, play-audiometry pure-tone thresholds (PTA) were determined at the corresponding frequencies.

There was a highly significant (p<0.001) correlation between MAGIC and PTA thresholds. Mean and standard deviation of threshold differences amounted to -1.5 dB and 9.6 dB, respectively. MAGIC test-time per frequency was on average 30 s, ranging from 14 s to 91 s and thus was lower than PTA test-time. By using animals as visual amplifiers and using a self-controlled measuring procedure the child’s attentiveness was considerably enhanced. Thus, MAGIC may provide an alternate to the commonly used procedures.