Stability of auditory steady-state responses over time

Maaïke Van Eeckhoutte, Jan Wouters, Tom Francart

ExpORL, Dept. Neurosciences, KU Leuven, Belgium

maaike.vaneeckhoutte@med.kuleuven.be

Auditory steady-state responses (ASSR) are used in clinical practice to detect hearing thresholds in difficult-to-test patients, such as infants and patients with an intellectual disability. Typically, if the stimulus is just audible, the ASSR can be detected after a measurement of around 2-5 minutes depending on carrier wave and modulation. It is assumed that the ASSR amplitude is stable over time, during one measurement. However, stimuli used for ASSR measurements can perceptually show loudness adaptation, which is a decrease in loudness judgment, while the intensity of the sustained stimulus remains fixed during several minutes. We investigated the stability (or adaptation) of the objective ASSR over time and the relation with perceptual loudness adaptation.

Fifteen normal-hearing adults participated in this study. Loudness adaptation was measured using a successive absolute magnitude estimation task, in which listeners had to give a number that corresponded to the loudness of the stimulus at regular intervals. ASSRs were evoked by 40 Hz mixed-modulated sinusoids with carrier frequencies of 500 Hz and 2000 Hz at 30 dB SL (soft level), which were also used in the first task. For data analysis, the ASSR amplitudes were calculated at intervals of 5.12 s.

Results indicated that the stimuli used for ASSR measurements caused loudness adaptation. The ASSR amplitudes remained stable over time for the 2000 Hz condition, but significantly decreased for the 500 Hz condition. This might have clinical implications for objective hearing assessments.

Key words: auditory steady-state responses, loudness adaptation, objective hearing assessments