Purpose. Many elderly persons have hearing problems. A few studies have shown abnormal waveforms on the auditory middle-latency responses (AMLRs) in elderly persons, although many audiological examinations have been performed. The purpose of this study is to examine AMLRs in elderly persons and the relationship between AMLRs and hearing difficulty. **Methods.** We examined 9 elderly persons (6 male and 3 female, 59–73 years old). Auditory functions were assessed by pure-tone audiometry and a monosyllabic-word identification test. Neuro-electrical activity was recorded from 3 scalp locations on the coronal plane, i.e., Cz, Cl (halfway between the left meatus and Cz), and Cr (halfway between the right meatus and Cz). AMLRs were elicited by clicks at the rate of 2 clicks/sec. The examination was performed while the subjects were awake and resting comfortably on a bed. EEGs were amplified to a bandwidth of 20–500 Hz. EEGs from 500 trials were averaged until 200 ms. **Results.** Of the subjects tested, one subject had a hearing problem in the right ear, although the hearing threshold as determined by pure-tone audiometry was within the normal range and the results of the word identification test were normal. The waveforms of the AMLRs recorded from the left and right hemispheres were asymmetric. The amplitude of the Pa-Nb component was reduced in the AMLRs recorded from the left hemisphere. **Discussion.** Jerger et al. (1991) performed an electrophysiological test on a young woman who complained that she had difficulty in hearing in her educational environment. They observed that the AMLRs in this subject were asymmetric. The results of this study suggest that AMLRs could be used as electrophysiological indices for assessing auditory processing disorders in elderly persons. Further research on AMLRs is required to establish the physiological indices of auditory processing disorders in elderly persons.

N. 18 - A PRELIMINARY STUDY OF THE SHORT-TERM AND LONG-TERM NEURAL ADAPTATION OF THE AUDITORY BRAINSTEM RESPONSE BY THE USE OF RANDOMIZED STIMULATION

Valderrama J[1], Alvarez I[1], de la Torre A[1], Segura JC[1], Sainz M[2,3], Vargas J[2]

[1]Department of Signal Theory, Networking and Communications, CITIC-UGR, University of Granada, Spain; [2]ENT Service, San Cecilio University Hospital, Granada, Spain; [3]Department of Surgery and Its Specialties, University of Granada, Spain

Brainstem auditory evoked response (BAER) signals represent the electrical activity of the auditory brainstem associated with a stimulus. The study of BAER at high stimulation rates is of great interest in the field of audiology since it presents several advantages: the reduction of the recording time, an earlier diagnosis of certain neural diseases, and the study of adaptation, which consists on a variation of the auditory response during a constant stimulus condition. This preliminary study is based on a novel stimulation technique that allows the recording of BAER at high rates of stimulation. This methodology consists on the average of auditory responses evoked by stimuli whose period varies randomly. Compared to other analogous techniques, this stimulation technique is the only methodology that allows the categorization of auditory responses according to the interval of the preceding stimulus. This premise has been used to design an experiment to check whether adaptation is a short-term or a long-term process. Only 6 normal hearing adults participated in this study. The results of this test suggest that

though both factors are involved in the hearing process, subjects can be classified according to their tendency towards a short-term or a long-term adaptation process. Understanding the biological mechanisms or the possible hearing diseases that influence such dispersion may have important repercussions in the field of audiology. Although a study with more subjects would be necessary to reach more solid conclusions, these preliminary results open up a new research line that may lead to a better understanding of the adaptation phenomenon.

N. 19 - CIRCULAR PHASE CLUSTERING BASED AUTO-ADAPTATION FOR THE OBJECTIVE ASSESSMENT OF ABR MEASUREMENT QUALITY

Strauss DJ, Corona-Strauss FI

Saarland University, Faculty of Medicine, Systems Neuroscience & Neurotechnology Unit, Homburg, Saar, Germany and Key Numerics, Saarbruecken, Germany

The objective assessment of the measurement quality of auditory brainstem responses (ABRs) recently became an important component of clinical practice/hearing screening. Most of the known ABR quality measures are based on simple morphological time-domain features such as amplitude and latency, e.g., by comparing single ABR sweeps to the averaged response. However, such morphological approaches may suffer in measurement conditions in which externally induced noise cannot be further reduced and thus result in a weak morphological stability of the ABR response. To approach this problem, we present a new quality measure which is based on the circular clustering of the instantaneous phase of ABR single trials, i.e., a correlate of neural synchronization processes. For this, band-limited Hardy space projections are employed to obtain the instantaneous phase of consecutive ABR single-trials which are arranged in a matrix representation. In this representation the instantaneous phase is evaluated along a fixed trace by means of directional statistics on the unit circle. The quality measure is now derived from the circular difference of the phase distribution of trials of the spontaneous activity, i.e., no auditory stimulation, from the distribution of trials after auditory stimulation. Twenty subjects (mean age approx. 25y, std: approx. 4y) with no history of hearing problems and normal hearing thresholds (below 15 dB (HL)) participated in our study. ABR single trials were obtained by calibrated broad band chirps at 20, 30, and 40 dB SPL and in the case of no stimulation, i.e., the spontaneous activity. Using these data, we show that our approach (a) allows for an auto-adaptation to the measurement condition, (b) allows for a robust and objective quantification of the measurement quality, and (c) can also be used for the objective ABR detection with a minimum number of trials by combining it with novelty detection machines.

N. 20 - ADAPTIVE FILTERS FOR ENHANCING AUDITORY BRAINSTEM RESPONSES TO SYNTHETIC VOWEL STIMULI

Fallatah A, Dajani HR

University of Ottawa, School of Electrical Engineering and Computer Science, Ottawa, Canada