Abstract

Mismatch Negativity: An Additional Signature for Accurate Neonatal Hearing Screening

Hardik J. Pandya

Biomedical and Electronic (10-6–10-9) Engineering Systems Laboratory, Department of Electronic Systems Engineering, Indian Institute of Science, Bangalore, India

Abstract:

Neonatal Deafness is one of the most common congenital deficits. Early Diagnosis with appropriate intervention can ameliorate subsequent lifelong disabilities. Hence, Neonatal Hearing Screening (NHS) is a crucial area of research for sensory systems. WHO recommends that all new-born should undergo Neonatal Hearing Screening (NHS) within the first three months after birth. Behavioral testing is not enough to validate the functionality of the auditory system resulting in using Electroencephalogram (EEG) for NHS. Precisely, neuronal responses in the form of bio-potentials occurring as a response to external auditory stimuli can be an objective signature for neonatal deafness. Brainstem Evoked Response Audiometry (BERA) is the current gold standard for NHS. It reflects biopotentials generated from cochlea to brainstem with response to an external auditory stimulus. Otoacoustic Emissions (OAE) is a commonly used alternative metric originating from sensory hair cells in inner ear. OAE checks functionality of auditory pathways from outer ear to the cochlea. So far, EEG responses from higher cortical areas have not been taken into consideration for NHS. Studies have shown that higher cortical potentials can evaluate auditory system comprehensively. Mismatch Negativity (MMN) is one of the Event Related Potential (ERP) which can be elicited by as a result of the auditory change. MMN is non-invasive, inexpensive and attention free ERP which can be observed at the time of birth. We have developed a prototype consisting stimuli generation unit, ERP acquisition and processing unit. We have recorded MMN using dry electrode from prefrontal cortex with response to auditory stimuli for n=6 adults. From the experiment performed, we believe that MMN can be a potential marker in addition to BERA for accurate NHS.

Biography:

Dr. Hardik J. Pandya is an Assistant Professor in the Department of Electronic Systems Engineering, Division of EECS, IISc Bangalore where he has developed the Advanced Microsystems and Biomedical Devices Facility for Clinical Research and Biomedical and Electronic (10-6-10-9) Engineering Systems Laboratory (BEES Lab) as well as BEES computational laboratory. The work in the laboratories is focused on carrying out cutting-edge research integrating biology/medicine with micro-nano technology for developing a new class of sensors, minimally invasive tools, and electronic systems to solve unmet clinical problems. The emphasis is on cancer diagnosis, surgery, therapeutics, drug screening, and smart microchips for healthcare.

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