

Hearing Diagnostics – The variability in potential biomarkers for cochlear synaptopathy after recreational noise exposure

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Background

Noise exposure in young adults mainly takes place during leisure time activities. Of these activities, festivals have been reported as the loudest. Even though a number of young adults attending such events report temporary hearing loss, dullness or tinnitus, the majority of young adults don't wear ear plugs when attending concerts or music festivals. A possible result of excessive noise exposure is a temporary threshold shift (TTS). Recent studies have shown that TTS may not be as benign as thought before. Despite full recovery of auditory thresholds and absence of outer hair cell damage, permanent deficits may occur at the level of the inner hair cell synapses [1]. This hidden hearing loss or cochlear synaptopathy occurs immediately after noise exposure and precedes degeneration of spiral ganglion cells. As high-threshold auditory nerve fibers have been shown to be most vulnerable to noise damage, these long term deficits stay undetected by pure tone audiometry (PTA). Difficulties may rather appear at suprathreshold level, which might explain complaints of speech understanding in noisy situations, tinnitus or hyperacusis or tinnitus. Suprathreshold Auditory Evoked Potentials (AEP) and Speech in Noise (SPIN) tests are promising measurements to diagnose cochlear synaptopathy in humans. AEPs are shown to be useful for diagnosing cochlear synaptopathy in rodents [2, 3], however, research in humans shows various results. The goal of the current study was to investigate potential biomarkers of cochlear synaptopathy. PTA, Distortion Product Otoacoustic Emissions (DPOAE), SPIN and AEP measurements were used to monitor auditory status in young adults, before and after attending a music festival.

Methods

A group of 20 normal hearing, young adults (18-25 years) attended a music festival in summer 2019. Before the event, all subjects were tested with a test battery including questionnaires, PTA, DPOAE, SPIN and AEP measurements. Auditory status was evaluated again at one, three and five days after the event.

Results

Preliminary data analysis of the baseline measurements do not show any statistical significant correlation between lifetime noise exposure and results of the audiological test battery. Between session comparisons do not show a significant difference of test results after the event compared to the baseline measurements. During the B-audio congress 2019, the results of this data collection will be given more in detail.

Discussion and conclusion

Preliminary data analysis shows no indication that lifetime noise exposure history nor noise exposure during a musical event can explain the intersubject variability of the test battery used in this study. These results in relation to test population characteristics and the use of hearing protection devices will be discussed. Future research includes expanding the number of participants and using an optimized audiological test battery to investigate cochlear synaptopathy in young adults after recreational noise exposure.



References

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