

The Mystery World of “Auditory Mechanics”



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Research Topics

- Hearing loss by kendo players
- Development of sweep frequency impedance (SFI) meter
- Construction of finite element (FE) model of neonatal ear canal and middle ear

Research Seeds

- **Impact-induced bone conduction simulation to ascertain the cause of hearing loss in kendo players**

Kendo, Japanese fencing, is a modern martial art descended from swordsmanship. It is practiced widely in Japan, Korea and many other countries today. To get points and win matches, each player tries to hit one of the four target areas on an opponent's body with a bamboo sword.

Many reports on the subject of audiometry have described that kendo training over many years often causes sensorineural hearing loss at 2000 Hz and/or 4000 Hz. Although the risk of kendo-associated hearing loss has long been known, its mechanism remains unclear.

Our hypothesis is that the cause of hearing loss by kendo might possibly be related to accumulation of small concussions in the inner ear by the excessive impact-induced bone conduction. We evaluated this hypothesis using impact experiments with a skull bone model (Fig. 1) and simulation using a finite element (FE) model of a human head and a kendo helmet (Fig. 2).

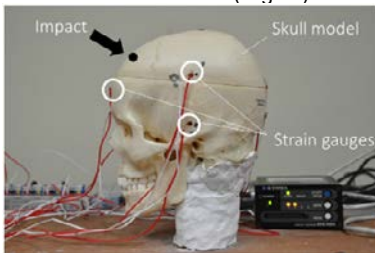


Fig. 1. Experimental setup for bone conduction map using a skull bone model.

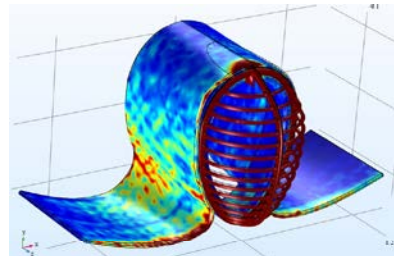


Fig. 2. Distribution of von Mises stress for Impact using FE model of kendo helmet.

Related Technology

- Measurement of microscale and nanoscale vibration using a laser Doppler velocimeter
- Measurement of otoacoustic emissions (OAEs)
- Measurement of auditory brainstem response (ABR)