

Changes in hearing threshold in workers with asymmetric hearing loss exposed to shipyard noise: an 11-year follow-up study

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Background

Asymmetric hearing loss affects only 1% of the general population without noise exposure, but can be as high as 36% in those exposed to workplace noise. The cause of asymmetric hearing loss is still unclear, but research suggests that noise may play a role. Individuals with asymmetric hearing loss may have a reduced ability to localize sound and difficulty in understanding speech in the presence of competing noise. Also, they will miss warning signs and have a negative impact on job performance.

Aim

Few studies have investigated threshold differences in subjects with asymmetry over time. The aim of this study was to investigate the changes in binaural hearing threshold difference (BHTD) and the factors influencing it in subjects with asymmetry over 11 years of follow-up.

Method

Asymmetric hearing loss was defined as a binaural hearing threshold difference of 15 dB or more in at least one frequency between 0.5 and 6 kHz. Data were collected from Korean shipyard workers during the 2010–2020 in this retrospective cohort study. 423 male workers underwent serial pure tone audiometry during the period. Each subject underwent a physical and otologic examination and completed a health-related questionnaire.

The linear mixed model was used to compare the mean differences between asymmetric and symmetric hearing loss groups.

Results

In the beginning of the study, the mean age was 45.4 ± 5.2 years and mean employment period was 21.8 ± 6.4 years. There was a significant difference in the proportion of subjects with noise exposure levels above 90 dB: 73.6% in the hearing symmetry group and 84.8% in the asymmetry group.

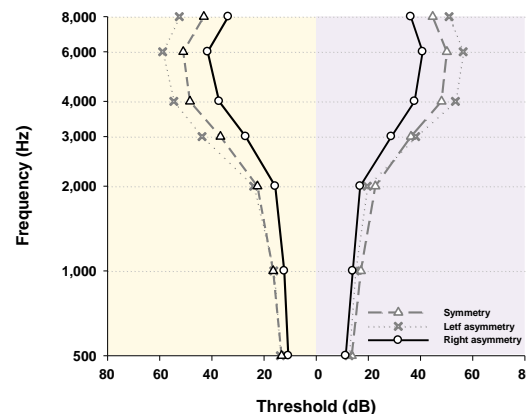


Figure 1. Mean thresholds by year of asymmetry at baseline

The average hearing thresholds of left asymmetrical subjects have higher thresholds in the left ear compared to right asymmetrical and symmetrical subjects. In the right ear, the pattern was reversed. Threshold differences between groups were evident in the high-frequency region (Fig. 1).

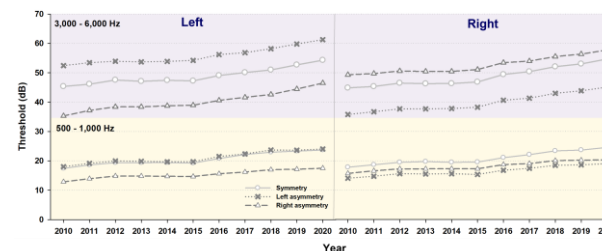


Figure 2. Changes in the average of hearing threshold over the study period by frequency and ear

Hearing threshold changes over time were tend to increase and greater in the high-frequency region compared to the low-frequency region. It was also observed that the change in hearing threshold was greater in left asymmetry than in right asymmetry during the follow-up period.

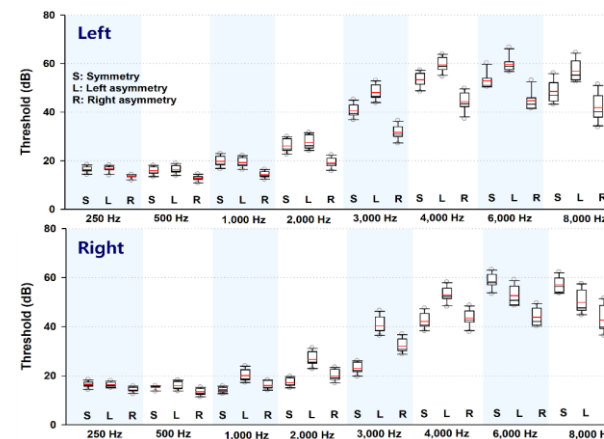


Figure 3. Changes in the average binaural hearing threshold difference (BHTD) in asymmetry during the follow-up period by ear

The binaural hearing threshold difference (BHTD) in asymmetry tended to increase and greater in the high-frequency region compared to the low-frequency region during study period. However, the difference in hearing threshold between symmetrical and asymmetrical also, left and right asymmetrical was not statistically significant (Fig 3).

Factors that influenced the hearing threshold in asymmetry included age, work experience, and noise exposure level, those of which noise exposure level was positively correlated but age and work experience were negatively correlated.

Conclusion

Hearing thresholds were higher for left asymmetry than for right asymmetry, and this was most pronounced in the high frequency range. The binaural hearing threshold difference (BHTD) between left and right asymmetry was similar and not statistically significant over the course of the study. Exposure to high-pitched sounds was found to have a significant effect on asymmetry. The presence of asymmetry is thought to impair speech understanding and warning sign recognition and should be taken into account when assigning tasks.