



The Effect of Low Frequency Noise on Working Speed and Annoyance

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Dear Editor-in-Chief

Generally, few studies have been conducted to compare the effect of low-frequency noises with high-frequency noises on the working speed and the degree of annoyance of individuals. One study showed the effect of low-frequency noise on the working speed in individuals (1), while another study showed the increase in the working speed (2). Concerning the annoyance, a study showed that low-frequency noise had a greater effect on the increasing annoyance than the high-frequency noise (3). On the other hand, a study has shown higher effect of high-frequency noise as compared to the low-frequency (4).

Hence, the aim of this study was to investigate the effect of low-frequency noise on the working speed and the rate of annoyance of the subjects under study.

This cross-sectional – interventional study was performed in the sound and vibration laboratory of the faculty in 2019. One of the inclusion criteria for the study was hearing health (hearing loss less than 25 dB). Moreover, not being sensitive and irritation to low frequency noises was another inclusion criterion. Eventually, 13 male and female students at Isfahan University of Medical Sciences, Isfahan, Iran who had low irritation and sensitivity

to low frequency noises were included as the participants to the study.

The protocol of this study was approved by the Medical Committee of Isfahan University of Medical Sciences at IR.MUI.RESEARCH.REC.1398.002. The working speed of the subjects was evaluated using mental arithmetic test and the rate of the perceived annoyance was measured using ISO 15666 in Likert format (0 to 11) due to exposure to noise sources with frequencies of 125, 250 and 1000 Hz in the sound pressure levels of 75, 85 and 95 decibels. In addition, in order to evaluate the effect of time, the amount of annoyance and speed before exposure (time zero), 45 and 90 min after exposure was measured. Furthermore, for the evaluation of the fatigue level of the participants, this factor measured at time=0 and every thirty min by a Likert scale (0 to 10). The data were analyzed by SPSS26 (IBM Corp., Armonk, NY, USA) software.

Comparison of subjects' perceived irritation at 30, 60 and 90 min at any of the frequencies and sound pressure levels showed no statistically significant difference. Also, comparing the results of annoyance except in a few cases in other cases showed a significant statistical difference. Comparison of



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working speed between frequencies of 250 and 1000 Hz at 95 dB sound level and the time of 90 min ($P = 0.025$) showed a significant statistical difference. There was no statistically significant difference between the rate of working speed in any of the sound pressure levels. There was a significant difference between the rate of working speed of the subjects between 0 and 90 min at 125 Hz and 95 dB sound levels ($P = 0.029$). Moreover, the statistical significant difference was observed at 1000 Hz frequency between 0 and 45 min and 75 dB sound pressure level ($P = 0.049$), between 0 and 90 min at 85 dB sound level ($P = 0.018$), and in the sound pressure level of 95 dB between 0 and 45 min ($P = 0.033$) and between 0 and 90 min ($P = 0.005$).

The results of the present study showed that increasing sound pressure levels and the exposure time in both low-frequency and high-frequency noises, increased the working speed and the amount of perceived annoyance in individuals. Exposure to both the low-frequency and high-frequency noise increases the working speed in the individuals. However, the effect of high-frequency noises on the working speed was greater than that of the low-frequency noises. Moreover, the speed of work increases with increasing sound pressure level and exposure time for all the different noises (low-frequency and high-frequency noises). High-frequency noise annoyance has a higher effect on the amount of annoyance experienced in individuals as compared to the low-frequency noises. This effect has direct relations with the sound

pressure level and duration of exposure to both the low-frequency and high-frequency noises.

Conflict of interest

The authors declare that there is no conflict of interest.

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