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A Study on the Correlation between Annual Noise Exposure (ANE) and Auditory Attention, as well as Hearing Loss in Military Personnel

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Executive Summary

There are various types of noise-generating equipment in the living and working environment of military personnel, which causes auditory and non auditory health problems. In order to assessment of occupational and non occupational noise exposure this study was conducted to investigate the validity and reliability of the Persian version of the noise exposure questionnaire (NEQ) as a unique quantitative tool and also its relationship with auditory attention and hearing loss among military personnel. The results of quantitative face validity, consistency and reproducibility of this questionnaire were confirmed the utility of NEQ as a quick tool to assess the annual noise exposure occupationally and Nonoccupational (routine/occasional). In addition, a direct and significant relationship has been observed between the annual exposure of workers to noise and the increase in hearing threshold in all the investigated frequencies.

Keywords: Noise exposure, Military personnel, Auditory health, Hearing loss

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Introduction

Noise, an unpleasant and undesirable phenomenon, can trigger a range of adverse effects, including auditory and non aduditory health problems.[1-3] Also research findings indicate that noise can compromise cognitive performance by impairing information processing.[4-6]

Hearing impairment stemming from noise is particularly prevalent in military vocations, where the use of hearing protection devices is often impractical to ensure the audibility of warning signals and instructions. Consequently, noise-induced hearing loss is a prevalent injury among American military retirees.[7]

Quantifying noise exposure poses challenges due to the diverse nature of exposure types (continuous and impulse noise) and the absence of a consistent exposure pattern, as observed in industrial settings. Moreover, military personnel encounter various noise sources in their residential and non-occupational environments, exacerbating the effects of noise in addition to occupational exposure.[8,9] The NEQ, developed by Johnson et al., can be employed in this context to address this. This questionnaire assesses both occupational and non-occupational noise exposure (continuous and impulse), providing a quantitative measure of mean annual noise exposure in decibels for military personnel.[10]

Given the heightened significance of noise exposure within military organizations due to their interactions with military weaponry and infrastructure, along with the critical nature of auditory responses in such roles, which can be compromised by noise exposure, this study aims to explore the relationship between annual noise exposure and auditory attention, as well as hearing loss, among military personnel.

Materials and Methods

This study was conducted on 220 military personnel working in one of the armored brigade units in Iran. The direction of annual noise exposure from the noise exposure questionnaire (NEQ), which is a tool for quantitative determination of annual noise exposure, is considered in this study. At first, the questionnaire was examined using face and content validity. Then, Cronbach's alpha test and retest method were used to check the reliability of the questionnaire. In order to measure the auditory attention of the employees, the dichotic number test tool has been used. By reviewing the job files of the employees, the condition of the hearing threshold of the employees in the frequencies of 500 to 8000 Hz has been investigated.

Results

The results of quantitative face validity showed that all questions have an impact score greater than 1.5, so all questions were included in the questionnaire. The results of internal consistency and reproducibility of this questionnaire were confirmed using Cronbach's alpha coefficient (0.81) and retest method (P-value < 0.001, r =0.922). The highest increase in the hearing threshold of the workers has been observed in the frequencies of 4000 and 6000. The results of Spearman's correlation test showed that there is an inverse and significant relationship between annual noise exposure and auditory attention (P-value < 0.001). In addition, a direct and significant relationship has been observed between the annual exposure of workers to noise and the increase in hearing threshold in all the investigated frequencies (P-value < 0.001).

Discussion

The study's results establish a direct and statistically significant connection between the intensity of annual noise exposure and hearing loss. Furthermore, an elevation in annual noise exposure, whether from occupational or non-occupational sources, substantially elevates the incidence of hearing loss among personnel. This aligns with the findings of Heupa et al., who reported that military personnel exposed to noise, particularly gunfire, suffered damage to their auditory systems and experienced a decrease in their hearing thresholds. Collee et al. investigated noise exposure and the prevalence of hearing loss among Belgian military personnel, revealing that infantry and commando forces were particularly susceptible to hearing loss due to exposure to loud noises, such as gunfire from large-caliber weapons. Al-Omari et al.'s study, examined the association between noise-induced hearing loss, flight time, and aircraft type. Their research revealed an 18% prevalence of hearing loss among military pilots, with fixed-wing aircraft pilots more affected than rotary-wing aircraft pilots.[11] Rezaei et al.'s investigation into impulse noise and acoustic trauma among military personnel following shooting incidents corroborates the potential for sound trauma even with exposure to such noises, emphasizing the necessity of hearing protection equipment and effective monitoring programs for these occupations.[12] These findings underscore the importance of prioritizing measuring and preserving hearing health in military personnel.

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Conflicts of Interest Disclosures

There is no conflict of interest to declare.

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