

## ORIGINAL ARTICLE

# Investigation of the effect of noise exposure in the workplace on the general health of steel industry workers

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## ABSTRACT

Improvements in knowledge as well as technology and industrial workers' exposure to adverse factors have caused more attention to be paid to the workers' occupational health. According to the report by W.H.O., noise, as one of the most important physical factors of workplace, causes 4 million dollars health damage every day. Noise can also reduce the workers' morale as well as motivation and, consequently, have negative effects on their performance. Considering the importance of occupational health, the present study aimed to determine the effect of noise exposure on the steel industry workers' general health. The present cross-sectional study was conducted on 50 steel industry workers as the exposed group and 50 general practitioners as the reference group. Both study groups completed the demographic information questionnaire as well as GHQ-28. Then, the similarity of the demographic characteristics in both groups was determined using t-test and Chi-square. After scoring the questionnaires, the subjects' final scores were computed and their general health statuses were determined. Besides, Mann-Whitney U test was used in order to compare the two groups' mean scores. The demographic characteristics were similar in both study groups. In addition, the two groups' mean scores were significantly lower than 23, as the cut-off point. The results also revealed a significant difference between the two groups regarding abnormal social performance and depression; in a way that the workers' mean score was significantly higher than that of the physicians ( $p < 0.001$  and  $p = 0.018$ , respectively). This implies that in comparison to the physicians, the workers had a significantly lower health status. In addition, 36% of the workers suffered from at least one psychological disorder. Overall, the steel industry workers had a lower level of psychological health; in a way that they were significantly different from the reference group regarding the abnormal social performance and depression. Therefore, noise can be considered as a risk factor in the incidence of psychological disorders.

**Keywords:** Noise, General health, Steel industry

## INTRODUCTION

Improvement in knowledge and technology, using modern instruments and apparatuses, and the workers'

exposure to adverse factors have all resulted in paying more attention to the occupational health of the workers, as the main resources of industry [1]. Nowadays, health is considered as one of the most important indexes of sustainable development [2] and existence of physical factors, such as noise, in the workplace puts the

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**Table 1.** Demographic characteristics of the two study groups

Study groups		Exposed group (n=50)	Reference group (n=50)	p-value*
<b>Study variables</b>				
Age (years)	Mean (SD)	29.92 (5.40)	30.6 (5.8)	0.225
Height (cm)	Mean (SD)	174.80 (6.14)	174.76 (6.31)	0.974
Weight (kg)	Mean (SD)	71.78 (12.15)	74.70 (7.66)	0.155
BMI	Mean (SD)	23.42 (3.28)	24.45 (2.19)	0.069

\*Independent sample t-test

**Table 2.** The results of evaluation of psychological health in the four subgroups in the exposed and the reference group

Study groups	Exposed group (n=50)	Reference group (n=50)	p-value*
GHQ-28 score	Mean (SD)	Mean (SD)	
Physical effects	3.58 (2.85)	3.06 (2.43)	0.353
Anxiety and insomnia	3.52 (3.29)	3.00 (2.91)	0.349
Abnormal social performance	11.35 (5.12)	7.94 (2.19)	<0.001
Severe depression	1.44 (2.18)	0.75 (2.14)	0.018
Total	19.85 (8.17)	14.71 (6.42)	<0.001

\*Mann-Whitney U

workers' health at a high risk [2]. According to the World Health Organization (W.H.O.), noise leads to 4 million dollars health damage every day [1, 3].

In general, repeated and continuous noise has gradual and long-term physiological as well as psychological effects on humans [4]. Noise can also reduce the workers' morale and motivation and, as a result, have negative effects on their performance [5]. Moreover, disorders in efficiency as well as work relationships and psychological stress are considered as the psychological effects of noise exposure [6]. Therefore, the psychological effects of noise are of utmost importance from the occupational health point of view and by gaining knowledge regarding this issue, one can design plans in order to improve the working conditions.

Up to now, various studies have used 28-item General Health Questionnaire (GHQ-28), as a screening instrument, in order to assess the physical effects (items 1 to 7), anxiety and insomnia (items 8 to 14), abnormal social performance (items 15 to 21), and stress (items 22 to 28) [7]. In this questionnaire, higher scores represent higher levels of psychological stress. Besides, the scores equal to or above 23 shows the individuals' undesirable psychological health status during the last month [9].

Based on what was mentioned above, the present study aims to determine the effect of noise exposure on the general health status of the steel industry workers.

## MATERIALS AND METHODS

The present cross-sectional study was conducted on 50 steel industry workers as the exposed group and 50 general practitioners as the reference group in one of the workshops of steel industry. Both study groups completed GHQ-28 and their demographic information was collected, as well. Some features, such as age, height, and weight, were also investigated and their similarity in the two study groups was evaluated. Then, the questionnaires were scored through the Likert scale, the scores of the four scales of the questionnaire as well as the total score were computed, and the subjects' general health status was determined. Afterwards, the data were entered into the SPSS statistical software and the mean scores of the two groups were compared through independent sample t-test.

## RESULTS

The demographic characteristics of the two study groups are presented in Table 1. The results revealed no significant difference between the two groups regarding the mean of the study variables ( $p>0.05$ ). In addition, all the study variables revealed to have a normal distribution in both the exposed and the reference group. According to the results, the mean score of GHQ-28 was 19.85 and 14.71 for the exposed and the reference group, respectively and the results of Mann-Whitney U test revealed this difference to be statistically significant ( $p=0.001$ ).

Using one sample t-test, the mean scores of the two study groups were compared with 23 and the results showed that both groups' mean scores were significantly lower than 23 ( $p=0.01$ ).

Moreover, the scores obtained in the subgroups of the questionnaire were compared through Mann-Whitney U test and the results showed the workers' scores of abnormal social performance and severe depression to be higher than those of the control group ( $p<0.001$  and  $p=0.018$ , respectively). The scores obtained for physical effects, anxiety and insomnia, abnormal social performance, and severe depression are presented in Table 2.

## DISCUSSION

In the present study, the questionnaires were scored according to the Likert scale since it provides a more acceptable distribution of the scores for parametric analysis [8]. Based on the other studies conducted on the issue, noise increases the incidence of a large number of diseases, reference to the physicians, and use of medication [10]. Thus, paying attention to noise pollution is considered as one of the requirements of human health.

As Table 2 depicts, a significant difference was found between the two study groups regarding the abnormal social performance and depression; in a way that the exposed group was in a lower status of abnormal social performance and depression compared to the reference group, which might be due to being exposed to noise in the workplace. This finding is in agreement with that of the study conducted by Jafari et al. [2].

Moreover, although the comparison of the two groups' mean scores revealed that both groups were psychologically healthy, the mean score of the exposed group was significantly different from that of the reference group, which can be attributed to noise exposure. Overall, being entered into a new environment, losing the family's support, and being faced with a different culture as well as economic problems are considered as possible stress factors [11]. Other factors, such as shift working, economic as well as social status, and alcohol abuse, can affect the individuals' psychological health, as well. Of course, further studies are needed to be conducted in order to confirm the findings of the present research.

One of the important limitations of the current study was considering a reference group. In fact, the reference group must be selected from the employees who are not exposed to noise and are in better general health status compared to the society. Thus, selecting the reference group from the society was quite difficult due to its being large and heterogeneous and, consequently, the physicians were selected because of being exposed to noise less. Overall, the only difference between the two study groups was the noise level of the workplace and considering the higher noise level in the steel industry,

the difference between the two groups might reveal the effect of noise on the psychological health.

## CONCLUSION

The findings of the present study showed that noise could affect the general health of the exposed group and disturb their quality of life regarding social performance as well as depression.

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