Archives of Occupational Health | Volume 2 | Issue 1 | January 2018 | 70-4.

Original

Factors Affecting the Use of Respiratory Protection Devices Based on the Health Belief Model in Welders

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Abstract

Background: Welding industry is one of the most dangerous industries in the world. Because of the nature of their jobs, welders are exposed to serious injuries. The present study aimed to investigate the effective factors on the use of respiratory protection devices in welding workshops. **Methods:** In this cross-sectional study, 180 welders were studied in Gonabad city. A respiratory protection inventory was used to investigate the effective factors on the use of respiratory protection devices based on the health belief model in welders. Data were analyzed using SPSS software. **Results:** The working hours were 1.39 (8.25, the respiratory protection score was 10.12 (91.25). In this study, which was carried out on 180 people, there was a significant correlation between the score of respiratory protection and marital status and working shift. However, there was no significant relationship between respiratory protection score and the level of education and type of employment. **Conclusion:** The results of this study revealed that the respiratory protection score in the studied welders is moderate and should be considered by managers and the relevant authorities.

Keywords: Personal protective equipment; Inhalation welding; Occupational health

Introduction

Undoubtedly, one of the most valuable investments in the industrial sector and the basis for the sustainable economic and social development of each country is its human resources. According to the World Health Organization, roughly 45% of the world's population is in the world labor power.[1,2] This enormous population spends about one third to two thirds of its lifetime in workplaces and is exposed to chemical, physical and biological agents.[3,4] Chemical detrimental factors are one of the major detrimental factors present in the workplaces which have the highest financial and mortal losses in the industrial sector due to the increasing plurality and diversification of the use of chemicals in the various manufacturing industries.[2,5,6] Presently, about 4 million people are employed in the chemical industry in the world, and are dealing with chemicals in the workplace in various industries. About one million people die or become disabled in the course of contact with chemicals annually.[6,7] Therefore, from the perspective of safety, chemical industries have always been classified as critical industries.[8,9]

Welding is one of the most important professions associated with risk and its workers are exposed to

Citation: Firoozi chahak A, Fani MJ, Alinaghi Langari AA, Beheshti <H. **Factors Affecting the Use of Respiratory Protection Devices Based on the Health Belief Model in Welders.** Archives of Occupational Health. 2018; 2(1): 70-4.
Article History: Received: 12 September 2017; Revised: 6 November 2017; Accepted: 20 December 2017

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various harmful physical and fatal chemical mechanical and physical factors that could endanger their health. Ultraviolet radiation caused by welding can cause itching, weeping, pain, burning eyes and fear of light.[10,11] In the advanced stages, it causes keratitis, corneal ulcers and even cataracts.[12]The welder is mainly exposed through inhalation of chemical substances.[13] Therefore, they are susceptible to a variety of pulmonary diseases According to the mentioned points, the biggest concern is from the perspective of industrial health, fumes. Several studies have been carried out on the effects of exposure to welded fumes on health.[14,15] Welding fumes cause bronchitis, stimulation of respiratory routes, metal fever, etc. In addition to existing hazards, fumes have adverse effects on organs such as the kidneys, cardiovascular system, skin and genitals. Given that the permanent control of all occupational hazards (including chemical, physical, mechanical and biological factors) is not possible,[16,17] or is very difficult based on the source of production and also in the transfer path, so the only solution is to equip employees with appropriate personal protective equipment and one of these devices is personal respiratory protection equipment.[17,18]Research has shown that traditional training is ineffective at present, and without knowing the complex and effective factors in changing behavior, access to change will not be possible. Therefore, safety education with the use of patterns that identify and reinforce effective factors on behavior, is essential.

Today, health education researchers have developed patterns that are efficient and useful to reach the goal of changing behavior using various theories of psychology and social sciences.[19] One of the effective models in health education and especially safety education is health belief model.[20]The health belief model is about change in behavior as a function of knowledge and attitude of the individual, and according to its components, makes people perceive a threat, and drives them to change their behaviors according to the stimuli for action.[18,21] Therefore, in view of the importance of respiratory protection for workers engaged in the welding industry, this study attempts to investigate the factors affecting the use of respiratory protection devices based on the health belief model in Gonabad welders.

Methods

The present study is a cross-sectional descriptive study that examines factors affecting the use of respiratory protection based on the health belief model of workers in welding industry of Gonabad city in 95. Sampling was conducted in a census form and the sample size included 180 workers in the welding industry.

The instrument for collecting data was a standard respiratory protection questionnaire with 26 items and in 2 parts which was designed as a researcher-made test. The validity of this questionnaire was evaluated by 3 people with Ph.D.in Professional Health, 3 persons with Ph.D. in Health Education and 2 medical specialists. The validity and reliability of the questionnaire was confirmed by calculating the Cronbach Alpha coefficient (α = 0.82). In this questionnaire, answers were classified as I completely disagree (1 point) to totally agree (5 points) based on Likert scale. The first part includes demographic information, and the second part includes demographic and field questions, including questions about age, marital status (single, married), work experience, monthly income, education, length of work time, and work shift. In addition, for ranking the domains, gaining scores of 33.3% was considered as poor, 33.4-66.6% as average and 66.7-100% as a good ranking. In the context of inclusion criteria, subjects of the research are justified on how to perform, confidentiality of information, and the purpose of the study, and all of them will be willing to enter the study. Moreover, those with underlying respiratory diseases were excluded from the study.

The obtained data were analyzed using descriptive statistics and analytical tests such as Pearson correlation coefficient, one-way ANOVA, independent t-test and linear regression analysis at a significant level of 0.05,

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analysis of principal components and Varimax rotation. All analyses in this study were performed using SPSS20 software.

Results

From the study carried out on 180 workers, the results of the mean and standard deviation of age was 34.21 (SD=9.27), work experience was 10.37 (SD=7.71), monthly income was 903333.33 (SD=407937.99), working hours were 8.25 (SD=1.39). The mean age of the study population was 34.21 years and the average work experience was 10.37 years. Their average working hours were 8.25 hours and their minimum and maximum hours were 5.00 and 15.00 hours, respectively.

In this study, the respiratory protection was 91.25 and the minimum and maximum respiratory protection scores were 67.00 and 130.00, respectively. The results of the study of the correlation coefficient of respiratory protection score are shown in Table 1 with age, work experience, monthly income and working hours. The results of the study showed that among 180 people, 39 were single and 141 were married. The mean and standard deviation of singles' respiratory protection score was 90.23(SD=10.34), while that of married people was 91.53 (SD=10.08). There was no significant relationship between marital status and respiratory protection score (p> 0.05).

The comparison of respiratory protection score with people's level of education was performed based on ANOVA test. The results of this study showed that the lowest mean respiratory protection score in bachelor subjects was 81 and the highest mean respiratory protection score in undergraduate students was 9.79 (SD=96.72). The average score obtained by participants in the whole scale was 91.25%. The results of ANOVA showed that there is a significant relationship between respiratory protection score and education (P <0.05). Also, the results of the study showed that the lowest mean respiratory protection score in contractual employment was 8.33 (SD=90.02) and the highest mean respiratory protection score in permanent employment was 97.27 (SD=14.76), the mean score of the participants in the whole scale was 91.25. The results of ANOVA test showed that there is a significant relationship between respiratory protection score and type of employment (P <0.05) (Table 2). The results of the study (Table 3) showed that the lowest mean respiratory protection score in the evening shift was 9.91 (SD=90.54) and the highest mean respiratory protection score in the morning shift was 11.43 (SD=97.25). The average score obtained by participants in the whole scale was 91.25. ANOVA test showed that there was a significant correlation between respiratory protection score and work shift (P <0.05).

Table 1. Relationship of Correlation coefficient of respiratory protection score with age, work experience, monthly income and working hours

Studied variables	Respiratory protection score	Age	Work experience	Monthly earnings	Hours of work
Respiratory protection score	1				
Age	-0.08	1			
Work experience	-0.015	0.73	1		
Monthly income	-0.013	0.04	0.45	1	
Hours of work	0.02	-0.01	0.01	0.14	1

Table 2. Comparing respiratory protection score with type of employment

Type of employment	Number	Average of respiratory protection score	Standard
Permanent	11	97.27	14.76
A treaty	3	92.33	10.06
Contractual	34	90.02	8.33
Daily worker	132	91.04	10.04
All workers	180	91.25	10.12

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Table 3. Comparison of respiratory protection score with work shift

Shift type	Number	Average of respiratory protection score	Standard deviation
Morning	16	97.25	11.43
Morning – evening	155	90.54	9.91
Morning-evening-night	9	92.77	8.40
All subjects	180	91.25	10.12

Discussion

Welding is one of the important components of many industries, and the National Institute for Safety and Health has estimated that at least two million people are working as welders.[22]The contact of welders over the years with gases and vapors caused by welding has resulted in adverse health effects. By increasing the age and experience of the welders, the amount of this undesirable effect is increased.

Hasheminejad et al[21] showed that there is a significant relationship between work experience, skill, age and level of workers' awareness of personal protective equipment. In this study, with a sample population of 180 welders, we found that there was no significant relationship between age, duration of work, work shift, and respiratory protection score, which is contrary to the findings of Hashemian et al. study, which may be due to differences in work environment and individual differences, but there is a significant inverse relationship between work experience and respiratory protection score (such that the use of respiratory protective equipment decreases with increasing work experience). The results of Hazawe Yi et al.[18]showed that the greater the consciousness, sensitivity, severity, benefits and perceived barriers of workers regarding the chemical agents of the work environment and occupational respiratory diseases and respiratory protective devices, the greater is their performance in using individual respiratory protection devices. In the present study, there was no significant relationship between education and respiratory protection score, which is consistent with the findings of Hazaveh et al before educational intervention.

This study showed that training has a direct impact on the performance of individuals and their use of personal respiratory protection, as the results of the findings of Hazaveh et al showed that the mean score of knowledge, perceived benefits and barriers of workers before educational intervention was moderate and performance score was lower than average. However, after the training intervention, the results revealed that the mean score of knowledge, sensitivity, severity, perceived benefits and barriers and performance of workers in the case group was significantly increased compared to the control group.[23,24]Saeifar also conducted his study on the impact of training on the knowledge and health performance of providers and workers at food supply and sales centers. The findings show that firstly, workers with higher professional health awareness had better performance. Therefore, increasing awareness of workers seems to increase the chance of developing safe behavior in them[18,20,25,26]

Overall, it can be concluded that there was no significant relationship between age, duration of work, work shift and respiratory protection score. This result suggests that these individual factors may not have an effect on the respiratory protection score, and other factors naturally alter the attitude of individuals toward safety.[19,24,27,28] The existence of a positive correlation between safe behaviors and individual factors including age and work record can indicate that with increasing age, duration of work and shift, people work less cautiously and increase their risk-taking. Although this might not be consistent with our social experience, none of the investigations on respiratory protection studied by the researcher had any special inquiries in this regard. Also, this study showed that there was no significant relationship between respiratory protection score and type of employment, but there is a significant relationship between respiratory protection score and work shift. According to the studies, no studies have

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been carried out regarding the effect of the factors such as fatigue and working conditions on respiratory protection score.

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