



# Effect of Occupational Stress on the Work Ability of Iranian Firefighters

Azam Hatami<sup>1,2</sup> and Davood Afshari<sup>1,3,\*</sup>

<sup>1</sup>Human Environment and Sustainable Development Research Center, Najafabad Branch, Islamic Azad University, Najafabad, Iran

<sup>2</sup>Department of Environmental Management, Najafabad Branch, Islamic Azad University, Najafabad, Iran

<sup>3</sup>Department of Occupational Health and Safety Engineering, School of Health, Ahvaz Jundishapur University of Medical Sciences, Ahvaz, Iran

\*Corresponding author: Department of Occupational Health and Safety Engineering, School of Health, Ahvaz Jundishapur University of Medical Sciences, Ahvaz, Iran. Email: afshari@ajums.ac.ir

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## Abstract

**Background:** Occupational stress is one of the factors affecting social life and is known as a serious threat to the workforce health in the world. Firefighters are subject to frequent occupational stress due to their working conditions and tasks.

**Objectives:** The current study aimed at investigating the effect of occupational stress dimensions on the work ability index of firefighters in a petrochemical company in Iran.

**Methods:** A total of 130 shift-working and day-working firefighters were selected from a petrochemical company using the census method. Occupational stress was evaluated using the health and safety executive (HSE) indicator tool, and the work ability index (WAI) was used to assess the work ability among firefighters. Pearson chi-square test was used to examine the correlation between the various dimensions of occupational stress and the WAI.

**Results:** The mean of occupational stress in the shift-working group was significantly higher than that of the day-working group ( $P = 0.029$ ). The results of the Pearson correlation test showed a significant relationship between the mean score of occupational stress and that of the WAI ( $P = 0.01$ ). Among the stressors, the perceived role and managerial support ( $R = +0.51$ ), and colleagues support ( $R = +0.50$ ) had the highest correlation with the work ability of firefighters.

**Conclusions:** The obtained results showed that occupational stress can affect the work ability of firefighters. Hence, to improve working conditions, identification of various dimensions of occupational stress, especially among shift workers, and implementation of constructive and managerial interventions should be prioritized.

**Keywords:** Job Stress, Work Capacity Evaluations, Firefighter

## 1. Background

Occupational conditions sometimes have a negative impact on the health of workers and employees of administrative and especially industrial units. In recent decades, occupational stress is considered an annoying phenomenon by researchers as well as the World Health Organization (1, 2). Stress is a set of physical, psychological, and perceptual reactions exerted by human physiological and neurological systems against internal and external factors that disturb the natural stability and balance (3). Occupational stress refers to a stress that affects a person in a specific job, and depending on the individual's experience, strength, and weakness in dealing with the existing conditions, certain feedbacks may appear in the person that can involve the person's mental, physical, and behav-

ioral aspects (4). The International Labour Organization explicitly states that occupational stress is the most recognized phenomenon that threatens the health of workers. Research shows that about 30% of the workforce in the developed countries have occupational stress (5-7). Other research results indicate that stress in the workplace affects many aspects of life. The prevalence and spread of this pressure in the workplace, especially in recent decades, led researchers to extensively analyze the issue in organizations and its impact on personnel performance (5). Occupational changes such as organizational changes, salary changes, job promotion, reduced or increased workforce, and social transformations are subjects that can put stress on a person resulting in agitation, worry, and anxiety (8). However, there are some jobs that are more prone to stress than the others due to their nature and tasks. Firefight-

ing is one of these stressful occupations with paramount importance. Due to high risk, high sensitivity, complex and uncertain working conditions, direct exposure to various types of accidents and harmful factors, shift work, and the necessity of personnel readiness at any time of the day firefighting is classified as a hard and harmful occupation. These factors result in higher stress in this job than other occupations (9, 10). Therefore, as explained earlier, occupational stress in firefighters can affect various aspects of their lives and job. Some of these aspects are studied and definite results are obtained. However, some aspects such as work ability are studied less. Many scholars and psychologists believe that a moderate level of stress is needed to improve occupational performance in individuals. On the other hand, if this balance is disrupted and stress rises beyond a moderate level, it can result in impaired performance and reduced productivity (11). That is why in some countries, the retirement age in stressful occupations is declined, which leads the ability improvement to be recognized as one of the most effective ways to prevent work inability and early retirement in recent years.

Workability is a complex concept that can be evaluated using the work ability index. This index is a set of factors that enables a person to properly fulfill his/her job requirements under certain conditions (11). In recent years, the work ability index is introduced as an important tool in professional health studies, and can be used to improve health and system efficiency.

## 2. Objectives

According to the importance of evaluating the work ability among the workforce and that no study is conducted so far in Iran with the variables investigated in the current study, the current study aimed at investigating the impact of occupational stress on the WAI in firefighters in a petrochemical company in Iran. It is expected that the results of the current study can determine the impact of occupational stress dimensions on work ability of the firefighters, and the results can be used to determine appropriate strategies to increase the abilities and efficiency of firefighters.

## 3. Methods

The current study was conducted in 2017 among firefighters of a petrochemical complex in Mahshahr, Iran. A total of 51 day-working and 79 shift-working firefighters were selected from the petrochemical company using the

census method. Data collection tools included two questionnaires, namely the work ability index and the health and safety executive indicator tool (HSE) as an occupational stress self-report questionnaire.

### 3.1. Work Ability Index

The current study employed the WAI that its high reliability and validity were confirmed in previous studies (12). The validity and reliability of the Persian version of WAI with a Cronbach's alpha coefficient of 0.79 was determined in Iran by Abdolalizadeh et al. (13). Regarding the method of distribution and completion of the questionnaire, after providing the necessary information and training about the questionnaire and its questions, the data were received from firefighters through semi-structured interviews. This questionnaire was evaluated by presenting a multifaceted image of work ability, including occupational health status, occupational nature of individuals (physical and mental), and work-related factors such as subjective ability of individuals and their estimation of work-induced disorders and their impact on occupational activity. This index was calculated by summing the scores obtained from each item. Based on these dimensions, each worker can obtain a score of 7 (as the worst estimate) to 49 (as the best estimate). The questionnaire is scored based on a Likert scale (14). Finally, based on the obtained scores, the work ability of firefighters was divided into four groups, namely poor (7 - 27), moderate (28 - 36), good (37 - 43), and excellent (44 - 49) (13).

### 3.2. Occupational Stress Questionnaire

In order to investigate the effect of stressors on the work ability, the Persian version of the HSE indicator tool was used (15). Several studies previously used the questionnaire (16-19). The questionnaire consists of four criteria related to the job content aspects (such as needs or demand, control, managerial support, and coworker support) and three criteria for the job concept (communication, role, and change). The HSE questionnaire items are scored based on a five-point Likert scale (never, rarely, sometimes, often, and always). The scores of each item represent the value measured for them, ranging from 1 (undesirable) to 5 (desirable), i.e., higher scores indicate higher health and safety in terms of stress and lower scores represent more stress among individuals (15).

### 3.3. Statistical Analysis

All statistical analyses were performed with SPSS version 16.0 (SPSS Inc., Chicago, IL, USA) at 0.05 significant level ( $P \geq 0.05$ ).

Paired *t*-tests (two-tailed) were used to compare values of the WAI between day-working and shift-working firefighters. The Pearson correlation coefficient was used to investigate the correlation between stressors and the work ability of firefighters.

#### 4. Results

Table 1 shows the demographic characteristics of the participants. The results of the Pearson correlation coefficient showed a significant correlation between the mean scores of the occupational stressors and the mean WAI (Tables 2 and 3). Among the stressors in the field of occupation, managerial support and coworker support, and in the job content, the perceived role had the highest correlations with the WAI in firefighters.

Table 1. Characteristics of Respondents

Variable	Frequency	Percentage
<b>Marital status</b>		
Married	110	84.62
Single	20	15.38
<b>Education</b>		
High school	3	2.31
College	61	46.92
Associate degree	32	24.62
Bachelor's degree	27	20.77
Master's degree	7	5.38
<b>Work experience, y</b>		
< 10	73	56.15
11 - 15	21	16.15
16 - 20	9	6.93
> 21	27	20.77
<b>Age, y</b>		
< 30	33	25.38
31 - 40	51	39.23
41 - 50	27	20.78
> 50	19	14.61

Table 2. Comparison of Mean Scores of the Work Ability Index in Different Age Groups

Age Group	Number	Mean ± Standard Deviation
20 - 30	27	43.50 ± 3.5
31 - 40	33	41.78 ± 3.9
50 - 41	51	34.30 ± 4.12
51 - 60	27	28.85 ± 2.56
60 - 65	19	24.83 ± 4.29

Investigation of the relationship between occupational stress in the shift-working and day-working groups

Table 3. Job Stress Status and Pearson Correlation Test Among WAI and Job Stress Among Firefighters

Variable	Level of Stress				WAI	
	No Stress	Low	Medium	High	R	P
Demand	28	51	18	3	-0.44	0.01
Control	31	44	21	4	0.40	0.01
Change	41	43	14	1	-0.46	0.01
Social communication	30	46	22	2	0.29	0.01
Management support	32	52	13	1.5	0.51	0.01
Support of colleagues	44	41	13	2	0.50	0.01
Role Understanding	78	17	4.5	0	0.51	0.01

showed that the mean of stress in the shift-working group was higher, and a significant difference was observed between occupational stress and the WAI between the two groups (Table 4).

Table 4. The Difference Between Means of Job Stress and WAI Both in Fixed and Rotating Working Shifts

Variable	Type of Working Shift		P Value
	Day-Working, N = 51	Shift-Working, N = 79	
Job stress	98 (18)	113 (23)	0.029
WAI	39 (5.8)	37.8 (4.3)	0.16

#### 5. Discussion

The current study aimed at determining the relationship between occupational stressors and the work ability in firefighters of a petrochemical complex.

According to the results of the study, the mean scores of occupational stressors, namely need (demand), control, change, and coworker support were above 30, and the mean scores of relationships and mass communication, managerial support, and perceived role were less than 30. Therefore, relationships and mass communication, managerial support, and perceived role may have a greater impact on stress than other dimensions. The current study results showed that the mean score of WAI of the firefighters was 34.65, indicating the moderate ability of firefighters. The WAI of Iranian firefighters was less than those of other occupations including healthcare workers (40.3) (20), bus drivers (36.8) (21), construction workers (36.46) (22), power plant workers (39.16), metal industry workers (40.7) (23),

Finnish police officers (39), and Belgian firefighters (40/6) (24), indicating the inappropriateness of the index. Kim et al. in his study showed that excessive job stress was related to the occurrence and the frequency of occupational injuries in Korean firefighters (25). Kujala et al., considered the working ability scores below 40 unfavorable for workers aged 30 - 40 years, while it was also unfavorable for those participating in the current study (mean age: 36 years) (26). In a study by Koohpayezad et al., in a power station, the average WAI with a mean age of 37 years was reported 12.39 (27).

Also, the result of a study by Sell et al., on the working ability showed that the physical needs of the occupation were among the most important risk factors to reduce work abilities (28). Estry-Behar et al., showed that unfavorable physical working conditions and inappropriate physical working conditions were among the causes with the greatest effect on the low work ability (29).

The mean score of WAI in different age groups showed that the age group 20 - 30 years obtained the highest mean ( $43.50 \pm 3.5$ ), suggesting the higher work ability of young workforce.

An objective of the current study was to investigate the relationships and effects of different dimensions of occupational stress on the WAI. In the current study, the correlation coefficient between the need (demand) factor and the WAI was negatively significant, which was consistent with the results of previous studies (25, 30). This relationship suggested that some of the working conditions of individuals such as combination of some physical and mental activities, high workloads, lack of time to rest, and being under pressure for a long time at work may reduce the work ability in such personnel. On the other hand, a significant and positive correlation of the control factor coefficient with the work ability indicated that if firefighters can increase their control over the work process through the decision-making process and adjust their work, they feel useful and their WAI increases; these findings were also consistent with the results of previous studies (30). A study from Japan also showed that high quantitative workloads, high variance in workload and high cognitive demands were associated with occupational injury in males working in small-to-medium sized manufacturing enterprise (31).

Among occupational stressors, the change factor had a negatively significant relationship with the WAI, which was consistent with the results of previous studies (25, 30). Therefore, with regard to the results of the current study, if the staff does not have the time to ask the manager about the changes in the organization and their opinions are not considered, their WAI decreases. According to the signifi-

cant association between relationships and mass communication factor with the WAI observed in the current study, it can be stated that if the firefighters have strong social relationships, create trust among each other, and are not worried about tension in the work environment, they are interested in their workplace, their occupational motivation and the WAI increase (25, 30).

The current study results showed a positive and significant relationship between managerial support, coworker support, and perceived role of the person with the WAI. This finding suggested that if firefighters were involved in decision-making, received positive comments, and feedback on their work, were supported by the manager when dealing with a problem or needing help, were understood when doing psychologically heavy tasks, and were encouraged at work by supervisors, their WAI score increases. In addition, when the firefighters face a problem, if they get the necessary and sufficient respect from their coworkers at workplace, they can express their problems, and try to solve each other's problems, and accordingly, their WAI increases.

The relationship between occupational stress and the shift-working group showed that the mean stress score in the shift-working group was higher than that of the day-working group, and there was a significant difference between occupational stress and the WAI among these two groups. In addition, the WAI in the day-working group was higher than that of the shift-working group. Therefore, it can be concluded that shift-working firefighters may have higher occupational stress and, consequently, a lower WAI. This can be attributed to being away from the family, the biometric characteristics of the body, and other physiological and psychological factors, which affect the severity of stress. In a study by Samadi and Golmohammadi (30) on the relationship between the WAI and occupational stressors in nurses, it was observed that shift-working nurses had significantly more occupational stress than day-working nurses. Cavalheiro et al. (32), and Hsu et al. (33), found a significant relationship between intermittent shift-working and night-working with stress (31, 34). The negative relationship between occupational stress and WAI is in agreement with the results from diverse occupational groups (35-38). And also, some studies indicated that increased stress and musculoskeletal pain were independently associated with lower work ability (39, 40).

### 5.1. Conclusions

The findings of the current study showed that the WAI in the studied firefighters was moderate and there was a significant relationship between the night-working

and different dimensions of occupational stress in firefighters. Occupational stress seemed to affect the night-working of firefighters. Therefore, to improve working conditions, identification of various dimensions of occupational stress, especially among shift workers, and implementation of constructive and managerial interventions should be prioritized.

### 5.2. Limitations

One of the limitations of the current study was that its results cannot be generalized to other occupations due to the nature of the firefighters' job. In addition, data were collected through participants' self-reports. Therefore, the views and perceptions of the respondents may be mixed with biases, thoughts, and judgments, which may affect the results of the study.

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### Footnotes

**Authors' Contribution:** Davood Afshari: Developing the study concept, design, and methods. Azam hatmi and Davood Afshari: Writing the primary draft of the manuscript. All authors contributed to the revision of the manuscript and read and approved the final version.

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