

The Relationship between Fatigue and Work Ability Index (WAI) of Workers in a Ceramic Industry in Yazd Province, 2014

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Abstract

Background: The basis of welfare and health in all individuals is their work ability. Many factors such as work and working conditions, fatigue, and individual characteristics affect the work ability. In the present study, we evaluated the work ability among workers employed in a ceramic industry and determined the relationship between fatigue areas. **Methods:** The present study was a descriptive cross-sectional study. 200 subjects were randomly selected and investigated. This study was conducted using two standard questionnaires of Work Ability Index (WAI) and Multidimensional Fatigue Inventory (MFI). Data were analyzed by SPSS software. **Results:** Mean general fatigue score was of 9.65 (SD=2.88) and the mean motivation score was 7.11 (SD=2.45). There was a significant difference in fatigue in different job groups in terms of work experience ($P < 0.05$). The mean of fatigue in different occupational groups was higher for those without experience than those with skill. The mean of the work ability index was 39.69 (good level). The highest correlation was found between the score of work ability index and fatigue index among job titles belonging to the operational group ($r = 0.97$). **Conclusion:** With the increase of the fatigue score, the score of the work ability index decreased. Better recognition of factors creating fatigue and providing appropriate strategies can be effective in reducing this factor.

Keywords: Work Ability Index; Ceramic Industry; Fatigue; Occupational health

Introduction

From the perspective of occupational health, social or rehabilitation insurance, the concept of work ability is based on the balance between individual characteristics and work needs.^{1,2} "Work ability and need model" is used in occupational health to explain the interaction between job position and worker's ability to do work. Basically, in this model, the job situation is described with physical, psychosocial, and operational needs and freedom of action. Based on

the comprehensive model of work ability, factors affecting working ability include individual characteristics, working conditions and work environment, and factors associated with lifestyle.² Under normal circumstances, it is assumed that the worker is able to meet his or her own working needs. When an imbalance occurs, it can lead to disability or absenteeism.³ The work ability is an index that indicates the extent to which workers will be able to do their job

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in the best possible way considering their work needs, health status and mental/intellectual abilities.⁴ The work ability was evaluated in a variety of ways, for instance, by using a simple question, asking individuals to score their work in a range of 5 to 10. In addition, the work ability can be calculated by using the number of sick leaves in the long-term, or the total number of days that a person has gone on a sick leave. In the 1980s, the results of the Finnish researchers' research on the work ability led to the development of the Work Ability Index Questionnaire. The main objective of this questionnaire is to assess the work ability of people.⁵

The work ability index is a functional tool for use in occupational health services as well as an auxiliary tool for maintaining work ability. Studies indicated that there is a good relationship between the results of clinical investigations and the work ability index.⁶ Moreover, in the continued studies conducted by the Finland Health Care Institute in the area of work ability, it was revealed that this tool can reliably predict changes in the work ability in different occupational groups. It is also significant to note that the work ability index reflects the level and quality of interaction between the work and the worker; therefore, it should not be interpreted as a health index for workers.⁷ On the other hand, fatigue is a complex phenomenon due to various factors that appear in different forms. Fatigue is based on a simple definition, a feeling of tiredness that is caused by excessive physical and mental work.⁸ Today, fatigue is more prevalent in the developed countries. Despite its high prevalence, there is little information about fatigue. In recent years, particular attention has been paid to fatigue due to the incidence of chronic fatigue syndrome.⁹ Different studies carried out on the prevalence of fatigue in different working populations indicate different statistics. Based on studies, 5-20% of the population suffers from lingering and resenting fatigue. In a study, 25% of Dutch workers reported fatigue during work.¹⁰

Therefore, with regard to the practical importance of the work ability to identify and assess the mutual

effects between the work conditions and environment on the health status of workers and employees in work environments, we aimed to determine the work ability index in the ceramic industry and compare it among the different occupation groups and their relationship with fatigue to take a step toward early identification of the environmental effects and working conditions on workers. Finally, by presenting suggestions for maintaining and improving work ability as one of the significant components, we can take measures in maintaining the health of the workers and increasing the productivity of these industries in the country.

Methods

This study was conducted with a descriptive cross-sectional method using random sampling. According to the results of the study of Safari et al,¹¹ and considering a 0.2 correlation coefficient and 80% test power and 95% confidence level, the sample was estimated as 200 subjects (out of 360 people). After collecting the questionnaires, 14 questionnaires were excluded for incomplete answers, and a total of 186 questionnaires were used. This research was conducted using two standard questionnaires of Work Ability Index (WAI) and Multidimensional Fatigue Inventory (MFI). The Work Ability Index (WAI) includes 7 dimensions of current work ability in comparison with the best life span, work ability in terms of physical and psychological needs, the number of current diseases diagnosed by a physician, sick leave during the past 12 months, individuals prediction of their work ability in the next two years, psychological resources and estimation of the losses due to illness.¹² The translation of the WAI questionnaire into Persian language and its validity and reliability in Iran were done by Abdulalizadeh et al.¹³ The Multidimensional Fatigue Inventory (MFI) is known as one of the most comprehensive and complete measurement tools regarding fatigue. A review of the literature and the history of the use of MFI suggest that several studies have been carried out on the universal dimension.¹⁴ This questionnaire

provides a deeper and more accurate understanding of the rate of fatigue by assessing five dimensions of fatigue including general fatigue, physical fatigue, decreased activity, decreased motivation and mental fatigue.¹⁵ This questionnaire is usable on the population of patients and healthy people, and includes 20 items that are scored on a 5-point Likert scale (from 1 = Yes, completely true, and 5 = No, completely wrong). Ultimately, higher score sum indicated more fatigue in individuals. The questionnaire was first introduced by Smets in 1996 and its validity and reliability were also evaluated in various demographic groups, such as cancer patients undergoing radiotherapy, patients with chronic fatigue syndrome, first year students of Psychology and Medicine, soldiers and third-year medical students.¹⁶

Data were analyzed by SPSS software (Version 22). Using the Kolmogorov-Smirnov test, the normal distribution of data was investigated and, if normal, parametric T-test and ANOVA tests were used and, if abnormal, the nonparametric tests (Mann-Whitney) were used. Spearman and Pearson Correlation Coefficients (depending on type of data and distribution) and Chi square test were used to examine the dual correlation between quantitative and qualitative variables. In this study, the confidence interval was at 95% and the significance level was at 0.05.

Confirmatory Factor Analysis showed that the questions of each dimension are descriptive of the same dimension, and the questionnaire has an in-depth homogeneity (alpha coefficient was higher than 8% for general, physical and mental fatigue and higher than 65% for the decrease in activity and motivation), other studies also confirmed the appropriate reliability and validity of this tool.¹⁶ This questionnaire was translated into Persian and its validity and validity were verified.¹⁷

Results

In the current study, 88.2% of participants were male, 40.3% had diploma, 85.5% were married, 61.8% had skill in work, 68.8% had operational job title and 59.1% also had intellectual, mental and physical job nature all together Table 1.

There was a significant difference in fatigue score among people in terms of work experience between 7 and 12 years. The mean of fatigue in different occupational groups was not different for those who were skilled in their work ($P > 0.05$), but for those without skill, the mean of fatigue in different occupational groups was different ($P < 0.05$). The mean of fatigue in different occupational groups was not significantly different for all educational levels except for the elementary level that was not reportable. Moreover, the mean of fatigue in different occupational groups on the basis of marital status did not show significant difference ($P > 0.05$).

Table 2 indicates that general fatigue with a mean of 9.65 (2.88) and decrease in motivation with a mean of 7.11 (2.45) were the highest and lowest fatigue dimensions, respectively.

Table 1. Descriptive analysis of demographic data of the studied population

Variable	Number	Percent
Level of education	Elementary	4 2.2
	Under Diploma	34 18.3
	Diploma	75 40.3
	Associate's Degree	33 17.7
	Bachelor's degree and higher	40 21.5
Marital status	Single	27 14.5
	Married	159 85.5
Skill	Qualified	71 38.2
	Not qualified	115 61.8
Sex	Male	164 88.2
	Female	22 11.8
Job title	Administrative	22 11.8
	Operational	128 68.8
	Repair	36 19.4
The job nature	Intellectual and mental	28 15.1
	Physical	48 25.8
	Both	110 59.1
Total	186	100

Table 2. Dimensions of the Multidimensional Fatigue Inventory (MFI)

Dimensions of fatigue	Minimum	Maximum	Mean	Standard deviation
General tiredness	4	17	9.65	2.88
Physical fatigue	4	16	7.97	2.74
Decrease in activity	4	16	7.28	2.69
Decrease in motivation	4	14	7.11	2.45
Mental fatigue	4	17	8.27	2.94
General fatigue	20	66	40.25	10.93

Table 3. The rate of internal correlation between fatigue dimensions

	General fatigue	Physical fatigue	Decrease in activity	Decrease in motivation	Mental fatigue
General fatigue	1				
Physical fatigue	** 0.46	1			
Decrease in activity	** 0.30	** 0.56	1		
Decrease in motivation	** 0.54	**0.65	** 0.57	1	
Mental fatigue	** 0.54	**0.50	**0.50	** 0.58	1

** Existence of correlation with the 0.01 confidence level (bilateral)

Table 4. Comparison of the mean of the work ability index among job titles of males

Job	Number	Minimum	Maximum	Mean	Standard deviation	P-Value
Operational	118	31	45	39.98	2.94	0.04
Repair	35	32	45	38.77	3.36	
Total	153	31	45	39.71	3.08	

Based on the results in Table 3, there was a significant correlation between the general and physical fatigue dimensions and the observed correlation was 0.46. There was a significant relationship between decrease in activity and general and physical fatigue and correlation coefficients were equal to 0.30 and 0.56, respectively. The mean of fatigue in repair, operational and administrative groups was 43.49, 39.85 and 36.59, respectively. The mean of job fatigue was higher in repair than in other groups, but this difference was not statistically significant ($P = 0.121$). The mean of work ability index for official, operational and repair workers was 39.98, 39.62 and 38.77, respectively, but this difference was not statistically significant ($P = 0.124$).

Based on Table 4, the mean of the work ability index in different occupational groups is different for males ($P = 0.04$). Correlation between the work ability index and job fatigue of workers among all job titles was significant and inverse (p value <0.05). In fact, with increase in fatigue score among all job

titles, the rate of work ability index decreased and vice versa.

Discussion

In the present study, the mean score of the work ability index was 39.69 (3.09). However, based on the Finland Health Care Institute, the work ability was at a good level within the score range of 37-43, but based on the mean age of the population studied (32 years), it seems that such a score is not desirable for those participating in this research. In this regard, we can mention a study done by Tuomi et al. in a metal industry in Finland where the mean score of the work ability index with a mean age of 42 years was 40.7.¹⁸ In another study in the Netherlands, in a metal industry with a mean age of 41.5 years, a mean score of 40.9 work ability index was reported.¹⁹ Considering that the mean age mentioned in the two studies above is higher than the present study; the low work ability index in this study can be due to the effect of differences in working conditions, working environment and lifestyle. In the present study,

the distribution of the work ability level was in such a way that 14.52% were in the middle category, 74.73% in the good category and 10.75% in the excellent category. In the present study, 14.52% of the subjects had a weak and moderate work ability index score, which is consistent with the study carried out in Finland.¹

In the present study, the highest score of work ability index belongs to the administrative occupational group and the lowest score of work ability index belongs to the repair occupational group. The reason for the low level of work ability in the repair occupational group and some other occupational groups in comparison with the administrative work group can be attributed to the nature of the job of the occupational groups studied and the risk factors in each of these occupations. Consequently, administrative personnel have a mental and intellectual nature, while workers in the repair and other occupational groups have a physical job nature.

In this regard, a study carried out by Goedhard et al. in a zinc production industry showed that physical needs in the zinc industry have reduced the work ability.²⁰ Moreover, the study carried out by Sell et al. on work ability indicated that the physical needs of the job, such as manual handling of burden, working in standing situation, high sound exposure, inappropriate physical status, are among the most significant risk factors for reducing work abilities. The job nature has a direct effect on the work ability.²¹ In a study by Ilmarinen et al., it was shown that in works with physical nature and physical-mental nature, the index of work ability has a downward trend than that of intellectual-mental needs.⁷ The present study also confirms this downward trend, so that individuals with the same physical, mental and physical occupational status had the lowest work ability index, and those with mainly physical-

mental and physical job nature had a high work ability index.

In the present study, the correlation between the score of the work ability index to determine the most significant factor affecting the work ability of the studied population was investigated. The results of the present study revealed that the highest correlation was obtained for the third item (estimating the work ability in the next 2 years). Therefore, it can be said that in this study, the work ability index has a significant effect on the work ability in the next two years. Meanwhile, studies in this area have also determined that there is a strong relationship between prediction of future work ability with high work ability.^{22,23}

The comparison between the mean of fatigue in five dimensions showed that general fatigue with a mean of 9.65 and decrease in motivation with a mean of 7.11 had the highest and lowest fatigue dimensions, respectively. This finding is similar to the results of a Danish study on ordinary people, and it was found that the mean of general fatigue and decrease in activity had the highest and lowest rate in the Danish population, respectively.¹⁴

The mean of fatigue in different occupational groups was not different for single and married people. In the study of Watt et al., it was observed that married men experience significantly lower fatigue than single men in dimensions of general fatigue, decrease in activity and mental fatigue.¹⁴ Bultmann's study on 12095 workers in the Netherlands, as well as Junghaenel's study, found that single people and those who lived alone showed more fatigue than married people.^{24,25} The results of this study were inconsistent with our findings.

No significant relationship was found between the level of fatigue and level of education. In the study of Halvani et al., the relationship between fatigue duration with age and educational level was significant.²⁶

Given that the work ability index changes over time, it is recommended that this factor be evaluated for more than one year. It is recommended that preventive measures be taken to improve lifestyle in order to enhance the work ability and prevent worker disability, as well as timely and targeted recruitment examinations should be tailored to each job. Work-related fatigue should also be compensated by rest during work to a degree that does not endanger the health and ability of workers in the long run, so appropriate rest periods and revitalization should be considered. Other recommendations include reducing work hours and shifts, encouraging exercise during work. Considering that in the present study, factors such as smoking and individual suitability for each job were not evaluated and are considered to be limitations in the study, it is recommended to consider them in future studies.

Conflict of interest

The authors declare no conflict of interest.

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