Safety and Health at Work 7 (2016) 43–48

Contents lists available at ScienceDirect

Safety and Health at Work

journal homepage: www.e-shaw.org

Original Article

Effects of Work-Related Stress on Work Ability Index among Iranian Workers

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ARTICLE INFO

Article history:
Received 4 August 2015
Received in revised form
15 October 2015
Accepted 31 October 2015
Available online 15 December 2015

Keywords:
Health and Safety Executive Indicator Tool
Iranian workers
Work Ability Index
work-related stress

ABSTRACT

Background: Work Ability Index (WAI) is a well-known and valid self-report tool that has been widely used in various studies to identify and avoid early retirement and work-related disability. Nevertheless, very few studies have been carried out to evaluate work ability in Iran. We aimed to investigate the WAI and the effect of work-related stress on it among Iranian workers.

Methods: A cross-sectional, descriptive and analytic study was carried out among 449 workers from five working sectors in three big cities of Iran. Work ability and work-related stress were measured using the Persian version of WAI and the Persian version of Health and Safety Executive Stress Indicator Tool.

Results: More than a third of the workers surveyed (34.70%) did not have an appropriate level of work ability (WAI < 37). There was a significant correlation between subscales of work-related stress and the mean score of WAI. Furthermore, the variables of body mass index, sleep quality, exercise activity, job tenure, and three subscales of work-related stress including demands, supervisor support, and role were significant predictors of WAI.

Conclusion: According to the results of this study, the interventional programs must be focused on improving supervisors support, eliminating ambiguity and conflicts in the role of workers in their job and organization, reducing job demands, improving sleep quality, and increasing exercise activity.

1. Introduction

With increasing age, physical and mental capabilities will also be reduced. In addition, the work ability of elderly people will become limited due to suffering from different diseases and health problems. Workforce in Iran, as in many developing countries, is rapidly aging. As a result, maintaining health and extending the working life of the Iranian workforce should be considered as a priority. In this regard, one of the solutions to achieve this goal is to maintain and improve the work ability [1,2]. In recent years, promoting the work ability has been identified as one of the effective ways to prevent work-related disability and early retirement [2]. Different tools and methods are used for the measurement of work ability of workers. Among the well-known tools, Work Ability Index (WAI) is a valid self-report tool that has been widely used in various studies to assess the work ability [3,4]. The aims of this index are to identify and avoid early retirement and work-related disability. It has some questions about the health condition and capabilities of workers, as well as the mental and physical demands and the nature of the job [1,5].

A review of the literature showed that the WAI could be influenced by various work-related stress. van den Berg et al [4] in their review study reported that the high physical and mental demands of job and low control over the job had a negative impact on the mean WAI score [4]. The results of other studies also showed that lack of support from supervisors [6], role ambiguity, and lack of information about changes in the organization [7] were strongly associated with this index. Rotenberg et al [8] in their study among

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http://dx.doi.org/10.1016/j.shaw.2015.10.005

nurses reported that high workload can cause poor WAI. Despite this finding, other work-related stress factors that might influence WAI, such as relationships and demands, have been less investigated. Stress can be affected by the contexts, cultures, norms, and value systems of different societies [9]. In fact, workers from different cultures have different perceptions about the importance of work-related stress [10]. Thus, for the development of effective ergonomic and occupational health intervention programs and to maintain and improve the health of employees from a specific culture and society, assessment of relative importance of different work-related stress factors is needed. Our literature review showed that most studies that investigated the impact of work-related stress factors on the WAI had been designed and conducted in developed and industrialized countries and there is little information on the subject in developing countries, especially in Iran. In addition, very few studies have been carried out to evaluate the work ability of Iranian workers. As a corollary, the purpose of this study was to investigate the WAI and the effect of work-related stress on it among workers in three big cities of Iran (Sabzevar, Birjand, and Isfahan). Moreover, the effect of sociodemographic, health, and work-related factors on WAI was also assessed.

2. Materials and methods

2.1. Study design and study sample

This was a cross-sectional, descriptive and analytic study, which was carried out in five working sectors in three big cities of Iran (Sabzevar, Birjand, and Isfahan). Workers engaged in five different working sectors including two training and medical hospitals, three banks, one oil refinery company, one cable manufacturing company, and one fire station were invited to participate in this study. After obtaining permission from the management of the working sectors, the study was conducted from July to September 2014. First, the researchers attended the workplaces and explained the purpose of the study to all workers; after gaining the trust and obtaining the informed consent of those who were eligible, the questionnaire was given to the participants, who completed it individually and in complete privacy. Anonymous questionnaires were used in the study and all the collected data were analyzed together. A total of 461 workers accepted to participate in this study. After reviewing the questionnaires and removing questionnaires with incomplete data, totally 449 questionnaires were used for statistical analysis. The Scientific and Medical Ethics Committee of all study sectors approved the ethical standards of the study.

2.2. Persian version of the WAI

WAI was developed by the Finland Institute of Occupational Health Research [5]. This index is aimed to identify and avoid early retirement and work-related disabilities. The work ability is calculated by summing up the scores obtained for the seven dimensions. The best possible estimate of the index has 49 points and the worst estimate has 7 points. Finally, based on the scores obtained, the work ability is classified into one of the four categories of poor (7–27), moderate (28–36), good (37–43), and excellent (44–49) [11]. The WAI questionnaire was translated into Persian and its validity and reliability were determined in Iran by Abdolalizadeh et al [12].

2.3. Persian version of Health and Safety Executive Stress Indicator Tool

To measure work-related stress, we used the Persian version of Stress Inventory developed by the Health and Safety Executive (HSE) Management of the United Kingdom. The questionnaire includes 35 questions that measures seven subscales of demands, control, supervisor support, peer support, relationships, role, and changes [13]. Scoring the answers is based on a 5-option Likert scale (never, seldom, sometimes, often, or always). Reliability and validity of the Persian version of this questionnaire were verified and approved by Azad Marzabadi and Gholami Fesharaki [14]. Compared with the other questionnaires in the field of measuring work-related stress, the HSE indicator contains limited number of questions, but includes multiple dimensions associated with work-related stress factor [15]. In addition, the HSE indicator has been developed as a part of the management standards approach based on available scientific literature [16]. The results from the confirmatory factor analysis conducted by Edwards et al [16] indicated an acceptable fit to the data for the instrument, which suggests that the original 35-item seven-factor measurement scale is a psychometrically robust instrument [16]. Furthermore, the HSE indicator has also been reported to be cross-culturally invariant [17].

2.4. Sociodemographic, health, and work-related factors questionnaire

To evaluate these factors we used a separate questionnaire that was designed by the researchers. Sociodemographic factors included age, gender, marital status, and educational level; health-related factors included smoking, exercise activity, sleep quality, and body mass index (BMI); work-related factors included work sector, job tenure, work schedule, second job, overtime working, work hours per weekly, work demands, workload, and occupational injuries.

2.5. Statistical analysis

To analyze the collected data we used SPSS version 21 (IBM Corp., Armonk, NY, USA). Descriptive statistical methods were used to demonstrate the characteristics and features of the study population. Independent t tests and univariate analyses of variance were used to examine the effects of sociodemographic and health and work-related variables on the WAI score. Pearson correlation coefficient was used to examine the correlations between seven subscales of Persian version of HSE and the WAI score. Finally, a hierarchical multiple regression analysis was used to predict the WAI score. In the first step, sociodemographic characteristics, health-related factors, and work-related factors were entered into the regression model. Then, in the second step, subscales of work-related stress were entered into the model. A significance level was set at $p < 0.05$.

Table 1
Descriptive statistic for the WAI dimensions

Variables	Mean (SD)	Range
1. Current work ability compared with lifetime best	7.69 (1.9)	3–10
2. Work ability in relation to the demands of the job	7.76 (1.6)	2–10
3. Numbers of current diseases diagnosed by a physician	4.81 (2.2)	1–7
4. Estimated work impairment due to diseases	4.95 (1.1)	1–6
5. Sick leave during the past 12 mo	4.44 (0.96)	1–5
6. Personal prognosis of work ability 2 y from now	5.76 (1.7)	1–7
7. Mental resources	2.62 (0.97)	1–4
Total WAI score	38.04 (6.3)	18–49

SD, standard deviation; WAI, Work Ability Index.

Table 2
Descriptive statistic for the subscales of HSE Stress Indicator

Variables	Mean (SD)	Range
Demands	2.99 (0.72)	1–5
Control	2.88 (0.68)	1–5
Supervisor support	3.1 (0.83)	1–5
Peer support	3.5 (0.82)	1–5
Relationships	3.7 (0.76)	1–5
Role	3.99 (0.80)	1–5
Changes	3.08 (0.98)	1–5

HSE, Health and Safety Executive; SD, standard deviation.

3. Results

Mean (standard deviation, SD) age of participants was 34.1 years (7.3 years), ranging from 20 years to 61 years. The mean (SD) job tenure and BMI of studied workers were 9.7 years (6.3 years) and 25.0 kg/m^2 (4.1 kg/m^2), respectively. Descriptive statistics related to the dimensions of WAI and subscales of the HSE stress indicator are presented in Tables 1 and 2, respectively. Descriptive statistics related to sociodemographic and health- and work-related factors and their associations with the WAI score are presented in Tables 3 and 4, respectively.

The mean (SD) score of WAI was 38.04 (6.3). The distribution of work ability was as follows: 8% were in a poor condition, 26.7% were in a moderate condition, 43.9% were in a good condition, and finally 21.4% were in an excellent condition. The lowest mean (SD) score of WAI was observed in workers with poor sleep quality [29.7 (6.5)] and in workers with BMI of 30 kg/m^2 or greater [35.0 (7.3)]. By contrast, the highest mean (SD) score of WAI was observed in workers with low workload [41.8 (3.6)] and in workers with good sleep quality [40.9 (5.7)]. The results of univariate statistical tests showed that there was a significant relationship between the mean WAI score with age ($p < 0.009$), sleep quality ($p < 0.001$), BMI ($p < 0.001$), exercise activity ($p < 0.03$), working sector ($p < 0.001$), job tenure ($p < 0.004$), working schedule ($p < 0.027$), working load ($p < 0.001$), and occupational injuries ($p < 0.001$; Tables 3 and 4).

The mean scores of subscales of HSE work-related stress were as follows: role (3.99), relationships (3.76), peer support (3.58), supervisor support (3.12), changes (3.08), and control (2.88). In addition, the mean score of the subscale of demands was 2.99. The results of Pearson correlation coefficient showed that the subscales of control, supervisor support, peer support, relationships, role, and

Table 3
The WAI score according to sociodemographic and health factors

Characteristics	*n* (%)	Mean WAI (SD)	*p*
Age groups (y)			
≤ 29	115 (25.6)	39.6 (5.6)	0.009*
30–39	243 (54.1)	37.4 (6.4)	
40–49	77 (17.1)	37.9 (6.6)	
≥ 50	14 (3.1)	37.8 (5.7)	
Sex			
Male	307 (68.4)	37.9 (6.6)	0.70†
Female	142 (31.6)	38.2 (5.5)	
Marital status			
Single	44 (9.8)	38.2 (5.9)	0.88†
Married	403 (90.2)	38.0 (6.3)	
Educational level			
Elementary	42 (9.4)	38.8 (5.2)	0.47*
Diploma	165 (36.7)	37.6 (6.9)	
University degree	234 (52.1)	38.2 (6.0)	
Sleep quality			
Good	33 (7.3)	40.9 (5.7)	< 0.001*
Moderately good	272 (60.6)	39.1 (5.7)	
Moderately bad	116 (25.8)	36.5 (6.2)	
Bad	23 (5.1)	29.7 (6.5)	
BMI (kg/m^2)			
≤ 24.9	232 (51.7)	38.2 (6.2)	0.010*
25–29.9	181 (40.3)	38.4 (6.0)	
≥ 30	36 (8.0)	35.0 (7.3)	
Smoking			
Yes	14 (3.1)	39.6 (4.9)	0.36†
No	430 (96.2)	38.0 (6.3)	
Exercise activity			
No	207 (46.1)	37.3 (6.4)	0.030†
Yes	242 (53.9)	38.6 (6.1)	

* One-way analysis of variance.
† Independent *t* test.
BMI, body mass index; SD, standard deviation; WAI, Work Ability Index.

Table 4
Work-related factors and their associations with WAI score

Characteristics	*n* (%)	Mean WAI (SD)	*p*
Work sector			
Cable manufacture	39 (8.7)	33.9 (8.4)	0.001*
Oil refining	120 (26.7)	38.1 (5.9)	
Bank	82 (18.3)	38.5 (6.3)	
Fire station	21 (4.7)	39.7 (5.4)	
Hospital	187 (41.6)	38.4 (5.9)	
Job tenure (y)			
≤ 4.9	159 (35.4)	40.0 (5.6)	0.004*
5–9.9	133 (29.6)	38.5 (6.2)	
10–14.9	95 (21.2)	37.2 (6.7)	
≥ 15	62 (13.8)	35.9 (7.0)	
Work schedule			
Day work	189 (42.1)	37.2 (6.7)	0.027*
Two shift	90 (20.0)	37.7 (6.4)	
Three shift	162 (36.1)	39.0 (5.7)	
Second job			
Yes	43 (9.6)	38.5 (7.1)	0.69†
No	400 (89.1)	38.1 (6.2)	
Overtime			
Yes	359 (80.0)	37.8 (6.4)	0.24†
No	85 (18.9)	38.7 (6.1)	
Work hours (weekly)			
≤ 48	156 (34.7)	38.5 (5.3)	0.41*
49–60	176 (39.2)	38.0 (6.8)	
≥ 61	117 (26.1)	37.5 (6.7)	
Work demands			
Physical	48 (10.7)	37.0 (6.6)	0.50*
Mental	25 (5.6)	38.2 (7.1)	
Physical–mental	371 (82.6)	38.2 (6.2)	
Work load			
Light	13 (2.9)	41.8 (3.6)	< 0.001*
Medium	196 (43.7)	39.7 (5.1)	
Heavy	230 (51.2)	38.0 (6.3)	
Occupational injury			
Yes	171 (38.1)	36.5 (7.1)	< 0.001†
No	267 (59.5)	39.1 (5.5)	

* One-way analysis of variance.
† Independent *t* test.
SD, standard deviation; WAI, Work Ability Index.

Table 5
Correlation coefficients between HSE Indicator Tool subscales and measures of WAI

Variable	1	2	3	4	5	6	7	8
1. WAI	–							
2. Demands	−0.27*	–						
3. Control	0.29*	−0.08	–					
4. Managerial support	0.43*	−0.17*	0.55*	–				
5. Peer support	0.26*	−0.01	0.47*	0.62*	–			
6. Relationships	0.31*	−0.42*	0.19*	0.43*	0.35*	–		
7. Role	0.32*	0.12†	0.39*	0.40*	0.45*	0.16‡	–	
8. Changes	0.31*	−0.11†	0.50*	0.69*	0.62*	0.36*	0.43*	–

* $p < 0.001$.
† $p < 0.05$.
‡ $p < 0.01$.
HSE, Health and Safety Executive; WAI, Work Ability Index.

Table 6
Significant variables affecting the WAI based on hierarchical multiple regression analysis

Characteristics	Step 1			Step 2		
	B	SE	β	*B*	SE	β
BMI (kg/m^2) ≥ 30 versus ≤ 24.9	−2.13	1.07	−0.09*	−2.0	0.98	−0.09*
Job tenure (y) ≥ 15 versus ≤ 4.9	−3.22	1.01	−0.17†	−3.07	1.01	−0.16†
Sleep quality						
Moderately bad versus good	−3.20	1.15	−0.22†	−2.44	1.07	−0.17*
Bad versus good	−9.84	1.57	−0.35‡	−7.23	1.47	−0.26‡
Occupational injuries (yes)	−1.58	0.59	−0.12†	–	–	NS
Exercise activity (no)				−1.13	0.52	−0.09*
Demands				−1.06	0.42	−0.12*
Managerial support				2.00	0.49	0.26‡
Role				1.58	0.38	0.20‡
r^2	0.29			0.42		
Adjusted r^2	0.25			0.38		

* $p < 0.05$.
† $p < 0.01$.
‡ $p < 0.001$.
BMI, body mass index; NS, not significant; SE, standard error.
B, Unstandardized regression coefficient; β, standardized regression coefficient.

changes were positively correlated to the WAI score. By contrast, the subscale of demands was negatively correlated with the WAI score (Table 5).

The results of regression modeling are presented in Table 6. The results of modeling showed that BMI, sleep quality, exercise activity, job tenure, and three subscales of work-related stress including demands, supervisor support, and role were significant predictors of WAI. With regard to the standardized regression coefficient (β), the subscales of supervisor support (β = 0.26) and role (β = 0.20) were the only positive predictors of WAI. By contrast, bad sleep quality (β = 0.26) and relatively poor sleep quality (β = 0.17) were the most important negative predictors of WAI.

4. Discussion

The results of this study showed that more than a third of workers surveyed (34.70%) did not have an appropriate level of work ability (WAI < 37). In addition, there was a significant correlation between subscales of work-related stress and the mean score of WAI. Furthermore, the variables of supervisor support, role, and status of sleep quality were the most important predictors of WAI.

The mean score of WAI (38.04) among surveyed workers in our study was similar to the mean score of WAI among Iranian workers [18] and other workers in developing countries [19,20]. According to the WAI categorical classification, mean scores of WAI of all the studied workers were at a good level (WAI ≥ 37); however, Kujala et al [21] reported that this categorical classification is appropriate only for people aged over 45 years. According to their recommendations, for workers who are in their early 30s, WAI score below 40 is considered to be inadequate [21]. According to this categorical classification and considering the mean age of the population studied, who were mainly young (31.75 ± 3.07 years), nearly 35% had poor work ability (WAI ≤ 36) and nearly 60% of participants had inadequate WAI (≤ 40). The results of the study show that there are no significant differences between the mean score of WAI among participants, with the exception of employees from cable manufacturing company. The participants from these sectors had adequate WAI scores. One important explanation is that in Iran, sectors such as hospitals, banks, oil refineries, and firefighting are funded and supported by the Iranian government. Therefore, these sectors are usually less affected by economic problems and their employees are normally provided with more advantages and benefits as well as job security. By contrast, private companies such as the cable manufacturing company in this study are nongovernmental and do not have such advantages. Within the last few years, more private companies in Iran made a large number of employees redundant due to economic problems. As a result, employees from such companies do not have job security and receive lower income, particularly compared with the governmental sectors. These problems can cause poor WAI. The results indicated that the participants from cable manufacturing company had poor WAI scores [mean (SD): 33.9 (8.4)].

The results of previous studies have shown that with increasing age, the WAI is also reduced [22,23]. Functional capacities of workers, in particular their physical capabilities, become weak and diminishes after the age of 30; if physical demands of job are not reduced, physical capabilities reach a critical level between 45 years and 50 years [24]. The results of this study showed that the WAI score of the participants aged under 29 years was higher than the other age groups, but no difference was observed among the other age groups (> 30 years of age). However, an inverse relationship was observed between job tenure and WAI, so that with increasing job tenure of the workers, the mean WAI score decreased. In fact, it can be concluded that age was not the only factor that reduced the WAI of the studied workers; thus, aging together with higher exposure to job-related factors (i.e., the increase in job tenure) can affect their WAI. The results of regression modeling showed the significant effect of job tenure on the mean WAI score of studied workers. In line with this result, Sormunen et al [25] indicated that the WAI score was inversely related to job tenure.

The results of regression modeling indicated that the two variables, namely, lack of exercise activity and BMI of 30 kg/m^2 or greater, had a negative impact on the mean score of WAI; it is in line with the findings of other studies [26,27]. Health, in accordance with the house model of WAI, is the basis and core structure of the WAI [28]. It is demonstrated that insufficient physical activity and obesity are negatively correlated with development of chronic diseases [27] and such diseases, as the dimensions of WAI, will in turn affect the total score of WAI. As a result, paying attention to these variables and implementing interventional programs to encourage workers to perform exercise activities and decrease BMI can help improve their health and work ability.

As one of the important findings of this study, we found a significant relationship between WAI and sleep quality, which was consistent with results reported by other researchers [29,30]. The mean WAI score of people with different levels of sleep quality showed the strong impact of these variables on WAI of the studied workers; accordingly, people who had a good sleep quality had a mean (SD) score of 40.9 (5.7), but for those who had a poor sleep quality, the mean (SD) WAI score was 29.7 (6.5). Sleep problems and sleep disorders are important factors affecting health, and these have been frequently mentioned in various sources. Taghavi et al [31] revealed that poor sleep quality had a very strong association with physical and mental health. In addition, the findings from the study by Lallukka et al [32] suggested that sleep disorders had an impact on subsequent sickness absence. These health problems might, in turn, have a negative impact on the WAI of workers. Sivertsen et al [33] conducted a study using a historical cohort design with a 4-year follow-up and reported that insomnia is one of the strong and independent risk factors for disability and subsequent work disability after retirement.

In this study, in line with other studies conducted on Iranian workers [18,34], the mean score of subscale of supervisor support

was not at a high level. This finding calls for more attention to this aspect and highlights the need for the implementation of preventive intervention programs and promoting the health of workers. The results of regression modeling, in line with the results of other studies [6,18], showed that the subscale of supervisor support was one of the most important variables predicting mean WAI score. The other subscale of work-related stress associated with WAI scores was role. In line with this result, Guidi et al [7] conducted a study among Italian workers and their results suggested the high impact of the subscale of role on WAI [7]. Previous studies demonstrated that poor support from supervisors and stress of the role can reduce job satisfaction, and lead to fatigue, occupational burnout, and multiple physical and mental problems [35–38].

One of the main factors affecting WAI is the high demands of job and its inconsistency with the work ability of the individual. The results of regression modeling showed that the subscale of job demand was one of the negative factors predicting mean WAI score; it is in line with the results obtained by other researchers [18]. The model proposed by Tuomi et al [2] for promoting work ability showed that the variables of job demands and environment are the most important predictors of work ability. The results of the modeling showed that these variables explained 28% of the total variance (r^2) of work ability [2].

It should be noted that although we employed workers from five different sectors, however, no significant difference was found in relation to subscales of work-related stress and the mean score of WAI among all surveyed sectors. Therefore, we suggest that this relation is not occupation specific.

This study has several limitations; the study used a cross-sectional survey design and the use of self-reported data. Moreover, given that most of the participants in the study were under 40 years of age, we should be cautious when generalizing the results to all Iranian workers. However, because the majority of Iranian workforce is young and the mean age of workers is low, the mean age observed in our study is not much different from the mean age of the workforce in Iran. Therefore, it is recommended to conduct similar studies in Iran among workers with different age ranges. Another limitation that should be included is that the external validity of the study findings applies to large urban sectors and not to those in rural areas. Future studies may need to be conducted to examine industries in this context. In this study, we used a self-reported work-related stress questionnaire developed in a developed country; because workers from different cultures have different perceptions of the importance of work-related stress, it is strongly recommended that future studies employ specifically designed questionnaires (specific to Iranian culture).

Together, considering the young mean age of the population studied, the mean WAI score of the participants was not appropriate. As a result, to prevent early retirement and improve the work ability of workers surveyed, it is necessary to implement ergonomics and occupational health programs. According to the results of this study, the interventional programs must be focused on improving supervisors support, eliminating ambiguity and conflicts in the role of workers in their job and organization, reducing job demands, improving sleep quality, and increasing exercise activity.

Conflicts of interest

All authors declare no conflicts of interest.

Acknowledgments

The authors of this study would like to express their gratitude and appreciation to the officials and personnel of the companies who participated in the study. They are also thankful to Dr Shojaei and Dr Faridan for their help in editing the article.

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