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Multiple dimensions of work-related risk factors and their relationship to work ability among industrial workers in Iran

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Objectives. The present study was designed to investigate the simultaneous effects of physical, psychosocial and other work-related risk factors on the work ability index (WAI) score among industrial workers. *Methods*. This study used a cross-sectional design with a questionnaire survey. A total of 280 workers were included in the study. Data were collected using three questionnaires including the Persian version of the WAI, the Persian version of the job content questionnaire and an author-developed measure (to assess work-related factors, health-related factors and socio-demographic characteristics). *Results*. The majority of the participants were young, but they had poor WAI scores (mean 37.3 ± 6.4) and 44.3% of them had *poor* or *moderate* work ability. Occupational accidents and injuries were found to be the strongest predictors of WAI scores. Additionally, there was a strong association between WAI scores and supervisor support, skill discretion, occupational training, sleep quality, work nature and educational level. *Conclusions*. Intervention programs should focus on improving supervisor support, sleep quality, job skills and knowledge and on decreasing physical and mental work demands. Additionally, implementing a comprehensive occupational health and ergonomics program for controlling and reducing hazardous working environments and occupational injury rates should be considered.

Keywords: work ability index; job content questionnaire; psychosocial factors; work-related risk factors; industrial workers

1. Introduction

Prevention of work-related diseases and promotion of worker health are major aims of occupational health and ergonomics experts. One of the efficient strategies to achieve these aims is identifying vulnerable workers and promoting their work ability [1]. The definition for work ability is the physical and psychological capacity of a person to perform ordinary, remunerative work and the ability to cope with work demands [2]. The concept of work ability encompasses the physical, psychosocial and social capabilities of a worker, of the organizational culture and of the work environment [2,3].

The work ability index (WAI) is one the most widely used instruments for measuring perceived work ability. This index was developed in Finland as part of a research project [2]. Previous studies have shown that poor WAI scores are a good indicator of turnover intention and they can predict early retirement and actual turnover [4,5]. The WAI is a self-assessment tool which involves answering a series of questions including the demands of the work, the worker's health and well-being and individual resources [3]. In a review of the literature, van den Berg et al. [4] reported that the WAI can be influenced by various occupational physical stressors and demographic variables such as age, education, job tenure, marital status, heavy physical work, extreme temperatures, poor working postures and bad odors in the workplace. Additionally, some researchers suggest that the WAI score is influenced by specific psychosocial stressors. Guidi et al. [6] found that the WAI score was associated with stressors of the Health and Safety Executive (HSE) indicator tool, including control, role and change. The work ability of white-collar workers in the Dutch commercial services industry was reported to be strongly associated with psychosocial factors at work such as teamwork, stress management and self-development [7]. The results of a study on workers of a Japanese information technology company indicated that the WAI score could be significantly influenced by supervisor support [8]. In addition, Mazloumi et al. [9] showed that skill discretion and social support among petrochemical industries workers were directly positively related to the WAI score, but the WAI score was inversely related to job demands, job strain and job insecurity. Nevertheless, the relationship between multiple dimensions of psychosocial work factors and work ability need to be examined in other contexts.

The WAI has a multifactorial nature and many work-related risk factors, including physical, psychosocial and

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other work-related risk factors, influence it [4,10]. Thus, for the development of effective intervention programs to maintain and improve workers' WAI, simultaneously focusing on multiple dimensions of work-related risk factors is necessary. However, our literature review showed that very few studies have addressed the simultaneous effects of work-related risk factors on the WAI score. Also, the relationship of important physical stressors and other work-related risk factors including hazardous conditions, physical exertion and physical isometric load, second jobs, overtime, occupational accidents and injuries, and conflict between work and family and social lives with the WAI score has been less investigated. Only one study was found that reported the effect of psychosocial work-related factors on the WAI score among Iranian workers [9].To the best of our knowledge, the study of the effect of physical and other work stressors on the WAI score among Iranian workers has not been investigated. In the present study we investigated the simultaneous effect of physical, psychosocial and other work-related risk factors on the WAI score among industrial workers in Yasuj City, Iran.

2. Methods

2.1. Study design and subjects

This study used a cross-sectional design with a questionnaire survey. All industrial workers in Yasuj City were invited to participate in the study. The workers were informed about the aims of this study and that their participation was voluntary. They were given and signed a written consent form before participating in the study. A total of 280 (84.8%) of the 330 workers participated in this study. The workers answered the questionnaires anonymously (to insure confidentiality and protect the privacy of the workers). The Ethics Committee of the faculty of Medicine, Trabiat Modares University and Yasuj University of Medical Sciences approved the ethical standards of the study.

2.2. Measures

Data were collected using three questionnaires. First, the Persian version of work ability index (P-WAI) was used to examine the work ability. This instrument is a self-report questionnaire with seven dimensions, including [11, p.404,Table 1]:

> current work ability compared with lifetime best (WAI-1), work ability in relation to the demands of the job (WAI-2), numbers of current disease diagnosed by a physician (WAI-3), estimated work impairment due to diseases (WAI-4), sick leave during the past 12 months (WAI-5), personal prognosis of work ability 2 years from now (WAI-6) and mental resources (WAI-7).

The total score of the WAI (7–49) is calculated by summing each dimension and is classified *poor* (scores ranging from 7 to 27), *moderate* (scores ranging from 28 to 36),

Table 1. Socio-demographic, health-related and work-related factors of the study subjects ($n = 280$).

Characteristic	*n* (%)	Mean (*SD*) WAI score	*p*
Age group (years)			
≤29	105 (37.5)	36.0 (6.6)	0.024†
30–39	151 (53.9)	38.0 (6.1)	
≥40	24 (8.6)	38.7 (6.5)	
Gender			
Male	263 (93.9)	37.0 (6.4)	0.000‡
Female	17 (6.1)	42.1 (4.7)	
Marital status			
Single	67 (23.9)	36.1 (6.4)	0.063‡
Married	213 (76.1)	37.7 (6.4)	
Educational level			
Elementary	55 (19.6)	35.7 (5.7)	0.033†
Diploma	141 (50.4)	37.3 (6.7)	
Associate	33 (11.8)	37.0 (5.7)	
BSc and above	51 (18.2)	39.4 (6.3)	
Sleep quality			
Good	82 (29.3)	40.6 (5.3)	0.000†
Neither poor nor good	134 (47.9)	36.2 (6.4)	
Poor	64 (22.9)	35.6 (6.4)	
Smoking			
Yes	33 (11.8)	34.1 (6.0)	0.002‡
No	247 (88.2)	37.8 (6.3)	
Job title			
Office	66 (23.6)	36.8 (6.5)	0.019‡
Other jobs	214 (76.4)	39.0 (5.8)	
Job tenure (years)			
<5	201 (71.8)	37.1 (6.2)	0.342†
5–10	73 (26.1)	37.8 (6.9)	
≥10	6 (2.1)	40.5 (4.4)	
Work schedule			
Day-work	163 (58.2)	38.8 (6.2)	0.000†
Two-shift	44 (15.7)	35.8 (6.3)	
Three-shift	73 (26.1)	35.0 (6.0)	
Second job			
Yes	18 (6.4)	34.9 (5.3)	0.092‡
No	262 (93.6)	37.5 (6.4)	
Overtime			
Yes	249 (88.9)	37.3 (6.4)	0.804‡
No	31 (11.1)	37.6 (6.4)	
Work hours (h/week)			
≤44	17 (6.1)	39.3 (6.3)	0.022†
45–55	70 (25.0)	39.2 (5.7)	
56–65	67 (23.9)	36.0 (6.6)	
66–75	84 (30.0)	36.9 (6.3)	
≥76	42 (15.0)	36.4 (6.7)	
Work nature			
Physical	58 (20.7)	36.8 (6.0)	0.103†
Mental	41 (14.6)	35.7 (6.5)	
Physical–mental	181 (64.6)	37.9 (6.4)	
Work load			
Light	8 (2.9)	37.7 (7.7)	0.962†
Medium	112 (40.0)	37.4 (6.1)	
Heavy	160 (57.1)	37.3 (6.6)	
Conflict between work and social life			
Low and very low	143 (51.1)	35.5 (6.3)	0.000†

(*Continued*).

Table 1. Continued.

Characteristic	*n* (%)	Mean (*SD*) WAI score	*p*
Somewhat	85 (30.4)	38.8 (6.2)	
Much and very much	52 (18.6)	39.9 (5.4)	
Conflict between work and family life			
Low and very low	133 (47.5)	36.0 (6.1)	0.002†
Somewhat	94 (33.6)	38.2 (6.6)	
Much and very much	53 (18.9)	39.2 (6.2)	
Occupational accidents and injuries			
Yes	84 (30.0)	34.8 (6.6)	0.000‡
No	196 (70.0)	38.4 (6.0)	
Occupational training			
Yes	153 (54.6)	38.2 (6.3)	0.012‡
No	127 (45.4)	36.3 (6.3)	

†One-way analysis of variance.
‡Independent *t* test.
Note: WAI = work ability index.

good (scores ranging from 37 to 43) and *excellent* (scores ranging from 44 to 49). The psychometric properties of the P-WAI were reported by Abdolalizadeh et al. in 2012 [11].

Second, the psychosocial and physical work-related demands were measured using eight dimensions (32 items) selected from the Persian version of job content questionnaire (P-JCQ) which was originally developed by Karasek et al. [12]. Psychometric properties of the scale have been reported by Choobineh et al. [13]. The dimensions were physical exertion (three items), hazardous conditions (five items), physical isometric loads (two items), skill discretion (six items), coworker support (four items), supervisor support (four items), decision authority (three items) and psychological job demand (five items). Each item is scored using a 4-point Likert scale (1 = *strongly disagree* or *often* to 4 = *strongly agree* or *never*). All dimensions were calculated according to the JCQ user guide [12].

The third questionnaire was an author-developed measure including work-related factors (i.e., job title, work hours per week, job tenure, work nature, overtime, work load, work schedule, second job, conflict between work and family and social lives, occupational training and occupational accidents and injuries), health-related factors (i.e., smoking and sleep quality) and socio-demographic characteristics (i.e., age, gender, marital status and educational level).

2.3. *Statistical analysis*

All analyses were performed using SPSS version 21. Descriptive statistics were used to represent the characteristics of the participants. The effects of socio-demographic, health and work-related variables on the WAI score were investigated using independent *t* tests and univariate analyses of variance (ANOVAs). Pearson's correlation coefficient was used to examine the correlations between P-JCQ dimensions and the WAI score. A significance level was set at $p < 0.05$. Finally, we used a hierarchical multiple regression analysis to predict the WAI score from the P-JCQ dimensions and work-related factors. Variables with $p < 0.05$ were retained in the final model. For regression modeling, control variables (socio-demographic and health-related factors) were entered in step 1, and then P-JCQ dimensions and work-related factors were entered in step 2.

3. Results

Of those 280 workers investigated, 93.9% were male, 76.1% were married and 91.4% were under 40 years old (the mean [*SD*] age of workers was 31.39 [6.0] years). The job tenure for most of them (71.8%) was <5 years and 93.9% of them worked more than 44 h/week (legal working hours in Iran). Only 30% of the participants had college education. In addition, the rate of self-reported occupational accidents and injuries was 30.0%. Participants' socio-demographic, health-related and work-related factors and their associations with the WAI score are presented in Table 1.

The mean (*SD*) score of the WAI was 37.3 (6.4). According to the categorical classification of the WAI score, 6.8, 37.5, 37.9 and 17.9% of participants had *poor, moderate, good* and *excellent* work ability, respectively. Overall, 44.3% of the workers reported inadequate work ability (WAI < 37).

The results of univariate analyses showed that the mean score of WAI significantly differed with age ($F = 3.8$), gender ($t = -4.2$), educational levels ($F = 2.9$), sleep quality ($F = 17.0$), smoking ($t = -3.2$), job title ($t = -2.4$), work hours per week ($F = 2.9$), work schedule ($F = 11.3$), conflict between work and family ($F = 6.4$) and social lives ($F = 13.2$), occupational training ($t = 2.5$) and occupational accidents and injuries ($t = -4.5$) (Table 1).

The correlation between scores of the P-JCQ dimensions and the WAI score is reported in Table 2. We found that coworker support, supervisor support and skill discretion were positively correlated to the WAI score. In contrast, the hazardous conditions dimension was negatively correlated to the WAI score. Of the P-JCQ dimensions, supervisor support showed the highest correlation with the WAI score.

The results of hierarchical multiple regression analysis to predict the WAI from the P-JCQ dimensions and work-related factors are presented in Table 3. The final model (second step) showed that sleep quality, educational level, work nature, occupational accidents and injuries, occupational training, skill discretion and supervisor support were significant predictors of the WAI. Occupational accidents and injuries were found to be the strongest predictors of the WAI score ($\beta = -0.26, p < 0.001$). The results of this modeling indicated that the explained variance (adjusted R^2) for the WAI score was nearly 35%.

Table 2. Means, *SD*s and correlation between the P-JCQ dimensions and the WAI score among the study subjects ($n = 280$).

Variable	*M*	*SD*	1	2	3	4	5	6	7	8	9
1. WAI	37.3	6.4	1								
2. Skill discretion	34.5	5.1	0.24***	1							
3. Coworkers' support	12.2	2.0	0.19**	0.27***	1						
4. Supervisor support	11.5	2.7	0.37***	0.39***	0.44***	1					
5. Hazardous conditions	10.0	3.7	−0.22***	0.01	0.14*	−0.24***	1				
6. Physical exertion	8.7	2.2	0.06	0.1	0.25**	0.05	0.39**	1			
7. Physical isometric load	5.7	1.7	−0.04	−0.02	0.16**	0.01	0.33***	0.58***	1		
8. Psychological job demand	34.1	5.1	−0.01	0.06	0.06	−0.10	0.19**	0.38***	0.24***	1	
9. Decision authority	31.4	6.1	−0.03	0.30***	0.15*	0.13*	0.06	−0.03	0.05	0.03	1

*$p < 0.05$; ** $p < 0.01$; *** $p < 0.001$.
Note: P-JCQ = Persian version of job content questionnaire; WAI = work ability index.

Table 3. Summary of the hierarchical multiple regression analysis for variables predicting the WAI score ($n = 280$).

	Step 1			Step 2		
Predictor	*B*	*SE*	*β*	*B*	*SE*	*β*
Age (years)						
≤29 versus ≥40	−3.14	1.42	−0.24*	–	–	*ns*
Educational level						
Elementary versus BSc and above	−2.71	1.25	−0.17*	−3.04	1.18	−0.19*
Sleep quality						
Neither poor nor good versus good	−3.86	0.84	−0.30**	−2.23	0.80	−0.175**
Poor versus good	−4.37	1.01	−0.29**	−2.45	1.01	−0.161*
Smoking (yes)	−2.66	1.13	−0.14*	–	–	*ns*
Work nature						
Mental versus physical–mental				−3.19	0.98	−0.18**
Occupational accidents and injuries (yes)				−3.65	0.77	−0.26***
Occupational training (no)				−1.74	0.72	−0.14*
Skill discretion				0.24	0.07	0.19**
Supervisor support				0.43	0.15	0.19**
R^2	0.188			0.430		
Adjusted R^2	0.158			0.348		

*$p < 0.05$; ** $p < 0.01$; *** $p < 0.001$.
Note: WAI = work ability index.

4. Discussion

In the current study, with regards to the multifactorial nature of the WAI, we assessed the effect of multiple dimensions of work-related risk factors on the WAI score. Although the majority of workers were young, they had poor WAI scores (with mean of 37.3 ± 6.4) and nearly half of them had *poor* or *moderate* work ability. According to the data reported by the Finnish Institute of Occupational Health (FIOH) [14,15], this mean of the WAI score indicates that the workers could be headed for early retirement. These results warrant enforcing immediate ergonomics and occupational health preventive measures among these workers.

There was a strong association between psychosocial work-related factors, including supervisor support, skill discretion and occupational training, with WAI scores. Additionally, occupational accidents and injuries were the best predictors of WAI score among measured independent variables.

It is biologically plausible that the prevalence of poor work ability increases with age [16]. In a review of the literature, van den Berg et al. [4] found that older age was associated with decreased work ability. Our literature search showed that the findings of most studies conducted in developed countries were consistent with this result. However, our findings demonstrated that the prevalence of poor work ability decreased with increasing age, with the participants aged ≤29 years having lower WAI mean scores as compared with the participants aged 40 years and older. It is noteworthy that the results of two studies by Fischer et al. [17] and Chiu et al. [18], conducted in developing countries, are consistent with our results. This difference can be due to differences in the working-age population between developed countries and developing countries. Also, the WAI score differences between age subgroups seen in our study may be due to the healthy worker effect (HWE) phenomenon [17]. Nevertheless, our regression analysis indicated that the association between

WAI score and age did not remain statistically significant after work-related risk factors were entered into the final model (second step).

Adverse health effects of sleep problems are well documented. Previous studies demonstrated that these problems are associated with cardiovascular diseases [19] and depression and anxiety [20]. Taghavi et al. [21] have reported that poor sleep quality was strongly associated with all domains of health-related quality of life (HRQOL), including physical health, psychological health, social relationships and the environment. Because health status is an important aspect of the WAI [2], it is obvious that sleep problems can cause a poor WAI [22]. The mean (*SD*) scores of WAI for the workers with good sleep quality and poor sleep quality were 40.6 (5.3) and 35.6 (6.4), respectively. The results of regression modeling showed that sleep quality was a significant predictor of WAI score. This is consistent with results from Mazloumi et al. [9] and Fischer et al. [17]. In a recent study, Lian et al. [22] found that insomnia and short sleep duration had a synergistic interaction with poor work ability. They found that these variables increased the risk of poor work ability by 300%.

Hierarchical multiple linear regression analysis indicated that occupational accidents and injuries were the strongest predictors of WAI scores among the studied variables. It has been demonstrated that occupational accident and work-related injuries lead to various health problems, such as psychiatric sequelae, acute stress disorder, sleep problems, long-term sickness absence, occupational turnover intention and decreased job satisfaction [23–25]. Additionally, it is obvious that this factor is closely related with dimensions of the WAI, especially numbers of current diseases diagnosed by a physician. Previous studies demonstrated that poor work environment, poor psychosocial work-related factors, high work demands, poor sleep quality, overtime, long work hours and work–family interference were potential risk factors for occupational injuries [26–30]. The results of present study showed that the workers were exposed to these risk factors and they reported high rates of self-reported occupational injuries. In this regard, 30.0% workers reported that they had work-related injury and 44.3% of them had inadequate work ability.

The regression modeling also showed that supervisor support was positively correlated with WAI scores, as shown by other researchers [4,8,9]. Sugimura and Thériault [8] reported that supervisor support was significantly associated with WAI dimensions including WAI-1, WAI-2, WAI-6 and WAI-7. In addition, poor supervisor support has been reported to be related with various aspects of work-related physical and psychological health status [21].

The other psychosocial factors associated with WAI scores were skill discretion and occupational training. This result was in agreement with findings reported by Mazloumi et al. [9]. Developing knowledge can lead to increased confidence and motivation to participate at work and can decrease work stress [15]. Ilmarinen and Rantanen [3] argued that developing skills and knowledge, in accordance with the requirements of work, can promote work ability. In addition, Tuomi et al.'s [15] model, designed to promote work ability, indicated that professional competence explained 15% of the total variance (R^2) of work ability.

The current research had some potential limitations that need to be taken into account. First, similar to other cross-sectional studies, it was not possible to draw causal relationships between the work-related risk factors and the WAI score. Second, to collect data we used self-report measures which could be subject to incorrect or distorted responses. In addition, we did not have access to records of injuries occurring in the workplaces. Hence, we collected such data through self-reported answers to questions. Third, because most of the participants were male and most of them were young, our results might not be generalized to all Iranian workers, although the demographic characteristics of the participants were not different from most of the workforce in Iran. Fourth, we studied industrial workers in one Iranian city. Generalization of the present study findings to all Iranian workers therefore has to be performed with caution.

5. Conclusion

The results indicate that the mean age of participants was low, but their mean WAI scores were not satisfactory and nearly half of them had *poor* or *moderate* work ability. Action plans should focus on promoting and improving supervisor support, sleep quality, job development skills and knowledge, and on reducing occupational injuries, physical and mental work demands. Finally, implementing a comprehensive occupational health and ergonomics program for controlling and reducing hazardous working environments should be considered.

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References

[1] Ilmarinen J, Tuomi K, Klockars M. Changes in work ability of active employees over an 11-year period. Scand J Work Environ Health. 1997;23(1):49–57.

[2] Ilmarinen J. Work ability – a comprehensive concept for occupational health research and prevention. Scand J

Work Environ Health. 2009;35(1):1–5. doi:10.5271/sjweh.1304
[3] Ilmarinen J, Rantanen J. Promotion of work ability during ageing. Am J Ind Med. 1999;36(Suppl 1):21–23.
[4] van den Berg TIJ, Elders LAM, de Zwart BCH, et al. The effects of work-related and individual factors on the Work Ability Index: a systematic review. Occup Environ Med. 2008;66(4):211–220. doi:10.1136/oem.2008.039883
[5] Salonen P, Arola H, Nygard CH, et al. Factors associated with premature departure from working life among ageing food industry employees. Occup Med (Lond). 2003;53(1):65–68. doi:10.1093/occmed/kqg012
[6] Guidi S, Bagnara S, Fichera GP. The HSE indicator tool, psychological distress and work ability. Occup Med (Lond). 2012;62(3):203–209. doi:10.1093/occmed/kqs021
[7] van den Berg TIJ, Alavinia SM, Bredt FJ, et al. The influence of psychosocial factors at work and life style on health and work ability among professional workers. Int Arch Occup Environ Health. 2008;81(8):1029–1036. doi:10.1007/s00420-007-0296-7
[8] Sugimura H, Thériault G. Impact of supervisor support on work ability in an IT company. Occup Med (Lond). 2010;60(6):451–457. doi:10.1093/occmed/kqq053
[9] Mazloumi A, Rostamabadi A, Saraji GN, et al. Work Ability Index (WAI) and its association with psychosocial factors in one of the petrochemical industries in Iran. J Occup Health. 2012;54(2):112–118. doi:10.1539/joh.11-0150-OA
[10] Bethge M, Radoschewski F. Physical and psychosocial work stressors, health-related control beliefs and work ability: cross-sectional findings from the German Sociomedical Panel of Employees. Int Arch Occup Environ Health. 2010;83(3):241–250. doi:10.1007/s00420-009-0442-5
[11] Abdolalizadeh M, Arastoo AA, Ghsemzadeh R, et al. The psychometric properties of an iranian translation of the work ability index (WAI) questionnaire. J Occup Rehabil. 2012;22(3):401–408. doi:10.1007/s10926-012-9355-3
[12] Karasek R, Brisson C, Kawakami N, et al. The Job Content Questionnaire (JCQ): an instrument for internationally comparative assessments of psychosocial job characteristics. J Occup Health Psychol. 1998;3(4):322–355. doi:10.1037/1076-8998.3.4.322
[13] Choobineh A, Ghaem H, Ahmedinejad P. Validity and reliability of the Persian (Farsi) version of the Job Content Questionnaire: a study among hospital nurses. EMHJ. 2011;17(4):335–341.
[14] Tuomi K, Ilmarinen J, Seitsamo J, et al. Summary of the Finnish research project (1981–1992) to promote the health and work ability of aging workers. Scand J Work Environ Health. 1997;23 Suppl 1:66–71.
[15] Tuomi K, Huuhtanen P, Nykyri E, et al. Promotion of work ability, the quality of work and retirement. Occup Med (Lond). 2001;51(5):318–324. doi:10.1093/occmed/51.5.318
[16] Ilmarinen JE. Aging workers. Occup Environ Med. 2001;58(8):546–552. doi:10.1136/oem.58.8.546
[17] Fischer FM, Borges FN, Rotenberg L, Latorre Mdo R, Soares NS, Rosa PL, et al. Work ability of health care shift workers: What matters? Chronobiol Int 2006;23(6):1165–1179.
[18] Chiu MC, Wang MJ, Lu CW, et al. Evaluating work ability and quality of life for clinical nurses in Taiwan. Nurs Outlook. 2007;55(6):318–326. doi:10.1016/j.outlook.2007.07.002
[19] Bonsen T, Wijnstok NJ, Hoekstra T, et al. Sleep quality and duration are related to microvascular function: the Amsterdam Growth and Health Longitudinal Study. J Sleep Res. 2015;24(2):140–147. doi:10.1111/jsr.12256
[20] Batterham PJ, Glozier N, Christensen H. Sleep disturbance, personality and the onset of depression and anxiety: prospective cohort study. Aust N Z J Psychiatry. 2012;46(11):1089–1098. doi:10.1177/0004867412457997
[21] Taghavi SM, Mokarami H, Nazifi M, et al. The influence of socio-demographic, health and work-related factors on health-related quality of life among Iranian industrial workers. Health. 2014;6(16):2250–2260. doi:10.4236/health.2014.616261
[22] Lian Y, Xiao J, Liu Y, et al. Associations between insomnia, sleep duration and poor work ability. J Psychosom Res. 2015;78(1):45–51. doi:10.1016/j.jpsychores.2014.09.009
[23] Anderson NJ, Bonauto DK, Adams D. Psychiatric diagnoses after hospitalization with work-related burn injuries in Washington State. J Burn Care Res. 2011;32(3):369–378. doi:10.1097/BCR.0b013e318217f83a
[24] Ghisi M, Novara C, Buodo G, et al. Psychological distress and post-traumatic symptoms following occupational accidents. Behav Sci (Basel). 2013;3(4):587–600. doi:10.3390/bs3040587
[25] Young CA, Corsun DL. Burned! the impact of work aspects, injury, and job satisfaction on unionized cooks' intentions to leave the cooking occupation. J Tourism Res Hospitality. 2009;34(1):78–102.
[26] Uehli K, Miedinger D, Bingisser R, et al. Sleep quality and the risk of work injury: a Swiss case–control study. J Sleep Res. 2014;23(5):545–553. doi:10.1111/jsr.12146
[27] Swaen GMH, van Amelsvoort LPGM, Bultmann U, et al. Psychosocial work characteristics as risk factors for being injured in an occupational accident. J Occup Environ Med. 2004;46(6):521–527. doi:10.1097/01.jom.0000128150.94272.12
[28] Dembe AE, Erickson JB, Delbos RG, et al. The impact of overtime and long work hours on occupational injuries and illnesses: new evidence from the United States. Occup Environ Med. 2005;62(9):588–597. doi:10.1136/oem.2004.016667
[29] Smith TD, DeJoy DM. Occupational injury in America: an analysis of risk factors using data from the General Social Survey (GSS). J Safety Res. 2012;43(1):67–74. doi:10.1016/j.jsr.2011.12.002
[30] Ghosh AK, Bhattacherjee A, Chau N. Relationships of working conditions and individual characteristics to occupational injuries: a case-control study in coal miners. J Occup Health. 2004;46(6):470–480. doi:10.1539/joh.46.470