Original Article

Effects of work-related stress on work ability index among refinery workers

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ABSTRACT

Introduction: Work-related stress is one of the basic problems in industrial also top 10 work-related health problems and it is increasingly implicated in the development a number of problems such as cardiovascular disease, musculoskeletal diseases, early retirement to employees. On the other hand, early retirement to employees from the workplace has increased on the problems of today's industries. Hereof, improving work ability is one of the most effective ways to enhance the ability and preventing disability and early retirement. The aim of This study is determine the relationship between job stress score and work ability index (WAI) at the refinery workers. **Materials and Methods:** This is a cross-sectional study in which 171 workers from a refinery in isfahan in 2012 who were working in different occupational groups participated. Based on appropriate assignment sampling, 33 office workers, 69 operational workers, and 69 maintenance workers, respectively, were invited to participate in this study. Two questionnaires including work related-stress and WAI were filled in. Finally, the information was analyzed using the SPSS-20 and statistic tests namely, analysis of covariance Kruskal-Wallis test. Pearson correlation coefficient, ANOVA and *t*-test. **Results:** Data analysis revealed that 86% and 14% of participants had moderate and severe stress respectively. Average score of stress and standard deviation was 158.7 ± 17.3 that was in extreme stress range. Average score and standard deviation of WAI questionnaire were 37.18 and 3.86 respectively. That placed in a good range. Pearson correlation coefficient showed that WAI score had significant reversed relationship with a score of stress. **Conclusion:** According to the results, mean stress score among refinery worker was high and one fator that affect work abiity was high stress, hence training on communication skills and safe working environment in order to decreses stress, enhance the work ability of workers.

Key words: Refinery workers, stress, work ability

INTRODUCTION

Work is one domain from which most adults derive satisfaction in life; equally it is the common source of a stressful experience.[1] Hence, one of the basic problems in recent decades along with industrialized societies that threaten human health is stress phenomenon and With increases in workloads of the past decades this phenomenon has increased.[2,3] When individual exposed with work demands and pressures that are not matched to their knowledge and abilities, may experience work-related stress and this circumstances made worse when employees feel that they have little control over work or how they can cope with its demands and pressures.[4] The National Institute of

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Occupational Safety and Health defines work related stress or job stress as the harmful physical and emotional responses that occur when the requirements of the job do not match the capabilities, resources, or needs of the worker.[5] Job stress is one of the top 10 work-related health problems and it is increasingly implicated in the development of mental ill-health, heart disease, and musculoskeletal disorders, as well as an increasing number of other condition, and early ill-health retirement.[6] Recent studies suggest that 50-60% of all lost working days are related to occupational stress.[7] Another aspect that is interest for study is the relationship between stress and performance. Although there is generally negative image in the minds of the people about stress, but for optimal activity, human needs moderate level of stress, because without stress people haven`t tried to do things. However, more stress impairs performance and productivity of employees in the organization.[8,9]

Workers employed in refinery industry depend on their workplaces are exposed to health risks, these including; various chemical hazards, fire, explosives, electricity, work outdoors and in unfavorable microclimates is affected by atmospheric influences throughout the year, high noise levels. Long-term stay in an isolated area also contributes to the work stress level, working in a sitting position and in closed spaces conflicts between workers and their working environment which this circumstance cause stress.[10-12]

One of the problems in current industrialized world is early retirement workers from the workplace. Despite increased life expectancy and better health in communities, in recent decades in many European countries period that people are worked has fallen.[13] Improving work ability is one of the most effective ways to enhance the ability and preventing disability and early retirement.[14,15] Work ability is defned as the ability of a worker to perform their job, taking into account work demand, and physical, and mental conditions.[16] The work ability index (WAI) is a well-accepted instrument to conceptualize work ability. Several studies have shown that a low score on the index is highly predictive of work disability during follow-up.[17] is built on the balance between personal resources and work demand' as represented in Figure 1.[18,19] WAI is a dynamic process that alters greatly for many reasons throughout an individual's work life.[9,20]

Health and work ability are an important factor for safety job in the refinery workers. According to Occupational and Workplace Health Issues, the aim of this study was to determine the relationship between work-related stress and WAI in refinery workers.

MATERIALS AND METHODS

This cross-sectional study was carried out in an Iranian refinery company in Isfahan, between June and September 2012. The participation in the study was voluntary. Approval was obtained from the company's ethics committee. Required sample size from two variables (WAI and job stress) and significance level

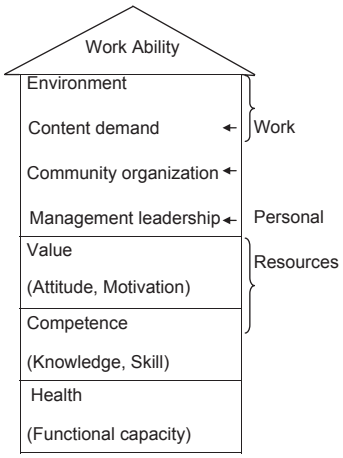

Figure 1: The work ability model

of 5% and error rate of 1, finally, the sample size with more sample for the study was considered. Standard deviation score of WAI in the study by Bresić[21] was 2.9 and required sample size 34 participant obtained. Standard deviation score of job stress in the study by Jahanbakhsh Ganjeh *et al*. was 6.52 and required sample size was 171 participant.[22] At the time of study in Refinery Company in Esfahan employed 200 office workers, 400 operational workers, and 400 maintenance workers. Based on appropriate assignment sampling, 33 office workers, 69 operational workers and 69 maintenance workers, respectively, were invited to participate in this study. The age median and standard deviation in years for office workers was (34.75, 8.67), for operational workers (35.75, 12.52) and for maintenance workers (35.47, 8.67). Participant who had job experience less than 1 year in the current refinery were excluded from this study and Entrance criteria included individuals tending to complete two questionnaires.

Questionnaire

Workers were invited to complete the occupational stress questionnaire and WAI questionnaire. First, evaluation of occupational stress was carried out by questionnaire. the questionnaire's reliability was confirmed using the test-retest exam (Test-Retest) (r = 0.82).[23] This questionnaire has 57 questions in 3 sections about interpersonal relationships, physical demands of work and job interest Number from 1 to 26 in the questionnaire was related to interpersonal relationship, from 27 to 48 related to physical demands and from 49 to 57 related to job interest that is completed in five-scale responding alternative, "never", "rarely" "sometimes", "often", "most times".[24] Furthermore, the demographic information of the employees such as age, occupation, workplace, duration of employment etc., was completed by all samples.

Work ability

Perceived work ability was measured by a questionnaire based index form the following seven items:[25] (i) Current work ability compared with a lifetime best (0-10 point); (ii) work ability in relation to both physical and mental demand

of work (2-10 point); (iii) number of current diseases (1-7 point); (iv) estimated work impairment due to diseases (1-6 point); (v) sick leave during the past year (12 months) (1-5 point); (iv) own prognosis of work ability 2 years from now (1, 4 or 7 point); (vii) mental resources (enjoying daily task, activity and life spirit, optimistic about the future) (1-4 point).

The cumulative index of WAI ranges from 7 to 49 points. It is divided into the categories: Poor (7-27 points), moderate (28-36 points), good (37-43 points), and excellent work ability (44-49 points). Subjects at or below 36 points were classified as having low work ability. Subjects at or above 37 points were classified as having satisfying work ability.[21]

Finally, the information was analyzed using SPSS-20 and statistic tests namely; analysis of covariance (ANCOVA) was performed to detect differences in WAI between groups. And mean WAI score with educational level. Age was used as the covariate. Differences in age between workplace groups were performed with Kruskal-Wallis test. Pearson correlation coefficient, ANOVA and *t*-test relationship was performed for relationships between work stress and variables mean age and tenure job. Pearson correlation coefficient was used for relation between years of work experience, age, and work-related stress with WAI scores. A $P < 0.05$ was considered to be statistically significant.

RESULTS

Response was obtained from 171 subjects. The workers were between 23 and 60 years old and their mean age was 35.5 ± 10.3 years. Differences in age between workplace groups were not significant (Kruskal-Wallis Chi-square = 3.21, $df = 2$, $P > 0.05$) - office workers were the youngest, and operational workers were the oldest. 69.7% office worker who responded were men, and 33.3% office workers were women, but all subjects in the field of operational and maintenance were men. The average period during which participants had been working at their current workplace was 11.8 years with rages of 1-38 years. 17.5% of workers were single and 82.5 were married. Of the total 171 workers included in the analysis, 104 (60.9%) were highly educated (college degree), while the remaining 67 (39.1%) had only school education.

Pearson correlation test, ANOVA and *t*-test did not show a significant relationship between work stress and variables mean age and tenure job ($P > 0.05$). Furthermore, ANCOVA revealed that after adjusting for age worker with higher educational degrees had statistically significantly lower mean job stress scores than those with lower degrees ($F = 2.60$, $P = 0.038$, $df = 4$, mean square = 757.951).

Based on the questionnaires, 86% of the workers were at a level of high stress, 14% at a level of moderate stress. The highest mean job stress scores was recorded among maintenance workers, followed by operational workers, while the lowest mean job stress scores was recorded among office workers.

Table 1 demonstrates all investigated stressors and their perceptions for workers at different workplace group. The stressors were grouped into three groups (interpersonal relationships, physical demands of work and job interest) based on the factor analysis. Median is shown for each stressor. In maintenance workers main stressor were physical demands of work and job interest and in operational workers interpersonal relationships was main stressor. Therefore, to quantify of three section of questionnaire mean stress score was 158.7, which placing in severe stress range.

Table 1 shows means WAI at three workplaces. The average WAI score for all workers showed satisfying work ability. The lowest work ability was recorded among the office workers, followed by operational workers while the highest work ability was recorded among the maintenance workers. ANCOVA showed that there was a significant after adjusting for the age difference in the WAI scores between the workplace groups ($F = 4.11$, $P < 0.05$, $df = 2$). Results of Pearson correlation test revealed that years of work experience and age have no significantly associations with WAI scores ($P > 0.05$).

Spearman coefficient correlation revealed inverse significant relationship between WAI scores and total score stress and components in the questionnaire except job interest that had a direct relationship [Table 2].

DISCUSSION

Results of current research in refinery workers indicate that a large number of employees' had severe stress (86%) and 14% workers had moderate stress that were consistent with the findings of previous studies about job stress and unsafe acts in vehicle manufacturing[23] and in the study by Jahanbakhsh Ganjeh *et al*. that was done among petrochemical worker

Table 1: Mean (±SD) component of stress score and WAI in occupational groups

	Mean	SD
Stress		
Unit office		
Interpersonal relationships	71.18	9.18
Physical demands of work	56.45	7.68
Job interest	28.15	4.15
Unit operation		
Interpersonal relationships	72.8	7.61
Physical demands of work	58.92	13.18
Job interest	26.55	4.75
C. Unit maintenance		
Interpersonal relationships	71.5	9.07
Physical demands of work	61.08	9.92
Job interest	28.43	4.41
Work ability index		
Unit office	36.39	4.53
Unit operation	37.18	3.71
Unit maintenance	37.56	3.66

WAI = Work ability index, SD = Standard deviation

Table 2: Relationship between mean component of stress and WAI score

Component of stress	WAI score	
	r	*P* value
Interpersonal relationships	−0.157	0.04
Physical demands of work	−0.198	0.009
Job interest	0.213	0.005
Stress score	−0.156	0.04

WAI = Work ability index

about the Relationship of Employees' Job Control with Job Stress result showed mean stress score was 38.82 that compare to result of this study was low.[22]

In maintenance workers due to nature of their work that Physical conditions of the workplace are consist of stressors such as harmful physical agents (noise, lighting), harmful chemical agents (fumes from the welding process, ventilation condition of saloons) and ergonomic risks (lifting and handling equipment, bad posture during working) maximum stress score of physical agent and job interest belong to this workers. In operational workers, the main stressor was interpersonal relationships. Finding revealed that worker with higher education level had lower stress, the reason can be appropriate with the organizational position and the education level and Pearson's skills and abilities. in this regard, Ross Randall (2005) noted that: Employees that their jobs are on the lowest level of the organizational hierarchy due to less participation in decision-making are more subject to stress.[26] Result of the current study shown no significant relationship between stress and age, that was consistent with study of Lambert, Boyas and Wind found no significant relationship between age and job stress.[27,28]

Result indicated that WAI score was significantly influenced by education level in workers, that is similar to research on nurses by Golubic *et al*. that suggest nurses with higher educational levels have better work ability than their colleagues with lower educational levels.[29] This study found no relationship between age and WAI which corresponds to Robert and Goedhard studies who stated the average change in WAI score with age is relatively small. Usually, age is accounting for less than 10% decline in work ability over the working life period. Possibly, the WAI score is affected more by factors that are based on work environment or work conditions as well as on individual health characteristics of the worker.[30] The average WAI score among workers above 36 points indicated satisfying work ability. In this study, the mean score of the WAI was37.18 ± 3.86 that placing in the good category. That consist with study in an oil company in Croactia,[21] among fire fighter in Belgium,[31] and in constructer worker in Netherland[32] among nurses in Zagreb university hospital,[29] it was almost the same value. Although, the mean WAI score was at a good level 42% of the workers were at the poor and moderate level as has be shown in Table 2 interpersonal relationships in workplaces had significant relationships with WAI score that is consistent with study by Van den Berg *et al*. that result showed, team work and interpersonal relationships as a psychosocial factor, had a significant relationship with WAI among professional workers in their workplaces, in other words increasing in team work resulted in increasing in WAI score.[33] And in the study by Bresić among office workers in the oil industry result showed Poor communication with colleagues was one of stressor in workplace.[21] In the current study physical demand as a stressor in the workplace had a negative but significant relationship with WAI score among refinery workers, it is documented that worker with high physical demand and high hand working such as construction workers are vulnerable for early retirement and disability.[34]

In our study, negative correlations were found for work-related stress and mean WAI score. Relationship is similar to some previous study, for instance, In a study by Kumasiro.[35] a negative relationship was observed between WAI score categories and the levels of stress. Stress perception was about 35% higher in workers with low-moderate WAI scores than in the good-excellent group of workers. In the study by Adel Mazlomi *et al*. that was conducted among petrochemical industry result indicated job stress were most negatively associated with the WAI, in the long run such strain can decrease functional capacities and work ability.[24] Vannanen *et al*. found a negative correlation between mental strain and working capacity.[36-42]

CONCLUSION

Most refinery workers in our study, regardless of whether they work in the office, operational, or maintenance, believed that they were pronouncedly exposed to stress. However, the perception of specific stressors depended on the workplace. The average WAI score of all subjects suggested satisfying work ability. Since the work ability is negatively associated with high levels of perceived work stress. Our results call for additional training of workers in communication skills and preventive measures to improve health and safety in the workplace.

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