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Original Article

The Impact of Job Stress and Job Satisfaction on Workforce Productivity in an Iranian Petrochemical Industry

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ABSTRACT

Background: Job stress and job satisfaction are important factors affecting workforce productivity. This study was carried out to investigate the job stress, job satisfaction, and workforce productivity levels, to examine the effects of job stress and job satisfaction on workforce productivity, and to identify factors associated with productivity decrement among employees of an Iranian petrochemical industry.
Methods: In this study, 125 randomly selected employees of an Iranian petrochemical company participated. The data were collected using the demographic questionnaire, Osipow occupational stress questionnaire to investigate the level of job stress, Job Descriptive Index to examine job satisfaction, and Hersey and Goldsmith questionnaire to investigate productivity in the study population.
Results: The levels of employees' perceived job stress and job satisfaction were moderate-high and moderate, respectively. Also, their productivity was evaluated as moderate. Although the relationship between job stress and productivity indices was not statistically significant, the positive correlation between job satisfaction and productivity indices was statistically significant. The regression modeling demonstrated that productivity was significantly associated with shift schedule, the second and the third dimensions of job stress (role insufficiency and role ambiguity), and the second dimension of job satisfaction (supervision).
Conclusion: Corrective measures are necessary to improve the shift work system. "Role insufficiency" and "role ambiguity" should be improved and supervisor support must be increased to reduce job stress and increase job satisfaction and productivity.

1. Introduction

The nature of work has changed considerably in many sectors of industry over the past decades [1]. Modern organizations consider job stress and job satisfaction of their employees as two important workplace issues [2]. According to recent studies, occupational stress accounts for 50–60% of all lost working days [3]. Work-related stress is considered to be harmful when physical and emotional responses occur when there is a mismatch between job requirements and the workers' capabilities, resources, or needs [4]. Most researchers agree that workplace factors can cause work-related stress [5]. These factors are divided into physical and psychosocial hazards. Exposure to physical hazards in the workplace can be associated with anxiety that, in turn, drives experiencing work-related stress. Psychosocial hazards include factors related to work design, organization, and management, together with workplace social structure that can have negative effects on individuals [6]. Work-related stress usually influences individual and organizational issues including behavioral, mental, as well as physical outcomes, performance, job satisfaction, and organizational commitment [7].

Applied research indicates strong correlations between dimensions of workplace, stress, and job satisfaction. High levels of work stress are associated with low levels of job satisfaction. Job

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stressors are predictive for job dissatisfaction and a greater propensity to leave the organization [8].

Job satisfaction is the affective orientation that an employee has towards his/her work. It can be considered as an overall feeling about the job or as a related constellation of attitudes about various aspects of the job [9]. There is growing evidence that current trends in employment conditions may have negative effects on job satisfaction and deteriorate the physical and mental health of employees [10]. Affective disposition on job satisfaction consists of two facets: positive affectivity and negative affectivity. High energy, eagerness, and pleasurable involvement represent positive affectivity while distress, unpleasant involvement, and nervousness show negative affectivity [11].

Work-related stress is a vital factor to job satisfaction. When functioning as a motivator, work-related stress results in creativity and satisfaction and consequently removes boredom and mundanity. Stress leads to aggression and low job satisfaction when it functions as a negative factor [2]. Job satisfaction may protect workers from stressors. Satisfaction is a regulating factor for stress. During the neoclassical period (1920–1950), theories supported the fact that employees' satisfaction directly affected productivity. They believed that there was a cause-effect relationship between satisfaction and productivity. This answered the question why organizations tried to improve their employees' productivity by different ways. These two factors (work-related stress and job satisfaction) may have a negative impact on the productivity of a working group and consequently cause an added cost to expenses of a company [2]. The analysis of the present situation at the international level has revealed, among others, the necessity of improving work quality and productivity, as well as providing safety and health in the work place [12].

The petrochemical industry is an important industry in Iran from the viewpoints of economics and employment. There are critical jobs in the petrochemical industry, such as control room operation, maintenance, site operation, firefighting, etc. In such an industry, job stress and dissatisfaction may have a negative impact on productivity and safety of employees.

Given the above, since there is little study on such issue among petrochemical employees, the present study was carried out to investigate the impact of job stress and job satisfaction on employees' productivity in an Iranian petrochemical company.

2. Materials and methods

This cross-sectional study was conducted from October 2014 to May 2015, in an Iranian petrochemical company with 325 employees, located at Asalouyeh, in the southern part of Iran in which methanol was produced as the final product. The sample size was determined with reference to a study by Naqvi et al [13]. Taking the β (power) of 80% and α (the first type error) = 5% into consideration, using Medcalc software (MedCalc Software bvba, Ostend, Belgium) the sample size was calculated to be 125. Participants were randomly selected from the personal list provided by the company.

2.1. Data gathering tools

An anonymous self-administered questionnaire was used to collect the required data for each participant. The questionnaire consisted of the following four parts:

(1) a demographic questionnaire was used for collecting personal details including age, weight, height, work experience, daily work hours, gender, marital status, level of education, type of employment and working schedule; (2) the Persian version of Osipow occupational stress inventory was used to investigate the level of job stress among the study population. Occupational stress was measured by six subscales, i.e., role overload, role insufficiency, role ambiguity, role boundary, responsibility, and physical environment. Each subscale contains 10 items. There are 60 items in total in the scale. Each item is scored on a 5-point Likert scale (1 = never, 2 = occasionally, 3 = sometimes, 4 = usually, and 5 = most of the time). A high subscale score depicts a greater level of role stressor. The obtained scores are classified as: low (10–19), low-moderate (20–29), moderate-high (30–39), and high (40–50) [14]. The total score of the job stress questionnaire is also divided into four levels, as follows: low (60–119), low-moderate (120–179), moderate-high (180–239), and high (240–300) [14]. The validity and reliability of this questionnaire were assessed in a study by Sharifian et al [15] and cronbach alpha coefficient was calculated to be 0.83; (3) the Persian version of Job Descriptive Index (JDI) was used to investigate job satisfaction. The JDI consists of 39 items in five subscales, i.e., work (10 items), pay (6 items), promotion (5 items), supervision (8 items), and coworkers (10 items). Each part measures one particular area of job satisfaction. A response was collected to each item on a 5-point Likert scale (1 = never, 2 = occasionally, 3 = often, 4 = usually, and 5 = most of the time). The scores of each subscale were added together for each respondent to obtain a JDI total score reflecting the overall job satisfaction. No cutoff point has been reported to define the upper and the lower limits of job satisfaction index in the scientific literature, therefore, we used the minimum and the maximum attainable scores of JDI (39–195) to judge about the level of job satisfaction in the study population. Regarding this, if the mean score of JDI was near the lower limit score (39), near the midpoint (117), and near the upper limit score (195), job satisfaction was considered as low, moderate, and high, respectively. The validity and reliability of this questionnaire were assessed in a study by Norbakhsh and Mirnaderi in which the cronbach alpha coefficient was 0.88 [16]; and (4) the Persian version of the Hersey and Goldsmith questionnaire was applied to investigate workers' productivity. This questionnaire consists of 26 items in seven subscales: ability (3 items), occupational identification (4 items), organization support (4 items), motivation (4 items), performance feedback (4 items), credit (4 items), and environment compatibility (3 items). Each item was scored on a 5-point Likert scale (1 = never, 2 = occasionally, 3 = often, 4 = usually, and 5 = true most of the time). Similar to JDI, no cut-off point has been indicated to define the upper and the lower limits for productivity index in the scientific literature, therefore, the minimum and the maximum attainable scores of this index (29–130) were used to judge about the level of productivity of the study population. Based on this, if the mean score of productivity score was near the lower limit score (29), near the midpoint (79.5), and near the upper limit score (130), productivity was considered as lower, moderate, and high, respectively. The validity and reliability of this questionnaire were assessed in a study by Nasirpour et al [17] in which the cronbach alpha coefficient was 0.81.

2.2. Data analysis

Upon completion of the field survey and data collection, data were transferred into the computer for statistical analysis. Statistical analyses were performed using SPSS version 19 (IBM, Armonk, NY, USA). Pearson correlation analysis was used to examine the relationship between quantitative variables such as stress, job satisfaction, and productivity scores. To assess the factors affecting productivity, linear regression analysis was applied. In all tests, the significance level was set at 0.05.

3. Results

Table 1 summarizes personal details of the employees who participated in the study. According to Table 1, mean age of the

Table 1
Demographic characteristics of the employees studied ($N = 125$)

Age (y)	Mean ± SD	30.95 ± 5.26
	Min–Max	22–48
Weight (kg)	Mean ± SD	77.16 ± 8.51
	Min–Max	60–105
Height (cm)	Mean ± SD	176 ± 6.00
	Min–Max	160–188
BMI (kg/m^2)	Mean ± SD	24.92 ± 2.59
	Min–Max	18.39–34.29
Work experience (y)	Mean ± SD	7.04 ± 3.81
	Min–Max	1–21
Working hours/day (h)	Mean ± SD	10.65 ± 1.48
	Min–Max	8–15
Sex	Male	112 (89.6)
	Female	13 (10.4)
Marital status	Single	37 (29.6)
	Married	88 (70.4)
Education	Under diploma/Diploma	33 (26.4)
	B.Sc.	54 (43.2)
	M.Sc.	38 (30.4)
Working schedule	Shift working*	69 (55.2)
	Day working	56 (44.8)

Data are presented as n (%)

* An arrangement of working hours that uses two or more teams (shifts) of workers, in order to extend the hours of operation of the work environment beyond that of conventional office hours.

study participants was 30.95 ± 5.26 years, ranging from 22 years to 48 years. The employees' mean work experience was 7.04 ± 3.81 years (1–21 years). A large majority of the participants had university education (73.6%). Some 70.4% of the study population was married and 55.2% of the participants were shift workers.

According to Table 2, the mean score of job stress was calculated to be 181.27 ± 24.17 indicating "moderate-high" level of stress. One-way ANOVA, independent *t* test and Pearson coefficient statistical procedures did not show any significant relationship between the mean job stress score and demographic characteristics of the participants. Additionally, the statistical analyses revealed no significant relationship between the mean scores of job stress and job satisfaction ($p = 0.152$) and productivity.

The mean job satisfaction score was found to be 129.96 ± 18.84 indicating "moderate" level of job satisfaction. One-way ANOVA test showed a significant U shape relationship between the mean score of job satisfaction and age ($p = 0.024$). A *post hoc* test indicated that there was a significant difference in job satisfaction means score among the three age groups, such that the mean job satisfaction score in the 31–38 years age group was lower than those of the other two groups (i.e., 22–30 years and 39–48 years). Independent *t* test also showed that the mean job satisfaction score

Table 2
Statistical analyses for assessment indices ($N = 125$)

Variable			Job stress (Mean ± SD)		Job satisfaction (Mean ± SD)		Productivity (Mean ± SD)	
			181.27 ± 24.17		129.96 ± 18.84		70.52 ± 11.89	
			Mean ± SD	*p*	Mean ± SD	*p*	Mean ± SD	*p*
Age groups (y)†		22–30	175.84 ± 22.37	0.06	133.38 ± 20.2	0.024	69.44 ± 10.96	0.37
		31–38	165.66 ± 24.34		125.59 ± 17.34		72.11 ± 13.39	
		39–48	175.75 ± 30.78		137.55 ± 15.69		67.63 ± 5.20	
Marital status*		Single	173.92 ± 24.96	0.43	123.38 ± 17.24	0.011	71.95 ± 10.55	0.38
		Married	170.16 ± 23.89		132.73 ± 18.88		69.92 ± 12.42	
Educational level†		Diploma	176.62 ± 24.93	0.319	134.88 ± 18.09	0.089	68.58 ± 12.35	0.55
		Associate diploma	168.98 ± 23.71		130.26 ± 19.28		71.02 ± 11.38	
		B.Sc.	169.68 ± 24.03		125.13 ± 17.67		71.44 ± 12.33	
Working schedule*		Shifts working	170.30 ± 26.81	0.57	129.10 ± 19.50	0.51	68.64 ± 11.27	0.024
		Day working	172.83 ± 19.37		131.33 ± 17.83		73.54 ± 11.56	
Daily working time (h)*		1–8	152.5 ± 14.84	0.31	133/00 ± 15/55	0.82	84.05 ± 12/02	0.094
		9–16	171.58 ± 24.21		129.91 ± 18.94		70.29 ± 11.80	
Stress dimensions	Role overload†	Low	–		–		71.70 ± 7.81	0.95
		Low-moderate					70.64 ± 12.89	
		Moderate-high					70.03 ± 10.40	
		High					72.03 ± 9.5	
	Role insufficiency†	Low	–		–		69.33 ± 4.72	0.06
		Low-moderate					73.92 ± 10.33	
		Moderate-high					68.07 ± 12.73	
		High					66.02 ± 0.5	
	Role ambiguity†	Low	–		–		75.93 ± 11.75	0.0001
		Low-moderate					72.83 ± 9.96	
		Moderate-high					70.98 ± 10.82	
		High					51.33 ± 20.41	
	Role boundary†	Low	–		–		68.73 ± 5.72	0.54
		Low-moderate					71.84 ± 11.05	
		Moderate-high					69.19 ± 13.71	
		High					79.51 ± 0.68	
	Responsibility†	Low	–		–		69.33 ± 4.72	0.325
		Low-moderate					72.06 ± 11.06	
		Moderate-high					68.82 ± 12.92	
		High					66.90 ± 11.1	
	Physical environment†	Low	–		–		69.00 ± 6.68	0.182
		Low-moderate					71.51 ± 9.86	
		Moderate-high					71.48 ± 10.80	
		High					64.50 ± 19.46	
Satisfaction dimensions	Work‡		–		–		0.025	
	Supervision‡		–		–		0.001	
	Coworkers‡		–		–		0.007	
	Promotion‡		–		–		0.08	
	Payment‡		–		–		0.789	

* Independent sample *t* test.
† One-way ANOVA test.
‡ Pearson correlation coefficient.

was significantly higher in married individuals than in single individuals ($p = 0.009$).

The mean score of productivity index was found to be 70.52 ± 11.89, indicating "moderate" level of productivity. A one-way ANOVA test showed a significant relationship between the mean productivity score and the third dimension of job stress (role ambiguity) ($p = 0.0001$). The mean score of productivity index showed a direct significant relationship with the first, the second, and the third dimensions of job satisfaction index (work, supervision, and coworkers) ($p < 0.05$). This indicated that higher scores of the mentioned dimensions of job satisfaction index were related to higher productivity.

Also, an independent t test indicated that the mean score of productivity index was significantly lower in shift workers than in fixed day workers ($p = 0.024$). No statistical significant relationship was found between the mean score of productivity index and other demographic characteristics.

In order to investigate the correlation between job stress and job satisfaction indices and productivity index in the study participants, Pearson correlation coefficient was used. The result of this analysis showed that although the correlation between job stress index and productivity index was not statistically significant ($p > 0.05$), the correlation between job satisfaction index and productivity index was statistically significant ($p = 0.04$). This relationship was positive and the correlation coefficient ($r = 0.37$) indicated a weak correlation between these two variables. This means that with an increase in the mean job satisfaction score, the mean productivity score would increase.

In order to investigate factors affecting productivity index, multiple linear regression analysis was used. Based on the results of one-way ANOVA and univariate analyses, it was found that work schedule (shift or fixed), working hours, the second, the third, and the sixth dimensions of job stress index (role insufficiency, role ambiguity, and physical environment) and the first, the second, the third, and the fourth dimensions of job satisfaction index (work load, supervision, coworkers, and promotion) were eligible to enter the linear regression model ($p < 0.25$) [18].

The results of regression modeling revealed that the variables of shift schedule, the second and the third dimensions of job stress (role insufficiency and role ambiguity), and the second dimension of job satisfaction (supervision) remained in the model. According to the coefficient of determination (R^2), 22.3% of the changes related to productivity index could be explained by current variables (Table 3). The final score of the job stress index is classified into four levels (low, low-moderate, moderate-high, and high). That is why a dummy variable was defined in order to correctly interpret the dimensions of stress; low job stress was regarded to be the base in the model.

4. Discussion

The results showed that the mean productivity score in shift workers was significantly lower than that of fixed day workers, which was in line with the results of other studies [19,20]. This decline may be due to factors such as health problems, impaired social life, sleep disorders, and circadian misalignment during shift work [21]. One reason could be that when people work outside of their normal sleep-wake cycle, a mismatch occurs between the body's biological clock and events taking place in the environment, and consequently affects the individual's activities [22].

The results showed a U shape significant relationship between the mean job satisfaction score and age, so that the mean job satisfaction score in the 31–38 years age group was significantly lower than those of the two other age groups (i.e., 22–30 years and 39–48 years). This finding is in agreement with the results of other studies [23,24]. One possible reason is that young people are highly motivated during the first years of employment which can lead to a high job satisfaction. This level of job satisfaction declines during the middle years of employment due to job repetitiveness and job restrictions; after this period, job satisfaction continuously increases with age [24]. This increase is justified based on Herzberg's "modified expectation" theory. On the basis of this theory, when age and job experience increase, the individual's expectations of her/his work begin to become more realistic. This may result in job satisfaction increment. In a study, a direct linear relationship was reported between age and job satisfaction which was not in agreement with Herzberg's hypothesis of the U-shaped relationship between these variables [25].

The results of the present study showed that job satisfaction in married individuals was higher than single ones, which was in agreement with the results of some other studies [26,27]. According to Bowen, single young people hesitate in decision-making on how to keep their jobs and do not know whether they have selected the jobs they are currently working in for their entire life or just for a certain period. Thus, job satisfaction in these individuals is lower than in older and married ones [27]. It is to be noted that these findings are not consistent with the results of other studies [28–30].

The results demonstrated a significant negative relationship between role insufficiency and productivity in such a way that when role insufficiency increased, productivity decreased. Meleis [31] defined role insufficiency as any kind of problem in identifying the role, playing a role, or role-related goals understood by the individual or others. This finding is similar to a study by Wu et al [32]. In this study, role insufficiency was determined as one of the factors which had a direct and significant impact on depression. Depression is a common mental health problem in the world which increases employees' absenteeism and reduces productivity [32]. It was also reported in a study that increased job stress was associated with increased role insufficiency [33]. Increased stress can lead to reduced job satisfaction and productivity of individuals [2].

The present study showed that there was a significant negative relationship between role ambiguity and productivity such that increased role ambiguity would cause reduced productivity in individuals. Role ambiguity is a state during which individuals have no clear and direct understanding about their roles in the organization [34]. It appears when the duties are not clearly defined for the individual and she/he is frightened of doing things or accepting responsibility. Role stressors mainly include role ambiguity and role conflict which can lead to increased employees absenteeism and frequent work delays, increase in employees' turnover and reduced workforce productivity [35]. In a study by Rizwan et al, a significant positive relationship was observed between role ambiguity and job stress such that role ambiguity was reported to cause 15% increase in job stress [28]. Increased job stress is accompanied with reduced performance and job satisfaction, which finally leads to lower productivity of individuals and increased costs incurred by the organization [2].

Table 3
Regression model indicating factors with influence on employees' productivity

Variable	β	Standard error	t	p	$R^{2\dagger}$
Shift working*	4.075	2.00	2.032	0.045	
Supervision	0.565	0.269	2.09	0.038	
Role insufficiency‡	−5.43	2.59	2.09	0.038	0.223
Role ambiguity§	−17.64	6.71	−2.62	0.01	

* Shift workers were considered as reference group.
† R^2 Adjusted R square.
‡ Poor fit between the participants' skills and their job.
§ Participants are unclear about what they are expected to do.

The results of the regression modeling indicated that supervision could have an effective role in increasing productivity, which was in agreement with the results of a study by Frimpong et al [36]. In this study, a strong interaction was reported between the workers' perceived supervisor support and productivity, in such a way that workers who were not supported by their supervisors had lower productivity as compared to those who were provided with adequate support [36]. Providing appropriate support in the workplace by the supervisor would cause reduced stress on the individuals and protect her/him against adverse effects of job demands, job dissatisfaction, and depression [33].

4.1. Limitations

Regarding the cross-sectional nature of the present study and data gathering based on self-report, the findings should be considered cautiously. In the self-report method, there may be problems will deception, denial, or recall. Additionally, in this study job stress and productivity were not examined using objective methods. The results of the study could be more conclusive if objective measures were included.

5. Conclusion

The findings of the present study showed that the employees' perceived job stress and job satisfaction were moderate-high and moderate, respectively. Also, their productivity was assessed as moderate. According to the study results, shift working, "role insufficiency", and "role ambiguity" were determined as the contributing factors for reduced productivity; "supervision support" was also found to be an effective factor for increased productivity. Based on the study findings, to achieve lower job stress, higher job satisfaction, and productivity in the workplace, the following supportive measures are recommended:

- Identifying and optimizing the factors influencing job stress and job satisfaction
- Providing direct staff support by management
- Employing individuals according to their expertise and abilities
- Providing exact definition and description of jobs for employees
- Selecting fit employees for shift working

Conflicts of interest

All authors have no conflicts of interest to declare.

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