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Analysis of The Causal Relationships of Shift Work, Job Stress and Job Satisfaction with The Occupational Health Level based on Fuzzy DEMATEL Method: A Cross Sectional Study

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ABSTRACT

Introduction: Damage to occupational health is one of the major challenges in the industry. Various studies have shown that productivity in industries has a significant relationship with occupational health. In addition, employee's health in the workplace can be affected by a variety of variables i.e., job stress, job satisfaction, and work in unconventional shifts. Therefore, the purpose of this study was to evaluate the causal relationships of shift work, job stress, job satisfaction with the occupational health level in a petrochemical industry.

Material and Methods: This cross-sectional study was implemented in 2017. The study sample consisted of 20 HSE experts selected using purposeful judgment sampling. A 4×4 matrix questionnaire consisting of four main parameters i.e., shift work, job stress and job satisfaction with occupational health level, was used for data acquisition. Data analysis was done using MATLAB software and Fuzzy DEMATEL method. Also, for each variable, two key values of D+R and D-R were calculated. These values show the degree of interaction and the type of interaction of the variable with other variables, respectively.

Results: Sixty percent of the experts participating in this study were male and 40.0% were female. Only 10.0% of the participants had a PhD degree. In addition, the mean age and the mean work experience of the subjects were 39.64±9.34 and 10.22±7.10 years, respectively. The parameters of shift work and job satisfaction were identified as an effective factor due to the positive values of D-R while occupational health variable with negative value of D-R, was considered as an affected factor. In addition, these results showed that the effect of these parameters on health is different with both direct and indirect mechanisms.

Conclusion: Using the Fuzzy DEMATEL method, our findings indicated that occupational health in the large industries can be influenced by different parameters with different sizes. Considering the interactions among these parameters in health analysis and the affecting factors, therefore, is very important. So, the health level in challenging industrial environment such as petrochemical industries can be affected by shift work as a root cause. This root cause, along with job satisfaction, has a significant effect on increasing stress levels and reducing health levels. Accordingly, any action to increase the health level should focus on improving shift patterns and increasing the level of job satisfaction of employees as a pivotal root and affecting causes on health level.

Keywords: *Occupational Health, Shift work, Job Stress, Job Satisfaction, Fuzzy DEMATEL*

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1. INTRODUCTION

Health is a triple physical, psychological, and social response to internal and external stimuli for maintenance, stability, and comfort. Job stress as one of the health determinants includes distressing emotional responses occuring in the event of a mismatch between the demands and requirements of a job requiring talent, resources, or staffing. Today, it has been determined that stress could either cause many physical and psychological illnesses or be involved in its evolution and development [1].

Job satisfaction is one of the emotional responses achieved by comparing actual work results with the expected ones. The consequences of job dissatisfaction are not only limited to the psychological level and individual dimensions; but also can be appeared after experiencing industrial conflicts and riots, strikes, punishment, and dismissal of workers, despotic order by the director, and other such issues i.e., Moreover, job dissatisfaction also affects economic and social development of societies [2].

In addition, work shift is considered as one of the factors affecting job stress. The results of the literature have shown that the number of stressful events and stress events in the shift workers is more than those in the day workers. Besides, the shift systems in the petrochemical industry are varied due to different reasons i.e., organizational, industrial, and economic challenges all may have their own characteristics, advantages, and disadvantages [3]. In addition, work shift can also affect job satisfaction and health in one hand, and can be linked to reduced ability to work in different timeframes as well as job dissatisfaction. Moreover, in the large and complex work environments such as petrochemicals, shift work is more prevalent; hence, its adverse effects will be considerably higher in such environments [3, 4].

Accordingly, the present study was designed and implemented with the aim of determining and analyzing multiple relationships among Job Shift, Job Stress, job satisfaction and health in the challenging and risky petrochemical industry.

2. MATERIAL AND METHODS

This study was conducted in 2017 in a large petrochemical industry. The statistical population of this study included 20 HSE experts who were selected using purposive sampling.

2.1. Research Tool

Data were collected using a 4 × 4 matrix questionnaire consisting of four main variables of work shift, job stress, job satisfaction, and health.

2.2. Data Analysis

Data were analyzed using MATLAB software (2017) and Fuzzy DEMATEL technique. DEMATEL approach is one of the multi-criteria decision-making tools based on graph theory enaling us to draw multi-criteria network relationships in the causal group through which, a better understanding of causal relationships would be achieved. The output of the DEMATEL process is providing a depicted perspective that is really helpful in identifying relationships among the criteria [5].

3. RESULTS AND DISCUSSION

In the first stage, direct relations matrix was developed by taking into account the opinions of experts. The first step, therefore, was acquisition of the average opinion of all experts based on the fuzzy score equivalent to the verbal terms. Then, based on the normal fuzzy matrix, the total relations matrix was calculated. The unlimited sequence of direct and indirect effects of the elements on each other (along with all possible feedback) was calculated as a geometric progression, based on the existing rules of graphs (Table 1). The sum of unlimited sequence from direct and indirect effects of elements on each other is in form of N (I-N)-1.

In the next step, the total defuzzy matrix was calculated (Table 2). In this step, based on the threshold value, it was determined whether the relationship between the two variables is significant or not. The threshold value was equal to the average

Table 1. Fuzzy matrix of total relationships

Variable	Shift Work	Job stress	Job satisfaction	Health
Shift Work	(0.16, 0.88, 2.64)	(0.41, 1.38, 3.08)	(0.26, 1.10, 2.79)	(0.40, 1.36, 3.08)
Job stress	(0.31, 1.10, 2.65)	(0.24, 1.16, 3.04)	(0.35, 1.19, 2.78)	(0.40, 1.37, 3.06)
Job satisfaction	(0.24, 1.02, 2.62)	0.41, 1.37, 3.04)	(0.17, 0.93, 2.73)	(0.40, 1.34, 3.03)
Health	(0.28, 1.02, 2.64)	(0.39, 1.31, 3.05)	(0.30, 1.08, 2.77)	(0.21, 1.06, 3.02)

Table 2. Total relation defuzzy matrix

Variable	Shift Work	Job stress	Job satisfaction	Health
Shift Work		1.56	1.31	1.55
Job stress	1.29		1.37	1.55
Job satisfaction	1.23	1.55		1.53
Health	1.24	1.52	1.31	

Table3. The order of influence and being under influence of the variables

Variable	D value	R value	D+R	D-R
Work shift	5.56	4.89	10.45	0.67
Job stress	5.61	6.03	11.64	-0.41
Job satisfaction	5.49	5.19	10.68	0.31
Health	5.39	5.96	11.35	-0.56

of the total number of defuzzy matrix values of the total relationship and was equal to 1.38, Thus, if the defuzzy weight of the two variables in Table 2 is less than the threshold value, the relationship between the two variables is not significant, and if it is greater than the threshold value, the relationship is significant.

The sum of each row in the diffused matrix of the total relationship (D) indicates the level of variability of the variable as a cause on the other variables, while, the sum of each column (R) indicates the level of variability of the variable from the other variables as an effect. In this way, by calculating these values, all variables are prioritized regarding the impact and effectiveness. Also, for each variable, two key values of D+R and D-R were obtained, indicating the amount of interaction and the type of interaction of the variable with other variables, respectively (Table 3).

According to our study findings, the factors i.e., work shift, job stress and job satisfaction are recognized as influencing factors on health. Moreover, interaction and the relationship between three independent and effective factors of work shift, job stress, and job satisfaction are also a very important finding achieved in this study. Additionally, the results of this study indicate that the level of impact or, in other words, the size of the relationship in each interaction is also different. Although estimating these relationships can also be done by numerical methods, this research employed

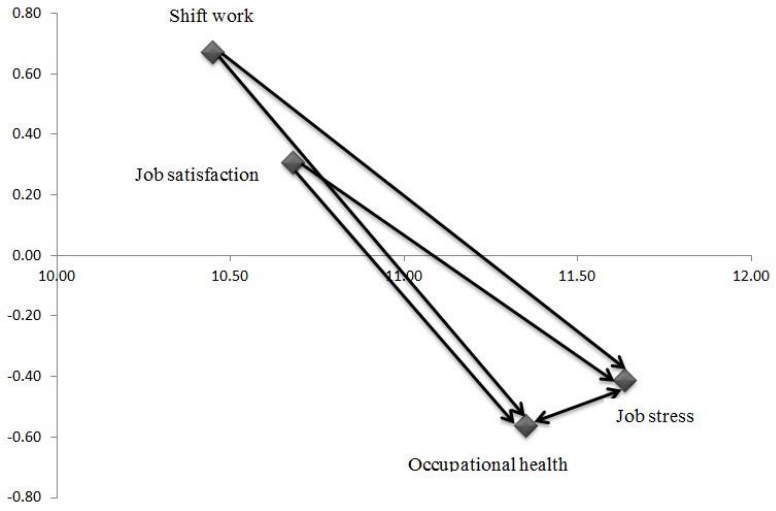

Fig. 1. Cause-and-effect relationships of variables

fuzzy DEMATEL method to express and analyze multiple relations in order to enhance the strength of the results of this study.

In line with the results of this study related to analyzing work shift and job satisfaction, the results of the other studies also show that work shift is associated with job dissatisfaction [1, 2]. For example, the study by Choobineh et al. showed a very strong relationship between work shift and health problems; the amount of gastrointestinal disorders, sleep disturbances, mental disorders, cardiovascular and musculoskeletal disorders is high in the shifting group [3, 6].

The impacts of shift work on stress and job satisfaction as well as the impact of stress and job satisfaction on health are other findings in this fuzzy analysis. Some studies have found that shift work has an impact on job satisfaction; besides, decreasing job satisfaction can also cause stress. Moreover, job stress has had a negative effect on job performance through organizational commitment and job satisfaction based on some previous studies [7, 8].

4. CONCLUSION

The present study aimed at determining and analyzing the relationships between work shift, job stress, job satisfaction, and health based on the application of fuzzy DEMATEL method. analyze The results indicate that health can be influenced by different factors with varying degrees of impact in large and complex industrial environments i.e., the petrochemicals with diverse shift systems with a burden of challenging and stressful tasks. In addition, the interactions of effective factors in health analysis and its effective factors are of a great importance. Besides, the indirect impact of work shift and job satisfaction can be very important factors in analysis as well as providing control measures.

5. REFERENCES

1. Lambert, E.G., et al., Job stress, job involvement, job satisfaction, and organizational commitment and their associations with job burnout among Indian police officers: A research note. Journal of Police and Criminal Psychology, 2018. 33(2): p. 85-99.
2. Kampkötter, P., Performance appraisals and job satisfaction. The International Journal of Human Resource Management, 2017. 28(5): p. 750-774.
3. Choobineh, A., et al., Health effects associated with shift work in 12-hour shift schedule among Iranian petrochemical employees. International journal of occupational safety and ergonomics, 2012. 18(3): p. 419-427.
4. Choobineh, A., et al., Shift work-related psychosocial problems in 12-hour shift schedules of petrochemical industries. International Journal of Occupational Hygiene, 2011: p. 38-42.
5. Wu, W.-W., Choosing knowledge management strategies by using a combined ANP and DEMATEL approach. Expert Systems with Applications, 2008. 35(3): p. 828-835.
6. Choobineh, A., et al., Shift work-related health problems in" 12-hour shift" schedule in petrochemical industries. Iran Occupational Health, 2010. 7(1): p. 44-53.
7. Kumar, M. and P. Bhalla, Stress among Nursing Staff in Hospitals and its Relation with Job Satisfaction, Job Performance and Quality of Nursing Care: A Literature Review. J Nurs Care, 2019. 8(492): p. 2.
8. Dall'Ora, C., et al., Characteristics of shift work and their impact on employee performance and wellbeing: A literature review. International journal of nursing studies, 2016. 57: p. 12-27.