Research Paper: The Effect of Safety Training Intervention on Safety Climate Among the Operational Staff of West Oil and Gas Company

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ABSTRACT

Background: The safety climate shows the attitude and general perception of the organization's management regarding safety. This study investigates the impact of safety training on the safety climate of operational employees working in the West Oil and Gas Company.

Materials and Methods: This study is quasi-experimental interventional research, which was conducted in the first half of 2019 in West Oil and Gas Production Company with a pretest-posttest design. The study population included all workers in the operational departments of The West Oil and Gas Production Company. The sampling was done randomly with 240 people. The study questionnaire included a demographic information questionnaire and the safety climate questionnaire of "the safety organization of England." The validity of the questionnaire was confirmed by safety professors, and its reliability was obtained at 0.84 using the Cronbach α coefficient.

Results: The mean score of safety climate components before the intervention was 2.65, and after the educational intervention reached 3.66. The safety improvement had the highest score among the components of the safety climate. Also, the lowest mean score of the component before the intervention was related to the violation of safety rules, which had the lowest mean score after the intervention of the licensing system.

Conclusion: Educational intervention improved the safety climate in West Oil and Gas Production Company, so safety training plays a vital role in increasing the safety climate in the oil and gas industries.

1. Introduction

In the last two decades, Iran has stepped in the development path. It has taken appropriate industrial and economic growth, leading to economic and social changes with good and bad consequences [1]. One of the effects of industrialization is the increasing number and variety of occupational accidents. Besides inflicting damages on human resources, they cause a lot of economic costs. Annually, 108000

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fatal accidents occur worldwide in the construction industry, equivalent to 30% of fatal occupational accidents [2]. The oil and gas industry is one of the largest employment industries in Iran. Safety issues related to the oil and gas industry in many countries have always been a significant problem and primary concern. The main reason for occupational accidents and injuries in the oil and gas industry are human errors and unsafe acts due to lack of safety programs [3]. Without sufficient awareness and identification of hazards, even the best safety programs will not be successful [4]. Today industry managers have found that one of the significant and essential ways to reduce accident rates is to pay attention to safety [5]. Research on the impact of psychological and organizational factors on behavior risk and the possibility of injury in the workplace has shown that the safety climate has a significant impact on these factors [6, 7]. Zohar, in 1980 coined the term "safety climate" and defined the safety climate as "a common understanding of personnel's policies, procedures, safety customs such as overall importance and real priority of safety in the workplace" [8].

The safety climate is a special form of organizational climate rooted in individual perceptions of the importance of safety in the workplace and directs the actions of employees and working groups and individual attitudes towards work [9]. Safety climate as a subset of safety culture examines employees' perceptions and inferences about the work environment, level of management interest in safety and safety-related measures, and participation in risk control. Workers' perception of workplace safety is directly related to occupational accidents [10]. Employees who perceive their jobs as relatively more dangerous are less involved in accidents. Also, employees who understand their work environment safety report lower work-related anxiety and stress [6]. Measuring the safety climate has many advantages, as reliable safety measurements can defy the limitations of traditional and old safety measurement methods, such as the rate of lost time of accidents or the investigation of accident reports [2].

Studies on the structure of safety climate in organizations indicate that due to a lack of codified training about safety and occupational health in industries, most workers are not aware of the risks in their workplace [11-14]. Researchers believe that education of safety issues is one of the most critical factors affecting the safety climate of organizations [8, 15-18]. Also, education promotes awareness and motivation, followed by changes in individual attitude, and ultimately improves the climate and safety performance [19]. Considering the importance of safety climate as one of the factors involved in preventing and reducing occupational accidents and also considering its positive impact on workers' safety performance, this study aimed to evaluate the effect of safety training on climate improvement and safety performance in operational workers of West Oil and Gas Company.

2. Materials and Methods

The present study is quasi-empirical interventional research conducted in the first half of 2019 in West Oil and Gas Company. It has a pretest-posttest design and aims to investigate the effect of safety training on employees' safety climate. The study population consisted of all workers in the operational departments of The West Oil and Gas Company. The selection of the target population was based on the fact that all employees received safety training. The target group had various risks and accidents common in many other workplaces. The random sampling process was performed to select workers in each section, and finally, 240 workers exposed to occupational hazards were included in the study.

It should be noted that the subjects were entered into the study with full knowledge of the study objectives and by completing the consent form. They were assured that the information remained confidential with the researchers and their answers would not cause any occupational problems for them. The questionnaire used in this study consisted of two separate sections: the first part was related to the background information of workers (age, marital status, education, work experience, job category, employment status, and previous incident history) and general information (questionnaire code for each worker, date and time of completion of the questionnaire), and the second part measures the safety climate of workers, with the safety climate questionnaire of the British safety organization. This questionnaire contains 43 questions and 11 components of safety climate: a commitment to management, awareness, and recognition of safety regulations, communication in the field of safety, violation of safety rules, improvement of safety rules and regulations, the impact of employees' intervention on safety, licensing system, safety rules, and regulations, encouraging safety, participate in safety improvement, and risk perception [6].

The questions are scored on a 5-point Likert scale from 5=completely agree to 1=completely disagree. Despite the validation of the original version of this questionnaire in Iran, in the present study, the Persian translation of the questionnaire was tested again in terms of validity and reliability. To assess the reliability of the questionnaire, the internal consistency method was used by calculating the Cronbach α of 0.84 using SPSS software. In addition, the comments of specialists were collected and applied in the

questionnaire to assess the validity of the questionnaire. The educational and technical interventions consisted of two stages: the first stage was an educational intervention and the second stage was a technical intervention with repetition of educational intervention.

Before the interventions began, a briefing was held for safety experts of all sectors to have training classes for workers, in which educational pamphlets, booklets, instructions, films, photographs, and educational PowerPoints were presented to the experts. The training course content was prepared based on the investigation of the accidents and their causes, risk assessment, risks in each job category, and interview (for surveys of experts and workers). The content included harmful factors and risky conditions in the workplace, how to deal with risky factors and conditions of the workplace, types of personal protective equipment and how to use them properly, informing workers about safe and unsafe behaviors and the impact of changing unsafe behaviors and the benefits of safe behaviors, empowering workers to recognize unsafe behaviors, awareness of the losses caused by inappropriate workstations and how to set up a suitable workstation, short breaks between work, and taking responsibility. Before the start of each training session, in a 15-minute briefing session, workers were told about the study objectives and confidentiality of the reported information.

Educational interventions consisted of two stages. The interventions were performed in 12 two-hour sessions over six weeks (each week on two different days). The training was conducted using a computer system, large monitor, and training board by group discussion method and interference of workers in training, surveying them about safe behaviors and improving conditions and encouraging them to act on the topics discussed. In this study, questionnaires were collected in two time points: the first time was before the interventions, and the second time was one month after the first training course. For data analysis, first, the mean and standard deviation of demographic information and the scores of climate and safety were determined.

3. Results

The study participants were all male since the staff of the operational areas was studied. The demographic characteristics of the sample size are presented in Table 1. The demographic characteristics of the sample size show that the highest frequency is related to the age range of 31 to 40 years, the majority had work experience between 11 and 15 years, and most employees have a bachelor's degree.

The mean scores of the components of safety climate in West Oil and Gas Company were examined before

Table 1. Demographic characteristics of the sample size

Characteristics		No. (%)
Gender	Male	240(100)
	Female	0(0)
Age, y	20-30	64(26.6)
	31-40	122(50.8)
	41-50	48(20)
	>50	6(2.6)
Work experience (y)	1-5	44(4.18)
	6-10	42(5.17)
	11-15	112(6.46)
	>15	42(5.17)
Education	Diploma and lower	60(25)
	Bachelor	142(59)
	Masters	38(16)

Table 2. Mean scores of safety climate components before the intervention

Variables	Mean±SD
Safety enhancements	3.39±0.578
Production pressure	3.36±0.624
Safety training	3.14±0.187
Management commitment	2.84±0.212
The role of the protection committee	2.68±0.321
Employee intervention in safety	2.44±0.314
Encouragement for safety	2.40±0.248
Safety rules and regulations	2.35±0.178
Licensing system	2.26±0.311
Safety communication	2.18±0.309
Violation of safety rules	2.10±0.347
Total	2.649±0.968

Health in Emergencies and Disasters Quarterly

the educational intervention, the results of which are presented in Table 2. After one month of training, the components of safety climate were measured again, the results of which are shown in Table 3.

The mean score of the components of safety climate before the intervention was 2.649, and after the educational intervention, it reached 3.66. All components of the safety climate increased after the intervention. The highest increase in the mean component was related to

Table 3. Mean scores of safety climate components after the intervention

Safety Climate Component	Mean±SD
Safety enhancements	4.19±0.127
Production pressure	4.07±0.212
Safety training	4.07±0.294
Management commitment	3.64±0.213
The role of the protection committee	4.18±0.228
Employee intervention in safety	3.00±0.358
Encouragement for safety	3.81±0.421
Safety rules and regulations	3.64±0.148
Licensing system	2.99±0.119
Safety communication	3.54±0.317
Violation of safety rules	3.19±0.306
Overall average	3.66±0.721

Health in Emergencies and Disasters Quarterly

safety communication, and the lowest increase was related to the employee intervention in safety. Before and after the intervention, safety promotion had the highest score among the components of the safety climate. Also, in terms of the lowest average score of the component, before the intervention, it was related to safety violations, which had the lowest average score after the intervention of the licensing system.

4. Discussion

Many injuries and casualties result from a lack of attention to safety measures in the industry. This study aimed to assess the level of safety climate among the operational staff of the West Oil and Gas Company and the effect of training on improving this important component. The present study showed that the level of safety climate among the operational staff working in the West Oil and Gas Company was at a moderate level before the training intervention. So that there is a capacity to increase the safety climate in the existing industry and safety items that are not used properly. In a study that examined the level of safety climate among employees of one of the copper production units, the mean level of safety climate among employees was moderate [20].

Measurement of safety climate in Chinese industries showed that the safety climate in China's Oil and Gas Industry is moderate [7]. Chenani et al., in their research entitled "Assessing the safety climate in the staff of Nain Tile Industries Company", evaluated the amount of cultural climate as moderate in the tile industry companies [21]. Seveer et al. assessed the level of safety climate as appropriate among workers in various oil and gas industries in European countries [9]. Dahl and Kongsvik, in a study entitled "Safety climate in the oil and gas industry", examined the mean safety climate among employees in various industries in European countries, whose results showed that the safety climate in Asian countries is moderate [3].

Measurement of the presence of components of safety climate in this study showed that the component of safety improvement before and after the intervention showed a higher average score than other components of the safety climate among employees. This finding indicates that employees are eager for the progress made in the safety zone, and employees welcome the use of advanced and modern safety tools. In the research of Aliabadi et al., among the components of safety climate, the component of power and management commitment had a better score than other components [19]. In the Chahak et al. research, the component of management commitment had the highest average score [22].

The results showed that educational intervention has increased and improved the safety climate among the employees of the West Oil and Gas Company. Thus, safety training can positively affect and increase the safety climate in industries, which ultimately reduces the number of injuries and casualties of work. Therefore, if the training is carried out according to the correct principles and with careful planning, it can be an essential factor in promoting the safety of workers and society. In line with the present study results, Grasoo et al. and Bamel et al. reported that educational intervention positively affected safety performance [5, 15]. Jafari et al. reported that educational intervention significantly increased the mean scores of management commitment, safety training, safety communications, employee intervention in safety, licensing system, safety rules and regulations, and violation of safety rules [17].

5. Conclusion

According to study results, holding training classes for workers and encouraging group discussion, expressing the importance of safety in the workplace, and technical measures can positively affect workers' safety behavior and promote organizational culture, and improve safety climate factors. Discussing and sharing people's experiences, a well-codified educational program, and allocating enough time can also promote safe behaviors. One of the limitations of the present study was the lack of a control group due to the existing conditions in the company. To overcome this limitation, a 1-month intervention was performed to examine the changes with higher reliability.

Ethical Considerations

Compliance with ethical guidelines

There were no ethical considerations to be considered in this research.

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Authors' contributions

All authors equally contributed to preparing this article.

Conflict of interest

The authors declared no conflict of interest.

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