

ORIGINAL ARTICLE

## Investigating Organizational Safety Climate and Its Impact on Incidence of Unsafe Behaviors among Firefighters

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### ABSTRACT

**Introduction:** Accidents may occur in all occupations. However, firefighting is considered one of the most dangerous occupations considering firefighters' perception of security, work-related injury rate, safety behaviors, attitudes, and norms. Therefore, this study aims to investigate the correlation between the organizational safety climate and unsafe behaviors among firefighters.

**Methodology:** This was a descriptive and survey research. The statistical population included all the managers and employees working in a fire department consisting of 16 fire stations in Tehran. A researcher-made checklist and an organizational safety climate questionnaire were used to assess the prevalence of unsafe behaviors and safety climate. The data were analyzed using SPSS 21.0 software.

**Results:** The employees' mean age, body mass index (BMI), and work, rest, and exercise duration were 32.5±66.83 years old, 25.69±3.7, 9.2±14.1 h/d, 8.15±1.73 h/d, and 5.44±4.46 h/w, respectively. Also, 66% of the employees were overweight and 29% had normal weight. Among the safety climate dimensions, the highest mean was related to management commitment to safety issues (33.7±62.68) and the lowest mean was related to priority over products (6.1±03.63). Unsafe behaviors were mostly associated with lack of using the breathing apparatus in small fires (91.9%) as well as personal protective equipment (PPE) (77.4%) in accidents and not performing operations with inappropriate physical condition (38.7%). The t-test results revealed a significant correlation between the safety climate and prevalence of unsafe behaviors ( $P \leq 0.05$ ). Moreover, a significant correlation was observed between the employees' knowledge, participation, attitudes, and environmental safety ( $P \leq 0.05$ ). However, no significant correlation was found between emergency preparedness, safety priority, and ignoring risks.

**Conclusion:** Organizational safety climate could affect and predict employees' behaviors. Therefore, it is recommended that fire department managers develop a plan to achieve the required safety climate and improve the safety climate level.

**KEYWORDS:** Safety climate; Organization; Unsafe behaviors; Firefighters

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## INTRODUCTION

Safety refers to the state of being safe and protected against injuries. In particular, workplace safety refers to protecting employees from exposure to potential hazards [1]. Improving the work environment is among the most important principles that could control the workforce's physical and mental health and provide high job satisfaction [2]. Behavior-based safety identifies and modifies behaviors in the workplace that could affect accidents. Therefore, organizational and social infrastructures of such behaviors should be taken into account [3].

Accidents may happen in all professions. However, firefighting is among the most dangerous occupations [4]. Firefighting organizations are formed to save human lives and property. Thus, firefighters could help the victims in critical environmental and working conditions. Firefighting organizations and teams mainly aim to create a healthy work environment and provide safety for firefighters [5]. Examining fire brigade historically has revealed that although firefighters use technically advanced equipment, the main hazards they may face have not changed [6-8]. Although technical advances significantly contribute to combating these hazards, the organizational culture approach, organizational commitment, sense of belonging, and safety climate and culture are of great importance as well [9-13].

Firefighters are mainly responsible for responding to fire emergencies, oil spills, accidents, and various disasters. Due to their occupational nature, they may be exposed to unexpected environmental stressors, heavy physical loads, toxic agents, and psychosocial hazards. Moreover, various health disorders such as injuries, respiratory and cardiovascular diseases, and cancer may develop [14-15]. Studies have demonstrated that firefighting is among the most dangerous occupations based on firefighters' perception of security, work-related injuries, safety behaviors, attitudes, and norms [16-19].

Safety culture and, consequently, safety climate, like other psychological and social characteristics, are inextricably linked with behavior. Employees of an organization adjust their behaviors based on how they perceive and analyze organizational structures and interactions [20]. The concept of safety climate emphasizes the employees' perceptions [21] which are associated with the level of workplace safety and safety practices implemented at the organization level.

However, there is a stronger relationship between the safety climate and workplace safety [22]. Safety climate is known as a major indicator of safety efficiency and predictor of occupational accidents. Identifying and evaluating the factors affecting it, especially leadership, can play a crucial role in effectively reducing the occurrence of accidents [23]. The two main sub-factors of safety climate, including organization's attitude towards safety and perception of safety, are associated with the accident rate. It is predicted that the accident rate will decrease as the safety climate of the organization increases [24]. Safety culture is the foundation of organizational culture and reflects the organization members' behaviors and attitudes towards maintaining health and safety performance [25-28]. The safety culture of an organization consists of four stages: basic values of safety, organizational factors, attitudes and ideas, and safe behaviors [29]. Organizational climate may play an important role in members' behaviors, level of motivation, and organizational commitment [30], so that safety climate could be considered a useful tool for assessing employees' behaviors and attitudes towards safety issues in the organization [31]. There are various safety climate criteria, including employees' role in workplace safety and ability to comply with safety issues, incident reporting, and safety enforcement incentive systems [32]. Recent studies have reported that safety climate could be used as a key indicator to identify organizational safety issues. Safety climate could be applied to perceive employees' performance, identify methods of controlling injuries, and find appropriate solutions. Managers refer to safety climate research to find appropriate solutions in safety training and behavioral modification programs and then examine the impact of these methods [33-34]. Numerous investigations have been conducted on organizational climate and safe behaviors among firefighters, including studies by Smith et al. [35-36], Chang et al. [37], Rajabi et al. [38], Martinez-Fiestas et al. [39], Ryu et al. [40], and Todd et al. [41].

Most of the incidents occurring among firefighters at work are due to factors such as difficulty in decision-making, lack of communication, as well as awareness of the situation and standard operating procedure, violation of protocols, and human errors. Therefore, effective measures should be taken to create a safe climate for management and solve the behavioral approach considering safety issues in the organization [42]. Given that firefighting tasks are dangerous and most of the hazards are difficult to eliminate, it is important that firefighters behave as safely as possible [43]. Since

firefighting dangers could not be eliminated, examining the organizational climate and unsafe behaviors among these community by addressing controllable behavioral factors could help develop safety and risk reduction programs. Assessing safety climate could be used as a preventive indicator to evaluate safety performance [44]. Although there is currently no accurate information about various incidents in the fire department in Iran, the limited published reports have indicated that occupational accidents are among the leading problems of industrial systems and a major cause of death. Therefore, the present study aims to investigate the correlation between the organizational safety climate and unsafe behaviors. Moreover, it highlights the importance of creating an appropriate organizational safety climate for improving firefighters' safe behaviors.

## METHODOLOGY

This study used descriptive and survey approaches to collect the data. The statistical population included all the managers and employees working in a fire department consisting of 16 fire stations in Tehran. A pilot study was performed to determine the sample size. An unsafe behavior checklist was prepared and experimentally completed by 10 employees. Then, the prevalence of unsafe behaviors was estimated as 16% by the pilot study. Accordingly, the sample size was determined to be 62 individuals using the following formula where  $z$  denotes the level of confidence,  $r$  is the prevalence of unsafe behaviors, and  $d$  is the percentage of error. A simple random sampling method was used due to the homogeneity of the population.

$$n = \frac{(z)^2 (r)^2}{d^2} = 62$$

Given that this was a field and applied research, the document review and field approach were applied to collect the data. A researcher-made checklist was employed to assess the prevalence of unsafe behaviors, the validity of which was evaluated by five experts, i.e., one with a doctorate degree in occupational health and four firefighters with an average operational experience of 15 years and relevant bachelor's degrees including

rescue operation management, disaster management, and health, safety, and environment (HSE) management. The firefighters' behaviors were observed during fire operations and evaluated by the researcher. The organizational safety climate questionnaire was employed to collect the data and examine the research variables. The validity and reliability of this 37-item questionnaire were evaluated by Mohammadi Zaidi et al. (2011) [45]. In this study, the results were analyzed in two sections: Descriptive and inferential statistics. In the descriptive section, the frequency distribution and central tendency indices including mean and standard deviation were examined. In the statistical test section, the normality of data distribution was examined. Accordingly, the appropriate statistical tests were selected. Considering the normal distribution of numerical data, the data were analyzed by the independent sample t-test and Pearson's correlation coefficient. The data were analyzed using SPSS 21.0.

## RESULTS

As presented in Table 1, the mean of contextual variables such as age, BMI, and work, rest, and exercise duration of the employees were calculated as  $32.5 \pm 66.83$  years old,  $25.69 \pm 3.7$ ,  $9.2 \pm 14.1$  h/d,  $8.15 \pm 1.73$  hour/day, and  $5.44 \pm 4.46$  hour/work, respectively. The results showed that 66.1% of the employees were overweight, 3.2% were obese, 1.6% were underweight, and 29% had normal weight.

As presented in Table 2, the highest mean was related to management commitment to safety and prioritizing its issues (33.62%) and the lowest mean was related to priority over products (6.03%).

The results showed that unsafe behaviors were mostly associated with the lack of using the breathing apparatus in small fires (91.9%) as well as personal protective equipment (PPE) (77.4%) in accidents and not performing operations with an inappropriate physical condition (38.7%) (Table 3).

The t-test results revealed a significant correlation

**Table 1.** Demographic and occupational data of firefighters

Item	Mean $\pm$ SD	Min	Max
Age (years)	32.66 $\pm$ 5.83	21	42
Height (cm)	178.42 $\pm$ 4.28	172	190
Weight (kg)	83.08 $\pm$ 12.51	65	100
BMI	25.69 $\pm$ 3.70	20.58	31.77
Work Duration	9.4 $\pm$ 2.1	4	14
Reset Duration	8.15 $\pm$ 1.73	4	12
Exercise Duration	5.44 $\pm$ 4.46	1	14

**Table 2.** Mean and standard deviation of safety climate dimensions in the studied fire stations

Dimensions	Item number	Mean $\pm$ SD	Min	Max
Management commitment to safety and prioritizing its issues	10	33.62 $\pm$ 7.68	17	47
Employees' knowledge and obedience to safety rules	7	29.69 $\pm$ 3.83	18	35
Employees' attitudes towards safety issues	4	18.27 $\pm$ 2	8	20
Employees' participation and commitment to safety rules	5	20.16 $\pm$ 2.6	13	24
Workplace safety	3	12.74 $\pm$ 2.07	6	15
Emergency preparedness in the workplace	4	10.83 $\pm$ 2.7	5	16
Priority over products	2	6.03 $\pm$ 1.63	2	10
Ignoring the risks	2	6.27 $\pm$ 1.66	4	10
All dimensions of safety climate	37	137.64 $\pm$ 13.76	88	168

**Table 3.** Prevalence of unsafe and safe behaviors in the studied fire stations

Item	Yes (%)	No (%)
Wearing pants and jackets during fire operations	100	0
Wearing a helmet and gloves	100	0
Using the breathing apparatus	93.5	6.5
Using the breathing apparatus in small fires	8.1	91.9
Using the hood in fires	91.9	8.1
Using PPE in accordance with the principles	87.1	12.9
Coordinating with the person in charge before entering the area of operation	98.4	1.6
Ensuring that PPE works properly at the beginning of the shift	100	0
Cleaning equipment after the mission	100	0
Not underestimating the risk during the operation	90.3	9.7
Not using elevators in building accidents and fires	90.3	9.7
Safe operation in well accidents	96.8	3.2
Having no risky behavior	100	0
Coordination between the physical and practical condition and operations	98.4	1.6
Not performing operations with inappropriate physical condition	61.3	38.7
Not performing operations continuously without interruption	95.2	4.8
Using PPE in accidents	22.6	77.4
Paying attention to the commander's warning and not working individually	93.5	6.5
Using the colleagues' experiences in fires and accidents	98.4	1.6
Lack of rush at work	96.8	3.2

**Table 4.** Correlation between the safety climate and employees' unsafe behaviors

	Employees knowledge	Participation	Employees attitudes	Environmental safety	Emergency preparedness	Safety priority	Ignoring risks	Safety climate	p-value
Unsafe behavior	0.03	0.001	0.033	0.028	0.062	0.278	0.918	0.02	

**Table 5.** Results of Pearson's correlation test in determining the correlation between unsafe behaviors and safety climate and contextual variables

	Age	BMI	Work duration	Rest duration	Exercise duration	p-value
Unsafe behavior	0.89	0.93	0.635	0.839	0.861	
	-0.017	0.011	-0.061	0.026	-0.023	r
Safety climate	0.488	0.689	0.133	0.764	0.114	
	-0.09	0.052	0.193	-0.039	0.19	r

between the organizational safety climate and employees' unsafe behaviors, suggesting that the more appropriate the organizational safety climate, the safer the employees' behaviors would be (Table 4).

Results of Pearson's correlation test revealed that the employees' unsafe behaviors and organizational safety

climate were not significantly correlated with age, BMI, and work, rest, and exercise duration (Table 5).

## DISCUSSION

This study examined the factors affecting the occurrence of unsafe behaviors among employees working in the fire department. In general, unsafe

behaviors occur due to the improper use of tools and equipment by employees, which leads to various risks in the workplace. Many factors could cause unsafe behaviors in the fire department, one of which is the organizational safety climate. Considering that the p-value was considered less than 0.05 in Pearson's correlation test, a significant correlation was observed between safe behaviors and safety climate. There was a significant correlation between employees' knowledge, participation, attitudes, and environmental safety ( $P \leq 0.05$ ). However, no significant correlation was found between emergency preparedness, safety priority, and ignoring risks, which was consistent with the study by Mosadeghi et al. [46]. Consistent with this work, Ted et al. found a significant and positive correlation between compliance behaviors and safety participation and safety climate. Both behaviors seemed protective and were associated with a reduced rate of injuries [41]. The correlation between safe behaviors and safety climate verified that unsafe behaviors could be changed to safe ones by providing a positive safety climate. Therefore, equipment, rules, and training could not individually modify behavior. Employees should first reach this conclusion that managers consider observing safety principles as a core value.

Inconsistent with this study, Lane et al. provided a comprehensive model of organizational safety behavior based on social cognitive theory and triple framework of dangerous environment, safety environment, and safety behaviors rather than evaluating safe/unsafe behaviors individually. This discrepancy could be due to different locations of these two studies [47].

Heydari et al. examined the correlation between the safety climate and safe behaviors using Pearson's correlation coefficient. The results revealed that constituent components of the safety climate were clearly correlated with safe behaviors, which was consistent with the results of this research [48].

Managers should develop specific policies for safety, management commitment to safety, etc., to encourage people to behave safely and create a positive safety climate in an organization and positive attitudes in employees in such a way that they believe that managers are truly committed to safety and it is considered a priority for them. Moreover, building a positive relationship with employees, exchanging information with them, involving them in decisions, and asking them to provide solutions create a sense of ownership in them, all of which could lead to a positive

safety climate and culture as well as safe behaviors.

However, these are not the only factors influencing individuals' behaviors and attitudes. The culture of the family, community, and previous organization in which the person has worked could also affect them. Spiritual and moral characteristics could cause differences in individuals' attitudes and beliefs. However, managers could not control these factors in an organization.

Clarke et al. indicated that the psychological climate, especially the perception of organizational attributes, was significantly associated with the safety climate. Safety climate acted as a partial mediator between the psychological climate and safety behaviors and had a positive effect on employees' safe behaviors, which was consistent with the results of this study [49].

Smith et al. showed that safety climate was positively correlated with compliance behavior ( $B = 0.13, P < 0.001$ ) and employees' safety participation ( $B = 0.22, P < 0.001$ ), so that improving safety climate among firefighters enhanced safe behaviors among employees, which was consistent with this work [50].

Givehchi et al. found that the level of safety climate was affected by the number of safety inspections so that non-compliance with safety as a result of safety inspections could be used to monitor the safety climate. Developing programs for scheduled safety inspections, recording findings as non-compliance with safety, and monitoring their process could be applied to evaluate the safety climate, highlighting the role of management in safety issues. This finding was consistent with this study [51].

Freaney et al. reported a significant correlation between safety culture and safety behavior. The results revealed that the more positive the safety culture, the more likely the firefighter would behave safely, which was consistent with this research [52].

Heydari et al. indicated that risk perception played an important role in the rate of unsafe behaviors among firefighters. The results showed that some important organizational and individual characteristics should be considered to promote firefighters' safe behaviors [53].

Unsafe behaviors were mostly associated with a lack of using breathing apparatus in small fires (91.9%) as well as personal protective equipment (PPE) (77.4%) in accidents and not performing operations with

inappropriate physical condition (38.7%), which was in line with Ground et al.'s study [54].

Fam et al. reported that inappropriate posture and lack of using PPE had the highest contribution [55]. Hasheminejad et al. showed that lack of using or improper use of PPE as well as carelessness were the most observed unsafe behaviors (56), which was consistent with these results. Employees' lack of awareness of dangers, unfamiliarity with PPE, lack of participation in selecting PPE, and lack of enough supervision by managers were among the main reasons for lack of using or improper use of PPE.

Examining dimensions of the safety climate demonstrated that the highest mean was related to management commitment to safety issues. Smith et al. showed that managers' attention to safety issues had a positive effect on understanding the safety climate among firefighters. Conversely, passive safety management had a negative impact on the safety climate. As expected, safety climate perception was positively and significantly associated with safety behaviors, including compliance behaviors and safety participation, which was consistent with this research [57].

The correlation test results showed no significant correlation between employees' unsafe behaviors and variables such as age ( $r = -0.017$ ,  $p\text{-value} = 0.89$ ), BMI ( $r = 0.011$ ,  $p\text{-value} = 0.93$ ), work duration ( $r = -0.061$ ,  $p\text{-value} = 0.635$ ), rest duration ( $r = 0.026$ ,  $p\text{-value} = 0.839$ ), and exercise duration ( $r = -0.023$ ,  $p\text{-value} = 0.861$ ). Furthermore, no significant correlation was found between the organizational safety climate and age ( $r = -0.09$ ,  $p\text{-value} = 0.448$ ), BMI ( $r = 0.052$ ,  $p\text{-value} = 0.689$ ), work duration ( $r = 0.193$ ,  $p\text{-value} = 0.133$ ), rest duration ( $r = -0.039$ ,  $p\text{-value} = 0.764$ ), and exercise duration ( $r = 0.19$ ,  $p\text{-value} = 0.114$ ), which was not in line with the results of the study by Heydari et al. [48]. The reason for this could be attributed to the type of occupation and working conditions. However, this finding was consistent with that of ÖZAY et al.'s study conducted on firefighters [58].

Agility and physical fitness are among the prerequisites for firefighters. Analyzing BMI showed that more than 66.1% of employees were overweight. Since most of the participants reported watching TV as their entertainment, the type of entertainment was more likely correlated with being overweight. The organization's structure and type of workload for people with different

experiences were among the other reasons for being overweight. Employees with more work experience, including drivers, were less involved in fire events due to job promotion. Thus, they spent less time exercising.

Research limitations are factors that may reduce the generalizability of research findings. Time limit and using a questionnaire as the main tool for data collection were among the limitations of this study. Moreover, each organization has its unique culture and climate, so findings of this study could not be easily generalized to any other organization.

It is recommended to examine the effect of factors affecting employees' unsafe behaviors in other organizations with similar structures and evaluate the impact of other management categories such as safety performance, employee productivity, safety commitment, safety motivation, safety attitude, etc. on employees' unsafe behaviors in future studies. Moreover, it is suggested to use other computational techniques such as fuzzy calculations and compare their results.

## CONCLUSION

Safety climate could influence and predict behaviors. Therefore, it is recommended that managers working in the fire department make decisions and develop a program to improve the level of safety climate considering the current and expected levels of safety climate. Holding training courses, creating an encouragement and punishment system, consulting experienced people and transferring their experiences to others are among the effective measures in this regard. Moreover, the supportive role of fire department managers in promoting safety climate and reducing unsafe behaviors could not be denied. This impact could be of cultural or financial type, in such a way that it could create positive attitudes and behavioral patterns for observing safety issues and reducing unsafe behaviors by producing values and encourage those who are diligent in observing safety issues. According to the researcher's observations, some officials of the organization, including station chiefs and managers, attended large fire incidents without wearing operational uniforms and using PPE, which could decrease the importance of using personal equipment. Therefore, considering that safety climate is transferred from the organization into employees at lower levels, all the points related to the managers should be considered. Thus, organizational managers should pay special attention to safety issues.

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