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Investigating the Relationship between Organizational Climate and Safety Climate at a Manufacturing Industry

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ABSTRACT

Organizational and safety climates are respectively general and specific forms of climates within organizations, which can affect individuals' performance. Organizational climate (OC) refers to the people's behavioral patterns, attitudes, and feelings within the organization. Safety climate (SC) refers to employees' perception of the organizational approach toward safety policies. The current study was aimed to investigate the association between OC and SC at a tile industry. In this cross-sectional and analytical study two standard questionnaires including sussman & deep and NOSACQ-50 were applied for the assessment of OC and SC, respectively. The Kolmogorov–Smirnov test was used to evaluate the normality of the quantitative data. Data were analyzed using Spearman, Mann-Whitney U, and Kruskal-Wallis tests. The results of the present study showed a significant and positive association between the dimensions of OC and SC. A significant association was found between OC, working departments, and type of employment. In addition, a significant association was found between SC and working departments. It is recommended that OC as a factor affecting SC, should be taken into account in researches. Considering OC impacts on people's attitudes toward organizational safety policies, it may be defined as a factor affecting the safety performance of organizations.

KEYWORDS: *Organizational Climate, Safety Climate, Sussman & Deep Questionnaire, NOSACQ-50, Manufacturing Industry*

INTRODUCTION

Safety is the main source of many organizational costs, it is one of the main concerns of many organizations [1]. According to the World Labor Organization, approximately 360,000 fatal accidents and 337 million work-related injuries occur worldwide each year. This imposes heavy costs on organizations resulting in indignation for employees and their families [2]. In the last decade which is known as the safety period, the impact of organizational factors on workplace safety has been increasingly understood. During this decade, most activities in the field of safety have focused on the structures of safety culture and SC [3].

In a study conducted by Clark, SC indicated as a consequential predictor of safety-related behaviours [4]. Other studies have shown that workers' safety perception is directly related to occupational accidents. Workers who perceive their work environment safer were less likely to have accidents than workers who perceive their work environment as unsafe. They also reported lower levels of job anxiety and stress [5].

Griffin and Neil defined SC as a kind of OC for those who experienced within an organization. According to their definition, SC has five factors including management values, safety communications, safety practices, safety training, and safety equipment [6]. Other available definition regarding SC can be individuals' perception of safety policies, procedures, processes, and behaviors in the workplace which indicates a real priority to safety over other organizational goals [7]. Zohar believed that the SC is a basic and shared psychological perception that may employees perceived as the level of safety in their work environment. He also divided SC into eight factors: the importance of safety training, effects of required work pace on safety, the status of the safety committee, the status of safety officer, effects of safe conduct on promotion, level of risk at the workplace, management attitudes toward safety, and effect of safe conduct on social status [8]. A study conducted by Flynn et al. pointed out that the most c

ommon dimensions of SC measuring related to management, system safety, risk, work pressure, and competence [9].

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SC Measuring is a well-known method for evaluating the association between organizational characteristics, safety within workplaces, and accident risks [2]. SC is a specific form of overall OC including factors such as management values, management, organizational processes, communications, and employee participation in the health and safety programs of the workplace [10].

OC is a multidimensional structure that encompasses a wide range of individual assessments of the workplace [11]. These assessments may relate to the general dimensions of environment such as leadership, roles, and communication, or specific dimensions like SC [10]. OC is defined as shared perceptions, feelings, and individuals' attitudes on the organization toward norms, values, and attitudes of the organization, which can positively or negatively affect the behavior of individuals [12].

Organizational factors as one of the most well-known hidden causes influencing the occurrence of events have attracted the attention of researchers after the Chernobyl accident. In addition, organizational factors are known as one of the indices affecting organizational safety while these factors can be effective in the prevention of future accidents within organizations [13]. Additionally, OC comprises a large number of factors in work environments such as adaptability to work challenges and pressures, cohesive relationships within workplaces, acceptance of innovation in job practices, and recognition of abilities and skills [14].

Studies have shown that OC affects the demanding Characters of the organization, especially in the functional area. Therefore, OC while affecting the behavior and mood of members of the organization, can strengthen or weaken the motivation of individuals to influence their performance [15].

Considering an ascending occupational accidents trend, the involvement of human factors in the occurrence of accidents, and the lack of studies investigating the relationship between general OC and SC within workplaces, this study was conducted to investigate the association between OC and SC dimensions at a tile industry in Yazd province, Iran.

MATERIALS AND METHODS

Participants:

This study was a cross-sectional and analytical study with the main purpose of investigating the association between the dimensions of OC and SC in a manufacturing industry. The association between organizational and safety climates with demographic characteristics was also considered. The selected company had seven departments and 252 employees in May 2019.

Data collection tools:

The data collection tool was a questionnaire consisting of three parts. The first part included demographic characteristics of the participants such as age, educational level, work experience, working department, marital status, accident experience, employments status, and shift work rotation. The second part included the Sussman & Deep questionnaire for the assessment of OC, and the third part included the Nordic SC questionnaire (NOSACQ 50).

Sample size:

The sample size was determined through a simple random sampling method using Cochran's formula and limited community modification (n = 252). Information from Shirali et al.'s study [16] was also used. The sample size was limited to 135 individuals considering 25% probability of falling. Finally, the study was conducted by 138 samples (3 more participants for more accuracy). Equations 1 and 2 were used for sample size determining.

Equation 1: $n_{0}= \frac{(Z_{1-\alpha/2})^2 S^2}{d^2}$

Equation 2: $n=\frac{n_0}{1+\frac{(n_0-1)}{N}}$

Where, n_0 is the correction factor, N is the total statistical population and n is the final sample size of the study.

Sussman & Deep Organizational Climate Questionnaire:

Sussman & Deep questionnaire includes 20 questions in five dimensions: clarity and purpose agreement (OC1), clarity and agreement of roles (OC2), satisfaction with rewards (OC3), satisfaction and agreement on procedures (OC4), and the effectiveness of communication (OC5). Questions are scored based on the Likert scale from totally agree to totally disagree. OC (Total OC) questionnaire scores ranged from 0 to 80 [17]. The reliability of this questionnaire was estimated by Dargahi et al. with Cronbach's alpha test using SPSS software which resulted to be 0.91 [15].

Nordic Safety Climate Questionnaire:

NOSACQ 50 questionnaire was developed based on the OC and safety theories, psychological theories, and empirical researches for five Nordic countries (Finland, Denmark, Norway, Sweden, and Iceland). The reliability of this questionnaire confirmed in all five Nordic countries. The questionnaire consists of 50 questions, 22 questions related to the management pursues of safety at the workplace, and 28 questions about employees' attitudes toward pursuing safety at the workplace.

NOSACQ 50 includes seven dimensions: management safety priority and ability (SC1), management safety empowerment (SC2), management safety justice (SC3), workers' safety commitment (SC4), workers' safety priority and risk non-acceptance (SC5), peer safety communication, learning and trust in safety ability (SC6) and workers' trust inefficacy of safety systems (SC7).

The mean total safety climate score is abbreviated as SC [16-18]. Yousefi et al. evaluated the reliability and linguistic validity of the Persian version of this questionnaire and used the Kuder Richardson-20 test to evaluate the reliability of the questionnaire. Consequently, the coefficient of Kuder Richardson-20 for all items of the questionnaire was determined 0.942 [19].

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Statistical Analysis:

Kolmogorov-Smirnov normality test was used to evaluate the normality of the quantitative variables of the study. Due to the abnormality of dimensional scores and total scores of OC and SC, the Spearman correlation coefficient was used to examine the correlation between these scores and the quantitative variables obtained from the demographic characteristics part of the questionnaire (staff age and work experience). Mann-Whitney U, a non-parametric test was also applied to investigate the relationship between quantitative and two-level qualitative variables. Kruskal-Wallis H, another non-parametric test was also used to investigate the association between quantitative and multi-level qualitative variables of study [20].

OC and SC scores were examined separately in each dimension using average and median indices (see Table 1). Cronbach's alpha coefficient was used to evaluate the reliability of each dimension score and total OC and SC questionnaires obtained score (refer to Table 2).

RESULTS

The age range of participants was 31-40 years-old (57.3%), most of them had a diploma (57.2%), work experience of 6-10 years (36.9%), the majority of participants were from the Balmil department (23.9%), most of them were married (79.7%), the majority of participants had no experience of accident (64.5%), the majority of employees had a contract (95.7%), and most of them were employed as work shifts (87.3%) (Table 1). The results of this study showed a normal distribution for the age variable ($P > 0.001$), while other quantitative variables of the study were abnormal ($P < 0.001$).

There was a significant association between working departments and the total scores of OC and SC, employment status and OC score, shift-working, and total SC score. However, there was no significant association among other qualitative and quantitative variables obtained from the first part of the questionnaire (demographic characteristics) and OC and SC scores (Table 1). The reliability coefficients of SC and OC dimensions were determined by the Cronbach alpha coefficient (Table 2). Satisfaction and agreement on procedures dimension in OC and management safety empowerment dimension in SC had the highest reliability coefficients, respectively.

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Table 1. Demographic data considering SC and OC score

Variable	Levels	Average SC score (median)	P-Value with SC	An average score of OC (median)	P-Value with OC
Age (years)	20-30	3.22 (3.34)	0.41	67.9 (72)	0.787
	31-40	3.25 (3.38)		68.6 (72)	
	41-50	3.17 (3.32)		69.85 (74)	
Level of education	Diploma	3.23 (3.32)	0.99	68.33 (72)	0.95
	Associate degree	3.24 (3.36)		69.35 (72)	
	Masters	3.24 (3.37)		68.2 (74)	
Work experience (years)	1-5	3.23 (3.34)	0.722	67.35 (70)	0.119
	6-10	3.2 (3.3)		67.45 (70)	
	10-15	3.29 (3.38)		71.15 (74)	
Working departments	Electricity	3.1 (3.2)	0.013*	63.5 (66)	0.022*
	Mechanics	3.54 (3.46)		71.77 (74)	
	Package	3.2 (3.36)		68.53 (73)	
	Furnace	3.31 (3.38)		72 (74.5)	
	Glazing	3.05 (3.09)		63.46 (66)	
	Balmil	3.22 (3.32)		67.81 (68)	
	Crusher	3.55 (3.6)		75.54 (78)	
Marital status	Married	3.23 (3.36)	0.96	68.07 (72)	0.53
	Single	3.23 (3.26)		70 (72)	
Accident experience	Yes	3.24 (3.36)	0.988	65.68 (73)	0.826
	No	3.23 (3.36)		68.36 (71)	
Type of employment	Contracting	3.03 (2.99)	0.09	58.83 (60.5)	0.017*
	Contractual	3.24 (3.36)		68.87 (73)	
Shift type	Working day	3.45 (3.44)	0.033*	72.82 (75)	0.122
	Work shift	3.2 (3.32)		67.85 (70)	

*$P < 0.05$

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Table 2. Safety climate and organizational climate dimensions Cronbach alpha reliability coefficient

Dimensions of safety climate	number of items	Reliability coefficient	Dimensions of organizational climate	Number of items	Reliability coefficient
Management safety priority and ability	9	0.874	Clarity and purpose agreement	4	0.781
Management safety empowerment	7	0.879	Clarity and agreement of roles	4	0.604
Management safety justice	6	0.853	Satisfaction with rewards	4	0.76
Workers' safety commitment	6	0.695	Satisfaction and agreement on procedures	4	0.8
Workers' safety priority and risk non-acceptance	7	0.733	The effectiveness of communication	4	0.652
Peer safety communication, learning, and trust in safety ability	8	0.583	Total OC	20	0.908
Workers' trust inefficacy of safety systems	7	0.708	-	-	-
Total SC	50	0.947	-	-	-

The results of Table 3 showed a quite significant correlation between dimensional scores and OC and SC scores.

The highest correlation coefficient was between the fourth dimension of OC (satisfaction and agreement on procedures) and the second dimension of SC (management safety empowerment) (Table 3).

The lowest correlation was between the first dimension of OC (clarity and purpose agreement) and the sixth dimension of SC (peer safety communication, learning, and trust in safety ability) (Table 3).

A significant association between OC and SC in the factory has been calculated as shown in Figure 1.

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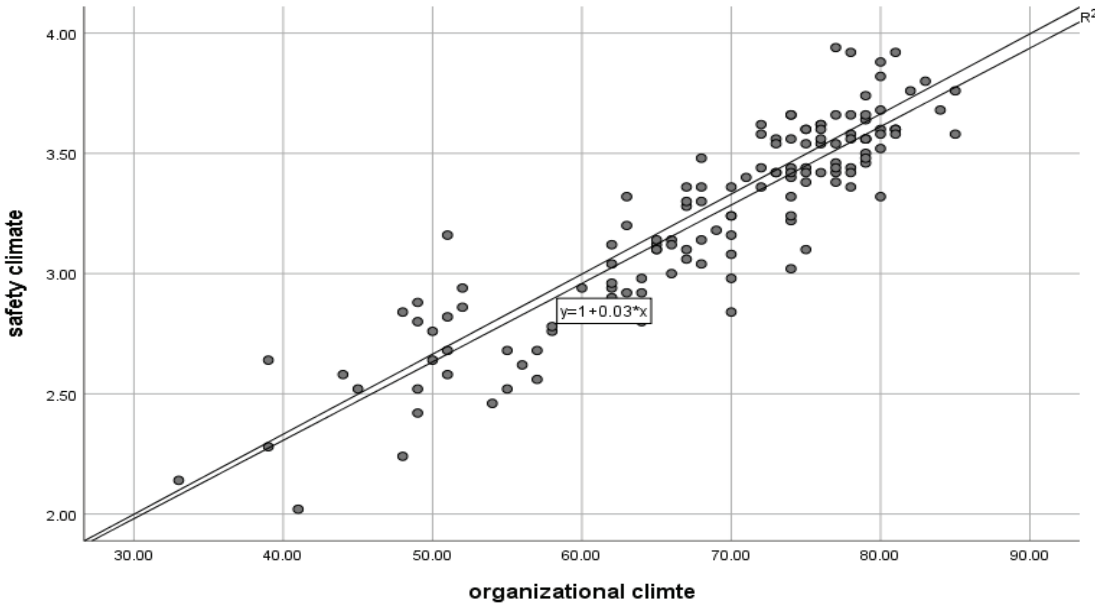

Fig1. Correlation between SC an

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Table 3 Correlation coefficients between OC and SC dimensions

variables	SC1	SC2	SC3	SC4	SC5	SC6	SC7	Total SC	OC1	OC2	OC3	OC4	OC5	Total OC
SC1	1													
SC2	0.779*	1												
SC3	0.756*	0.845*	1											
SC4	0.587*	0.625*	0.614*	1										
SC5	0.461*	0.498*	0.548*	0.491*	1									
SC6	0.423*	0.437*	0.336*	0.466*	0.309*	1								
SC7	0.609*	0.645*	0.63*	0.664*	0.457*	0.499*	1							
Total SC	0.867*	0.895*	0.888*	0.779*	0.63*	0.556*	0.804*	1						
OC1	0.571*	0.679*	0.628*	0.465*	0.381*	0.235*	0.547*	0.656*	1					
OC2	0.921*	0.755*	0.727*	0.555*	0.415*	0.454*	0.63*	0.839*	0.546*	1				
OC3	0.768*	0.863*	0.745*	0.572*	0.506*	0.402*	0.541*	0.807*	0.563*	0.679*	1			
OC4	0.759*	0.951*	0.824*	0.582*	0.431*	0.417*	0.68*	0.868*	0.699*	0.762*	0.715*	1		
OC5	0.5*	0.507*	0.534*	0.376*	0.389*	0.396*	0.355*	0.522*	0.485*	0.476*	0.485*	0.481*	1	
Total OC	0.844*	0.91*	0.83*	0.615*	0.5*	0.426*	0.662*	0.892*	0.804*	0.829*	0.803[8]	0.895*	0.705*	1

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DISCUSSION

Human resources are one of the main organization evolvement factors in which the role of OC in improving the human performance of individuals is undeniable. On the other hand, the more organizational employees are in line with organizational practices, the more motivated they will be to participate in organizational affairs [6-8]. The importance of management practices and workplace climates in organizations can be seen in the occurrence of major events such as Piper Alpha and Chernobyl [21].

It can be said that organizational climate may be affected by peoples' motivation and reinforced by job satisfaction, stimulation, collaboration, and job interest. On the contrary, a low level of motivation results in job dissatisfaction, frustration, and depression [14]. SC evaluation provides a useful measurement tool for the assessment of the safety programs, safety status in the workplaces. It is worth noting that the assessment of safety status by evaluating SC compensates may minimize many of the limitations of the traditional indices of safety measurement [22].

The primary purpose of the present study was to investigate the association between OC and SC in a manufacturing industry. Investigating OC and SC association with demographic characteristics was another purpose of the current study. The internal interactions between OC and SC dimensions also were investigated. The majority of previous studies investigated the association among SC, safety behavior, safety leadership, safety performance and etc. [1-23-25] but until now, less attention has been paid to the effectiveness and interactions of OC and SC dimensions in the working environment.

This study provides valuable evidence about the association between general and specific forms of organizational climates (SC). The results of the present study showed that SC is closely associated with OC. This may indicate the impact of OC on SC and the probable indirect impact of the general OC on safety outcomes. The results of a study conducted by Neal et al. showed OC as a predictor of SC which was in line with the results of the present study [10]. Meanwhile, designing and implementation of recuperative interventions may improve the general OC and SC.

According to the results of this study, dimensions of OC and SC were significantly associated. This finding may indicate the importance of the mutual association between the dimensions of SC and OC. This means that weakness or strength in one dimension of each climate may have a positive or negative effect on the dimensions of the other one.

No significant association was found between OC and SC with work experience. The results of a study conducted by Seyyedmoharrami et al. showed no association as well [17]. The study conducted by Oah et al. also found no significant association between SC and work experience [24]. Despite the differences in study environments, it may be indicated that work experience may not significantly associate with employees' perception of SC.

Although the literature indicates that individuals with a history of occupational accidents feel less safe in the workplaces and report a weaker safety climate [1], the findings of the present study showed no significant association between OC and SC of individuals with or without having a history of occupational accidents exists. The results of a study conducted in one shipbuilding industry showed a significant association between having occupational accident history and some dimensions of SC [26]. However, other studies in some manufacturing industries represent no significant association between SC and history of having an occupational accident [24].

Another important finding of the present study is the different level of OC and SC perception among employees of different working departments despite their presence and activities in the same organization. This may be rooted in differences in knowledge and safety motivation of individuals [10]. Different management styles in different working departments may affect employees' perception of the OC and SC.

The results of the present study also showed an association between OC and employment status that is not consistent with the results of a study conducted in one official setting [17]. This may indicate the importance of the type of employment on the perception of OC in industrial work environments compared to official work environments. While there

was no significant association between SC and employment status. It can be concluded that employment status may have no impact on the perception of SC of employees.

Findings of a study conducted by Kim et al. showed a significant association between safety climate and employment status [26]. This difference might be attributed to the differences in the type of industry where the present study was conducted.

CONCLUSION

Despite the limitations, the results of the present study represent a significant impact of OC on the perception of workers' SC in working environment. It seems that a high work practices quality and dimensions related to OC may improve SC and safety performance. Finally, it can be said that the findings of the current study can be used as a guideline to investigate the latent mechanisms affecting safety practices in diverse workplaces.

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CONFLICT OF INTEREST

The authors declare that there is no conflict of interest.

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