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Creating Safer Workplaces: Predictive Power of Incidents Reporting Rate and Its Dimensions by Safety Climate

MOHAMMAD REZA KHODABAKHSH[1], FARIBA KIANI[2*], and EHSAN KIANI[3]

[1]Young Researchers and Elite Club, Mashhad Branch, Islamic Azad University, Mashhad, Iran; [2]Young Researchers and Elite Club, Shahrekord Branch, Islamic Azad University, Shahrekord, Iran; [3]Department of Mechanical Engineering, Shakrekord University, Shahrekord, Iran.

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ABSTRACT

Safety climate received substantial attention due to its potential for explaining variation in safety-related outcomes. Aim of present study was to determine degree of safety climate related to incidents reporting rate and its dimensions among workers' Isfahan Steel Company. A self-administered anonymous was distributed to 189 workers. The survey included demographic factors, incidents reporting rate and its components (physical symptoms, psychological symptoms and accidents) and the safety climate Questionnaire. The data were analyzed by multivariate (MANOVA) and correlation techniques. The results showed that: 1) there was internal significant correlation between safety climate with incident reporting rate as well as with its two components namely physical symptoms and psychological symptoms; 2) there wasn't a significant relationship between safety climate and accident; 2) In multivariate analysis, safety climate respectively about 6%, 7% and 11% of the variance of variables of incidents reporting rate, physical and psychological symptoms significantly predicted (p<0.05). The results of this study suggest that promoting the perception of safety climate can be important to prevent the development of work-related diseases and to promote workers health.

Keywords: *Safety climate, Incident, Physical symptoms, Psychological symptoms*

INTRODUCTION

People working in the steel industry have been identified as having higher frequencies of occupational health problems, including musculoskeletal problems, than the total workforce. As a high risk industry, there is a need to investigate factors that affect the occurrence of these accidents to be able to protect workers [1]. Occupational accidents are considered as one of the most important factors for disable and absenteeism workers. Since 1970 until now, the world's increasing efforts to prevent occupational accidents have performed, but yet rate of occupational accidents is high. Each year, almost 250 million occupational accidents are reported causing to injuring 160 million workers [2]. Traditional methods to secure employees' safety have concentrated on the physical and biomechanical aspects of work by improving machines, equipment and task completion manners [3]. However, it is believed that dimensions of psychosocial work environment such as safety climate as experienced by workers are related to depressive symptoms and poor health [4]. There are many studies that show safety

* **Corresponding author:** Fariba Kiani, E-mail: fariba.kiani64@yahoo.com

climate is considered as strong predictor to control the occupational accidents. It is related to many problems such as occupational disease, musculoskeletal disorders and other health outcomes in work environment [5]. Many researchers observed significant relationship between the incidents and safety climate [6].

Safety climate received considerable attention due to its potential for explaining variation in safety-related outcomes [4]. Safety climate is defined here as ''employees' perceptions in relation to safety policies, procedures, and practices'' (following Zohar [7]). Policies and procedures are the guidelines established to certify safe behavior, and practices are the process of the implementation of the policies and procedures as well as workers' perceptions of the relative importance of safe behavior at workplace [8]. The previous researches indicated that a positive safety climate is a critical part of a safe workplace. In brief, safety climate is a theoretical term concentrating more on the perception of behaviors than on the behaviors themselves [9]. Safety climate reflect the extent to which workers believe that their individuals' safety and health are valued within the organization and reflect the relative stress that employees believe is placed on safety vs. productivity [8, 10, 11].

There is increasing evidence of safety climate as an antecedent of safety performance [12]. Safety climate would be related to employees' perceptions of injury risk and job safety [13, 14]. Management acts and behaviors are an important area for intervention in improving safety climate [15]. A positive safety climate, shaped by supervisors' commitment and sight to safety, is related to improve communications about safety and human errors [16]. The psychosocial environment is broadly recognized to affect workers' well-being [17]. The positive relationships between dimensions of general work climate and safety climate have received empirical support [18]. Psychosocial conditions are related to safety performance [19-20]. However, the relationship between safety climate and occupational incidents reporting has not been studied adequately. Previous studies have been mainly focused on particular jobs [21-25], and no attempt has been made to describe the association between safety climate and occupational incidents among Steel industry workers. Also, less research has simultaneously focused on dimensions of occupational incidents namely physical symptoms, psychological symptoms and accidents.

In this study, we examined degrees of safety climate in associattion with incidents reporting rate and its dimensions by distributing a self-administered questionnaire to workers in various departments of Isfahan Steel Company, Iran.

MATERIALS AND METHODS

Participants

In this descriptive-correlation study, workers (n=200) from Isfahan Steel Company, in 2012, selected by stratified random sampling method as research sample, provided written informed consent to complete a self-administered anonymous questionnaire. Totally, 189 (92%) workers returned the questionnaire.

Measurements

After translation of questionnaires of safety climate and incident reporting rate, the original English along with Persian versions were presented to three cases of faculty members of Psychology Department and 4 individuals of Safety and Mental Health professionals; thus, about 22 versions of each scale were represented to sample of workers and were asked to opine about their questions and their reliability. After studying preliminary opinion, the final scales were developed and were individually presented to workers. The following questionnaire was used**:**

Demographic factors

Five demographic factors, namely age, gender, marital status, education, and years of working experience, were included. Marital status was classified as married or not married (including divorced and widowed).

Safety climate

Workers' perceptions of safety climate were measured with the 50-item workplace safety scale (WSS) developed by Hayes, Perander, Smecko, et al. [26]. This instrument assesses employees' perceptions of work safety and measures five distinct constructs of safety climate, each with 10 items: (a) job safety perception (sample item: "Safety programs are effective"; $\alpha = 0.88$), (b) coworker safety perception (sample item: "Pay attention to safety rules"; $\alpha = 0.77$), (c) supervisor safety perception (sample item: "Enforces safety rules"; $\alpha = 0.91$), (d) safety management perception (sample item: "Responds to safety concern"; $\alpha = 0.89$), (e) safety programs and policies perception (sample item: "Effective in reducing injuries"; $\alpha = 0.81$). The total coefficient α score was .91. Participants responded on a 5-point scale ranging from 1-strongly disagree to 5-strongly disagree. Past research has shown this questionnaire to have good psychometric properties [28].

Incident reporting rate

This questionnaire is a tool for collecting data about reporting incidents rate of Barling, Loughlin, Kelloway [29] and includes three components: (a) physical symptoms (sample item: "In the last months, how frequently have you experienced headache or dizziness on the job?"; $\alpha = .81$), (b) psychological symptoms (sample item: "In the last months, how frequently have you experienced been unable to concentrate on work related tasks?"; $\alpha = 0.79$) and (c) accident (sample item: "In the last months, how frequently have you experienced slipped, tripped or fell on the same level?"; $\alpha = 0.72$). The total coefficient α score was .80. This

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Table1. Mean, standard deviation, and internal correlation between variables (n =189).

			Correlations				
Variable	**M**	**SD**	**1**	**2**	**3**	**4**	**5**
Safety climate	61.31	7.67	1				
Incident reporting rate	43.26	11.07	-0.25*	1			
Physical symptoms	16.93	5.02	-0.27*	0/88**	1		
Psychological symptoms	11.10	4.33	-0.33**	0.77**	0.56**	1	
Accident	15.22	4.31	-0.01	0.76**	0.55**	0.32**	1

*p<0.05, **p<0.01

Table 2. Multivariate analysis (MANVOA) of the predictor variable of safety climate based on the criterion variables of incidents reporting rate, physical symptoms, psychological symptoms and accident.

Source	Effect	Value	F	Df	Error df	Sig.	Partial Eta Squared	Observed power
Safety climate	Pillai's Trace	0.14	4.3	3	185	0.007	0.15	0.85
	Wilk's Lambda	0.85	4.3	3	185	0.007	0.15	0.85
	Hotelling's Trace	0.17	4.3	3	185	0.007	0.15	0.85
	Roy's Largest Root	0.17	4.3	3	185	0.007	0.15	0.85

Table 3. Univariate analysis of variance on scores of incidents reporting rates, physical and psychological symptoms according to predictive variable of safety climate.

Source	Dependent variable	Sum of Squares	df	Mean square	F	Sig.	Partial Eta Squared	Observed power
Safety climate	Incident reporting rate	630.56	1	630.56	5.43	0.022	0.065	0.73
	Physical symptoms	145.52	1	145.52	6.13	0.015	0.073	0.78
	Psychological symptoms	157.43	1	157.43	9.25	0.003	0.11	0.85
	Accident	0.25	1	0.25	0.01	0.91	0.01	0.05

questionnaire has high internal reliability (α Cronbach = 80% to 70%) and also a good validity [27]. Scoring is based on a Likert scale of four degrees from 1 (never) to 5 (more of 5 times).

RESULTS

Part I: Demographic characteristics of participants

Almost the majority of participants were male because the main occupational groups were at production line. Ages ranged from 18 to 53 yr; the mean age of the participants was 39 yr (SD= 5.58 yr). Sixty two percent of the participants were high school graduates, 38% were university graduates. Eighty eight percent were married and 12% were unmarried. Almost half of the participants (42%) had been employed for more than 16 years, 28% were employed between 6 to 15 yr and 30 percent were employed for less than 6 years.

Part II: Descriptive statistics

Means, standard deviation and internal correlations of variables under study are presented in Table 1.

As can be seen the relationship between safety climate with incident reporting rate and with whose two dimensions namely physical symptoms and psychological symptoms was significant (p<0.05). There was not a significant relationship between safety climate and accidents.

Part III: Multivariate Analysis

To assess predictive power incidents reporting rate and its dimensions by safety climate were used of the canonical correlation method that is performed with multivariate analysis. The results are presented in Table 2.

As in Table 2 is observed, safety climate variable predict almost 15% of variance of incidents reporting rate and its dimensions (p<0.01). Univariate analysis of variance on the criterion variables considering predictor variable of safety climate is presented in Table 3.

As can be seen safety climate variable respectively about 6%, 7% and 11% of the variance of variables of incidents reporting rate, physical symptoms and psychological symptoms significantly predicted (p<0.05). Also, safety climate about 1% of the variance of accident predicted but these effects was not

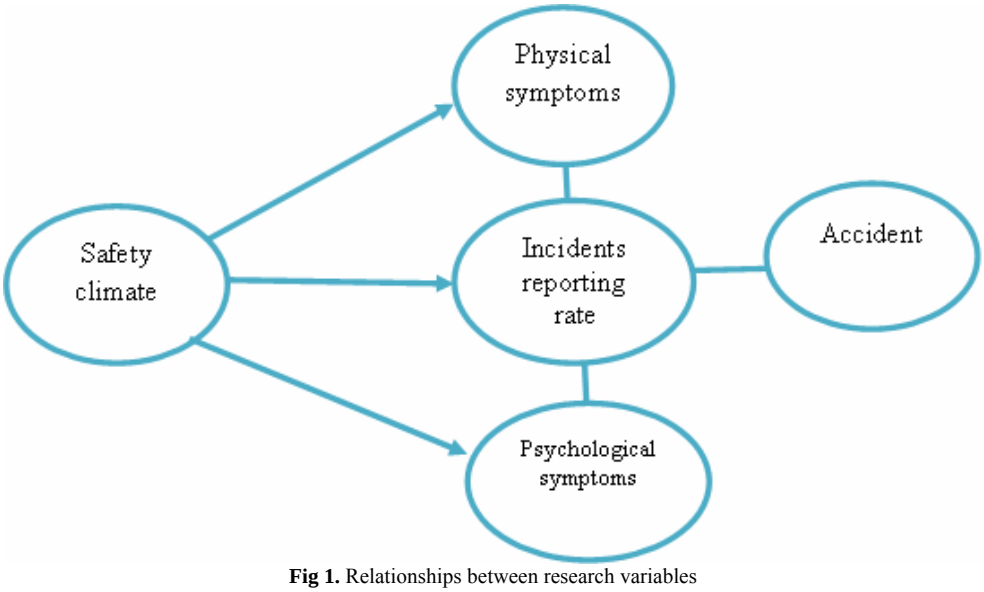

Fig 1. Relationships between research variables

statistically significant. Relations between variables of this study are shown in Fig. 1.

DISCUSSION

During the past few decades, several researchers have attempted to show the effects of safety climate on workers' occupational safety behaviors and work injuries across a range of industrial settings [18, 30-32], for example, construction [33], manufacturing [34], energy [35], airports [36], road administration [36] and health care services [37]. Therefore, this need feel that these relationships be investigate in other industrials.

The current study clarified the associations of perceived safety climate with incidents reporting rated and its dimensions among workers' Isfahan Steel Company. The results indicated that incidents reporting rate and its two dimensions that are physical and psychological symptoms were negatively related to safety climate. In addition, no significant association was observed between safety climate and accidents. Safety climate significantly predicted about 6%, 7% and 11% of the variance of variables of incidents reporting rate, physical and psychological symptoms. These results are consistent with the findings of the previous studies [38-40]. For example, Mortazavi et al. [38], concluded that the perception of safety climate factors can be the causes of occupational accidents and diseases. Safety climate assessment can be a proactive safety performance indicator and can be used to improve the level of safety in organizations [40]. Safety climate within groups predict subsequent changes in individual safety motivation and safety motivation associated with subsequent changes in self-reported safety performance [41]. Safety climate (safety attitudes and communication) predict occupation injuries [42]. Lu and Tsai [43] reached to a positive association between safety climate and safety behavior. These results can be interpreted on the basis of the following possibilities.

First, in identifying workplace factors that lead to injuries in workplace, recent studies have highlighted safety climate as a leading indicator of safe behaviors and accidents [41-42]. Neal and Griffin [41] define safety climate as employee perceptions of the policies, procedures and actions relating to safety in the work environment. Safety climate is believed to shape employees' behavior through the expectations they form about how organizations value and reward safety behaviors and actions [8]. Safety climate can be conceptualized as a higher order or fundamental factor involving perceptions of work environment safety-related attributes and the relative priority of safety with other competing goals (such as productivity and speed) [8, 10]. So, employees do not spend all time for doing faster their jobs and do their work with more patience. On the other hand, employees with the perception of work pressure have more job stress and want to do their work rapidly; therefore, at the time of working with organization machinery and perhaps even at the time of their passing involve in more accidents. The perception of employees about the company philosophy and its supervisor of production or safety, after the organization's policy towards safety, was the second important factor in predicting safety performance [35].

Second, workers with negative perceptions of safety climate (e.g. high workload, work pressure) tend to engage in unsafe behaviors, which in turn increases their susceptibility to accidents [44-45]. Employees spend all their times for doing faster their jobs and do their work with less patience. Therefore, at the time of working with organization machinery and perhaps even

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at the time of their passing involve in more accidents. The perception of employees about the company philosophy and its supervisor of production or safety, after the organization's policy towards safety, was the second important factor in predicting safety performance [46-47].

Third, Kirkcaldy et al. [48] showed that the safety climate in an organization is effective in reducing the destructive effects of stress in incidence of accidents. The theory of demand-control (DC) describes occupational stress as developing from the structural or organizational aspects of the work environment and not the individual characteristics [49]. A part of this theory is interaction between the job demands which is put on the employee and the management to coordinate those demands [50]. Employees involved in low control, high demands and low support positions, are in a higher danger of bodily and psychological harm from occupational stress [51]. As was noted, in the current research, the questionnaire of safety climate was consisted of five components: job safety perception, supervisor safety perception, coworker safety perception, management safety perception, safety program and policies perception [26]. Therefore, the components of safety climate can be related with providing resources for managing job demands. Strong safety climate can providing support from peers and managers (support) by changing workers' perceptions of coworker, supervisor and management safety actions, safety program and policies; and the employees' perception of work demands would decrease (demand) by changing the perceptions of job safety.

Fourth, one aspect of organizational behavior that is very likely to have an influence on workers' perceptions on organizational safety and in turn influence safe work behaviors is the extent to which workers perceive their organizations as being supportive and caring [48]. A strong, positive safety climate is created when management, coworkers, and job tasks consistently encourage employees to carry out their jobs safely. A positive safety climate is an important part of a safe work environment [49]. Furthermore, research suggests that a positive safety climate, shaped by supervisors' positive interactions with employees and their committed and constructive approach to dealing with safety-related issues is related to improved communications about safety issues [8, 16]. The supervisor support is a resource that reduce perceive of stressor in the workplace. Indeed supervisor support combination of assistance and expression sensational support by the supervisor to enhance the well being in employee. Supervisor support provides a psychological and physical resource that influences the psychological state of employee. Supervisors the pivotal role in the provision of work setting supports. Level of burnout is reduced, if worker feel able to negotiate about work problems with supervisor [52]. Fako [53] resulted that a successful accommodation and confrontation with the job demands removes the tangible effects of occupational stress on individuals. Probst and Estrada [54] concluded that under-reporting incidents were higher in working environments with poorer organizational safety climate or where supervisor safety enforcement was inconsistent.

Khodabandeh et al. [55] concluded that there has been no change for the improvement of safety climate in organizations. Educational interventions can be improved employees' safety and common perceptions of workplace safety policies and climate [56]. Kakaei et al. [57] showed that human errors were the main factors of the occupational accidents, therefore, the educational courses and planning actions for improving safety are essential and helpful to promote safety cultures and climates and to prevent the occupational accidents.

The result of current study supports the use of safety climate measures as useful diagnostic tools in ascertaining workers' perceptions of the way that safety is being operationalized.

About the existence of weak relationship between safety climate and accident can be said that in order to establish this relationship also should be other conditions such as high-risk environments, unsafe equipment and machines, weak organizational support, risk taking, etc.

The findings of this research emphasize the importance of safety climate in predicting psychological distresses, occupational incidents and coping with them. Safety intervention needs to focus on improving safety climate in organizations, as well as on the preventive coping methods against occupational incidents. Zacharatos et al. [47] showed that employees who conceive that their organization uses high commitment work actions, such as training and teamwork, reported higher levels of safety climate and fewer incidents in workplace. Recent researches suggest that management behaviors are a vital area for safety interventions in improving safety climate in organizations [8]. Helping managers to construct strong policies, practices and procedures to prevent occupational stress will improve safety climate [58].

The practical implications are best perceived in terms of amelioration of occupational stress. Improving safety climate as a reliable safety index, along the aspects described in the introduction, may decrease the health detrimental effects of job demands via the improved uptake of emotional resources by workers.

CONCLUSION

Improving safety climate in organizations can be useful in decreasing occupational accident rate and physical and psychological health of employees. Improving safety climate on the basis of an understanding of safety performance factors and to lead more employees to join safety activities and follow

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safety rules and regulations. It is recommended that the future research examines the effects of safety interventions to improve safety climate. The present study needs to be replicated in different populations and needs more empirical support. Till then, the findings of the study should be interpreted with caution. Further, the cross-sectional design of the study and participants (i.e., a group of employee) exert some limitations on the generalization of the findings. Finally, the problems and limitations on the use of self-repotting instruments should not be overlooked.

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