Sosyoekonomi

2023, Vol. 31(55), 37-48

RESEARCH ARTICLE

ISSN: 1305-5577
DOI: 10.17233/sosyoekonomi.2023.01.02
Date Submitted: 08.09.2021
Date Revised: 15.09.2022
Date Accepted: 24.10.2022

The Relationship Between Safety Climate and Safety Performance Indicators: A Field Study

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Güvenlik İklimi ve Güvenlik Performansı Göstergeleri Arasındaki İlişki: Bir Alan Araştırması

Abstract

In recent years, there has been an increased interest in studying the importance of human factors in occupational accidents. This study examines the relationship between safety climate and performance indicators. The study sample consists of 195 employees working in a manufacturing company. The analysis revealed a statistically significant positive relationship between the safety climate and safety behaviours, one of the safety performance indicators. This study's results can guide relevant parties in increasing employees' safety awareness, creating a safe working environment, and preventing occupational accidents.

Keywords : Occupational Accidents, Safety Climate, Safety Performance, Safety Behaviour.

JEL Classification Codes : J28, D23, I12.

Öz

Son yıllarda iş kazalarında insan faktörünün öneminin araştırılmasına ilgi artmıştır. Bu çalışma güvenlik iklimi ile güvenlik performansı göstergeleri arasındaki ilişkiyi incelemeyi amaçlamaktadır. Araştırmanın örneklemini bir imalat firmasındaki 195 çalışan oluşturmaktadır. Yapılan analizler sonucunda güvenlik iklimi ile güvenlik performansı göstergelerinden biri olan güvenlik davranışı arasında istatiksel olarak anlamlı pozitif bir ilişki tespit edilmiştir. Bu çalışmada elde edilen sonuçlar çalışanların güvenlik bilincinin artırılması, güvenli bir çalışma ortamının oluşturulması ve iş kazalarının önlenmesi konusunda ilgili taraflara rehberlik edebilir.

Anahtar Sözcükler : İş Kazaları, Güvenlik İklimi, Güvenlik Performansı, Güvenlik Davranışı.

1. Introduction

Occupational accidents are one of the most significant problems in today's workplaces. According to the International Labor Organization (ILO), approximately 2.3 million people worldwide die yearly from occupational accidents and diseases. In addition, 340 million people have occupational accidents annually, and 160 million are exposed to negative consequences of occupational diseases (ILO, 2020).

Over many years, workplaces in Turkey have made some progress in solving the problem of occupational accidents, but much improvement is still needed. Approximately 142,469 people died from occupational accidents and diseases between 1946 and 2005 (Yardım et al., 2007). Looking at more up-to-date statistics published by the Social Security Institution (SGK) in Turkey, 13,876 employees lost their lives to occupational accidents between 2009 and 2018; 422,453 occupational accidents occurred in 2019, and 1,147 people died in these accidents (SGK, 2020).

Research focuses on the causes of occupational accidents due to their high number around the world; studies categorise these causes as follows: unsafe environment (an item left out in the open haphazardly, slippery floor, lack of protective devices on machines, etc.) and unsafe behaviour (failure to comply with safety rules, failure to use personal protective equipment, etc.) (Bilir, 2016). Although study results vary, 88% of occupational accidents are caused by unsafe behaviours of employees, 10% by unsafe environments, and 2% by unexpected reasons (Seo, 2005).

These rates show that employees' unsafe behaviours play an important role in occupational accidents. Therefore, studies focus on issues impacting employees' unsafe behaviours (Dodoo & Al-Samarraie, 2019). The concept of safety climate, in which the first empirical studies were conducted in the 1980s (Zohar, 1980), is one of the key concepts associated with the safe behaviour of employees and work accidents.

Recently, there has been an increasing interest in studies examining the relationship between safety climate and occupational safety outcomes in Turkey. In these studies, it is seen that the relationship between safety climate and a single performance criterion such as safe behaviour is generally examined (Yücebilgiç, 2007; Sadullah & Kanten, 2009; Yorulmaz et al., 2016; Ören & Er, 2016). In this sense, a methodologically important contribution of the current research is using two different safety performance criteria: safe behaviour and employee-reported near misses and work accidents.

This study examines the relationship between safety climate and performance indicators. It will contribute to the limited literature on this subject in Turkey and guide further studies to aid in preventing occupational accidents.

2. Theoretical Framework and Hypotheses

Safety climate is generally considered an important organisational factor in ensuring safety within an organisation. Zohar (1980), who pioneered empirical studies on safety climate, defines it as "a summary of molar [holistic-basic] perceptions that employees share about their work environments… [and] a frame of reference for guiding appropriate and adaptive task behaviours." According to another definition, safety climate refers to the perception of policies, procedures, and practices related to safety in a workplace (Neal & Griffin, 2000: 69). These shared perceptions derive from several factors, including organisational safety norms and expectations; management decision-making; and safety practices, policies, and procedures, which together serve to convey an organisational commitment to safety (Hahn & Murphy, 2008).

Various tools are used to measure employees' perceptions of occupational safety, including two scales to measure safety climate: scales with one dimension and scales with more than one dimension. For example, Garcia et al. (2004), Dejoy et al. (2004), and Probst & Estrada (2010) evaluate safety climate using scales with one single dimension, whereas Neal et al. (2000), Cooper & Philips (2004), Evans et al. (2005), Wu et al. (2008), Yule et al. (2007), Vinodkumar & Bhasi (2008), and Zhu et al. (2010) evaluate safety climate using scales with more than one dimension.

Safety performance, another concept discussed in this study, is considered a subset of organisational performance (Wu et al., 2008). Generally, safety performance is defined as "actions or behaviours that individuals exhibit in almost all jobs to promote the health and safety of workers, clients, the public, and the environment" (Burke et al., 2002). Safety performance measurement is one of the basic components of an occupational health and safety management system. This measurement helps organisations achieve their occupational health and safety objectives and allows them to determine which departments or employees perform by occupational health and safety rules and identify and improve existing problem areas (Lingard et al., 2011). Various indicators are used to measure safety performance (Yule, 2003):

- Company accident statistics that allow a comparison of companies with low and high accident rates,
- Near-miss incidents and accidents reported by employees,
- Safety behaviours reported by employees,
- Determination of an employee's safety performance rate by a manager or an expert.

Studies on the relationship between safety climate and safety performance reveal that positive or negative safety climate perception affects safety performance. Results of these studies suggest that there is a positive relationship between safety climate and safety behaviours (Neal et al., 2000; Neal & Griffin, 2000; Garcia et al., 2004; Cooper & Philips, 2004; Wu et al., 2008; Zhu et al., 2010; Lu & Yang, 2011; Kundu et al., 2015; Froko &

Umar, 2015; Jusoh & Panatik, 2016; Al-Zubaidi & İmamoğlu, 2017; Hosny et al., 2017; Boshoff et al., 2017; Lyu et al., 2018; Lee et al., 2019; Changquan et al., 2020; Elmoujaddidi & Bachir, 2020; Saedi & Majid, 2020; Yücebilgiç, 2007; Sadullah & Kanten, 2009; Yorulmaz et al., 2016; Ören & Er, 2016). In addition, some studies have reported a significant relationship between safety climate and exposure to occupational accidents or near-miss incidents (Williamson et al., 1997; Evans et al., 2005; Hahn & Murphy, 2008; Vinodkumar & Bhasi, 2008; Karadal & Merdan, 2017).

The main hypotheses of this study are established as follows:

H_1: There is a significant relationship between safety climate and exposure to occupational accidents.

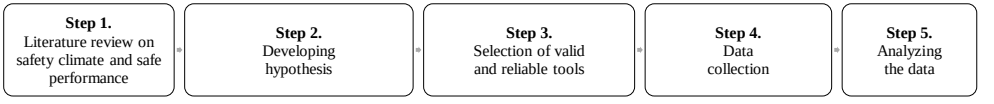
H_2: A significant relationship exists between safety climate and exposure to near-miss incidents.

H_3: A significant relationship exists between safety climate and employees' safety behaviours.

3. Research Methodology

Under this heading is information about the research sample, data collection tools and data analysis. The steps followed in the research are shown in Figure 1.

Figure: 1
Methodological Steps



Before starting the research, the relationships between safety climate and safety performance were examined. In the second step, hypotheses were developed using the research results in the literature. In the third stage of the research, valid and reliable measurement tools used in the relevant literature were examined, and a questionnaire was developed. Data collection in a determined business was completed in the following research stage. The data were analysed and reported in the last stage of the research.

3.1. Research Sample

This study, which was conducted to measure the relationship between safety climate and safety performance, was carried out in a manufacturing company in Trabzon, Turkey. The study sample consists of blue-collar employees in two different factories of this company. A total of 299 employees, including 14 white-collar and 285 blue-collar, are

employed in the company. The questionnaire used in this study was administered in line with the purposive sampling method during one-on-one interviews with blue-collar employees during working hours in the fourth week of October 2018 and the first week of November 2018. An occupational safety expert from the company accompanied the researcher during the administration of the questionnaire. The purpose and importance of the questionnaire were explained to each employee, whereby they were informed that the questionnaire was not about the company and would be used for scientific research. The questionnaire was applied to 195 blue-collar participants, excluding the cafeteria and security staff. The return rate for the questionnaires was 100%. Four questionnaires were not evaluated and were excluded from the study because they contained missing data. The evaluations and analyses were carried out using a total of 191 questionnaires.

3.2. Data Collection Tools

The survey method was used to collect data within the scope of the study. The first part of the questionnaire asks for personal information, including demographic questions about the employee's age, gender, marital status, education level, working years, and working unit.

The safety climate scale, which was developed by Lingard et al. (2009), adapted into Turkish by Türen et al. (2014), and consists of 14 questions and two dimensions (management perspective and rules; co-workers and safety training), was used to measure the employee's perception of safety climate. The management perspective and rules dimension consist of 10 items to measure management's opinions about occupational safety and employees' perceptions regarding occupational safety rules in the organisation (sample item: "Sufficient resources are available for health and safety here"). The co-workers and safety training dimension consist of 4 items to measure the employee's perceptions of their co-workers' ideas about occupational safety and occupational safety training (sample item: "It is important for me to work safely if I want to be respected by others on my team"). This is a 5-point Likert-type scale (1: strongly disagree; 5: absolutely agree). As the scores obtained from the scale increase, the perception of the safety climate increases.

This study used two tools to measure safety performance:

1. Exposure to occupational accidents and near-miss incidents: The participants were asked whether they had had an occupational accident or experienced a near-miss incident during work. The response to this question included only "yes" or "no" options.

2. Safety Behaviour Scale: This scale was developed by Neal et al. (2000) and adapted into Turkish by Dursun (2012). It includes questions to evaluate the safety behaviours of employees. The scale consists of 6 questions in total and has two different dimensions: safety compliance and safety participation (sample item: "I use all necessary safety equipment while I do my job"). This is a 5-point Likert-type scale. A higher scale score indicates a safer behaviour level.

3.3. Data Analysis

The data were analysed using the Statistical Product and Service Solutions (SPSS) 16.0 program. Before analysing the data, the normal distribution of the data was examined to decide on analysis techniques. This study used skewness and kurtosis values to determine whether the data were distributed normally. Hair et al. (2014) assume that if the skewness and kurtosis values are between -1 and +1, the data are normally distributed.

In the normality analysis, the skewness and kurtosis values were divided by the standard errors of skewness and kurtosis, and the data were found to be not normally distributed. Therefore, non-parametric Mann-Whitney U and Spearman Correlation analyses were used to evaluate the data.

4. Results

Table 1 presents the employees' demographic characteristics, including gender, marital status, age, education level, working year, and working unit.

Table: 1
Demographic Characteristics of the Participants

Variable	Category	N	%	Variable	Category	N	%
Gender	Male	191	100	Working years	0-5 years	118	62.8
	Female	0	0		6-10 years	46	24.5
Marital status	Married	128	67.0		11 years and above	24	12.7
	Single	63	33.0	Working unit	Injection	30	16.0
Age	18-30 years	63	33.2		Cutting	10	5.3
	31-44 years	94	49.5		Machine	27	14.4
	45 years and above	33	17.3		Assembly	40	21.3
Education level	Literate	3	1.6		Packaging	39	20.7
	Primary school	103	53.9		Delivery	7	3.7
	High school	69	36.1		Strobe	26	13.8
	University	16	8.4		Other	9	4.8

All the employees are male; this may be because the manufacturing industry is generally prone to male employment due to its characteristic structure. In addition, 67% of the employees are married, and 33% are single. Regarding their education level, 1.6% of the employees are literate, 53.9% are primary school graduates, 36.1% are high school graduates, and 8.4% are university graduates; a significant portion has only a high school degree or below. The overall low level of education may be because people working in the manufacturing industry are usually blue-collar workers. The employees' ages range from 21 to 54, and their mean age is 35±8.12 years. The employees' working years vary between 1 and 15 years and the mean working years are 5±3.60 years. Finally, 16% of the participants work in injection, 5.3% in cutting, 14.4% in the machine, 21.3% in assembly, 20.7% in packaging, 3.7% in delivery, 13.8% in strobe, and 4.8% in other departments.

Table 2 shows the relationship between safety climate variables according to exposure to occupational accidents in any period of working life.

Table: 2
Difference between Participants' Safety Climate Perceptions and Exposure to Occupational Accidents

Scales	Occupational Accident								Mann-Whitney U	P
	Yes				No					
	N	Mean Rank	Mean	Sd	N	Mean Rank	Mean	Sd		
Management's perspective and rules	20	80.25	3.19	1.10	171	97.84	3.51	.96	1395.0	.178
Co-workers and safety training	20	93.60	3.58	1.11	171	96.25	3.61	1.05	1668.0	.857

Sd: Standard deviation.

Accordingly, employees who have not had an occupational accident have higher mean perceptions of safety climate in both dimensions than those who have had an occupational accident. However, the difference is not statistically significant ($p>0.05$).

Table 3 presents the relationship between safety climate perception and near-miss incidents, another safety performance variable discussed in this study.

Table: 3
Difference between Participants' Safety Climate Perception and Exposure to Near-miss Incidents

Scales	Near-miss Incidents								Mann- Whitney U	P
	Yes				No					
	N	Mean Rank	Mean	Sd	N	Mean Rank	Mean	Sd		
Management's perspective and rules	37	80.41	3.21	.94	154	99.75	3.54	.98	2272.0	.056
Co-workers and safety training	37	92.50	3.50	1.15	154	96.84	3.64	1.03	2719.5	.666

Sd: Standard deviation.

Accordingly, employees who have not had a near-miss incident have a higher mean perception of the safety climate in both dimensions than those who have had a near-miss incident. However, the difference is not statistically significant ($p>0.05$).

Table 4 shows the correlation analysis results regarding the relationship between safety climate and safety behaviour.

Table: 4
Results of Spearman Correlation Analysis between Safety Climate and Safe Behaviours of Employees

Scales	Management's Perspective and Rules	Co-workers and Safety Training	Safety Compliance	Safety Participation
Management's perspective and rules	1			
Co-workers and safety training	.715**	1		
Safety compliance	.643**	.695**	1	
Safety participation	.567**	.625**	.704**	1

** *p<0.01.*

Accordingly, safety compliance and participation significantly relate to safety climate dimensions. There is a moderate positive correlation between safety compliance, management's perspective and rules ($r = .643$), and co-workers and safety training ($r = .695$). There is also a moderate positive correlation between safety participation, management's perspective and rules ($r = .567$), and co-workers and safety training ($r = .625$).

5. Discussion

Today, tens of thousands of people die yearly from occupational accidents despite precautions and regulations. Therefore, it may be insufficient to consider occupational accidents only from a technical perspective or to deal with them within legal regulations, suggesting that the human factor should also be emphasised. Based on the impact of the human factor, safety climate -a concept expressed as the basic perceptions shared by employees about their workplace- is important in preventing occupational accidents.

This study examined the relationship between safety climate and safety performance indicators. Employees who did not have near-miss incidents or occupational accidents have higher mean scores in both safety climate dimensions than those who had a near-miss incident or occupational accident. Still, this difference is statistically insignificant ($p>0.05$). Williamson et al. (1997) examined the effect of safety climate on occupational accidents and perception of workplace danger. They determined significant differences in positive safety practices, risk justifications, and optimism levels among those who were exposed to occupational accidents and those who were not. They found no significant difference between them in terms of fatalism and personal motivation for safety.

As a result of the correlation analysis conducted to determine the relationship between the dimensions of safety climate and safety compliance, a significant positive relationship was found between safety compliance and both dimensions of safety climate ($p<0.01$). In their study with workers in the construction industry, Lyu et al. (2018) examined the effect of safety climate on employees' safety behaviours. They found a positive relationship between the perceptions of construction workers about safety climate and their safety compliance levels. In their study with hospital staff, Neal et al. (2000) concluded that safety climate directly affects employees' compliance with safety behaviours. These results are similar to those of other studies in the literature.

According to the correlation analysis results regarding the relationship between dimensions of safety climate and safety participation, there is a significant relationship between safety participation and both dimensions of safety climate ($p<0.01$). Froko & Umar (2015) found a significant relationship between the control practices dimension of safety climate and safety participation in their studies with mine workers. In addition, in their study with workers from the manufacturing and mining industries, Neal & Griffin (2000) have concluded that safety climate directly affects safety performance (safety compliance and safety participation).

6. Theoretical and Practical Implications

The current research examines the relationships between safety climate and safety performance. Studies in this area have examined the relationship between a safe climate and the safe behaviour of employees. Although safe behaviour is an important occupational safety performance criterion, it is seen that there are different performance criteria in the

measurement of safety performance (Yule, 2003). The current research contributes to the literature examining the relationship between safety climate and multiple performance criteria, such as safe behaviour and near-miss incidents and occupational accidents that employees are exposed to. As a result, the variables discussed in the research contribute to the theories to be developed in the field of occupational safety.

This research also has practical implications for occupational safety experts and occupational safety managers working in the sector. The results of the study show that the behaviours of the employees related to occupational safety are related to the safety climates of the organisations. In this sense, managers and experts need to improve the security climate of their institutions for employees to exhibit safer behaviours while doing their jobs. In addition, the research results have important implications for policymakers working in the field of occupational safety. To prevent social and economic losses caused by occupational accidents, it is seen that it is important to improve the perceptions of employees about occupational safety in studies to be carried out at the country or sector level.

7. Limitations and Future Research Directions

This study has some limitations. First, because the survey was conducted only in a company in the manufacturing sector, its results cannot be generalised to all industries. In addition, the study was conducted only in the province of Trabzon. It included only blue-collar workers, among whom there were no female participants. Moreover, only the study's survey method was used as a data collection tool. Another limitation is that only male employees participated in the survey. Including female participants in different studies will reveal gender differences in the perception of occupational safety. Finally, a vital research limitation is the correlation analysis between safe climate and safe behaviour only. While correlation analysis gives information about a relationship between variables, it does not show a cause-effect relationship between variables.

Researchers who want to study this subject in the future can obtain more detailed information by including people working in different provinces and sectors within the scope of their studies. They can form a sampling group by including both female and male employees. Similarly, they can obtain more effective results by increasing the sample size if they want to use the survey method. In addition, they can use qualitative methods such as interviews and focus group interviews as data collection tools and thus can address the subject from different angles.

8. Conclusion

Occupational accidents are one of the important problems of today's working life. As a result of work accidents, millions of employees lose their lives or become temporarily and permanently disabled, causing significant economic losses. The research results show that a safe climate is important in creating a healthy and safe working environment. These results indicate that it is important to develop the perceptions and attitudes of the employees in the

arrangements to be made to prevent occupational accidents. This is important to prevent significant human and economic losses that occupational accidents may cause.

Consequently, regulations, activities, and investments aimed at ensuring occupational health and safety within the organisation, rather than being considered a cost factor, should be deemed a process that will contribute to the realisation of organisational goals and objectives, increase profit margins in the long term, have a positive effect on the corporate reputation in front of the public, and increase the employees' organisational commitment, job satisfaction, and work performance.

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