DIFFERENCES IN SAFETY CULTURE AND SAFETY MOTIVATION AMONG DIFFERENT OCCUPATIONAL GROUPS

Sertaç TEMUR[1], Ahmet Ebrar SAKALLI[2], Hamdi Emre BAĞIRAN[3], Zeynep Feride OLCAY[4], Mehmet Ali BADEM[5]

Abstract

In Turkey, the rate of fatal accidents per 100 thousand workers has been recorded as approximately 11 people per 100 thousand employees. The safety culture created in the workplace plays a significant role at reducing these rates. Employees with safety motivation are observed to exhibit positive safety behaviors. The aim of this study is to examine the relationship between the behaviors and attitudes of individuals belonging to different occupational groups towards safety culture and safety motivation. In this study, the scale conducted by Fung was applied to occupational groups in different sectors. Turkish adaptation and validity studies were carried out for the scales. In addition, ANOVA test, parametric tests, independent sample t-test were used.

The results of analyses have shown that the safety climate scale has a four-factor structure, and the safety motivation has a single-factor structure. When the safety attitude of the management, organization-al commitment and communication factors are examined in terms of occupational groups and sectors, it has been observed that the academic sector has less organizational commitment and safety attitude than the other groups. However, when the analysis between occupational groups and sectors were examined, no significant difference was found within the scope of safety motivation.

In conclusion, the management or leaders who are involved in safety reduce the risk-taking rates of the employees. In addition, academicians and workers in the educational sector show less safety attitude and have less organizational commitment.

Keywords: Safety Culture, Safety Climate, Safety Motivation, Organizational Commitment
JEL Classification: JEL-I, JEL-L, JEL-M

FARKLI MESLEK GRUPLARI ARASINDA GÜVENLİK KÜLTÜRÜ VE GÜVENLİK MOTİVASYONU FARKLILIKLARI

Öz

Türkiye'de 100 bin çalışan başına düşen ölümlü kaza oranı yaklaşık 11 kişi olarak kaydedilmiştir. İşyerlerinde oluşturulan güvenlik kültürü, bu oranların düşürülmesinde önemli bir rol oynamaktadır. Güvenlik motivasyonuna sahip çalışanların olumlu güvenlik davranışları sergiledikleri gözlemlenmektedir. Bu çalışmanın amacı, farklı meslek gruplarına mensup bireylerin güvenlik kültürü ve güvenlik motivasyonuna yönelik tutum ve davranışları arasındaki ilişkiyi incelemektir. Bu çalışmada Fung tarafından yapılan ölçek farklı sektörlerdeki meslek gruplarına uygulanmıştır. Ölçekler için Türkçe uyarlama ve geçerlilik çalışmaları yapılmıştır. Ayrıca ANOVA testi, parametrik testler, bağımsız örneklem t testi kullanılmıştır.

Analiz sonuçları güvenlik iklimi ölçeğinin dört faktörlü, güvenlik motivasyonunun ise tek faktörlü bir yapıya sahip olduğunu göstermiştir. Yönetimin güvenlik tutumu, örgütsel bağlılık ve iletişim faktörleri meslek grupları ve sektörler açısından incelendiğinde akademik sektörün diğer gruplara göre daha az örgütsel bağlılığa ve güvenlik tutumuna sahip olduğu görülmüştür. Ancak meslek grupları ve sektörler arasındaki analizler incelendiğinde güvenlik motivasyonu kapsamında anlamlı bir fark bulunamamıştır.

---

[1] Asst. Prof., Uskudar University, Health Sciences Faculty, Occupational Health and Safety Department, sertac.temur@uskudar.edu.tr, ORCID: 0000-0003-4845-1452

[2] Asst. Prof., Istanbul Medipol University, Vocational School of Health Services, Occupational Health and Safety Department, ahmet.sakalli@medipol.edu.tr, ORCID: 0000-0003-0445-0722

[3] Asst. Prof., Istanbul Aydin University, Anadolu BIL Vocational School, Occupational Health and Safety Department emrebagiran@aydin.edu.tr, ORCID: 0000-0003-2395-9700

[4] Asst. Prof., Istanbul Aydin University, Anadolu BIL Vocational School, Occupational Health and Safety Department zeynepolcay@aydin.edu.tr, ORCID: 0000-0001-5720-7350

[5] Lecturer, Izmir Kavram Vocational School, Occupational Health and Safety Department, mehmet.badem@kavram.edu.tr, ORCID: 0000-0001-6205-925X

Sonuç olarak, güvenlikle ilgilenen yönetim veya liderler çalışanların risk alma oranlarını azaltmaktadır. Ayrıca, eğitim sektöründeki akademisyenler ve çalışanlar daha az güvenlik tutumu göstermekte ve daha az örgütsel bağlılığa sahip olmaktadır.

1. Introduction

Statistical records indicate that the incidence rate of fatal accidents per 100 thousand workers in European Union countries in 2017, is 2.25 (Eurostat, 2020). In Turkey, the rate of fatal accidents per 100 thousand workers has been recorded as approximately 11 people per 100 thousand employees (Olcay et al., 2021). The safety culture created in the workplaces plays a significant role at reducing these rates. Workplace accidents and injuries are associated with safety culture (Choudry et al., 2007). Employees must have sufficient safety awareness for the desired safety culture to be created in workplaces. To talk about the existence of a safety culture in workplaces, employees should have sufficient motivation. Employees with safety motivation are observed to exhibit positive safety behaviors (Hedlund et al. 2016). Studies show that safety motivation is positively related to safety performance, that is, safe behavior (Neal & Griffin, 2004).

Safety culture, safety performance and safety motivation have been investigated separately in many studies. It is aimed to investigate the relationship between these terms and to be led to research on safety culture in Turkish literature.

1.1. Safety culture

The safety culture mentioned in the report, which was first prepared after the nuclear disaster in Chernobyl, in 1986, is generally described as a concept that has a strong impact on workplace accidents and injuries (Abdullah et al., 2016). Safety culture is often associated with the way employees think or behave on issues related to safety. According to Cooper (2000), safety culture is a sub-dimension of organizational culture that is thought to affect the attitudes, and behaviors of members in relation to an organization's ongoing health and safety performance (Cooper, 2000). There are many definitions in the literature on the definition of safety culture (Cooper, 2000; Turner et al., 1989; Özkan & Lajunen, 2003; Guldenmund, 2000; Wiegmann et al., 2004). As the concept of culture, which forms the basis of safety culture, is an abstract concept by nature, it is difficult to provide a concise definition of the concept (Yule, 2003). In addition, the definition of safety culture, as put forward by researchers, attempts to address different dimensions. Many researchers' definitions of safety culture by addressing different

ARAŞTIRMA MAKALESİ

dimensions have also been effective in this. The main difference between safety and security, whilst safety focuses on events that happened unintentionally, security focuses on events that happened intentionally (Line et al., 2006).

In addition to the fact that safety culture is an abstract concept, sectoral differences in which safety culture studies are conducted can be considered as one of the leading reasons for the diversity in the definition. Although the concept of safety culture is handled in different dimensions in a variety of sectors, the most basic similarities that stand out in the definitions are as follows (Wiegmann et al., 2004).

Table 1. Safety Culture Definitions (Wiegmann et al., 2004)

A safety culture expresses the values shared among group and organization members at all levels.
Safety culture concerns management and control systems, as well as safety issues in an organization.
Safety culture is ensured by the participation of individuals at all levels of the organization.
The safety culture in organizations has an impact on the behavior of the employee in the work environment.
Safety culture often reflects the relationship between reward systems and safety performance.
Safety culture reflects voluntary behavior in organizations regarding learning and development, as a result of incidents, accidents and mishaps.
Safety culture is a durable, stable, and resistant concept.

Source: Wiegmann et al., 2004

In general, the beliefs, attitudes and values of the individuals who make up the organizations, as well as all the activities, audits, surveillance and policies applied towards attaining and fostering the safety culture within the organizations are the dimensions of the safety culture (Reason, 2000). Reason (1997) cited conscious culture, reporting culture, fair culture, flexible culture and learner culture as key elements of safety culture. These elements interact with one another to provide a conscious safety culture structure for the reduction of organizational accidents, and a safer work environment (Reason, 1997).

1.2. Safety Culture – Safety Performance (Behavior) Relationship

According to Reason (1998), it has been argued that culture reaches all parts of the organizational system equally, and it exerts a consistent effect. Therefore, it could be claimed that it is more effective at improving safety performance than improved supervision or stricter procedures (Parker, 2006). When employees feel that their personal safety is taken seriously by the management, they are more willing to cooperate in order to improve safety performance (Choudry et al., 2007). This situation explains the direct effect of safety culture values on general safety behaviors (Clarke, 2000; Fung et al., 2005). Therefore, it can be said that safety performance emerges only when there is an adequate safety culture (Saad, 2016). According to Patankar and Sabin (2010), employee attitudes directly affect safe behaviors.

The commitment of the management to safety and risk-management behavior are taken as sub-dimensions of safety culture, and there is a relationship between the management's commitment to safety and risk-management behavior of employees (Yule et al. 2007; Mearns & Yule, 2009). Yule et al., (2007) took risk-management behavior as a sub-dimension of the safety climate and applied it as an indicator of safety performance. Training and informing the employees to understand the existing risks in their dangerous jobs by the management has a reducing effect on the risk- management behavior of the employees. Another perspective on risk- management behavior is that, in addition to innate personality differences, employees' past experiences affect their risk- management behavior. Generally, a person who has had a work accident in the past has higher safety awareness and shows better risk- management behavior (Fung et al., 2005). Risk-taking behavior is all the behaviors exhibited by the employees even though they do not have certain knowledge about the results (Neihart, 1999; Rosenbloom, 2003).

It is understood that management has a key role in building the safety culture. If the management shows a good approach to safety, the workers' safety performance could be change according to their behavior. And this situation affects the safety culture directly.

1.3. Safety Culture and Safety Motivation Relationship

Safety motivation refers to an individual's inclination to engage in safety-related behaviors and the importance they place on these actions. It encompasses the personal drive and values that encourage adherence to safety practices (Neal & Griffin, 2006). Awareness and willingness of employees to demonstrate better safety performance, depend on safety motivation (Vinodkumar & Bhasi, 2010). Safety performance is defined by two main elements: safety compliance and safety participation, both integral to safety behaviors. Safety compliance refers to the adherence

ARAŞTIRMA MAKALESİ

to required safety procedures and the actions necessary to maintain a safe work environment. On the other hand, safety participation involves proactive efforts that extend beyond an employee's formal responsibilities. This includes voluntarily assisting colleagues, promoting safety initiatives, taking initiative, and actively seeking to improve safety conditions at work. By engaging in safety participation, employees contribute to fostering a safety-conscious atmosphere that benefits the entire workforce, enhancing overall workplace safety (Neal & Griffin, 2002). Safety motivation is a crucial factor in determining whether employees follow safety guidelines and actively participate in safety-related activities. According to Christian et al. (2009), there is a strong connection between safety motivation and safety performance, with safety performance inversely related to the occurrence of accidents and injuries. This relationship highlights the role of safety motivation in enhancing workplace safety. Additionally, a study by Al-Bayati (2021) in the construction industry found that safety motivation positively impacts safety culture by improving safety performance, further reinforcing its importance in creating safer work environments.

1.4. Aim of the Study

The concept of safety culture, which has been proven to be effective in reducing occupational accidents in workplaces (Fung et al., 2005) has been investigated in the Turkish literature by using scales such as different parameters and safety climate. This study aims to reveal the relationship between safety culture, safety motivation and safety performance as well as pioneering the future safety culture studies to be conducted in the Turkish literature within the scope of scale adaptation.

2. Methods

The safety culture scale which is conducted by Fung et al. (2005) and the short form of safety motivation scale developed by Neal, Griffin, and Hart (2000) are used for sampling in this study. The items of the scales safety culture and safety motivation were firstly translated into Turkish from English by two Psychology and two Occupational Safety experts who were fluent in English and Turkish. It was later translated into Turkish by two English Language and Literature linguists. One of the most important problems in scale adaptation studies is that the mother tongues of the original scale, and the scales in the adapted studies are different. For this reason, cultural translations should be made in accordance with the adapted language. Afterwards, these Turkish translations were translated into English and compared with the original form of the scale, the translation-repeat process was completed. The English version

of the scale was carefully compared to the original and then reviewed by the experts in Psychology and Occupational Health and Safety. Following their thorough evaluations, the final version of the scale was established and determined to be suitable for use in the current study.

2.1. Sampling

In the factor analysis, it was stated that the ratio of the number of individuals/variables is important when deciding upon the sample selection (Doğan et al., 2017). Regarding this approach, many views have been put forward for the individual/variable ratio. Considering the literature, the most accepted opinions are; Kline(2014) stated that the individual/variable ratio should be kept at 10:1, with a sample size of not less than 100, but this ratio could be reduced to at least 2:1. According to a general rule, it is stated that the sample size of the research group should be five times the number of items or the number of observed variables for the use of factor analysis technique (Child, 2006).

2.2. Data Collection Tools

To determine the variability of participants, demographic information questions such as gender, age, education level, sector, occupational group were included.

In the study conducted by Fung et al. (2005), the Safety Culture scale was employed, yielding a Cronbach's alpha coefficient (α) of 0.89. Since the scale had not previously undergone validity and reliability testing in Turkish, this study conducted exploratory factor analysis, confirmatory factor analysis, and internal consistency analysis with data from 409 participants. The original scale's sub-dimensions included organizational commitment and communication, accident and near-miss reporting, line management commitment, the supervisor's role, personal responsibility, co-worker influence, risk-taking behavior, and barriers to safe behavior. Due to their limited item count, the factors related to reporting accidents and near misses, as well as the supervisor's role, were excluded from the analysis. Participants assessed the scale items using a five-point Likert scale (1 = Strongly Disagree, 5 = Strongly Agree).

The scale used in the study is the short form of safety motivation that Neal, Griffin, and Hart (2000) discussed in their study which included two scales: safety motivation and safety knowledge, under the title of determinants of safety performance. In the original study, the alpha(α) value of safety motivation was found to be 0.93. As Turkish validity and reliability studies had not been carried out before, exploratory factor analysis and internal consistency

analysis were performed with the data collected from 409 participants in this study. Safety motivation scale measures individual motivation to perform safety-related operating procedures. (1= Strongly Disagree, 5= Strongly Agree).

SPSS 24.0 was used for statistical operations in the study. To determine the validity and reliability of the scale, firstly, the procedures related to validity were applied. The KMO (Kaiser-Meyer-Olkin) sample fit test and Bartlett's test were performed primarily for the sample fit and factorability levels of the scale, and the significance level in this test was measured according to the $p<.001$ level. As there was a noticeable correlation between the factors in the safety culture scale in the analysis made, the "direct oblimin axis rotation technique" was used in the interpretation of the factors. This method further facilitates factor formation (Creed & Machin, 2003). In the safety motivation scale, on the other hand, the Varimax rotation method, which is the most widely used and which brings some factor loads in each column closer to 1, while bringing the remaining values closer to 0 was used (Çokluk et al., 2010). This method involves rotating factors to maximize variances with fewer variables. A kurtosis value between +1.0 and -1.0 is considered excellent for most psychometric purposes, while values within the range of -2.0 to +2.0 are generally acceptable (George & Mallery, 2010). Skewness, which measures the symmetry of a distribution compared to a normal distribution, is considered significant when it falls outside the -1.0 to +1.0 range, indicating a highly skewed distribution (Hair et al., 2013). The normality test results indicated that all dimensions in the study met the normality assumption, falling within the optimal range. Following this, confirmatory factor analysis (CFA) was conducted with a separate sample group. Parametric tests, such as independent sample t-tests and analysis of variance (ANOVA), were utilized to determine whether observed variations in the sample reflect consistent patterns in the broader population or are due to chance. Since the ANOVA revealed that one group differed significantly from the others, the Tukey test was applied due to the homogeneity of distribution and the categorical nature of the independent variable with three groups. Confirmatory factor analysis was performed using Amos 26.0, while all other analyses were conducted in SPSS.

3. Results

This research consisted of 409 participants from various regions of Turkey so as to ensure that the individual/variable ratio, which needs the most sampling among the sample selection proposals, is kept as 10:1 that is needed to conduct factor analysis. Data was collected by sending the relevant scale forms created on Google Form to the volunteer participants. Demographic information of the participants is shown in Table 2.

Table 2. Demographic Information

Variable (N=409)		Frequency	%
Gender	Male	289	70,7
	Female	120	29,3
Age	26 and below	109	26,7
	27-34	113	27,6
	35-41	107	26,2
	42 and above	80	19,6
Education Status	Primary education and below	24	5,9
	High school	44	10,8
	Bachelor's degree and above	341	83,4
Industry	Production	92	22,5
	Education	61	14,9
	Textile	56	13,7
	Construction	73	17,8
	Service industry	127	31,1
Profession Group	Worker	109	26,7
	Engineer-Technician	116	28,4
	Academician	55	13,4
	Occupational Health and Safety Professionals*	87	21,3
	Management Staff	42	10,2

(*Occupational health and safety professionals refer to occupational safety experts, workplace physicians, other health personnel and occupational safety technicians.)

In addition, unlike the example above, 261 people were used only to be used in confirmatory factor analysis.

Exploratory Factor Analysis (EFA): The Turkish version of the scale was administered to 409 adults. After the SPSS data entry was completed, exploratory factor analysis was performed. There are 2 items in each of the 2 factors in the original scale. The idea that a factor must have at least 3 items in order to be very stable is more accepted in the literature (Velicer & Fava, 1998; Hogarty, 2005). Therefore, 2 factors were not analyzed.

The KaiserMeyer-Olkin test (KMO) was performed to determine whether the sample size was sufficient. The KMO ratio should be above 0.5, and 0.70 is good, 0.80 is very good, and 0.90

is excellent (Sharma, 1996). In this study, the safety culture and safety motivation KMO values were found to be 0.86 and 0.82, respectively. Bartlett's value, on the other hand, was found to be 3279.23 and 1127.17 significance levels, p<.001, respectively.

According to Table 3, as a result of EFA, it was seen that the Turkish version of the safety culture scale had a four-factor structure that is different from the original scale and explained 66% of the total variance. As it is more accurate to remove items loaded more than once in factor analysis from the adaptation, items loaded on more than one factor were removed from the Turkish version. Stevens (1996) stated that values above .30 indicate sufficient loading for a variable to be included in a factor. The risk-management behavior factor and the obstacles to safety behavior factor, were reverse coded. In addition, items 3 and 7 in the management's safety attitude factor, were also reverse coded. While performing the analysis, the reverse coded factors and items were analyzed by rotating. As a result, high scores indicate a high safety culture and high safety motivation. The factor loadings of the scales are given in Table 3 and Table 3. Accordingly, the Turkish validity of the scale was found to have 4 factors, different from the original. Considering these factors:

- F1 = Organizational Commitment and Communication

- F2 = Management's Safety Attitude

- F3 = Risk-Taking Behavior

- F4 = Obstacles to Safe Behavior

Table 3. Factor Result of Safety Culture

		Organizational Commitment and Communication (F1)	Management's Safety Attitude (F2)	Risk-Taking Behavior (F3)	Obstacles to Safe Behavior (F4)
1	Top management takes job safety seriously.(Üst yönetim, iş güvenliğini ciddiye alır.)	,74			
2	There are adequate resources for job safety in the workplace. (İşyerinde, iş güvenliği için yeterli kaynaklar mevcuttur.)	,69			
3	Management gives low priority to safety training.(Yönetim, iş güvenliği eğitimine düşük seviyede öncelik verir.)		,82		

4	The workplace values our views on safety. (İşyeri, güvenlik konusundaki görüşlerimize değer vermektedir.)	,84			
5	You will always be informed about the results of the meetings that deal with occupational safety. (İş güvenliğini ele alan toplantıların sonuçları hakkında her zaman bilgilendirilirsiniz.)	,80			
6	The occupational safety department makes an important contribution to the safety of your workplace. (İş güvenliği departmanı, işyerinizin güvenliğine önemli bir katkı sağlar.)	,77			
7	Work efficiency is often seen as more important than job safety. (İş verimliliği genellikle iş güvenliğinden daha önemli görülür.)		,70		
8	Managers are very helpful if advice is sought on occupational safety issues.(İş güvenliği konularında tavsiye istenmesi halinde, yöneticiler çok yardımcı olmaktadır.)	,84			
9	Your manager is open to ideas on how you can improve safety (Yöneticiniz, güvenliği nasıl geliştirebileceğinize dair fikirlere açıktır.)	,82			
10	Your manager is not doing enough to ensure safety. (Yöneticiniz, güvenliği sağlamak için yeterince bir şey yapmıyor.)		,69		
11	Some employees pay less attention to safe work. (Çalışanlardan bazıları güvenli çalışmaya daha az dikkat göstermektedir.)			,88	
12	Some employees have difficulty perceiving the risks associated with their jobs.. (Bazı çalışanlar işleriyle ilgili riskleri algılamakta zorluk çekmektedir.)			,85	
13	Not all safety procedures, instructions or rules are fully implemented by employees. (Güvenlik prosedürlerinin, talimatların ya da kuralların hepsi, tam olarak çalışanlar tarafından uygulanmamaktadır.)			,55	
14	Some safety procedures, instructions or rules are difficult to follow. (Bazı güvenlik prosedürlerin, talimatların ya da kuralların uygulanması zordur.)				,77
15	There are some physical conditions in the workplace that limit the safe working space of people. (İşyerinde insanların güvenli bir şekilde çalışma alanını kısıtlayan bazı fiziksel koşullar vardır.)				,62

| 16 | There are some safety procedures, instructions or rules that are difficult to follow. (Uygulanması zor olan bazı güvenlik prosedürleri, talimatları ya da kuralları vardır.) | | | | ,93 |
| 17 | There are jobs that are difficult to work with safely. (Güvenli bir şekilde çalışılması zor olan işler bulunmaktadır.) | | | | ,81 |

**Table 4. Factor Result of Safety Motivation**

		Factor load (SM)
1	I believe that occupational health and safety is an important issue. (İş sağlığı ve güvenliğinin önemli bir konu olduğuna inanıyorum.)	,78
2	I believe it is valuable for me to make an effort to ensure or improve my personal safety. (Kişisel güvenliğimi sağlamak veya geliştirmek için çaba göstermemin değerli olduğuna inanıyorum.)	,78
3	I always think it is important to ensure the continuity of occupational safety. (İş güvenliğinin devamlılığını sağlamanın her zaman önemli olduğunu düşünüyorum.)	,85
4	I believe it is important to reduce the risks of accidents in the workplace. (İş yerindeki kaza risklerini azaltmanın önemli olduğuna inanıyorum.)	,73

As indicated in Table 4, it is seen that the Turkish version of the short form of safety motivation (SM) scale has a single factor, as in the original, and explains 79% of the total variance. The scale questions are presented in Table 3 both in English and in Turkish.

Confirmatory Factor Analysis (CFA): It was found to be a 4-factor scale according to EFA. In the next step, CFA was applied, and the 4-factor structure of the measurement tool was tested. While testing the CFA, 261 people were used, unlike the sample used in the EFA, and these 261 people only applied the CFA test.

A standardized regression coefficient of less than 0.5 in CFA is not desirable (Hair et al., 2013). For this reason, above 0.5 was taken into consideration. As can be seen in figure 1, all of the standardized regression loads are at the desired values (varying between 0.66 and 0.84). There is also a correlation between sub-dimensions. And

Figure 1. Safety culture CFA result
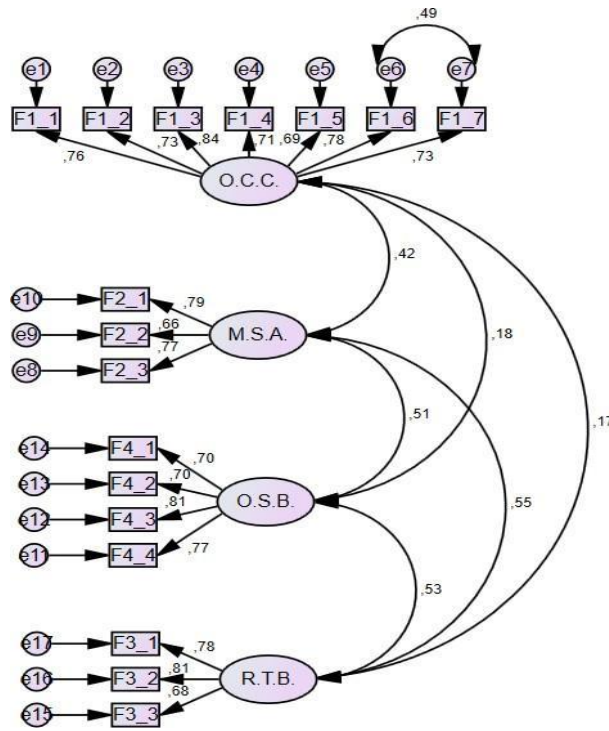
(Note: O.C.C.: Organizational Commitment and Communication, M.S.A.: Management's Safety Attitude, R.T.B.: Risk-Taking Behavior, O.S.B.: Obstacles to Safe Behavior)
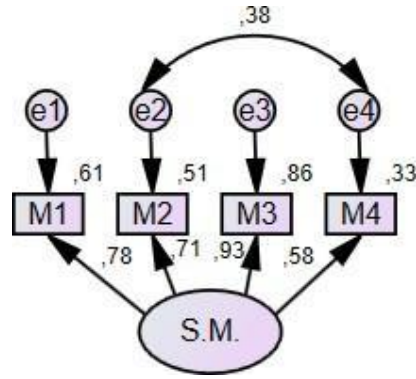
Table 5. CFA outcome of safety culture

Criterion	Good fit	Acceptable fit	Result achieved
(χ 2 /sd)	≤ 3	≤ 4-5	1,88
RMSEA	RMSEA< 0,05	0.05 ≤ RMSEA ≤ 0.10	0,06
SRMR	SRMR< 0,05	0.05 ≤ SRMR ≤ 0.10	0,05
CFI	0,97≤CFI≤1	0,95≤CFI<0,97	0,95
GFI	0,95 ≤GFI ≤1,00	0,90≤ GFI <0,95	0,91
AIC	Default model must be less than Saturated and Independent model		Default: 292
			Saturated: 306
			Independence:2292

(Note: RMSEA – Root Root mean square error of approximation; CFI: Comparative fit index, GFI: Goodness-of-fit index, AGFI: Adjusted goodness-of-fit; RMSEA:Root mean square error of approximation; RMSR: Root mean square residuals; NFI: Normed fit index.) **For the reference values source:** (Bayram, 2010; Yakubu & Dasuki, 2018).

As can be seen in figure 2, all the standardized regression loads are within the desired values. (varying between 0.58 and 0.93).

Figure 2. Safety motivation CFA result

(Note: S.M.: Safety motivation)

As seen in Table 6, all of the CFA fit indices of safety motivation are in good relationship.

Table 6. CFA outcome of safety culture

Criterion	Good fit	Acceptable fit	Result achieved
(χ2 /sd)	≤ 3	≤ 4-5	0,25
RMSEA	RMSEA< 0,05	0.05 ≤ RMSEA ≤ 0.10	0,00
SRMR	SRMR< 0,05	0.05 ≤ SRMR ≤ 0.10	0,00
CFI	0,97≤CFI≤1	0,95≤CFI<0,97	1,00
GFI	0,95 ≤GFI ≤1,00	0,90≤ GFI <0,95	1,00
AIC	Default model must be less than Saturated and Independent model		Default: 292 Saturated: 306 Independence:2292

(Note: RMSEA – Root Root mean square error of approximation; CFI: Comparative fit index, GFI: Goodness-of-fit index, AGFI: Adjusted goodness-of-fit; RMSEA:Root mean square error of approximation; RMSR: Root mean square residuals; NFI: Normed fit index.) **For the reference values source:** (Bayram, 2010; Yakubu & Dasuki, 2018).

Cronbach Alpha coefficient values for the sub-dimensions of safety culture and safety motivation are specified in Table 7. Accordingly, the α value of the organizational commitment and communication sub-dimension is ,91; α value of management's safety attitude sub-dimension is .72; α value of the risk-taking behavior sub-dimension is .74; the α value of the obstacles to safe behavior sub-dimension, was found to be .82 and the α value of the safety motivation was found to be .91. If the calculated α value is at least 0.70, it is stated to be reliable (Karakoç & Dönmez, 2014).

Table 7. Internal consistency result of scale dimensions

	Organizational commitment and communication	Management's safety attitude	Risk taking behavior	Obstacles to safe behavior	Safety Motivation
α value	,91	,72	,74	,82	,91

(Note: α = Cronbach Alfa)

According to Table 8, a significantly positive correlation was observed between the organizational commitment and communication (F1) factor and the management's safety attitude (F2) factor. As organizational commitment and communication increase, it was observed that management's safety attitude also increases. Likewise, there is a positive relationship between organizational commitment and communication and safety motivation (SM). It was further observed that as organizational commitment and communication increased, safety motivation also increased.

Apart from this, the correlation between the management's safety attitude (F2) factor, and risk-management behavior (F3) was found to be significantly positive. Considering that F3 is reverse coded and inverted while scoring, we can state that as the management's safety attitude increases, risk- management behavior decreases. Likewise, there is a positive and significant relationship between the management's safety attitude (F2) and obstacles to safe behavior (F4). Considering that the F4 factor is reverse coded and inverted while scoring, as the management's safety attitude increases, obstacles of safe behavior decrease. It is also revealed that the correlation of the management's safety attitude factor with all the other factors in the scale is significant.

There is a positive and significant correlation between risk-management behavior (F3) and obstacles to safe behavior (F4). In addition, it was determined that there is a significant negative relationship between F3 and safety motivation. It means that this is very little. (-0.10).

Table 8. Correlation between the factors

		F1	F2	F3	F4	F5
F1	Pearson Correlation	1	,337 **	,082	,054	,170 **
	Sig. (1-tailed)		,000	,096	,278	,001
F2	Pearson Correlation	,337 **	1	,442 **	,387 **	,007
	Sig. (1-tailed)	,000		,000	,000	,893
F3	Pearson Correlation	,082	,442 **	1	,454 **	-,102

						*
	Sig. (1-tailed)	,096	,000		,000	,039
F4	Pearson Correlation	,054	,387 **	,454 **	1	- ,003
	Sig. (1-tailed)	,278	,000	,000		,953
F5	Pearson Correlation	,170 **	,007	- ,102 *	- ,003	1
	Sig. (1-tailed)	,001	,893	,039	,953	

**. Correlation is significant at the 0.01 level.

* The correlation is significant at the 0.05 level.

.(Reverse factors and sweat coded items' scores were reversed)

(F1 = Organizational Commitment and Communication, F2 = Management's Safety Attitude, F3 = Risk-Taking Behavior, F4 = Obstacles Safe Behavior, F5 = Safety Motivation)

To summarize table 8, the correlation between the factors is as below:

● Between F1 and F2, F5,
● Between F2 and F1, F3, F4,
● Between F3 and F2, F4, F5,
● Between F4 and F2, F3,
● Between F5 and F1, F3

In Table 9, the differences in safety culture and safety motivation within occupational groups were investigated. The outcome of this research revealed that there was no significant difference between occupational groups in safety motivation (p >0,05). Significant differences were found in the organizational commitment and communication (F1) factor within the occupational groups. When we look at these differences, it is seen that workers and technicians-engineers have more positive attitudes than academicians. In addition, it has been observed that the management staff have more positive attitudes than academicians and OHS employees.

According to the occupational groups, the management's safety attitude (F2) significantly differs. When we look at these differences, it has been determined that workers and technicians-engineers have more positive attitudes than academicians. There is no significant relationship between occupational groups in F3 and F4.

Considering the organizational commitment and communication (F1) factor, it is seen that the management staff has the highest average. The reason for this could be the fact that the management staff is obliged to report accidents, and to establish good communication with their subordinates (workers), and legally they have serious responsibilities regarding occupational

accidents. Indeed, in a similar study, it was stated that the audit personnel displayed higher organizational commitment and communication than the workers. The reason for this situation is that workers generally report their accidents, think that organizational commitment and communication are outside their field of interest, and that these should be managed by their superiors (Fung et al. 2005).

Table 8. Tukey test for occupational groups

Variables		Profession group	N	$\overline{x}$	Ss	p	Difference among groups
	1.	Worker	109	4,68	,50		
F5	2.	Technician-Engineer	116	4,78	,60	1,24	-
	3.	Academician	55	4,85	,28		
	4.	OHS employees	87	4,87	,60		
	5.	Management staff	42	4,76	,52		
	1.	Worker	109	3,84	,90		
	2.	Technician-Engineer	116	3,84	,88	< ,01	1>3; 2>3;
F1	3.	Academician	55	3,38	,88		5>4; 5>3
	4.	OHS employees	87	3,50	,90		
	5.	Management staff	42	4,06	,89		
	1.	Worker	109	3,08	1,12		
F2	2.	Technician-Engineer	116	3,10	1,03	< ,01	1>3; 2>3
	3.	Academician	55	2,78	,94		
	4.	OHS employees	87	2,52	1,00		
	5.	Management staff	42	2,90	1,14		

F3	1.	Worker	109	2,43	,92		
	2.	Technician-Engineer	116	2,29	,84		
	3.	Academician	55	2,35	,92		
	4.	OHS employees	87	2,09	,99	1,27	-
	5.	Management staff	42	2,19	,96		
F4	1.	Worker	109	2,62	,99		
	2.	Technician-Engineer	116	2,47	,94		
	3.	Academician	55	2,74	,86	0,49	---
	4.	OHS employees	87	2,51	1,00		
	5.	Management staff	42	2,62	1,19		

(F1 = Organizational Commitment and Communication, F2 = Management's Safety Attitude, F3 = Risk-Taking Behavior, F4 = Obstacles Safe Behavior, F5 = Safety Motivation)

In Table 10, the differences in safety culture and safety motivation among the sectors studied were examined. As a result of these analysis, it was determined that safety motivation showed a significant difference between occupational groups. When this difference is examined; It turns out that manufacturing sector employees have fewer positive attitudes about safety motivation compared to other sector employees.

Significant differences were found in the organizational commitment and communication (F1) factor within the occupational groups. When we look at these differences; It is revealed that workers in the manufacturing and construction sectors have more positive attitudes than those working in the education sector.

According to the sectors worked, significant differences in management's safety attitude (F2) were determined. It is seen that the employees in the manufacturing sector have more positive attitudes about the management's safety attitude compared to the employees in the other sectors. There was no difference between F3 and F4 according to the sector.

Table 9. Sectors differences in safety culture and safety motivation (independent T-test result)

Variables		Working Sector	N	$\overline{X}$	Ss	p	Difference among groups
	1.	Production	92	4,60	,52		
F5	2.	Education	61	4,87	,26	,00	2>1; 4>1;
	3.	Textile	56	4,76	,52		5>1
	4.	Construction	73	4,83	,68		
	5.	Service industry	127	4,84	,53		
	1.	Production	92	3,92	,72		
F1	2.	Education	61	3,41	,84	,00	1>2; 4>2;
	3.	Textile	56	3,84	,99		
	4.	Construction	73	3,91	,75		
	5.	Service industry	127	3,59	1,01		
	1.	Production	92	3,39	1,03		
F2	2.	Education	61	2,89	,85	,00	1>2; 1>3;
	3.	Textile	56	2,80	1,14		1>5
	4.	Construction	73	2,98	1,06		
	5.	Service industry	127	2,57	1,06		
	1.	Production Education	92	2,44	,91		
	2.	Textile Construction Service industry	61	2,34	,88		
	3.		56	2,31	,86		
F3	4.		73	2,30	,99	,14	-
	5.		127	2,12	,93		

ARAŞTIRMA MAKALESİ

			N	$\overline{X}$	Ss		
	1.	Production Education	92	2,83	1,03		
	2.	Textile Construction	61	2,65	,88		
F4	3.	Service industry	56	2,39	1,04	,30	-
	4.		73	2,46	,96		
	5.		127	2,48	1,00		

(F1 = Organizational Commitment and Communication, F2 = Management's Safety Attitude, F3 = Risk-Taking

Behavior, F4 = Obstacles Safe Behavior, F5 = Safety Motivation)

In table 11, differences in safety culture and safety motivation by gender were examined. The result of these examinations shows that women had significantly higher safety motivation attitudes than men.

A difference was found between gender and management's safety attitude (F2). Accordingly, men have a higher perception of management's safety attitude than women.

No gender differences were found between F1, F3 and F4.

Table 11. Gender differences for safety culture and safety motivation (independent T-test result)

Variables	Gender	N	$\overline{X}$	Ss	p	Difference among groups
F5	1. Male	289	4,73	,57		
	2. Female	120	4,87	,40	,00	2>1
F1	1. Male	289	3,78	,90		
	2. Female	120	3,60	,89	,06	-
F2	1. Male	289	2,98	1,10		
	2. Female	120	2,73	,99	,03	1>2
F3	1. Male	289	2,31	,92		
	2. Female	120	2,22	,93	0,37	-
F4	1. Male	289	2,54	1,02		
	2. Female	120	2,63	,97	0,40	-

(F1 = Organizational Commitment and Communication, F2 = Management's Safety Attitude, F3 = Risk-Taking

Behavior, F4 = Obstacles Safe Behavior, F5 = Safety Motivation)

ARAŞTIRMA MAKALESİ

4. Conclusion

In conclusion of the study, it is revealed that management has a key role to establish a safety culture in the workplaces. Management's safety attitude is a crucial factor for developing a positive safety culture in the workplace, as it correlates with all the other factors within the scales analyzed. However, the safety attitude and organizational commitment of the education sector and academicians are insufficient compared to the other sectors in the study.

Considering the analysis on the effect of safety communication and organizational commitment on safety culture and safety motivation, it can be argued that the presence of safety- related communications and organizational commitment among employees, can also positively affect safety motivation, and prevent work accidents that may occur (Table 10).

When the differences in safety culture and safety motivation between different work sectors are examined, employees in the education sector experience problems in safety attitude, organizational commitment and communication factors compared to other sectors (Table 8). Considering the analysis examining the differences in safety culture and safety motivation among different occupational groups, it has seen that academicians have less safety attitude and organizational commitment in safety attitude, organizational commitment and communication factors than other occupational groups (Table 8).

In a study conducted by Crossman (2008) on firefighters, it was commented that communication and incentives in the work environment positively affect safety motivation. It has been observed that the effectiveness of safety communication increases cooperation in work areas and provides a positive safety culture (Vecchio-Sadus, 2007).

According to a study on the high-risk industry, it is stated that OHS experts have a key role in overseeing the safety of employees and reducing accidents (Guennoc et al., 2019). In addition, workplace accidents and injuries are associated with safety culture (Choudry et al. 2007). For this reason, safety culture perceptions of OHS employees are very important. When the differences in safety culture and safety motivation between occupational groups are examined, it is seen that OHS professionals are significantly lower than the management staff in organizational commitment and communication factor compared to other sectors, while they are at the same level as other occupational groups. However, it was expected that these employees in critical missions would be higher professionally than other employees.

Considering the results of the analysis, it can be said that the participation and interest of the management or leaders in safety studies reduces the risk-taking rates of the employees. In a study investigating the impact of safety management on safety culture, it was seen that the commitment of managers or leaders, the inclusion of employees in safety procedures, communication and coordination, safety training and inspection practices had a positive effect on safety culture (Gao et al., 2019).

Employees in the manufacturing sector have a higher perception of organizational commitment and communication and management's safety attitude compared to other sectors, while they have a worse situation in terms of safety motivation compared to many other sectors. Investigating the reasons for this low level of safety motivation in the manufacturing sector may be the subject of further studies.

Finally, due to the lack of commitment to organization, it is recommended that these problems in the education sector should be examined in more detail in future studies and more social studies should be conducted for academicians. And this translation study will help for the future studies which are aimed to measure safety culture.

References

Abdullah, M. S., Othman, Y. H., Osman, A., & Salahudin, S. N. (2016). Safety culture behaviour in electronics manufacturing sector (EMS) in Malaysia: The case of flextronics. Procedia economics and finance, 35, 454-461. https://doi.org/10.1016/S2212-5671(16)00056-3

Al-Bayati, A. J. (2021). Impact of construction safety culture and construction safety climate on safety behavior and safety motivation. Safety, 7(2), 41. https://doi.org/10.3390/safety7020041

Bayram, N. (2010). Yapısal Eşitlik Modellemesine Giriş AMOS Uygulamaları. Ezgi Kitabevi. ISBN: 9758606891, 9789758606894

Child, D. (2006). The essentials of factor analysis. A&C Black.

Choudhry, R. M., Fang, D., & Mohamed, S. (2007) The nature of safety culture: A survey of the state-of-the-art. Safety science, 45(10), 993-1012. https://doi.org/10.1016/j.ssci.2006.09.003

Christian, M. S., Bradley, J. C., Wallace, J. C., & Burke, M. J. Workplace Safety: A Meta-Analysis of the Roles of Person and Situation Factors. Journal of Applied Psychology, 94(5), 1103–1127. 2009. https://doi.org/10.1037/a0016172

Clarke, S. (2000). Safety culture: under-specified and overrated?. International Journal of Management Reviews, 2(1), 65-90. https://doi.org/10.1111/1468-2370.00031

Çokluk Ö., Şekercioğlu G., Büyüköztürk Ş. (2010). Sosyal Bilimler İçin Çok Değişkenli İstatistik, Pagem Akademi, Ankara, 203.

Cooper, M. D. (2000). Towards a model of safety culture. Safety science, 36(2), 111-136. https://doi.org/10.1016/S0925-7535(00)00035-7

Creed, P. A., & Machin, M. A. (2003). Multidimensional properties of the Access to Categories of Experience scale. European Journal of Psychological Assessment, 19(2), 85. https://doi.org/10.1027/1015-5759.19.2.85

Crossman, D. C. (2008). The impact of safety culture on worker motivation and the economic bottom line (Doctoral dissertation, Capella University). Website: https://www.proquest.com/dissertations-theses/impact-safety-culture-on-worker-motivation/docview/304816593/se-2 (Last Access: 24.05.2023)

Doğan, N., Soysal, S., & Karaman, H. (2017). Aynı örnekleme açımlayıcı ve doğrulayıcı faktör analizi uygulanabilir mi?. Pegem Atıf İndeksi, 373-400. Website: https://www.researchgate.net/publication/318393409_AYNI_ORNEKLEME_ACIMLAYICI_VE_DOGRULAYICI_FAKTOR_ANALIZI_UYGULANABILIR_MI (Last Access: 24.05.2023)

Eurostat. (2020, April 28). Are EU citizens safe at work?. https://ec.europa.eu/eurostat/en/web/products-eurostat-news/-/edn-20200428-1 (Last Access: 24.08.2023)

Fung, I. W., Tam, C. M., Tung, K. C., & Man, A. S. (2005). Safety cultural divergences among management, supervisory and worker groups in Hong Kong construction industry. International journal of project management, 23(7), 504-512. https://doi.org/10.1016/j.ijproman.2005.03.009

Gao, Y., Fan, Y., Wang, J., Li, X., & Pei, J. (2019). The mediating role of safety management practices in process safety culture in the Chinese oil industry. Journal of Loss Prevention in the Process Industries, 57, 223-230. https://doi.org/10.1016/j.jlp.2018.11.017

George, D., & Mallery, M. (2010). SPSS for Windows Step by Step: A Simple Guide and Reference, 17.0 update (10a ed.) Boston: Pearson. https://doi.org/10.4324/9780429056765

Guennoc, F., Chauvin, C., & Le Coze, J. C. (2019). The activities of occupational health and safety specialists in a high-risk industry. Safety Science, 112, 71-80. https://doi.org/10.1016/j.ssci.2018.10.004

Guldenmund, F. W. (2000). The nature of safety culture: a review of theory and research. Safety science, 34(1-3), 215-257. https://doi.org/10.1016/S0925-7535(00)00014-X

Hair, J. F., Black, W. C., Babin, B. J., Anderson, R. E., & Tatham, R. L. (2013). Multivariate Data Analysis: Pearson Education Limited. ISBN: 129202190X, 9781292021904

Hedlund, A., Gummesson, K., Rydell, A., & Andersson, M. (2016). Safety motivation at work: Evaluation of changes from six interventions. Safety science, 82, 155-163. https://doi.org/10.1016/j.ssci.2015.09.006

Hogarty, K. Y., Hines, C. V., Kromrey, J. D., Ferron, J. M., & Mumford, K. R. (2005). The quality of factor solutions in exploratory factor analysis: The influence of sample size, communality, and overdetermination. Educational and psychological measurement, 65(2), 202-226. https://doi.org/10.1177/0013164404267287

Karakoç, F. Y., & Dönmez, L. (2014). Ölçek geliştirme çalışmalarında temel ilkeler. Tıp Eğitimi Dünyası, 13(40), 39-49. https://doi.org/10.25282/ted.228738

ARAŞTIRMA MAKALESİ

Kline, Paul (2014). An easy guide to factor analysis. Routledge, 2014. Website: An Easy Guide to Factor Analysis - Paul Kline - Google Kitaplar (Last Access: 24.04.2023)

Line, M. B., Nordland, O., Røstad, L., & Tøndel, I. A. (2006). Safety vs security? In PSAM Conference, New Orleans, USA. Website: https://www.researchgate.net/profile/Maria-Bartnes/publication/289470660_Safety_vs_security/links/568d02eb08aefb48d4bf256c/Safety-vs-security.pdf (Last Access: 24.04.2023

Mearns, K., & Yule, S. The role of national culture in determining safety performance: Challenges for the global oil and gas industry. Safety science, 47(6), 777-785. 2009. https://doi.org/10.1016/j.ssci.2008.01.009

Neal, A. F., & Griffin, M. A. (2004). Safety climate and safety at work. In J. Barling, & M. R. Frone (Eds.), The psychology of workplace safety (pp. 15–34). Washington, D. C.: American Psychological Association. https://doi.org/10.1037/10662-002

Neal, A., & Griffin, M. A. (2002). Safety climate and safety behaviour. Australian journal of management, 27(1_suppl), 67-75. https://doi.org/10.1177/031289620202701S08

Neal, A., & Griffin, M. A. (2006). A study of the lagged relationships among safety climate, safety motivation, safety behavior, and accidents at the individual and group levels. Journal of applied psychology, 91(4), 946-953. https://doi.org/10.1037/0021-9010.91.4.946

Neal, A., Griffin, M. A., & Hart, P. M. (2000). The impact of organizational climate on safety climate and individual behavior. Safety science, 34(1-3), 99-109. https://doi.org/10.1016/S0925-7535(00)00008-4

Neihart, M. (1999). Systematic risk-taking. Roeper Review, 21(4), 289-292. https://doi.org/10.1080/02783199909553977

Olcay, Z. F., Sakalli, A. E., Temur, S., & Yazici, A. (2022) A study of the shift in fatal construction work-related accidents during 2012–2019 in Turkey. International journal of occupational safety and ergonomics, 28(3), 1522-1532. https://doi.org/10.1080/10803548.2021.1900503

Özkan, T., & Lajunen, T. (2003) Güvenlik kültürü ve iklimi. Pivolka, 2(10), 3-4. 2003. Website: https://elyadal.org/pivolka/10/PiVOLKA_10_01.pdf (Last Access: 24.04.2023)

Parker, D., Lawrie, M., & Hudson, P. A (2006) framework for understanding the development of organisational safety culture. Safety science, 44(6), 551-562. 2006. https://doi.org/10.1016/j.ssci.2005.10.004

Patankar, M. S., & Sabin, E. J. (2010) The safety culture perspective. In Human factors in aviation (pp. 95-122). Academic Press. https://doi.org/10.1016/B978-0-12-374518-7.00004-3

Reason, J. (1997) Managing the Risks of Organisational Accidents. Ashgate Publishing. Website: Managing the Risks of Organizational Accidents - James Reason - Google Kitaplar (Last Access: 24.04.2023)

Reason, J. (1998). Achieving a safe culture: theory and practice. Work & stress, 12(3), 293-306. 1998. https://doi.org/10.1080/02678379808256868

Reason, J. (2000). Safety paradoxes and safety culture. Injury Control and Safety Promotion, 7(1), 3-14.. https://doi.org/10.1076/1566-0974(200003) 7:1;1-V;FT003

ARAŞTIRMA MAKALESİ

Rosenbloom, T. (2003). Risk evaluation and risky behavior of high and low sensation seekers. Social Behavior and Personality: an international journal, 31(4), 375-386. https://doi.org/10.2224/sbp.2003.31.4.375

Saad, N. M. (2016). PhD thesis. The influence of safety culture on safety performance in Saudi Arabian construction industry, University of Salford Manchesher, College of Science. Website: https://www.proquest.com/dissertations-theses/influence-safety-culture-on-performance-saudi/docview/2568297409/se-2?accountid=151252 (Last Access: 24.04.2023)

Sharma S. (1996). Applied Multivariate Techniques, John Wiley Sonc Inc, New York, 116. ISBN: 978-0-471-31064-8.

Stevens, J. (1996). Applied multivariate statistics for the social sciences (3rd ed.). Mahwah, New Jersey: Lawrence Earlbaum Associates. https://doi.org/10.4324/9781410604491

Turner, B. A., Pidgeon, N., Blockley, D., & Toft, B. (1989). Safety culture: its importance in future risk management. In Position paper for the second World Bank workshop on safety control and risk management, Karlstad, Sweden (pp. 6-9).

Vecchio-Sadus, A. M. (2007). Enhancing safety culture through effective communication. Safety Science Monitor, 11(3), 1-10.

Velicer, W. F., & Fava, J. L. (1998). Affects of variable and subject sampling on factor pattern recovery. Psychological methods, 3(2), 231. https://doi.org/10.1037/1082-989X.3.2.231

Vinodkumar, M. N., & Bhasi, M. (2010). Safety management practices and safety behaviour: Assessing the mediating role of safety knowledge and motivation. Accident Analysis & Prevention, 42(6), 2082-2093. https://doi.org/10.1016/j.aap.2010.06.021

Wiegmann, D. A., Zhang, H., Von Thaden, T. L., Sharma, G., & Gibbons, A. M. (2004). Safety culture: An integrative review. The International Journal of Aviation Psychology, 14(2), 117-134. https://doi.org/10.1207/s15327108ijap1402_1

Yule, S. (2003). Safety culture and safety climate: A review of the literature. Industrial Psychology Research Centre, 1-26. Website: https://citeseerx.ist.psu.edu/document?repid=rep1&type=pdf&doi=29777e7c99e400b272d081ab4831eb0cf5ae5afc (Last Access: 24.04.2023)

Yule, S., Flin, R., & Murdy, A. (2007). The role of management and safety climate in preventing risk-taking at work. International Journal of Risk Assessment and Management, 7(2), 137-151. https://doi.org/10.1504/IJRAM.2007.011727