Received Date: 24 November 2022 I Accepted Date: 11 January 2023

RESEARCH ARTICLE

OPUS Journal of Society Research

A Study of the Relationship between Safety Perceptions and Mindfulness

Mehmet Nurettin Uğural [1]

[1] Assist. Prof., Istanbul Kultur University, Istanbul/Türkiye
ORCID: 0000-0002-8037-7603
E-Mail: m.ugural@iku.edu.tr

Corresponding Author:
Mehmet Nurettin Uğural

January 2023
Volume:20
Issue:51
DOI: 10.26466//opusjsr.1209605

Citation:
Uğural, M. N. (2023). A study of the relationship between safety perceptions and mindfulness . *OPUS– Journal of Society Research, 20*(51), 125-137.

Abstract

It is well known that the construction industry has a high rate of workplace accidents, resulting in complex legal situations and legal cases. Researchers are debating whether the majority of workplace accidents and injuries are the result of employees' unsafe work practices or unsafe working conditions. In this context, it has been determined that we must comprehend the trait predictors of safety behaviors, which influence workplace accidents and injuries. This study's primary objective is to identify the factors that influence safety behavior in construction workplaces. In previous studies, the effects of employee perceptions of safety culture on safety behavior performance were typically measured with the aid of various mediators. This study, unlike previous ones, focuses on revealing the mediating effect of employee mindfulness perceptions in the relationship between safety culture and safety behavior. Using a sample of 387 employees from the Turkish construction industry, a 58-item survey was conducted to determine the impact of safety culture perception and mindfulness on self-reported safety behavior. A structural equation model was used to analyze and explain the relationships between the proposed framework's constructs. The results of the study indicate that safety culture is associated with safety behavior, and that mindfulness mediates this relationship. There are significant relationships between employees' perceptions of safety culture, mindfulness, and safety behavior, according to the findings. Safety culture and mindfulness are significant predictors of safety behaviors, and mindfulness is an essential personal resource for a successful safety-focused organization.

Keywords: *Organizational Culture, Mindfulness, Safety Behaviors, Project Management, Civil Engineering.*

Öz

İnşaat sektörü, karmaşık yasal durumlara ve yasal davalara neden olan yüksek düzeyde iş yeri kazalarıyla tanınmaktadır. Sağlık ve güvenlik araştırmaları insan davranışının yaralanmaları veya ölümleri önlemede merkezi bir rol oynayabileceğini öne sürmektedir. Ek olarak, araştırmacılar, işyeri kazalarının ve yaralanmalarının çoğunun, güvenli olmayan çalışma koşullarından ziyade çalışanların belirlenen güvenlik tedbirlerine uymamasından kaynaklandığını tartışmaktadırlar. Bu çalışmanın temel amacı, şantiyelerde güvenlik davranışlarının öncüllerini anlamaktır. Daha önceki çalışmalarda, çalışanların güvenlik kültürü algılarının güvenlik davranışlarının performansı üzerindeki etkileri genellikle çeşitli aracılar yardımıyla ölçülmüştür. Önceki çalışmalardan farklı olarak bu çalışmada, güvenlik kültürünün güvenlik davranışı üzerindeki ilişkisinde çalışanların bilinçli farkındalık algılarının aracılık etkisini incelenmiştir. Çalışmada Türk inşaat sektöründen 387 çalışandan oluşan bir örneklemle, çalışanların güvenlik kültürü algısı ve farkındalığının güvenlik davranışları üzerindeki etkisini ölçmek için 58 maddelik bir anket uygulanmıştır. Önerilen çerçevede yer alan yapılar arasındaki ilişkileri analiz etmek ve açıklamak için bir yapısal eşitlik modeli kurulmuştur. Araştırma bulgularına göre, güvenlik kültürünün güvenlik davranışı ile ilişkili olduğu ve güvenlik kültürü ile güvenlik davranışları arasındaki bu ilişkiye bilinçli farkındalığın aracılık ettiği görülmüştür. Çalışma sonucunda, çalışanların güvenlik kültürü algıları, farkındalıkları ve güvenlik davranışları arasında önemli ilişkiler olduğunu görülmektedir. Güvenlik kültürü ve bilinçli farkındalık, güvenlik davranışlarının önemli belirleyicileridir ve başarılı bir güvenlik odaklı organizasyon için gerekli olan yararlı bir kişisel kaynaktır

Anahtar Kelimeler: *Örgüt Kültürü, Farkindalik, Güvenlik Davranışları, Proje Yönetimi, Inşaat Mühendisliği.*

Introduction

Creating a safe work environment is one of the most pressing concerns in the business world. Despite the growing emphasis on health and safety, thousands of workplace accidents continue to occur annually. These incidents have a significant impact on the economy and the future of the country, as well as on individuals, their families, and society. Construction is a high-risk industry in which workers engage in a variety of tasks that may expose them to fatal dangers (Zhang et.al., 2020). Tools, resources, materials, equipment, and method statements can vary from project to project. The discontinuity of projects and work force, as well as the use of subcontractors, contribute to the industry's uncertainty and high risk. In recent years, it has been determined that organizational, managerial, and human factors, rather than technical failures, account for the majority of accidents. (Schwatka et.al., 2021; Chan et.al., 2022). Consequently, research has centered on the concept of safety issues. (Naji et.al., 2021). Several studies on safety culture and safety performance in various industries were conducted in Turkey. (Aytaç and Dursun, 2018; Çalış and Küçükali, 2019).

Safety culture is one of several concepts that are currently being considered as having the potential to move organizations to higher levels of safety (Seo et.al., 2022). The safety culture of an organization is one of the most influential factors on employee safety behavior. The safety performance of construction employees reflects their perception of the safety culture and their attitude toward safety on the job site. Measuring safety performance assists organizations in achieving their health and safety management objectives. Another important concept that piques people's interest whenever it is mentioned is mindfulness, which is advocated by Karl Weick and his associates and affects employee behavior. (Weber and Glynn 2006). Mindfulness is a psychology term that refers to the act of focusing on one's internal and external events in the present. (Brown & Ryan, 2003). Due to the risks and dangers associated with construction work and building sites, it is crucial that the individual's focus must be on the present.

These three concepts are embedded in in a variety of literature, implying that they are more distinct than they may be. The goal of this paper is to discuss how these ideas converge, as well as to investigate their limitations and tensions. The paper begins with a look at safety culture before connecting it to personal mindfulness and safe behavior strategies. The target of this paper is to delve into the relationship between safety culture, mindfulness, and safety behavior in depth using Ajzen's planned behavior theory (Ajzen, 1991).

Theoretical Background and Literature Review

Safety Culture

Studies on safety culture have been conducted for over thirty years, but there is no consensus regarding the concept's definition. (Guldenmund, 2000; Cooke & Durso, 2008; Cooper, 2019). Lack of clarity on the issue of safety culture, makes it more difficult to develop and implement safety culture approaches, so a few researchers focus on the concept of 'climate'. Safety culture became an accepted term in "technical" areas such as mining, engineering, oil and construction (Vignoli et.al., 2021). In particular, the academic literature examined safety culture in terms of social psychological and organizational psychological traditions. According to the definition provided by the Advisory Committee on the Safety of Nuclear Installations (ACSNI) the safety culture of an organization is made up of individual and group values, attitudes, perceptions, competencies, and patterns of behavior that determine the organization's commitment to health and safety management as well as its style and proficiency. (Anon, 1994).

One of the definitions of construction-specific culture describes the construction safety culture as follows: Construction safety culture is a subcomponent of organizational culture, and it represents workers' impressions of the organization's safety management system, which consists of rules, practices, and procedures that illustrate how safety is applied on construction

sites. (Choudhry et al., 2007). The construction industry is most interested in the cultural behavioral consequences because they are more perceptible and accessible in daily business operations. Despite this difference in conceptualization and operationalization, the idea of a "safety culture" is critical to the success of contemporary strategies for enhancing safety performance results. (Guldenmund, 2000).

Mindfulness

It can be traced back to the Buddhist religious heritage for eons. The term "mindfulness" is derived from the Pali word "sati," which means "awareness, attention, and remembrance" (Bodhi, 2000). The term "mindfulness" refers to a method of paying conscious and nonjudgmental attention to the present moment. Mindfulness is described as "a receptive attention to and awareness of current events and experiences" in its most basic form (Brown et al., 2007). In recent years, there has been a surge in interest in the idea of mindfulness concerns within organizational science study. Its practice has grown in popularity, and mindfulness research has grown at an exponential rate. Mindfulness training is used by companies such as LinkedIn, Aetna, Mayo Clinic, Google, Ford, Intel and the United States Army to improve workplace functioning. Emerging evidence from a variety of disciplines suggests that mindfulness is fundamentally linked to many aspects of workplace functioning (Gelles, 2015). Nonetheless, despite growing interest, the industrial-organizational community has paid little attention to mindfulness (Hyland et al., 2015).

Mindfulness is one of the main factors affecting the behavior of the individual. Based on past research, it is possible that attention-enhancing experiences and actions that characterize aware humans may impact the capacity to govern self-regulation, i.e., cognitive and emotional control. (Good et al., 2016). In contrast, because less conscientious individuals pay attention to a variety of internal experiences and attributes, their tendencies are stricter and more susceptible to opposing habits and thoughts, resulting in a weaker relationship between intention and behavior. There has yet to be any research on mindfulness and safety culture and behavior in the field of construction management. The following are a few studies on 'mindfulness' and the construction industry. In their ethnographic action research, Olde et al. (2016) employed mindfulness as a lens to evaluate how 4D affects the coordination of utility construction operations (Olde et al., 2014). Liang et al. (2016) investigated the direct and indirect effects of mindfulness characteristics on construction workers' health and safety performance through stress. By summarizing the characteristics of mindfulness and placing them within a theoretical framework, as well as by refining a mindfulness – stress – productivity model, the researchers aimed to gain a better understanding of the sophisticated interactions between individual mindfulness, stress, and performance parameters in construction workers. (Liang et al.,2016).

Safety Performance

Overall safety performance is defined as actions or behaviors practiced by virtually all individuals to increase the health and safety of employees, customers, the public and the environment.

A study by Burke et al. (2002) developed a potentially applicable overall safety performance model for the safety performance of many business areas. In this model, a 4-factor structure has been established for overall safety performance. These four factors are;

1- Personal protective equipment usage
2- Participate in business practices to reduce risk
3- Health and safety information communication
4- To fulfill the rights and responsibilities of employees respectively.

The four factors are based on the safety culture, climate and performance studies conducted in the literature.

According to the literature, behavior-based safety management systems improve industrial safety performance. Two prominent studies in this field have demonstrated that behavior-based safety management can be effective even in difficult construction environments. (Duff et al., 1994, Mattila & Hyodnmaa, 1988).

Different methods are used to measure safety performance. The four most commonly used methods are as follows (Yule, 2003):

1- Accident statistics
2- Events and accidents reported by employees
3- Safety behaviors reported by employees
4-Determination of safety performance of an employee by an administrator or supervisor

Measuring safety performance is one of the most important factors in achieving the targets of organizations safety management.

Planned Behavior Theory

Most previous research on organizational factors influencing employee safety behavior lacked a theoretical framework to explain the psychological aspects of employee safety behavior (Zohar, 2000; Glendon & Litherland, 2001). Since Zohar's (1980) study, several safety climate surveys have been developed. However, only a few studies have been designed using behavior theory (Hall, 2006; Fogarty & Shaw, 2010). It is reasonable to presume that several employees are not aware of the existence of organizational culture and how it influences employee behavior. The study's theoretical framework was provided by Ajzen's (1991; 2005) theory of planned behavior (TPB), which explains the psychological aspects of employee behavior (Baron, 2008). The TPB's main assumption is that all human actions are motivated by good intentions.

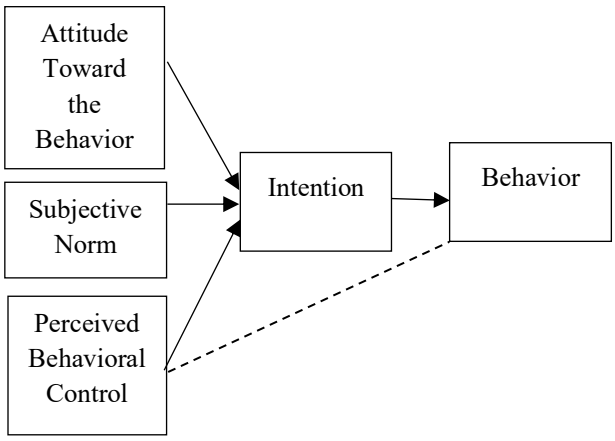

Figure 1. The Theory of Planned Behavior (Ajzen, 1991)

Figure 1 depicts the essential components of Ajzen's theory of planned behavior. Attitudes, subjective norm, and perceived behavioral control constructs can all be utilized to accurately anticipate a person's intentions for any form of conduct. Second, projected goals mixed with perceived behavioral control can explain disparities in actual behavior (Ajzen, 1991, p.2005).

It is reasonable to assume that people have attitudes toward certain behaviors. Individuals' actual behavior, on the other hand, is a result of their attitudes, subjective norms, and work pressures. Subjective norms are the perceptions of others' ideas and behaviors that have a substantial impact on an individual's viewpoints (Fogarty & Shaw, 2010). These could be closely related to the individual's coworkers or friends. Perceived behavioral control, which also serves as a direct predictor of actual behavior, serves as the third predictor of intention. Perceived behavioral control refers to external factors that prevent someone from engaging in a behavior even when they have a strong desire to do so.

The theory can be applied to the concept of safety behavior using an example from construction sites and the construction industry context. The example illustrates how an employee's safety behavior may occur as a result of TPB guidance. A safety helmet is an important safety tool for construction workers because it protects them in the event of an accident. It is also a safety rule to wear one while working on a building. However, some employees refuse to use it. This unsafe behavior has the potential to be dangerous. The workers have developed a negative attitude toward the safety helmet, according to TPB. Second, workers' attitudes toward safety helmets were influenced by their coworkers' attitudes. This situation is a group norm, according to TPB (Baron, 2008). Third, the workers find the safety helmet inconvenient. The helmet may save the worker's head in the event of an accident, but it may also cause the worker's head to become hot and obstruct his movement while working in a building site. (Ajzen, 1991; 2005).

The effects of organizational safety culture and mindfulness on safety behavior in the construction sector

Safety culture is an unobservable structure with many dimensions, and many employees probably do not know how they affect their presence or cultural behavior. Examining the relationship between employee safety behaviors and employees' organizational safety culture perceptions will help prevent human-induced accidents in high-risk industries (Helmreich et al., 2001). Even a minor human error can have disastrous consequences in high-risk industries.

Mindfulness is one of the main factors affecting the behavior of an individual. Based on previous research, it can be suggested that attention-enhancing experiences and events that characterize conscious individuals may influence the ability to control self-control, that is, the ability to control cognitive and emotional control (Kuhl & Fuhrmann, 1998). Conversely, because less attentive individuals pay attention to a range of internal experiences and contextual cues, their behaviors are more rigid and defenseless to the opposite habits and thoughts, so that a relationship of intention-behavior that is not so strong emerges.

Safety culture and mindfulness can reshape and colorize the attitudes and behaviors of employees on the work safety side. The identification of organizational determinants of individual safe behaviors and the determination of conscious awareness levels can be useful in designing and modifying current safety culture.

Since no study examining safety culture, mindfulness and safety behaviors variables together was found in the literature research, it can be said that this research is an original study. In this context, the main contribution of the research is to determine the effects of safety culture and mindfulness perceptions of construction industry workers on safety behaviors. In addition, it will play a significant role in the studies to reveal the relationship of safety behaviors with some variables with the data obtained from the sample selected from various companies in the production field in the construction sector.

In the study, the answers to the following research questions were sought to be tested based on the theoretical framework:

1. How effective are perceptions of safety culture and mindfulness in predicting employees' perceptions of safety behaviors?
2. What is the indirect effect of the perception of safety culture on mindfulness perceptions as well as its direct effect on safety behaviors?

Methodology

The main idea of this study is that safety culture alone is not enough to prevent the occurrence of workplace injuries caused by safety behavior. Therefore, a support mechanism must be in place to avoid workplace injuries. In this study, it is suggested that employees' intention to mindfulness will help safety culture and safety behaviors to function better. In other words, mindfulness has an auxiliary role that is thought to reduce workplace injuries in the relationship between safety culture and safety behavior. Numerous studies in the construction industry suggest a direct relationship between safety culture and safety behavior. (e.g., Meliá, Fugas & Silva, 2012; Lu & Yang, 2011; Guo, Yiu& González, 2016). Several studies have been conducted to show the relationship between safety culture and workplace / occupational injuries. (e.g., (Kearney et al., 2015; Liu et al., 2015). Several studies have looked at how mindfulness traits, either directly or indirectly, affect the health and safety performance of construction workers when under pressure. (Liang et al., 2016; Liang & Leung (2015). At this time, it is believed that the literature lacks a comprehensive explanation of the effects of mindfulness on safety culture and behavior, as well as the mediating effect of mindfulness between safety culture and safety behavior to reduce workplace injuries. This is the contribution this research and proposed model aims to make. In the data analysis phase, the following model was established to reveal the relationships between variables, to guide the research and to form hypotheses. This study employed Ajzen's (2005) theory of planned behavior (TPB) to develop a conceptual model that incorporated management attitude into the safety culture construct. Safety culture and mindfulness are independent variables in the model; safety behaviors take place as a dependent variable. With the help of the model, the effects of the employees' perception of safety

culture and mindfulness on the perceptions of safety behaviors and the relationship between them is tried to be determined. While developing the research model, previous studies on the subject in the literature were considered; the research model is presented in figure 1 below, based on the studies of Gong et al. (2009), Sengupta (2011), and Guo et al. (2014) expressed.

Figure 2 illustrates how the TPB perspective suggests that individual safety behavior is influenced by safety culture. In other words, an individual's perception of an organization's safety culture can be used to predict an individual's actual safe or unsafe behaviors. Second, an organization's safety culture has a direct impact on individual mindfulness intentions and predicted mindfulness, as well as the safety culture's level of perception, which can influence safety behaviors. In addition to this, the main aim of this study is to determine the mediating role of intention to mindfulness in the safety culture and safety behavior in terms of workplace injuries.

In accordance with the study's purpose, research questions posed, and research model, the following hypotheses are proposed to test the structural relationships among the study variables. The research model proposes several relationships between latent variables. However, individual attitude, workplace pressures, management attitude and group norms were observed to measure the safety culture construct as an exogenous variable using a four-factor model. Mindfulness was treated as a single-factor exogenous variable in the study. A two-factor model was used to measure the safety behavior construct by observing violation and error behaviors as an endogenous variable. Based on the literature and model, three hypotheses were proposed to explain the relationship between safety culture, mindfulness perception, and self-reported safety behaviors.

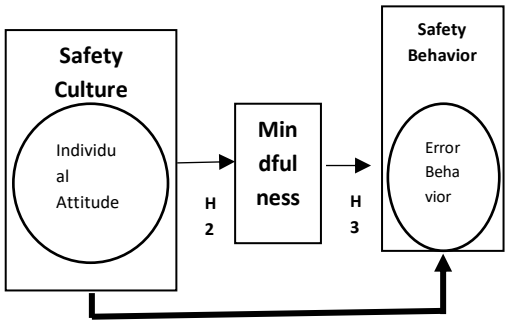

Figure 2. Study's Conceptual Model Based on the Planned Behavior Theory

H1: There is a positive and meaningful relationship between safety behavior and safety culture.

H2: There is a positive and meaningful relationship between safety culture and mindfulness.

H3: There is a positive and meaningful relationship between mindfulness and safety behavior.

Mediating Mechanisms

Although we have proposed a direct relationship between safety culture, mindfulness, and safety behavior, the intention of mindfulness will mediate the relationship between safety culture and safety behavior. Specifically, the relationship between safety culture and safety behaviors will be stronger when mindfulness perception of workers is strong compared to when opposite.

H4: The connection between safety culture and safe behaviors is complicated by the presence of a mediating factor called mindfulness.

Safety culture is a four-component exogenous variable. Safety behavior is an endogenous variable with a two-factor model that includes violation and error components. According to the TPB model, mindfulness is the latent construct that mediates the relationship between organizational safety culture and individual safety behavior. (Shapiro, et al., 2006).

Participants and Procedure

A questionnaire was administered to 900 workers selected at random from 27 different Istanbul construction sites. There were 387 questionnaires returned for a response rate of 43%. Due to missing

data and extreme values, 34 questionnaires were excluded from the evaluation, and the responses of 353 employees were analyzed.

Instrument

The questionnaire used in the research consists of four parts. The first section, which consists of three questions, was designed to assess demographic and occupational variables. In this part of the questionnaire education level, age, experience in construction industry are included.

The second part; safety culture perception of the respondents was measured with the thirty-one items. The survey questionnaire was created by analyzing questions from Hall (2006), Fogarty and Shaw (2010) and Seo et al. (2004) surveys. In this scale there have been observations that a safety culture consists of four subcomponents, which are individual attitude, group norms, management attitude, and pressure in the workplace. The individual's attitude is the first part of the safety culture model that must be considered. The individual attitude is indicative of the individual's dedication to safety, the usage of safety equipment, and the willingness to take safety risks, as well as the individual's view of safety regulations, safety infractions, and safety blunders. (Hall, 2006; Fogarty and Shaw, 2010). This part has seven items. Group norms are the second component of the safety culture. Group norms highlight the influence of coworkers on an individual's attitude and intentions about safety conduct. (Seo et al., 2004). This part has 8 items. The management's attitude to safety is the third element of a safety culture. It reveals how individuals view the management's support and commitment to safety. (Seo et al., 2004). This part has nine items. Workplace pressure is the last component of safety culture and has 7 items. For some authors workplace pressure is a pioneer of intent, violation and error behavior (Ajzen,1991; Fogarty,2004). All four subcomponent surveys have reliability scores ranging from 0.71 to 0.92 on this scale.

As a result, the third part, individual workplace safety behavior, can be divided into two subcomponents. While an error is defined as legal activities that do not achieve the desired result, an intentional disregard for formal safety regulations and procedures is the definition of a violation. (Wiegmann & Shappell, 2001). Fogarty and Shaw's (2009) infraction items are selected since they were designed to detect both ordinary and unusual transgressions. Based on error definitions, questions reflecting decision, skill-based, and perceptual error dimensions were selected from Seo et. al. (2004)'s unsafe behavior construct for the error construct. The violations construct had five items and the error construct had four items to allow for the observation of individuals' workplace safety behavior.

Last, individual mindfulness was measured using Brown and Ryan's Mindful Attention Awareness Scale (MAAS) (2003). They created the MAAS to measure everyday attention and awareness. MAAS is a prominent mindfulness scale (Ruiz et al. 2016). To ensure that respondents understood the survey questions correctly, they were translated into Turkish. Prof. Heyecan Giritli, a native Turkish speaker who was asked to review the Turkish version of the survey due to her familiarity with the study's concepts, reviewed it. Participants were asked to use a five-point Likert scale to respond to questions. Table 1 indicates the dimensions, and explanations for the study variables, as well as their sources, number of questions and measurement levels.

Table 1. Research Instruments

Study Variables	Dimensions	Source	Item Number
Exogenous Variable **(Safety Culture)**	Management Attitude	Seo et. al. (2004) Hall's (2006) Fogarty and Shaw's (2009)	9
	Individual Attitude		7
	Group Norms	Seo et. al. (2004)	8
	Workplace Pressure	Seo et. al. (2004)	7
Endogenous Variable **(Safety Behavior)**	Violation Behavior	Fogarty and Shaw's (2009)	5
	Error Behavior	Seo et al. (2004)	4
Mediating Variable (M**indfulness)**	Mindfulness	Brown and Ryan's (2003)	15

Reliability of Measurement

In the testing phase of the research questions, frequency and descriptive analysis were applied to

the data. The compliance of the data to normal distribution was tested by Kolmogorov-Smirnov analysis and kurtosis and skewness tests. Reliability analyzes of scales and sub-dimensions were calculated using the Cronbach alpha reliability coefficient.

Analysis of Data

"SPSS v21" and "AMOS v24.0" programs were used for the analysis of the data obtained from the questionnaire applied in the study. Pearson Correlation was calculated to determine the relationships between dependent and independent variables. Regression analysis was applied to see the effect of independent variables on dependent variables. In order to determine the mediating effect of mindfulness in the effect of safety culture on safety behaviors, a path analysis was performed using the structural equation model and the findings obtained were evaluated.

Analysis and Findings

The variables expressing the analysis and findings of the study are detailed below.

Demographic analysis

The demographic characteristics of the respondents are shown in Table 2 to reflect a better profile of the sample.

Table 2. Demographic data for respondents

Demographic variables	Categories	Number of responses	%
Education Level	Elementary School	54	15,29
	High School	89	25,12
	Graduate	155	43,90
	Master's degree	55	15,59
Age Group	<30 years	163	46,17
	30-50 years	137	38,81
	>50 years	53	15,01
Experience in construction industry.	<5 years	140	39,66
	5-10 years	125	35,41
	>15 years	88	24,93

Factor and Reliability Analysis.

First, the compatibility of the data collected in this study with the presented model was tested by Confirmatory Factor Analysis (CFA) using SPSS v21, AMOS v24.0 statistical programs. Based on the results in Table 3, it was clear that the data fit the model.

Table 3. Confirmatory Factor Analysis Results and Reliability Values of the Model

Scale	$\Delta\chi^2$/sd	RMSEA	CFI	IFI	α
Safety Culture	1.58	0.044	0.917	0.892	0.92
Safety Behavior	3.22	0.076	0.952	0.940	0.83
Mindfulness	2.74	0.067	0.902	0.841	0.94

In addition, for the construct validity testing, convergent and discriminant assessments of each of the three scales used in the study were conducted. In order to evaluate convergent validity, the average variance extracted (AVE) was tested with acceptable values to be ≥0.70.

Table 4. Average Variance Extracted, Composite Reliability and Alpha Reliability.

Variables	AVE	CR	α
Safety Culture	0.739	0.919	0.843
Safety Behavior	0.780	0.923	0.814
Mindfulness Intention	0.777	0.935	0.789

Note: CR, Composite Reliability; AVE, Average Variance Extracted α, Alpha Reliability.

Table 5 provides the arithmetic means and standard deviations for the perception points of the study participants for the variables of the study. Examining the safety culture (mean = 3.74, standard deviation = 0.92) reveals that employee safety culture levels are high. Examining individuals' perceptions of safety behaviors reveals that their perceptions are high (mean = 3.36, standard deviation = 0.97). The mean score for mindfulness was 2.06, with a standard deviation of 0.82. This result indicates that the participants' perceptions of mindfulness are low.

Table 5. Lowest and Highest Values of Variables, Means and Standard Deviation.

Scale	Minimum	Maximum	Mean	SD
Safety Culture	1	5	3,7493	,92852
Safety Behavior	1	5	3,3699	,97004
Mindfulness	1	5	2,0692	,82396

Correlation Analysis

Pearson correlation coefficients were computed to determine the relationships between dependent and independent variables (Table 6). Examining the correlations between the variables revealed a moderate positive relationship between safety

culture and safety behaviors, a low-level positively between safety culture and mindfulness, and a moderate positive relationship between safety behaviors and mindfulness.

Table 6. Correlation Findings

Scale	Safety Culture	Safety Behavior	Mindfulness
Safety Culture	1		
Safety Behavior	0.416**	1	
Mindfulness	0.264**	0.385**	1

N=353, (**) p<.01

All variables are found to have significant relationships with one another. In the scale development study by Turner and Valentine (2001), for example, there is a similar positive correlation (r = 0.265, p = 0.001) between safety culture, which is the dependent variable, and safety behavior, which is the independent variable, as well as demographic variables, which are considered control variables, and a positive relationship between safety culture and safety behavior. Various studies have demonstrated that there is a correlation between safety culture and safety behaviors (Cooper and Phillips, 2004; Fogarty and Shaw, 2009). The results of studies examining the relationship between mindfulness and safety behaviors indicate a strong and positive association between the two variables (Weick at. all.,1999; Hopkins,2002). It can be said that the present study's findings are consistent with the existing research.

Structural Equation Model Results of Research Model

The results of the AMOS analysis of the hypothetical model related to the performed work are presented in Table 7. In Table 7, analyses were performed utilizing the accepted indexes from prior studies, the accepted value ranges, and the measurement model results from the research application. In addition, the application's results data were interpreted in light of similar studies published in the literature.

Table 7. Literature Indexes and Research Model Results

Literature Indexes	Acceptable Values	Research Model
RMSEA	<,05-,08≤,	,072
CMIN/DF	0< χ2/sd ≤ 5	3.753
IFI	>,90	,907
TLI	>,90	,882
CFI	>,90	,926
RMR	<,1	,082

Aside from the TLI value, all other values in Table 7 of the study fall within the acceptable range established by the literature. These results demonstrate the applicability of the study. (Guo et.al., 2014).

Table 8. Regression Measurement Model Results of the Research

Associations in the Model	Estimate	S.E.	p	Hypothesis	Explanation
SC →SB	.746	.036	.003**	H1	Accept
SC→M	.785	.037	.009**	H2	Accept
M→SB	.793	.115	***	H3	Accept
SC→M→SB	.063	.036	.038*	H4	Accept

N=353, (*) p<.05, (**) p<.01, (***) p<.001
SC: Safety Culture; SB: Safety Behaviors; M: Mindfulness; Estimate: Standardized Regression Weights; S.E.: Standardized Error

The effect between perceptions of safety culture and safety behaviors was found to be significant (= 0.74, p .001) based on the results of the regression measurement model presented in the study's Table 8. There is a positive relationship between safety culture and safety behaviors, and safety culture is an important predictor of safety behavior, according to previous research (Nyhan, 1999). In this context, this study provides support for previous research. Examining the interaction between safety culture and mindfulness reveals a significant effect above the intermediate level (= 0.78, p .009). According to the research conducted by Reichers et al. (2017), safety culture has similar positive effects on mindfulness. However, various studies have also found that employees' perceptions of safety culture increase in proportion to their level of mindfulness (Wanous et al., 1994; Abraham, 2000).

Likewise, when the effect of mindfulness perception on safety behavior was evaluated, a positive and moderately significant relationship was discovered (=0.79, p .000). Andersson (1996) proposed a similar positive relationship between perceptions of worker awareness and attitudes towards organizational security behaviors, which is supported by these findings. Consistent with the literature, the positive outcomes of mindfulness perceptions, which are viewed as one of the causes of safety behavior (Thompson et al., 1998; Turner

& Valentine, 2001), are positive. In addition to direct effects, structural equation models created with the AMOS program can also be used to determine indirect effects (Arbuckle, 2007). In the final hypothesis of the study, the effects of employee perceptions of safety culture on safety behavior were measured, the mediating effect of mindfulness was identified, and the results were interpreted. Examining the results of Table 8 reveals that the mindfulness levels of employees have a full moderating effect on the positive and insignificant effect of employees' perceptions of safety culture on safety behaviors. This circumstance demonstrates that the safety cultures of employees have indirect effects (mediated by mindfulness) on their safety behaviors.

These results revealed that all the research hypotheses were accepted and that the high safety culture of employees in the workplaces increased the perceptions of mindfulness and safety behavior, similarly, the safety behaviors of those with high levels of mindfulness positively affected the safety behaviors and mindfulness had a mediating effect on safety culture and safety behaviors.

Discussion and Conclusion

This study aims to examine the perception of safety culture, the relationship between mindfulness and safety behavior, their interaction, as well as the effects of safety culture and mindfulness on safety behavior. By combining safety culture, mindfulness, and safety behavior, substantial contributions have been made to the literature that primarily examines these variables. In addition, it was intended to provide construction industry employees, managers, and leaders with management-related advice based on the findings and recommendations. According to the findings of this study, a high perception of safety culture among employees in an organization has a positive impact on individuals' perceptions of safety behaviors, and the resulting high perception of mindfulness contributes to the employees' higher safety behavior. Considering the total impact of mindfulness perception on safety behavior, it is evident that it has a substantial effect. The strong relationship between safety behavior and mindfulness can explain this result. There may be a correlation between mindfulness and safety behaviors, according to reports (Thompson et al., 1998; Turner & Valentine, 2001). Similarities exist between the study's findings and those of studies focusing on safety culture, safety behaviors, and mindfulness perceptions (Leung, M. Y., Liang, Q., & Yu, J., 2016; Klockner, 2013).

In addition to these studies, it has been discovered that people's perceptions of mindfulness influence their perceptions of safety behaviors. Mindfulness, however, can serve as a bridge between how people feel about safety culture and how they act regarding safety. Thus, it can be stated that research results are applicable to business. The results of the research can be used to provide managers with useful advice. For instance, if an organization wants its employees to be more mindful, the employer can increase the employees' safety culture level to achieve this result. Because this study demonstrates that employees pay close attention to and care about their perceptions of the safety culture at work. If there isn't much of a safety culture at workplace or if employees believe their supervisors don't care enough about safety culture, this could cause employees to become more complacent, which would make them less mindful and less likely to act safely. Since there is a direct correlation between safety culture and safety behaviors, this could result in negative outcomes such as decreased security and an increase in accidents. Therefore, it may be prudent for managers in the construction industry to focus on how employees feel about safety in order to encourage safer behavior. Even though the study has many contributing findings, it has some limitations, as do other studies. The most significant limitation is that the sample is limited to employees from a single city and region. As a result, conducting studies with a diverse range of participant groups will improve the generalizability of the research findings in future studies, and different variables representing the precursors and successors of safety behavior will contribute to the literature. Furthermore, because the data collected by the questionnaire method represents an internal evaluation that the

participants make entirely on their own, conducting evaluations with the assistance of supervisors who can conduct external evaluations or at different time intervals will reduce the limitations of the common method variance error that may occur. Aside from these limitations, it is known that other factors influence safety behaviors, and the generalizability of the research can be improved by controlling for these in future studies.

References

Abraham, R. (2000). Organizational cynicism: Bases and consequences. *Genetic, social, and general psychology monographs*, *126*(3), 269.

Ajzen, I. (1991). The theory of planned behavior. *Organizational behavior and human decision processes*, *50*(2), 179-211.

Ajzen, I. (2005). *Attitudes, personality, and behavior (2nd ed.).* Open University Press.

Andersson, L. M. (1996). Employee cynicism: An examination using a contract violation framework. *Human relations, 49*(11), 1395-1418.

Anon. (1994). *ACSNI [Advisory Committee on the Safety of Nuclear Installations] study group on human factors Third report: organizing for safety.* Health and Safety Executive.

Arbuckle, J. L. (2007). Amos 16.0 [computer software]. Small waters.

Aytac S. & Dursun S., (2018). The effect on the safety culture of occupational accidents and safety behavior: The case of Turkey, *Proceedings of International Academic Conferences*, 7809355, International Institute of Social and Economic Sciences.

Baron, R. A. (2008). The role of affect in the entrepreneurial process. *Academy of Management Review, 33*(2), 328–340. https://doi.org/10.5465/amr.2008. 31193166

Bodhi, Bhikkhu (2000). *The connected discourses of the Buddha: A translation of the Samyutta Nikaya.* Wisdom Publications.

Brown, K. W., & Ryan, R. M. (2003). The benefits of being present: Mindfulness and its role in psychological well-being. *Journal of Personality and Social Psychology, 84*, 822- 848.

Brown, K. W., Ryan, R. M., & Creswell, J. D. (2007). Addressing fundamental questions about mindfulness. *Psychological Inquiry*, *18*(4), 272-281.

Burke, M. J., Sarpy, S. A., Tesluk, P. E., & Smith-crowe, K. R. I. S. T. I. N. (2002). General safety performance: A test of a grounded theoretical model. *Personnel psychology, 55*(2), 429-457.

Chan, A.P.C., Yang, Y., Choi, T.N.Y. and Nwaogu, J.M. (2022). Characteristics and causes of construction accidents in a large-scale development project. *Sustainability,14*, 4449. https://doi.org/ 10.3390/su14084449

Chiang, C. F., & Hsieh, T. S. (2012). The impacts of perceived organizational support and psychological empowerment on job performance: The mediating effects of organizational citizenship behavior. *International Journal Of Hospitality Management*, *31*(1), 180-190.

Choudhry, R. M., Fang, D., & Mohamed, S. (2007). Developing a model of construction safety culture. *Journal Of Management In Engineering, 23*(4), 207-212.

Cooke, N. J., & Durso, F. (2008). Stories of modern technology failures and cognitive engineering successes. Boca Raton, FL: CRC Press.

Cooper, M. D., & Phillips, R. A. (2004). Exploratory analysis of the safety climate and safety behavior relationship. *Journal of safety research,* 35(5), 497-512.

Cooper, M. D. (2019). The efficacy of industrial safety science constructs for addressing serious injuries & fatalities (SIFs). *Safety Science*, *120*, 164–178.

Çalış S., Küçükali U.F. (2019). The work safety culture as a subculture: The structure of work safety culture in Turkey. *Procedia Computer Science"* p. 158.

Dedobbeleer, N., & Beland, F. (1991). A safety climate measure for construction sites. *J. Saf. Res*., *22*, 97-103.

Duff, A. R., Robertson, I. T., Phillips, R. A., & Cooper, M. D. (1994). Improving safety by the modification of behavior. *Construction Management and Economics, 12*(1), 67-78.

Fogarty, G. J. (2004). The role of organizational and individual variables in aircraft maintenance performance. *International Journal of Applied Aviation Studies, 4*(1), 73-90.

Fogarty, G. J., & Shaw, A. (2010). Safety climate and the theory of planned behavior: Towards the

prediction of unsafe behavior. *Accident Analysis & Prevention,* 42(5), 1455-1459.

Gelles, D. (2015). *Mindful work: How meditation is changing business from the inside out*. Houghton Mifflin Harcourt.

Glendon, A. I., & Litherland, D. K. (2001). Safety Climate Factors, Group Differences and Safety Behavior in Road Construction. *Safety Science,* 39, 157-188.

Gong, Y., Huang, J.-C., & Farh, J.-L. (2009). Employee learning orientation, transformational leadership, and employee creativity: The mediating role of employee creative self-efficacy. *Academy of Management Journal*, *52*, 765-778.

Good, D. J., Lyddy, C. J., Glomb, T. M., Bono, J. E., Brown, K. W., Duffy, M. K., ... & Lazar, S. W. (2016). Contemplating mindfulness at work: An integrative review. *Journal of Management, 42*(1), 114-142.

Guldenmund, F. W. (2000). The nature of safety culture: A review of theory and research. *Safety science*, *34*(1), 215-257.

Guo, H., Yu, Y., Liu, W., & Zhang, W. (2014). Integrated application of BIM and RFID in construction safety management. *Journal of Engineering management, 28*(4), 87-92.

Guo, B. H., Yiu, T. W., & González, V. A. (2016). Predicting safety behavior in the construction industry: Development and test of an integrative model. *Safety science*, *84*, 1-11.

Hall, P.A., Elias, L.J., & Crossley, M. (2006). Neurocognitive influences on health behavior in a community sample. *Health Psychology, 25*, 778–782.

Helmreich, R.L., Ashleigh, C. and Merritt, A.C. (2001). Culture at work in aviation and medicine. in Helmreich, R.L. and Merritt, A.C. (Eds), *National Organizational and Professional Influences, Ashg*ate, Aldershot. Brookfield.

Hopkins, A. (2002). Safety culture, mindfulness and safe behavior: Converging ideas? *Working paper 7. National Centre for OHS Regulation, Canberra.*

Hyland, P. K., Lee, R. A., & Mills, M. J. (2015). Mindfulness at work: A new approach to improving individual and organizational performance. *Industrial and organizational Psychology*, *8*(4), 576-602.

Kearney, G. D., Rodriguez, G., Quandt, S. A., Arcury, J. T., & Arcury, T. A. (2015). Work safety climate, safety behaviors, and occupational injuries of youth farmworkers in North Carolina. *American Journal Of Public Health, 105*(7), 1336-1343.

Klockner, K. (2013). Keeping my mind on the job: Mindfulness and workplace safety. Paper Presented at the *1st International Conference on Mindfulness*, Rome, May 8-12.

Kuhl, J., & Fuhrmann, A. (1998). Decomposing self-regulation and self-control: The volitional components checklist. In J. Heckhausen & C. Dweck (Eds.), *Life-span perspective on motivation and control (*p.19-45). Mahwah, NJ: Lawrence Erlbaum.

Liang, Q., & Leung, M. Y. (2015). Analysis of the relationships between mindfulness and stress for construction professionals. *Management, 469*, 478.

Liang, H. Y., Tang, F. I., Wang, T. F., Lin, K. C., & Yu, S. (2016). Nurse characteristics, leadership, safety climate, emotional labour and intention to stay for nurses: A structural equation modelling approach. *Journal of advanced nursing*, *72*(12), 3068-3080.

Lin, W.-T., & Liu, Y. 2012. Successor characteristics, organizational slack, and change in the degree of firm internationalization. *International Business Review, 21*(1), 89–101.

Liu, X., Huang, G., Huang, H., Wang, S., Xiao, Y., & Chen, W. (2015). Safety climate, safety behavior, and worker injuries in the Chinese manufacturing industry. *Safety science, 78*, 173-178.

Lu, C.-S., & Yang, C.-S. (2011). Safety climate and safety behavior in the passenger ferry context. *Accident Analysis and Prevention, 43*, 329-341.

Mattila, M., & Hyödynmaa, M. (1988). Promoting job safety in building: An experiment on the behavior analysis approach. *Journal of Occupational Accidents, 9*(4), 255-267.

Meliá, J., da Silva, S. A., & Fugas, C. S. (2012). Formal safety versus real safety: Quantitative and qualitative approaches to safety culture. In *11th International Probabilistic Safety Assessment and Management Conference and the Annual European Safety and Reliability*

Conference 2012, PSAM11 ESREL 2012 (p.6498-6503).

Naji, G.M.A., Isha, A.S.N., Mohyaldinn, M.E., Leka, S., Saleem, M.S., Rahman, S.M.N.B.S.A., Alzoraiki, M. (2021). Impact of safety culture on safety performance; mediating role of psychosocial hazard: An integrated modelling approach. *Int. J. Environ. Res. Public Health, 18*, 8568. https://doi.org/10.3390/ijerph18168568

Nyhan, R. (1999). Increasing affective organizational commitment in public organizations: The Key Role of Interpersonal Trust. *Review of Public Personnel Administration, 19*, 58-70.

Olde Scholtenhuis, L. L., Hartmann, T., & Dorée, A. G. (2014). Comparing mindfulness in manual and 4D-supported coordination practices. In *Construction Research Congress 2014: Construction in a Global Network* (p.160-168).

Ruiz FJ, Suárez-Falcón CJ, Riãno-Hernández D. (2016). Psychometric properties of the mindful attention awareness scale in Colombian undergraduates. *Suma Psicol*., *23*(1), 18-24.

Schwatka, N.V., Hecker, S. & Goldenhar, L.M. (2021). Defining and measuring safety climate: A review of the construction industry literature. Ann. *Occupational. Hygiene J*., *60*, 537–550.

Sengupta S (2011) International climate negotiations and India's role. In: Dubash NK (ed) *Handbook of climate change and India: development, politics and governance.* Oxford University Press, p.101–117.

Seo, D. C., Torabi, M. R., Blair, E. H., & Ellis, N. T. (2004). A cross-validation of safety climate scale using confirmatory factor analytic approach. *Journal of safety research, 35*(4), 427-445.

Seo, H.J., & Hong, A.J. (2022). Safety engagement in the workplace: Text mining analysis. *Safety*, *8*, 24. https://doi.org/10.3390/ safety8020024

Shapiro, S., Carson, L., Astin, J. and Freedman, B. (2006). Mechanism of mindfulness. *Journal of Clinical Psychology, 62*(3), 373–86.

Thompson, R. C., Hilton, T. F., & Witt, L. A. (1998). Where the safety rubber meets the shopfloor: A confirmatory model of management influence on workplace safety. *Journal of Safety Research, 29*, 15–24.

Turner, J. H., & Valentine, S. R. (2001). Cynicism as a fundamental dimension of moral decision-making: A scale development. *Journal of Business Ethics*, *34*(2), 123-136.

Wanous, J. P., Reichers, A. E., and Austin, J. T. (1994). Organizational cynicism: An initial study. *Academy of Management Proceedings*, *1994*(1), 269–273. https://doi.org/10.5465/ambpp.1994.10344804.

Weber, K., & Glynn, M. A. (2006). Making sense with institutions: Context, thought and action in Karl Weick's theory. *Organ. Stud*., *27*(11), 1639–1660

Weick, K. E., Sutcliffe, K. M., & Obstfeld, D. (1999). Organizing for high reliability: Processes of collective mindfulness. *Research in Organizational Behavior*, *21*, 81-123.

Wiegmann, D. A., & Shappell, S. A. (2001). Human error perspectives in aviation. *The International Journal of Aviation Psychology, 11*(4), 341-357.

Vignoli, M., Nielsen, K., Guglielmi, D., Mariani, M.G., Patras, L., & Peirò, J.M. (2021). Design of a safety training package for migrant workers in the construction industry. *Safety Science, 136*, 105124.

Yule, S. (2003). *Senior management influence on safety performance in the UK and US energy sectors.* Unpublished doctoral thesis. University of Aberdeen, Scotland.

Zhang, M., Zhu, M. & Zhao, X. (2020) Recognition of High-Risk Scenarios in Building Construction Based on Image Semantics. *J. Comput.Civ. Eng*., *34*, 04020019.

Zohar, D. (2000). A group-level model of safety climate: testing the effect of group climate on micro-accidents in manufacturing jobs. *Journal of Applied Psychology, 85*, 587.