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UNSAFE BEHAVIOR AMONG EMPLOYEES IN THE CONSTRUCTION INDUSTRY

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Abstract. *This paper investigates risk tolerance, risk perception and safety climate perception among construction workers. This is important because there is a significant risk to worker health and safety in the construction industry. Questionnaires were used to prove the general hypothesis that there is a significant difference between construction workers and managers, and the analysis was done using the SPSS software package. The results confirm the general hypothesis.*

Key words: *risk tolerance, risk perception, safety climate perception*

1. INTRODUCTION

Emphasis on the health, safety and protection of all human beings, in general, should be the hallmark of any advanced society. The construction industry is one of the most dangerous industries in the world, having an accident rate far higher than that of other industries (Fang et al., 2006). Despite improvements in construction safety over the last few decades, still, injuries and fatal accidents occur on a regular basis, so construction safety appears to have reached a certain level (Howell et al., 2002; Bhattacharjee and Gosh, 2011; Langford et al., 2000; Guo et al., 2016). Global estimates by the International Labor Organization indicate that the construction industry accounts for more than 60,000 fatal accidents annually, which is approximately 10-20% of the world's work-related fatalities (ILO, 2015). The critical safety situation in the construction industry and the serious consequences of accidents necessitate the investigation of their causes and the implementation of effective strategies to improve safety in construction to be of exceptional importance.

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In general, the safe behaviors of workers and managers in the construction industry have two aspects: safe behavior and unsafe behavior. This research is focused on the unsafe behaviors of employees in the construction industry because they are considered the most obvious and direct cause of accidents at work (Fleming and Lardner, 2002; Choudhry & Fang, 2008). Hence, in order to improve safety performance in construction, investigating the underlying causes of these unsafe behaviors is crucial.

Currently, two types of risky behavior are cited by researchers that explain why workers tend to behave unsafely, namely: unintentional and intentional risky behaviors. Unintentional risk behaviors refer to cases where risks are not considered or when workers do not pay attention to them because they may not know and have no idea how to perform the task in a safe way (Abdelhamid & Everett, 2000). These unintentional risky behaviors are easily prevented through specific training, which aims to develop safety awareness and improve relevant safety-related operational skills. Deliberate risk behaviors refer to situations where workers expose themselves to risks by deciding to continue work activities in a pre-existing unsafe situation that has been identified or by choosing to behave unsafely, regardless of the risky conditions in the work environment (Luo et al ., 2016). These risky behaviors are far more difficult to identify and prevent, given that the processing of risk information is complex and unclear (Tchiehe and Gauthier, 2017), and decisions to take risks are usually subjective. In such a case, it is necessary to understand how workers process and react to safety risks in construction because interventions for unsafe or risky behaviors depend greatly on how people think about risk (Weber et al., 2002; Xia et al., 2017). Many human factors have been investigated to determine how they influence unsafe behaviors. Socio-demographic characteristics (age, level of education, occupation), physical characteristics, psychological characteristics, attitudes, work skills and behaviors were analyzed among construction workers (Shin et al., 2015b; Mohammadfam et al., 2017; Techera et al., 2018; Hwang et al., 2018). Management skills, leadership and management behaviors have been investigated among managers (Wu et al., 2016; Sunindijo and Zou, 2013; Feng, 2013).

In this paper, risk tolerance, risk perception and perception of safety climate among construction workers are investigated. Risk tolerance is defined as the amount of risk an individual is willing to take to achieve a goal (Hunter, 2002) and this trait is thought to be critical in determining safe behaviors. In addition to risk tolerance, in research on individual behavior, great importance is also given to cognitive variables that shape the safety behavior of the individual, such as the perception of risk and the perception of a safe climate. Empirical findings indicate that risk perception is a direct determinant of people's behavior in risky situations (Simon et al., 2000; van Winsen et al., 2014; Fung et al., 2012). It also refers to the safety climate, which has a large and important influence on risky and unsafe behaviors and refers to employees' perception of safety policies, procedures and practices in the organization (Neal and Griffin, 2006).

2. An Investigation of Risk Tolerance, Risk Perception and Perception of Safety Climate among Construction Workers

Risk tolerance is at the core of all safety decisions, and each safety decision is made by subjectively assessing the acceptability of the risk and choosing one of the following alternatives, that is, to proceed as planned, to invest resources to mitigate some safety risk or not to proceed (Hallowell, 2010; Rae, 2007). This observation implies the fundamental

role of risk tolerance in professional settings and in that context, an effective decision-making process is of paramount importance and any information that can increase the effectiveness of this process is useful, especially assessments of their risk tolerance. Risk tolerance was explored and compared between supervisors and workers, with all participants provided with a definition of injury severity (eg, minor first aid injury to fatality) and asked to rate frequency in a unit of time, such as the number of days, weeks, months, or years (Hallowell, 2010). These values were used to represent risk tolerance and by applying this method, a statistically significant difference in risk tolerance was found between workers and managers. This analysis had certain limitations of accuracy:

- It is believed that the method used to assess risk tolerance does not adequately prepare employees or even managers for specific risk scenarios. Even when employees and managers are aware of the items, the risks they associate with them could vary depending on the participants' varied work histories.
- Another popular way to measure risk tolerance is to describe common risk scenarios, such as "worker steps on floor to open side" and "safety nets do not cover construction when construction is in progress".Although these measures provide detailed risk scenarios, workers and managers may still be unable to make an accurate assessment because any risk scenario includes information about the frequency and severity of the risk.

Two ways of perceiving risks are mentioned: (1) rational risk perception and (2) emotional risk perception. Rational risk perception means that people tend to perceive risks through the formulation of three parameters: (a) probability of occurrence of the risk, (b) severity of the impact of the risk and (c) expected benefit from the risk, i.e. multiplication of risk probability and severity (Cordell, 2002). Such a rational perception of risk can be problematic if applied to the emotional perception of risk among construction workers because it can only be possessed by experts in a specific field (Slovic, 2016). On the other hand, emotional risk perception means perceiving risks through direct and intuitive reasoning (Slovic, 2016; Xia et al., 2017) and such perception is usually influenced by various factors, including internal factors of personality traits, risk attitude, knowledge and emotions (Baloi and Price, 2003; Wang and Yuan, 2011), and external factors of culture, political environment and work position (Hallowell, 2010; Rees-Caldwell and Pinnington, 2013).

In safety research, safety climate refers to employees' perception of the safety policies, procedures and practices of the organization they work in (Zohar, 2000; Neal and Griffin, 2006), which affects their safety behaviors (Wishart et al., 2017). A safe climate, as a shared understanding of workplace safety issues, serves as a frame of reference for employees that guide normative and adaptive work behaviors by providing cues regarding expected contingencies of behavioral outcomes (Zohar, 2000), that is, the behaviors of employees are shaped or influenced by their perception of the safe climate within the organizational context.

The main problem and task addressed in this research are: Do construction workers and managers in the construction industry differ in terms of risk perception, risk tolerance and perception of a safe climate?

The general hypothesis in this study is whether construction workers and managers in the construction industry differ in terms of their risk perception, risk tolerance and perception of a safe climate.

For the purpose of this research, questionnaires for risk tolerance, risk perception and safety climate were used. The research sample consists of 60 construction workers and 20

managers from the construction industry. They are employed in small to medium-sized construction companies, according to the number of employees, according to their age, they are not older than 55 years and have a working experience in the company in which they are employed for no less than 5 years. The data collected using the measuring instruments were processed and analyzed with the SPSS software package.

Table 1 and Table 2 show the descriptive statistical results for the perception of risk by construction workers and managers, in terms of arithmetic mean and standard deviation, and the result of the Mann–Whitney U-test, which determines the statistical significance of the difference in perception of risk between construction workers and managers.

Table 1 Descriptive statistics on risk perception among construction workers and managers

	Work position	N	Mean	Std. Deviation	Std. Error Mean
Risk perception	Construction workers	60	37.22	5.533	0.714
	Managers	20	44.95	5.165	1.155

Table 2 Difference between construction workers and managers in risk perception

Independent-Samples Mann-Whitney U Test Summary	
Total N	80
Mann-Whitney U	1002.500
Wilcoxon W	1212.500
Test Statistic	1002.500
Standard Error	89.861
Standardized Test Statistic	4.479
Asymptotic Sig. (2-sided test)	<.001

Table 3 and Table 4 show the descriptive statistical results for the tolerance of risk by construction workers and managers, in terms of arithmetic mean and standard deviation, and the result of the Mann–Whitney U-test, which determines the statistical significance of the difference in tolerance of risk between construction workers and managers.

Table 3 Descriptive statistics on risk tolerance among construction workers and managers

	Work position	N	Mean	Std. Deviation	Std. Error Mean
Risk tolerance	Construction workers	60	39.55	5.401	0.697
	Managers	20	33.80	3.238	0.724

Table 4 Difference between construction workers and managers in risk tolerance

Independent-Samples Mann-Whitney U Test Summary	
Total N	80
Mann-Whitney U	229.000
Wilcoxon W	439.000
Test Statistic	229.000
Standard Error	89.831
Standardized Test Statistic	-4.130
Asymptotic Sig. (2-sided test)	<.001

Table 5 and Table 6 show the descriptive statistical results for the perception of safety climate by construction workers and managers, in terms of arithmetic mean and standard deviation, and the result of the Mann–Whitney U-test, which determines the statistical significance of the difference in perception of safety climate between construction workers and managers.

Table 5 Descriptive statistics on safety climate perception among construction workers and managers

	Work position	N	Mean	Std. Deviation	Std. Error Mean
Safety climate perception	Construction workers	60	78.72	6.290	0.812
	Managers	20	92.95	5.960	1.333

Table 6 Difference between construction workers and managers in safety climate perception

Independent-Samples Mann-Whitney U Test Summary	
Total N	80
Mann-Whitney U	1126.500
Wilcoxon W	1336.500
Test Statistic	1126.500
Standard Error	89.853
Standardized Test Statistic	5.860
Asymptotic Sig. (2-sided test)	<.001

Regarding the comparisons between construction workers and their managers, and in terms of risk perception, risk tolerance and perception of a safe climate, aimed at verifying the truth of the general hypothesis, the result of the Mann-Whitney U-test for the difference between construction workers and managers in terms of risk perception is 4.479 and is statistically significant at a level less than 0.05 ($p < 0.001$).

3. Conclusion

The construction industry is one of the most dangerous industries in the world, having an accident rate significantly higher than that of other industries. Despite improvements in construction safety over the past decades, still, injuries and fatal accidents still happen frequently, so construction safety has not yet reached a certain level. The safe behaviors of workers and managers in the construction industry have two aspects: safe behavior and unsafe behavior, and this research focused on the unsafe behaviors of employees in the construction industry. There are two types of risky behavior: unintentional and intentional risky behaviors. In this paper, risk tolerance, risk perception and perception of safety climate among construction workers were investigated.

The primary issue and task of this research were to determine whether construction workers and managers in the construction industry differ in terms of their risk perception, risk tolerance and perception of a safe climate. The general hypothesis was whether such differences exist between construction workers and managers in the construction industry. The findings of the investigations support the general hypothesis by demonstrating that managers exhibit a higher degree of risk perception compared to construction workers, while construction workers exhibit a higher degree of risk tolerance and construction workers exhibit a lower degree of perception of a safe environment.

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NEBEZBEDNO PONAŠANJE MEĐU ZAPOSLENIM U GRAĐEVINSKOJ INDUSTRIJI

Ovaj rad istražuje toleranciju rizuka, percepciju rizika i percepciju bezbednosne klime među građevinskim radnicima. Ovo je važno s obzirom na to da građevinska industrija ima visok stepen rizika kada je u pitanju bezbednost i zdravlje radnika. Upitnicima je dokazana opšta hipoteza da postoji značajna razlika između građevinskih radnika i rukovodilaca, a analiza je urađena korišćenjem softverskog paketa SPSS. Rezultati potvrđuju opštu hipotezu.

Ključne reči: *tolerancija na rizik, percepcija rizika, percepcija bezbednosne klime*