



Factors Related to Unsafe Behaviour among Construction Workers: An Update Literature Review

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ABSTRACT

Construction become an hazardous occupation according to the unique nature of its activities commonly observed in the field. This review aims to delve into the risk factors of the unsafe actions on construction industry. The investigation involved analyzing findings from 16 relevant studies employing a qualitative content analysis procedure, variables, themes, and factors were extracted from the studies. Furthermore, all the studies underwent a review process to evaluate the result of the evidence provided. The content analysis revealed five categories: individual factors, project management, job characteristics, team dynamics, and stakeholders. The review emphasized that project management factors, such as organization, leadership, training, and procedure of working play a crucial role in minimizing the occurrence of unsafe behaviors. Additionally, individual factors emerged as the most significant risk factors of unsafe behaviour of workers including knowledge, perception, competency, psychology, and physical health. In conclusion, further research is needed to enhance the understanding of the relationship between theories of unsafe actions and empirical finding

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ABSTRAK

Konstruksi dianggap sebagai pekerjaan berbahaya terutama karena sifat unik dari aktivitasnya yang biasa diamati di lapangan. Tinjauan ini bertujuan untuk menggali faktor-faktor yang mempengaruhi perilaku tidak aman pada industri konstruksi. Investigasi melibatkan analisis hasil dari 16 studi sebelumnya yang relevan menggunakan prosedur analisis konten kualitatif, variabel, tema, dan faktor diekstraksi dari studi. Selain itu, semua penelitian menjalani proses peninjauan untuk mengevaluasi kekuatan bukti yang diberikan. Analisis isi mengungkapkan lima kategori utama: faktor individu, manajemen proyek, karakteristik pekerjaan, kelompok kerja dan stakeholder. Tinjauan ini menekankan bahwa faktor manajemen proyek sangat penting seperti organisasi, kepemimpinan, pelatihan dan prosedur kerja berkontribusi untuk meminimalkan terjadinya perilaku tidak aman. Selain itu, faktor individu menjadi faktor risiko terbanyak menciptakan perilaku tidak aman dalam bekerja seperti pengetahuan, persepsi, kompetensi, psikologi dan kesehatan fisik. Kesimpulannya, penelitian lebih lanjut perlu dilakukan untuk meningkatkan pemahaman tentang hubungan antara teori tindakan tidak aman dan temuan empiris.

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INTRODUCTION

The global incidence of work accidents remains significantly elevated, and there has been a consistent annual rise in their numbers. According to the International Labor Organization (ILO), an estimated 2.3 million individuals, both male and female, lose their lives each year due to work-related accidents or illnesses. Furthermore, there are approximately 340 million work accidents and 160 million individuals affected by work-related diseases worldwide annually. (International Labour Organization, 2022; Sulistyaningtyas, 2021).

The construction industry is a vital sector in the national economy, where workers hold a crucial position in ensuring the success of diverse projects. However, this industry frequently faces challenges and disruptions due to recurring accidents and injuries that hamper its progress and development (Seokho et al., 2013; Zhang et al., 2020). Approximately 60,000 individuals lose their lives in construction accidents annually across the globe, equating to an accident occurring approximately every 9 minutes. Consequently, ensuring the safety of workers from such accidents is a significant priority for any construction organization (S. Li et al., 2020). Over the years, safety experts have extensively deliberated on physical precautions like machinery maintenance, housekeeping, and inspections, as they are believed to be responsible for accidents due to poor physical conditions. However, several prior studies have indicated that approximately 80% of accidents within the construction industry can be attributed to unsafe worker behavior (Baker et al., 2020; H. Li et al., 2015; Mohammadi & Tavakolan, 2019; Yu et al., 2017).

Workers' risky actions is formulated to be the root cause of construction accidents, so it is very important to make the right strategy to deal with unsafe behavior while doing work (Khoshnava et al., 2020). This serves as the reason for conducting an article review on the various factors that influence the unsafe behavior of construction workers. This review will encompass different perspectives such as the "individual" level, "organizational management" level, "project" level, and external factors related to "production operations" (Fang et al., 2020; Zhou et al., 2019). Despite the presence of journals addressing the topic of construction workers' unsafe behavior, there remains a lack of a comprehensive and cohesive system framework. To overcome this research gap, a literature study was carried out.

METHODS

Type and research design

This study employs an analytical research approach by conducting a literature review. The purpose of this research is to establish a theoretical basis that can assist in addressing the research problem and uncover various relevant theories pertaining to the case. Specifically, this study focuses on exploring factors associated with unsafe behavior among construction workers.

Literature search strategy

In searching journals using keywords (AND, OR NOT or AND NOT) which are used for more detail in disbursing journals and can make it easier to search for the desired

journal. The keywords used are "Factors that influence Unsafe Work Behavior in Construction Workers". The first stage, a manual search was performed on a paper database published from 2015 to 2020 to identify titles, abstracts, and keywords. To obtain relevant articles, a systematic search was conducted on two databases, Science Direct and PubMed. The process involved examining articles that were published in English, removing any duplicates, and extracting corresponding articles based on their relevant abstracts. The selection of studies was performed using Mendeley bibliography software. The first step involved screening the abstracts, followed by a thorough evaluation of the full text. Articles or studies deemed irrelevant were excluded based on their suitability and relevance to the research purpose. To identify pertinent previous works, specific research keywords such as "unsafe behavior" OR "unsafe performance" AND "constructs" were chosen. Upon completing the search in the databases, the total number of journals was tallied. Afterwards, the titles and abstracts of the papers were thoroughly reviewed, and those identified as relevant to the review were selected for complete retrieval and review. Papers were selected based on the following inclusion criteria: A journal describing the factors that influence unsafe work behavior in construction workers, issued between January 2015 to December 2020, available online, Journals are written in English.

Data analysis

Relevant study articles related to the planned topic, systematically reviewed and analyzed. Data analysis was carried out by conducting a study of all articles in three stages, namely summarizing, compiling research questions to determine the subtitle of the discussion and discussing the results of the research by providing criticism or opinions.

RESULTS AND DISCUSSION

Of the 205 articles searched from 2 reputable international journal sites PubMed and ScienceDirect which were published from 2015-2020, 16 articles that met all the inclusion criteria were collected and an analysis of the findings of the studies were conducted on the factors associated with unsafe behavior in working with construction workers.

From the summary data that has been analyzed qualitatively, the risk factors associated with unsafe behavior in construction workers are recorded (table 2).

In table 2, it can be seen that there are several factors that cause a worker to commit unsafe acts at work. From the results of data analysis, there are 4 articles which conclude that knowledge and education, worker training and poor physical conditions regarding occupational health and safety are risk factors for accidents. Project management and organization are one of the most common risk factors found in the 8 journals analyzed. This shows that bad management will be an external factor that must be considered. Another factor that was found to have an important role in the unsafe behavior of workers is the work group including the competence of workers and perceptions of work groups that can influence the attitudes of workers in the construction sector which are found in the 5 journals that were searched. In the same way, unfavorable work environment factors contribute significantly to the unsafe behavior found in 6 journals. From a stakeholder perspective, the construction

sector is also a major factor in the formation of unsafe behavior by workers which was found in 3 journals on contractors, 2 journals on supervisors and 1 journal on construction clients. Other factors related to unsafe behavior at work are low motivation, lack of PPE availability, training, attitude, supervision from management, age, work pressure,

work procedures, length of work, psychology, worker integrity, type of work, economy, emotional intelligence, culture, beliefs, language of employment contracts regarding psychological safety (individual beliefs about worker safety and obligations in the form of work agreements) and length of service.

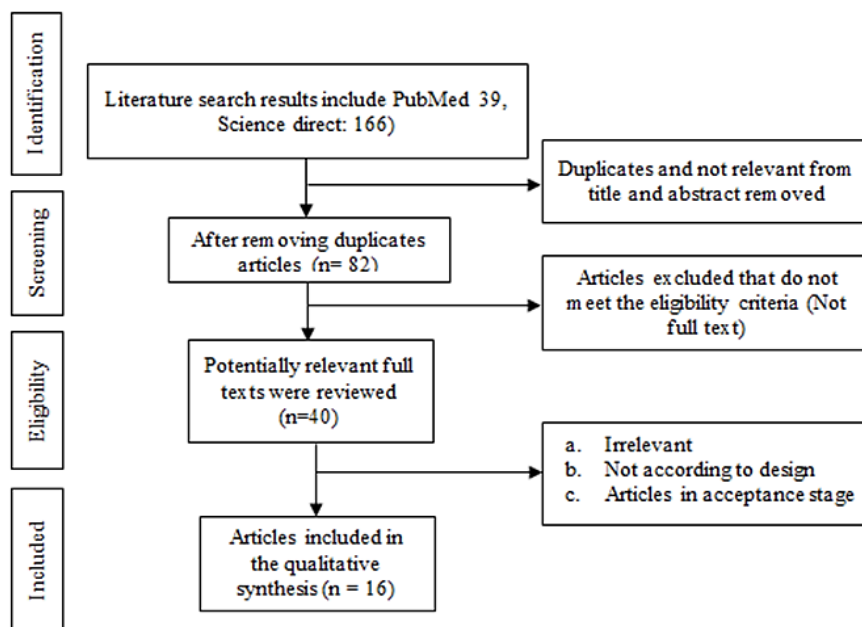


Figure 1. PRISMA Flow Diagram for Database Search of Studies

Table 1 Summary of Articles that Meet the Selection Criteria According to the Research Purpose

Authors	Title	Type of research	Results
(Wang et al., 2016)	Critical factors and paths influencing construction worker's safety risk tolerances	Mix Method	This research was conducted to investigate the dominant factors that lead to unsafe action at work. The findings indicated that external factors, including safety management and work characteristics had a greater impact on unsafe action compared to internal factors such as personal subjective perception, knowledge, and work experience. Notably, safety management emerged as the most significant contributor to worker safety risk tolerance.
(Asilian-Mahabadi et al., 2018)	A qualitative investigation of factors influencing unsafe work behaviors on construction projects	Qualitative study	By conducting in-depth interviews with 113 construction workers with an average working time of 15 years, the research shows that the factors contributing to unsafe behavior at work are management (economic and social conditions of work, project management, and contractor competence), organization (climate client safety, contractor safety climate, work group security, organizational culture), safety supervision and management, individual character (motivations and prohibitions, perceptions, attitudes, beliefs). Management and organizational culture were found to be causal factors that lead to human error and unsafe behavior at construction sites.
(Khoshnava et al., 2020)	Assessing the impact of construction industry stakeholders on workers' unsafe behaviours using extended decision making approach	Mix Method	The results of the study show that contractors have a major role in influencing workers' unsafe behavior among all stakeholder groups. The stakeholders such as clients, construction managers and supervisors also have an influence of unsafe work behavior because they have the authority to implement safety management during the construction phase.
(Moshood et al., 2020)	Ranking of human factors affecting contractors' risk attitudes in the	Quantitative study	Contractors play an important role in the unsafe attitudes at work. The five main factors that influence a contractor's risk attitude are as follows: Work experience (mean value: 3.64, Std: 0.56), physical health, educational background, professional competence and

	Malaysian construction industry		emotional intelligence.
(Dong et al., 2015)	Occupational and non-occupational factors associated with workrelated injuries among construction workers in the USA	Quantitative study	The study was conducted by taking data from 12.686 workers and analyzing work-related injuries among construction workers over a 12 year period. The results showed that workers with high school education and below had a higher accident rate (95% CI 10.6 ± 12.9%, p-value <0.001) than workers with higher education. Number of jobs > 2 types (95% CI 11.9 ± 17.2%, sp-value <0.001), working hours > 8 hours per day (95% CI 11.1 ± 15.3%, p-value 0.003) , the type of work that often lifts / bends / kneels (95% CI 9.9 ± 12.5%, p-value 0.070) is also a factor that influences work accidents in the construction industry.
(Newaz et al., 2019)	The psychological contract: A missing link between safety climate and safety behaviour on construction sites	Qualitative study	The results indicate that the factors influence safe work behavior are commitment to work safety management (direct effect 0.001, p value 0.97), safe work behavior of supervisors (direct effect 0.01, p value 0.96), safe behavior of co-workers (immediate effect 0.35, p value 0.001) , and psychological security contracts (direct effect 0.41, p value 0.001). The Psychological Safety Contract is an important point that must be considered to avoid unsafe behavior in workers.
(Patel & Jha, 2016)	Evaluation of construction projects based on the safe work behavior of co-employees through a neural network model	Qualitative study	The study utilized a neural network approach to conduct the research. The outcomes revealed multiple factors influencing the subject, including environmental monitoring, work pressure, adherence to safety rules and procedures, individual recognition, communication, commitment, competency, evaluation of the physical work environment, and assessment of work hazards.
(Winge et al., 2019)	Causal factors and connections in construction accidents	Quantitative study	The analysis identified seven primary factors that were prominently observed: worker behavior, risk management practices, direct supervision, utilization of materials or equipment, local hazards, worker capabilities, and management strategies.
(Chen et al., 2017)	Impact of individual resilience and safety climate on safety performance and psychological stress of construction workers: A case study of the Ontario construction industry	Quantitative study	These findings showed the significance of both organizational and individual factors in shaping individual safety performance and psychological well-being. Construction organizations should pay attention to not only monitoring employees' safety performance but also their psychological well-being. By fostering a positive safety climate and implementing training programs that target the enhancement of workers' psychological health, particularly in the realm of post-traumatic psychological health, organizations can improve their overall safety performance.
(Mohammadfam et al., 2017)	Constructing a Bayesian network model for improving safety behavior of employees at workplaces	Qualitative Study	In this study, 1.150 construction workers were research subjects. The analysis of result reveal that attitudinal factors, motivation, and safety knowledge serve as the most reliable indicators of safety behavior in the workplace because small changes in their state are associated with changes in the probability of safe or unsafe work behavior.
(Korkmaz & Park, 2018)	Comparison of Safety Perception between Foreign and Local Workers in South Korea' s Construction Industry	Quantitative Study	The results obtained from conducting an independent sample t-test, regression analysis, and Pearson correlation coefficient analysis demonstrate that language, education, nationality, and age significantly influence the safety perceptions of foreign workers. Furthermore, the effectiveness of managerial safety directives was found to be comparatively lower for foreign workers as compared to Korean workers.
(Abukhashabah et al., 2020)	Occupational accidents and injuries in construction industry in Jeddah city	Quantitative study	According to the questionnaire results, the primary factors contributing to accidents and injuries are attributed to workers' lack of awareness about work safety and their limited experience, accounting for approximately 80% of cases. The most commonly reported types of accidents and injuries in this industry involve falls from heights (exceeding 80%) and incidents of electric shock (over 60%). Additionally, other contributing factors include inadequate training (30%), insufficient provision of personal protective equipment (25%), and a lack of safety supervision or presence of safety and health officers on-site (16%).
(Jung et al., 2020)	Impact of Work Environment and Occupational Stress on Safety Behavior of Individual Construction Workers	Quantitative study	A study conducted on 399 construction workers at 29 construction sites in South Korea aimed to investigate the direct and indirect effects of various factors on safety behavior. The results indicated that safety knowledge and motivation were positively associated with safety compliance and participation behavior among construction workers. However, traits of depression and anxiety were found to negatively impact safety motivation, knowledge, and ultimately, safety behavior. Job demands, lack of job control, absence of rewards, and insufficient organizational justice were identified as factors that adversely affected safety behavior. Surprisingly, the study did not find

			a significant relationship between job support and safety behavior.
(Liang et al., 2019)	Understanding the Factors and the Corresponding Interactions That Influence Construction Worker Safety Performance from a Competency-Model-Based Perspective: Evidence from Scaffolders in China	Qualitative Study	A comprehensive assessment identified a total of 17 crucial items related to worker safety competence. These items were further examined in relation to four factors: individual character and predisposition, adjustment and adaptability, work attitude, and safety-related operating qualifications. The subsequent analysis revealed that all of these factors significantly contribute to an individual's safety competence. Specifically, individual character and inclinations were found to have the greatest influence on the development of safety competence. However, the intermediate effects of adjustment and adaptability should not be overlooked, as they also play a significant role both theoretically and practically.
(Low et al., 2018)	The Risk-Taking Propensity of Construction Workers– An Application of Quasi-Expert Interview	Qualitative Study	Through the utilization of quasi-expert interviews, this qualitative study identified seven factors associated with the risk-taking inclination of construction workers. These factors encompass both organizational elements such as safety supervision and inspection, safety culture, social influence, and workplace conditions, as well as individual aspects including risk attitudes, perceived risk, and perceived behavioral control. The findings suggest that these factors play a significant role in shaping the risk-taking tendencies of construction workers.
(Shin, 2015)	Factors that affect safety of tower crane installation/dismantling in construction industry	Qualitative Study	This study focused on a tower crane installation/disassembly project in Korea, employing accident analysis and conducting focus group interviews involving 38 cases of fatal tower crane accidents that occurred between 2001 and 2011. It was found that accidents during the installation/disassembly process accounted for 68.4% of all fatal accidents. The accident analysis identified the workers' failure to adhere to work procedures as one of the primary causes of these accidents. Further investigation identified several factors influencing the safety of tower crane installation/disassembly, including the competence of workers, the involvement of stakeholders such as the main contractor, damage to tower crane components, and the prevailing working conditions during the task.

Table 2 Factors Associated with Unsafe Behavior at Work

Factors	Source
Constraints in decision-making time, safety regulations, knowledge, work group behavior, completeness of project information, safety training, supervision, attitude of superiors, weather, availability of PPE, sensitivity to potential hazards, work experience	(Wang et al., 2016)
From general management factors including economic and social conditions, contracts and project management, contractor competence. Regarding organizational factors, these include the culture within the organization, the safety climate established by contractors and clients, as well as the safety climate within work groups. In terms of supervision factors, this encompasses the working conditions present and the safety systems that have been implemented. From individual factors including motivation, perception, culture, beliefs, values and attitude of workers.	(Asilian-Mahabadi et al., 2018)
Work safety climate, perceptions of work safety, working environment conditions	(Khoshnava et al., 2020)
Education, competency, work experience, physical health, emotional intelligence	(Moshood et al., 2020)
Number of jobs, length of work, physical condition of workers, and type of work	(Dong et al., 2015)
Work safety management, work behavior of supervisors, work group safety climate, employment contracts regarding psychological security (individual beliefs about worker safety and obligations in the form of work agreements)	(Newaz et al., 2019)
Environmental monitoring, work pressure, safety rules and procedures, personal rewards, communication, commitment, competence, assessment of the physical work environment and work hazards	(Patel & Jha, 2016)
Risk management, project management, worker capabilities and supervision	(Winge et al., 2019)
Length of work, age, training, management, work pressure, perceptions of work groups, knowledge, unsafe conditions, perceptions of supervisors, psychological conditions	(Chen et al., 2017)
Motivation, management, environment, work procedures, attitudes, knowledge, work pressure and worker participation in work safety	(Mohammadfam et al., 2017)
Perception, training, language, education, age	(Korkmaz & Park, 2018)
Work experience, lack of accident alertness, insufficient training, poor use of PPE, no safety and health officers or supervisors	(Abukhashabah et al., 2020)

Work environment and work stress	(Jung et al., 2020)
Physical condition, knowledge, awareness of danger, management, work group, work attitude, psychology, worker integrity	(Liang et al., 2019)
Work organization (work culture, social influence, and work environment), individual factors (work attitudes, perceptions)	(Low et al., 2018)
Work procedures, inspections, signaling errors, poor use of PPE, lack of competency, unclear instructions, uncontrollable conditions such as narrow roads, confined spaces.	(Shin, 2015)

Source: Primary Data, 2023

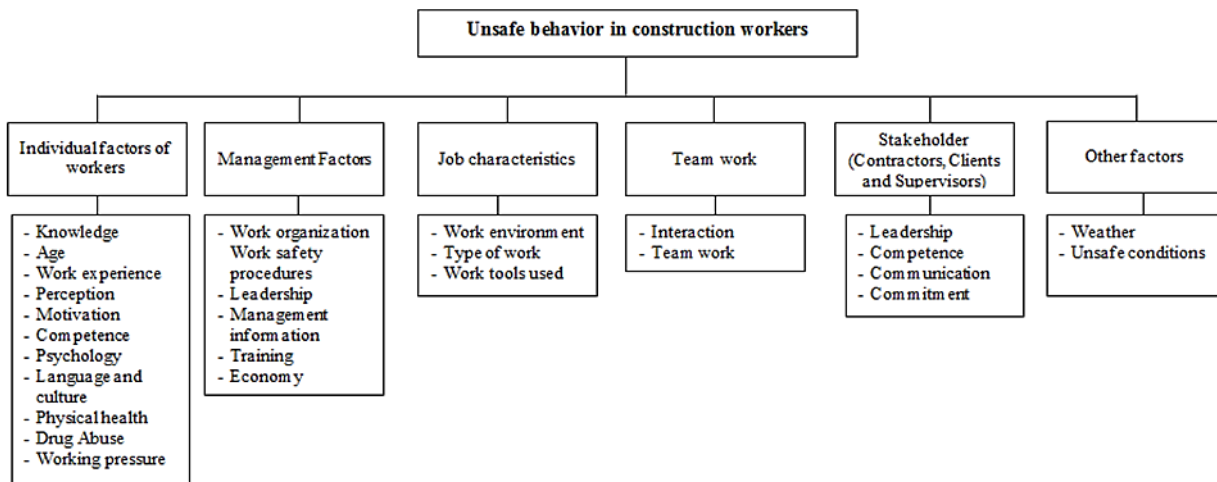


Figure 2. The conceptual framework illustrates the factors that influence unsafe behavior among construction workers

Based on an analysis of the literature and content, a comprehensive scheme was developed to identify the factors that can lead to work accidents in the construction sector due to unsafe behavior (Figure 2).

This study provides an in-depth description of the factors influencing unsafe behavior among construction workers. Previous researches have primarily focused on methodological aspects rather than theoretical or conceptual issues. Through a comprehensive review, this study identifies existing research that investigates the factors contributing to unsafe actions by workers. By addressing conceptual ambiguities and enhancing comprehension of the relationship between theory and empirical findings, this review contributes to the development of an integrated conceptual model. Figure 2 presents the conceptual model, which identifies both external and internal risk factors associated with unsafe behavior and accidents among construction workers.

Individual Factors

Existing studies have consistently emphasized the crucial role of individual characteristics in shaping unsafe behavior and subsequent work accidents within construction sites. This study further builds knowledge by identifying several key variables that serve as risk factors. These variables include attitude and motivation, age and experience, unintentional and intentional actions, competencies and abilities, and psychological stress. By comprehensively review these factors, this research contributes to a deeper understanding of the multifaceted nature of unsafe behavior in construction settings (Moshood et al., 2020). Among the various individual characteristics examined, safety attitudes and motivation, as well as age and experience, exhibit a strong association with unsafe behavior in the workplace.

Numerous studies have identified inappropriate actions as a direct contributing factor to construction accidents. Hence, a clear connection can be established between individual characteristics and other influential factors impacting unsafe behavior and accidents on construction sites. The research findings highlight that improper actions, such as engaging in unsafe acts, improper utilization of personal protective equipment, and disregarding established safety protocols, directly lead to construction accidents. Furthermore, factors like lack of skills and expertise serve as a foundation for non-compliance with work regulations. As a result, individual characteristics intertwine with other elements, exerting influence on unsafe behavior and accidents within construction settings. The presence of work pressure prompts workers to undertake higher risks. A majority of the interviewees emphasized the pivotal role of "management commitment to safety" in influencing unsafe behavior (Asilian-Mahabadi et al., 2018).

Management factors

Management commitment is an important element in an organization that affects safety performance (Eskandari et al., 2021). This commitment will motivate employees that the organization will provide the resources needed to support safety performance so that it can have a direct effect on worker compliance and participation in safety (Lu et al., 2020). Required resources such as finance, personnel, time and other support such as training, making work safety and health programs and considering work safety in decision making. Management commitment directly affects worker safety compliance and safety participation (Baldissone et al., 2019; Lu et al., 2020). Without commitment, the performance of safety management will almost certainly fail.

Working Group

The available literature suggests that the relationship between working group factors to unsafe behavior and accidents is quite limited. Group norms refer to the shared attitudes accepted among a particular group of people. If a group can cultivate and integrate a positive attitude towards safety, it can effectively manage and prioritize safety measures (Umair Mughal, 2020). As such, it is the foundation of a good safety culture. However, many of the previous researches have been descriptive in nature. Future studies on this topic are recommended.

Stakeholders

There are six identified themes that exhibit moderate evidence of their association with unsafe behavior and accidents at construction sites: contractor size, interaction, incentives, competence, subcontractor climate, and subcontractor level. Notably, contractor size exhibits a significant negative correlation with accidents. However, larger companies often rely on subcontractors and prioritize cost-effectiveness, leaving minimal room for investment in health and safety measures. In cases where safety errors occur during subcontractor work, the responsibility is typically attributed to the main contractor (Agustiawan, 2020; Wu et al., 2017). Therefore, it is crucial to further explore the role of subcontractors in influencing unsafe behavior and accidents on construction sites. Large companies and main contractors should place increased emphasis on monitoring, training, and incentivizing subcontractors to ensure their performance and adherence to safety regulations.

LIMITATION OF THE STUDY

This study has limitations. The design used in collecting review data is still literature review. There is no measurement of the odds ratio or risk relative of risk factors for unsafe behavior in workers.

CONCLUSIONS AND SUGGESTIONS

The health workers involved in this study were predominantly female and the majority were over 25 years old. Most health workers had good resilience and self-efficacy although 67.30% of health workers experienced low stress. The test results showed that predictors (age, gender, resilience, and self efficacy) were significantly associated with the level of stress experienced by health workers. Management needs to pay attention to workload, a safe work environment, and provide training so that health workers are able to manage and minimise the risk of work stress while providing health services to COVID-19 patients.

ETHICAL CONSIDERATIONS

Funding Statement

There was no support from any organization for this study.

Conflict of Interest Statement

There is no conflicts of interest in this study.

REFERENCES

- Abukhashabah, E., Summan, A., & Balkhyour, M. (2020). Occupational accidents and injuries in construction industry in Jeddah city. *Saudi Journal of Biological Sciences*, 27(8), 1993–1998. <https://doi.org/10.1016/j.sjbs.2020.06.033>
- Agustiawan, Y. (2020). *Improving the relationship between main contractors and sub-contractors in Indonesian transportation infrastructure projects* [Queensland University of Technology]. <https://doi.org/10.5204/thesis.eprints.206904>
- Asilian-Mahabadi, H., Khosravi, Y., Hassanzadeh-Rangi, N., Hajizadeh, E., & Behzadan, A. H. (2018). A qualitative investigation of factors influencing unsafe work behaviors on construction projects. *Work*, 61(2), 281–293. <https://doi.org/10.3233/WOR-182799>
- Baker, M. G., Peckham, T. K., & Seixas, N. S. (2020). Estimating the burden of United States workers exposed to infection or disease: a key factor in containing risk of COVID-19 infection. *PloS One*, 15(4), e0232452.
- Baldissone, G., Comberti, L., Bosca, S., & Murè, S. (2019). The analysis and management of unsafe acts and unsafe conditions. Data collection and analysis. *Safety Science*, 119, 240–251. <https://doi.org/10.1016/j.ssci.2018.10.006>
- Chen, Y., McCabe, B., & Hyatt, D. (2017). Impact of individual resilience and safety climate on safety performance and psychological stress of construction workers: A case study of the Ontario construction industry. *Journal of Safety Research*, 61, 167–176. <https://doi.org/10.1016/j.jsr.2017.02.014>
- Dong, X. S., Wang, X., & Largay, J. A. (2015). Occupational and non-occupational factors associated with work-related injuries among construction workers in the USA. *International Journal of Occupational and Environmental Health*, 21(2), 142–150. <https://doi.org/10.1179/2049396714Y.0000000107>
- Eskandari, D., Gharabagh, M. J., Barkhordari, A., Gharari, N., Panahi, D., Gholami, A., & Teimori-Boghsani, G. (2021). Development of a scale for assessing the organization's safety performance based fuzzy ANP. *Journal of Loss Prevention in the Process Industries*, 69, 104342. <https://doi.org/10.1016/j.jlp.2020.104342>
- Fang, D., Huang, Y., Guo, H., & Lim, H. W. (2020). LCB approach for construction safety. *Safety Science*, 128, 104761. <https://doi.org/10.1016/j.ssci.2020.104761>
- International labour Organization. (2022). *The enormous burden of poor working conditions*. https://www.ilo.org/moscow/areas-of-work/occupational-safety-and-health/WCMS_249278/lang--en/index.htm
- Jung, M., Lim, S., & Chi, S. (2020). Impact of Work Environment and Occupational Stress on Safety Behavior of Individual Construction Workers. *International Journal of Environmental Research and Public Health*, 17(22), 8304. <https://doi.org/10.3390/ijerph17228304>
- Khoshnava, S. M., Rostami, R., Zin, R. M., Mishra, A. R., Rani, P., Mardani, A., & Alrasheedi, M. (2020). Assessing the impact of construction industry stakeholders on workers' unsafe behaviours using extended decision making approach. *Automation in Construction*, 118, 103162. <https://doi.org/10.1016/j.autcon.2020.103162>

- Korkmaz, S., & Park, D. J. (2018). Comparison of Safety Perception between Foreign and Local Workers in the Construction Industry in Republic of Korea. *Safety and Health at Work*, 9(1), 53–58. <https://doi.org/10.1016/j.shaw.2017.07.002>
- Li, H., Lu, M., Hsu, S. C., Gray, M., & Huang, T. (2015). Proactive behavior-based safety management for construction safety improvement. *Safety Science*, 75, 107–117. <https://doi.org/10.1016/j.ssci.2015.01.013>
- Li, S., Wu, X., Wang, X., & Hu, S. (2020). Relationship between social capital, safety competency, and safety behaviors of construction workers. *Journal of Construction Engineering and Management*, 146(6), 4020059.
- Liang, K., Fung, I. W. H., Xiong, C., & Luo, H. (2019). Understanding the Factors and the Corresponding Interactions That Influence Construction Worker Safety Performance from a Competency-Model-Based Perspective: Evidence from Scaffolders in China. *International Journal of Environmental Research and Public Health*, 16(11), 1885. <https://doi.org/10.3390/ijerph16111885>
- Low, B., Man, S., & Chan, A. (2018). The Risk-Taking Propensity of Construction Workers—An Application of Quasi-Expert Interview. *International Journal of Environmental Research and Public Health*, 15(10), 2250. <https://doi.org/10.3390/ijerph15102250>
- Lu, Y., Taksa, L., & Jia, H. (2020). Influence of management practices on safety performance: The case of mining sector in China. *Safety Science*, 132, 104947. <https://doi.org/10.1016/j.ssci.2020.104947>
- Mohammadfam, I., Ghasemi, F., Kalatpour, O., & Moghimbeigi, A. (2017). Constructing a Bayesian network model for improving safety behavior of employees at workplaces. *Applied Ergonomics*, 58, 35–47. <https://doi.org/10.1016/j.apergo.2016.05.006>
- Mohammadi, A., & Tavakolan, M. (2019). Modeling the effects of production pressure on safety performance in construction projects using system dynamics. *Journal of Safety Research*, 71(November), 273–284. <https://doi.org/10.1016/j.jsr.2019.10.004>
- Moshood, T. D., Adeleke, A. Q., Nawanir, G., & Mahmud, F. (2020). Ranking of human factors affecting contractors' risk attitudes in the Malaysian construction industry. *Social Sciences & Humanities Open*, 2(1), 100064. <https://doi.org/10.1016/j.ssaho.2020.100064>
- Newaz, M. T., Davis, P., Jefferies, M., & Pillay, M. (2019). The psychological contract: A missing link between safety climate and safety behaviour on construction sites. *Safety Science*, 112, 9–17. <https://doi.org/10.1016/j.ssci.2018.10.002>
- Patel, D. A., & Jha, K. N. (2016). Evaluation of construction projects based on the safe work behavior of co-employees through a neural network model. *Safety Science*, 89, 240–248. <https://doi.org/10.1016/j.ssci.2016.06.020>
- Seokho, C., Sangwon, H., & Dae-Young, K. (2013). The Relationship between Unsafe Working Conditions and Workers' Behavior and Their Impacts on Injury Severity in the U . S . Construction Industry. *Queensland University of Technology*, 2, 1–45.
- Shin, I. J. (2015). Factors that affect safety of tower crane installation/dismantling in construction industry. *Safety Science*, 72, 379–390. <https://doi.org/10.1016/j.ssci.2014.10.010>
- Sulistyaningtyas, N. (2021). Analisis Faktor-Faktor Penyebab Kecelakaan Akibat Kerja Pada Pekerja Konstruksi: Literature Review. *Journal of Health Quality Development*, 1(1), 51–59. <https://doi.org/10.51577/jhqdv1i1.185>
- Umair Mughal, M. (2020). The Impact of Leadership, Teamwork and Employee Engagement on Employee Performances. *Saudi Journal of Business and Management Studies*, 05(03), 233–244. <https://doi.org/10.36348/sjbms.2020.v05i03.008>
- Wang, J., Zou, P. X. W., & Li, P. P. (2016). Critical factors and paths influencing construction workers' safety risk tolerances. *Accident Analysis & Prevention*, 93, 267–279. <https://doi.org/10.1016/j.aap.2015.11.027>
- Winge, S., Albrechtsen, E., & Mostue, B. A. (2019). Causal factors and connections in construction accidents. *Safety Science*, 112, 130–141. <https://doi.org/10.1016/j.ssci.2018.10.015>
- Wu, C., Li, N., & Fang, D. (2017). Leadership improvement and its impact on workplace safety in construction projects: A conceptual model and action research. *International Journal of Project Management*, 35(8), 1495–1511. <https://doi.org/10.1016/j.ijproman.2017.08.013>
- Yu, Y., Guo, H., Ding, Q., Li, H., & Skitmore, M. (2017). An experimental study of real-time identification of construction workers' unsafe behaviors. *Automation in Construction*, 82(May), 193–206. <https://doi.org/10.1016/j.autcon.2017.05.002>
- Zhang, J., Xiang, P., Zhang, R., Chen, D., & Ren, Y. (2020). Mediating effect of risk propensity between personality traits and unsafe behavioral intention of construction workers. *Journal of Construction Engineering and Management*, 146(4), 4020023.
- Zhou, C., Chen, R., Jiang, S., Zhou, Y., Ding, L., Skibniewski, M. J., & Lin, X. (2019). Human dynamics in near-miss accidents resulting from unsafe behavior of construction workers. *Physica A: Statistical Mechanics and Its Applications*, 530, 121495. <https://doi.org/10.1016/j.physa.2019.121495>