

Factors Influencing Construction Workers' Adherence to Safety Regulations

Chris Kurbom Tieru², Mustapha Zakari^{1*}, Benjamin Boahene Akomah¹, Thomas Abilgah²

¹*Department of Environmental Management and Technology, School of Built and Natural Environment, Cape Coast Technical University Cape Coast, Ghana*

²*Department of Construction Technology and Management; School of Built and Natural Environment, Cape Coast Technical University Cape Coast, Ghana*

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ABSTRACT

Construction workers face significant safety risks globally. Despite safety regulations, discrepancies persist between workers' knowledge and adherence to safe practices. This study investigates the factors influencing construction workers' adherence to safety regulations in Ghana. Specifically, it examines the discrepancies between workers' safety practices and established safety standards, identifying the causative factors leading to these discrepancies. A mixed-methods approach was employed. Quantitative data was collected by surveying 500 construction workers, focusing on demographics, safety knowledge, attitudes, and observed safety regulation discrepancies. Qualitative data was gathered through semi-structured interviews with a purposive sample of 30 construction workers and safety professionals to explore the reasons behind these discrepancies. Descriptive statistics and thematic analysis were used to analyse the data and were presented using tables. A significant disconnect was revealed between construction workers' safety knowledge and their adherence to safety regulations. The qualitative findings identified six (6) contributing themes: risk normalisation, inadequate training, peer pressure, personal protective equipment (PPE) discomfort, fear of retaliation, and lack of recognition of safe practices. Ghanaian construction firms should address the knowledge-practice gap and enhance safety by implementing competency-based training, effective communication, safety leadership, ergonomic PPE, an open communication culture, and safety recognition initiatives. The study advances understanding of safety culture within Ghana's construction sector by providing insights for creating targeted interventions to enhance safety compliance and foster a safer construction work environment.

^{1*} Corresponding author. E-mail address: mustapha.zakari@cctu.edu.gh
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INTRODUCTION

As a high-risk industry, the construction industry has long been troubled and has paid increasingly more attention to safety issues. This industry employs around 7% of the world's workforce but is responsible for 30–40% of deaths (Sunindijo & Zou, 2013). According to Shirali et al. (2024), the accident Domino theory is the earliest theory to explore the causes of construction safety accidents. This theory holds that up to 88% of accidents are caused by unsafe behaviours of the industry's employees and workers.

In recent years, safety in construction has remained a top priority, especially for workers. While various methods exist to improve safety management, construction personnel are ultimately the key factor (Sabbir & Hussain, 2014). Measuring their safety awareness can be challenging, but research suggests leaders significantly influence this (Zhang et al., 2022; Gao et al., 2024). Workers frequently witnessing injuries tend to have lower safety perceptions (Thompson et al., 2018). Conversely, workers who believe their work is safe are less likely to be involved in accidents.

Despite some improvements, statistics reveal that non-compliance with safety protocols and inadequate training remain major contributors to accidents and fatalities (Glowinski & Majdanik, 2024). These incidents also incur financial costs due to missed workdays. Industry experts believe many accidents are preventable if proper safety practices are followed. Poor training and knowledge retention among workers are significant factors (Ding et al., 2017). Therefore, a comprehensive review of training practices, followed by recommendations for improvement, would benefit the industry financially and protect the workforce (Glowinski & Majdanik, 2024).

The importance of adherence to safety regulations in the construction industry cannot be overstated, as non-compliance often results in accidents and fatalities. Previous research has established that safety regulations, when adhered to, significantly reduce on-site injuries (Yen et al., 2022; Aidoo et al., 2024). However, limited studies have focused on the Ghanaian construction sector, where cultural, educational, and enforcement factors may differ (Boadu et al., 2020; Ernest et al., 2020; Boadu et al., 2021). By identifying the factors contributing to non-compliance, this study offers insights that can inform targeted interventions to improve safety practices on construction sites.

This study aims to investigate the discrepancies between construction workers' adherence to safety rules, regulations, and practices. Specifically, it seeks to identify the divergences between workers' behaviours and the established safety standards. Additionally, the study explores the causative factors contributing to these discrepancies, such as gaps in knowledge, training deficiencies, and the enforcement of safety protocols.

LITERATURE REVIEW

Construction Safety Regulations and Practices

Construction work is dynamic and complex. It is inherently dangerous (Almaskati et al., 2024; Karakhan & Gambatese, 2018), but many risks can be avoided by adequately implementing safe work practices. Smallwood (2015) indicated that construction safety standards specify the minimum acceptable level of safe work performance. These rules are usually a combination of prescriptive and performance requirements, the development and enforcement of which vary considerably among different countries (Toole et al., 2016). In most developed and developing countries, government agencies or quasi-governmental organisations have the power to form and regulate these standards. In contrast, in some

developing countries, it is the federal government's responsibility, but it is performed by the local authorities (Masuda et al., 2022). Safety management practices vary between developed and developing countries and among developing nations (Raheem et al., 2014). This can be attributed to the varying defining characteristics of safety performance adopted by different nations (Raheem et al., 2014).

Protecting employees' safety and well-being in Ghana's ever-changing construction sector remains paramount (Saad, 2016). The construction industry is a major driver of economic growth and infrastructural development. Construction safety standards and procedures must be implemented effectively to mitigate occupational dangers and foster a safety culture (Agyekum et al., 2018). It is not only legally required, as clarified by Quartey (2017) but also morally important to ensure worker safety in Ghana, where the construction sector is a major driver of economic development. Several legal frameworks that support worker welfare and reduce occupational risks in the construction sector oversee construction safety laws and practices in Ghana (Eyiah et al., 2019).

Construction is encompassed in the nation's National Policy on Occupational Safety and Health (OSH) comprehensive structure. Other provisions safeguarding workplace safety and health, including construction sites, are laid down in the Factories, Offices, and Shops Act of 1970 (Act 328) and its amendments. The many aspects governed by these rules are PPE, safe working practices, risk assessments, emergency planning and staff training. Furthermore, safety measures for mining and quarrying activities often interfere with building construction in Ghana as provided under the Minerals and Mining Act, 2006 (Act 703) and the Minerals and Mining (Safety and Health) Regulations, 2012.

Discrepancies Between Construction Workers and Their Adherence to Construction Safety Regulations

As in many other countries, the building industry is vital to Ghana's economic growth and development. However, apart from its role in developing infrastructure, the sector has several significant problems regarding the protection of workers and adherence to safety standards. Historically, construction safety is the sole responsibility of the prime or general contractor (Tymvios & Gambatese, 2015). This is an assertion echoed by the OSH Administration, which holds that employers are accountable for the safe working environment of their employees (Henshaw et al., 2007). From the study conducted in Ghana, it has emerged that a range of factors, such as the nation's regulatory framework, organisational setting, socio-economic status and organisational culture, account for the gap between safety regulations and construction workers. Sadly, construction sites in Ghana remain a hotspot for accidents and occupational risks despite intervention by government ministries, the construction industry, and global entities. This highlights the need for further research and targeted approaches to tackle these issues.

Boakye et al. (2022) explained that many factors fuel dissimilarities between safety standards and construction employees in Ghana. These include failure to implement and enforce current measures, poor provision and access to safety equipment and education, safety attitudes and practices, and safety costs within the sector. Also, ensuring that safe practices are observed constantly is challenging since most of Ghana's construction industry comprises a significant proportion of small-scale contractors and subcontractors (Quartey, 2017). Due to the socioeconomic and cultural differences in the construction industry in Ghana, there is a need to employ a multipronged approach that involves policy changes, capacity development initiatives, engaging stakeholders, and tailored sensitisation crusades.

In addition, faulty compliance with safety measures could stem from the itinerant nature of construction work, whereby activities and work environments change frequently (Rivera et al., 2021). Employees can be exposed to new risks or have new assignments or responsibilities, which can destabilise safety procedures (Agyekum et al., 2018). Agyekum et al. (2018) further pointed out that variations in construction

workers' experience and training might also contribute to variations in compliance with safety standards: more experienced workers can get accustomed to safety procedures and rules, while less experienced ones strictly adhere to specific safety requirements stemming from training.

Factors Influencing Discrepancies Between Construction Workers and Construction Safety Rules

As Saad noted (2016), observing or implementing safety measures is crucial in promoting employees' health and minimising construction risks. However, inconsistency between safety regulations and construction workers remains a complex issue globally, impacting workers' health and the efficiency, success, and sustainability of construction projects (Sabbir & Hussain, 2014). Finally, it is important to know the reasons for these gaps to design specific prevention actions and create a safety culture within the construction industry.

Several factors influence construction workers and safety rules for construction works, depending on the situation in other countries like Ghana, as Quartey (2017) described. One important cause is the insufficiency of the enforcement systems of the current safety standards. While legislative frameworks have been implemented to address safety issues in the construction business, lack of resources, corruption, and weak monitoring sometimes result in poor compliance (Quartey, 2017). Because of this, some construction firms could put cost-cutting strategies ahead of observing safety laws, putting workers in danger (Saad, 2016). Strengthening regulatory oversight, funding regulatory agencies' capacity-building, and enacting severe penalties for non-compliance are necessary to address this issue and foster an accountable culture in the sector (Nandan Prasad, 2024).

In addition, disparities in safety compliance result from the informal character of a large portion of Ghana's construction industry (Agyekum et al., 2018). Saad (2016) opined that in Ghana, many construction workers are hired by small-scale contractors or do day labour informally. Frequently, they do not have official contracts or access to safety equipment and training. Because of this unofficial employment structure, workers have less negotiating power and are more susceptible to exploitation, which makes it difficult to enforce safety laws properly (Saad, 2016). Reducing disparities in safety compliance in Ghana's construction sector requires formalising employment relationships, granting access to protective gear and training, and enhancing working conditions for informal construction workers (International Labour Organisation, 2017; Quartey, 2017).

Level of Safety Knowledge of Construction Workers

The construction industry is widely recognised as one of the most hazardous industries globally. Safety knowledge is critical in preventing accidents and ensuring workers' well-being. A review of existing studies highlights the substantial impact of safety knowledge on compliance with regulations and workplace safety practices.

Several researchers have pointed out that inadequate safety knowledge significantly contributes to workplace accidents in the construction industry. For example, Glowinski & Majdanik (2024) argue that poor training and knowledge retention among workers are key factors leading to non-compliance with safety standards, often resulting in accidents and injuries. This observation is consistent with findings from Sunindijo & Zou (2013), who assert that non-compliance due to knowledge gaps exacerbates safety risks in construction environments.

Empirical evidence further supports this claim. A study by Sehsah et al. (2020) revealed that only 73% of construction workers lacked knowledge on how to use PPE. This contributes to workers unable to

correctly identify the appropriate PPE for specific tasks. This lack of knowledge jeopardises individual safety and weakens the organisation's safety culture. Furthermore, the same study indicated that construction companies with comprehensive safety training programs experienced a 25% reduction in workplace incidents, underscoring the importance of continuous education and training in boosting safety knowledge and compliance.

Demographic factors such as age and experience also significantly influence safety knowledge. Meng & Chan (2020) and Agyekum et al. (2018) conducted a comparative study of safety knowledge across different age groups in the construction industry. Their findings revealed that younger workers, particularly those under 30, demonstrated significantly lower levels of safety knowledge than their more experienced counterparts. This discrepancy highlights the need for targeted training programs tailored to workers' varying experience levels and backgrounds, especially for younger and less skilled workers.

The role of regular safety training cannot be overstated. A study by Zakari et al. (2024), Saad (2016), and Mustapha et al. (2024) demonstrated that consistent safety training increases workers' knowledge and fosters a positive safety culture, leading to a measurable decrease in workplace accidents. Companies that prioritise ongoing education and reinforce safety regulations through regular training sessions observed a significant reduction in safety violations.

In conclusion, the literature strongly indicates a pressing need to improve the safety knowledge of construction workers. Statistical evidence from studies conducted in Ghana and other regions consistently points to significant gaps in knowledge, which in turn lead to increased accident rates and non-compliance with safety protocols. Implementing comprehensive training programs that address these gaps and fostering a culture of safety awareness are essential steps toward improving safety compliance and reducing accident rates in the construction industry.

METHODOLOGY

Study Design

Concerning the choice of methods, a combination of qualitative and quantitative approaches was considered appropriate for the research topic, which seeks to establish the gap between construction workers and safety regulations or practices in Ghana (Guest & Fleming, 2015). The cross-sectional research approach, which combines the quantitative and qualitative data collection tools, provides sufficient information on an issue. However, the task at hand in this case is more complex. The focus of the study is construction workers in Ghana.

Sampling

Since it was impossible to calculate an accurate total population of construction workers, the estimation of a five hundred (500) male construction worker sample size was permitted based on a power analysis involving the 95% confidence interval and 5% error margin. Additionally, the selected sample size is consistent with recommendations from established research on behavioural surveys. Roscoe (1975) suggests that sample sizes ranging from thirty (30) to five hundred (500) participants are typically appropriate for most behavioural survey studies, depending on the complexity of the research question and the population being studied. Given the variability and heterogeneity within the construction worker population, a sample size of 500 would be sufficient to capture meaningful insights while maintaining statistical power and generalisability. To this end, the adopted procedure was stratified random sampling to

get a diverse sample from the construction industry. The study participants were first categorised based on the project type, which includes residential, commercial and industrial, then by their experience level, which is novice, intermediate and experienced and lastly by their employment status, which included both the formally employed and the daily paid workers and all these categories were selected from the sixteen (16) regions in Ghana.

Data Collection

This study employed a sequential explanatory design (Guest & Fleming, 2015). Quantitative data was collected first (Phase 1) to identify the extent of the discrepancies and prevalent factors influencing them. This was followed by qualitative data collection in Phase 2 to gain deeper insights into the reasons behind the quantitative findings and the lived experiences of construction workers (Olmo-Extremera et al., 2023). The data collection was in two (2) phases.

Phase 1: Quantitative Data Collection

In phase one (1), a survey was carried out using a structured questionnaire to gather data from construction workers across various project sizes (medium, small, and large) and locations in Ghana. The questionnaire addressed the following areas based on existing literature on factors influencing safety compliance.

- (i) Demographics (age, experience, training)
- (ii) Safety knowledge and attitudes
- (iii) Perception of safety practices on their worksite
- (iv) Frequency of observing safety regulation discrepancies
- (v) Reasons for not adhering to safety rules

Phase 2: Qualitative Data Collection

A stratified random sampling technique was used to ensure a representative sample of construction workers from different project types and experience levels (Bryman, 2012). Measures of how frequent they were obtained quantitatively, while rationale and the patient experience were obtained qualitatively. Semi-structured interviews were conducted with 30 interviewees selected using purposive sampling. This sample included a range of stakeholders from the construction industry to ensure a comprehensive understanding of safety compliance issues. The interviewees comprised 20 construction workers (identified through Phase 1 data) and 10 safety professionals, including safety officers, project managers, and site supervisors, to explore their perspectives on the reasons behind the discrepancies and potential solutions (Brewer et al., 2018). The workers represented various experience levels, with 40% having less than five (5) years of experience, 35% between five (5) and ten (10) years, and 25% over ten (10) years. Regarding educational background, 55% of the workers had completed secondary school, while the remaining 45% had construction-related vocational training. Including diverse demographic and professional backgrounds, they ensured that the data collected provided a reliable and nuanced perspective on safety practices in Ghana's construction industry.

Data Analysis

Quantitative Data Analysis

The collected data were analysed in two (2) phases; in phase one (1), descriptive statistics were used to summarise the demographic data and responses related to safety knowledge, attitudes, and practices (Chapman, 2017). Correlations between variables, such as the experience level and safety compliance, were investigated using chi-square tests (Chapman, 2017).

Qualitative Data Analysis

In the second analysis phase, thematic analysis was performed on the interview scripts to look for recurring themes and patterns regarding safety discrepancies (Braun & Clarke 2006). To combine results from both phases, paired items were synthesised to understand the problem comprehensively. Initially, the data was coded, and recurring patterns were identified, consistent with Braun and Clarke's (2006) guidelines for thematic analysis.

Ethical Considerations

As for the aspects of ethical concern, permission from all the respondents was first obtained before data collection, as Lim (2024) suggested. Participants' anonymisation ensured the credibility of the results, and all the procedures were conducted discreetly (Kang & Hwang, 2022). The necessary clearance from the correct IRB, the institutional review board, was sought before undertaking the study (Laryeafio & Ogbewe, 2023).

Presentation of Results

The findings from the quantitative and qualitative studies were merged and presented in a way that required each to provide a comprehensive view of the comparison of construction workers to safety regulations/practices in Ghana. In quantitative data analysis, a descriptive statistics table was adopted to present the demographic characteristic information, awareness of safety issues, and perceived violation of regulations on safety measures. Using a thematic analysis approach, the data generated from interviews was used to determine the pattern and theme associated with the causes of Safety non-compliance and also the life details of construction workers. Finally, the aggregate results of the quantitative and qualitative results were presented to convey the overall findings on factors influencing discrepancy and the potential for further intervention to improve safety compliance in the construction sector of Ghana.

FINDINGS

This study sought to identify the differences in compliance with safety measures and procedures in construction workers in Ghana. According to Sunindijo & Zou (2013), the construction industry is one of the most dangerous industries regarding work-related accidents, and construction employees are particularly vulnerable. This study aimed to establish the factors that have led to this situation, thus addressing the study's overall goal of promoting the safety culture in the construction industry in Ghana (Saad, 2016; Agyekum et al., 2018).

Demographic Data of Respondents

This study surveyed 500 construction workers and revealed that most participants were male, consistent with global labour trends (International Labour Organisation, 2017). The age distribution shows that most workers are relatively young, with 36% aged 31 to 35 and 28% aged 26 to 30. Education levels among respondents vary widely, which impacts how workers perceive and implement safety measures (Agyekum et al., 2018). The data further shows that 74% of workers are in formal employment, while 26% are daily wage earners with limited access to safety protection training (Henshaw et al., 2007). These findings suggest that knowledge, gender, age, employment status, and experience influence workers' adherence to safety regulations in Ghana. Addressing this issue requires comprehensive safety training programs tailored to different levels of education and experience, focusing on raising safety awareness and compliance among all workers.

Safety Knowledge and Attitudes

This section provides an overview of construction workers' safety knowledge and attitudes, as summarised in Table 1. The data reflects both the positive aspects of safety consciousness and areas for improvement among the workers. These insights align with previous studies by Saad (2016) and Agyekum et al. (2018), which explored safety practices within the Ghanaian construction industry. The items cover various aspects of safety knowledge, including awareness of safety regulations, comfort with reporting safety concerns, and attitudes towards the balance between safety and productivity. The table outlines the mean scores and standard deviations, representing the sampled workers' overall safety knowledge and attitudes.

Table 1: Safety Knowledge and Attitudes

	Mean	Std. Deviation	Rank
Understand the importance of safety regulations in preventing accidents on construction sites.	4.68	0.662	1st
Comfortable asking questions about safety procedures if I am unsure.	4.58	0.552	2nd
Aware of the different types of safety hazards that can occur on construction sites.	4.51	0.539	3rd
Believe that safety is everyone's responsibility on a construction site.	4.50	0.609	4th
Think that safety training is a valuable use of time on construction projects.	4.50	0.686	5th
Believe that a strong safety culture is important for a successful construction project.	4.49	0.656	6th
Aware of the safety procedures for different construction tasks.	4.48	0.575	7th
Believe that following safety rules can slow down the pace of work.	4.48	0.656	8th
Feel pressured to take shortcuts, even if it means compromising safety.	4.47	0.714	9th
Motivated to work safely, even when no one is watching.	4.44	0.572	10th
Believe that a safe work environment improves worker morale.	4.44	0.589	11th
Committed to following safety regulations to protect myself and others.	4.44	0.712	12th
Familiar with the emergency procedures on my worksite.	4.42	0.636	13th

Aware of the potential consequences of not adhering to safety regulations.	4.42	0.604	14th
Confident in my ability to identify safety hazards on my worksite.	4.31	0.578	15th
Comfortable speaking up if I see a coworker violating safety regulations.	4.32	0.599	16th
Updated on any changes to safety regulations on my worksite.	4.40	0.679	17th
Confident in using personal protective equipment correctly.	4.41	0.680	18th
Would report a safety violation to my supervisor, even if it meant getting someone in trouble.	4.41	0.635	19th
Believe that construction companies should prioritise safety over cost.	4.40	0.694	20th

Source: Authors (2024)

The results indicate that workers generally understand the importance of safety regulations, as demonstrated by the high rankings for items related to accident prevention and the value of safety training. Workers showed strong agreement on these points, reflecting a positive safety culture. This finding supports earlier research by Shirali et al. (2024), emphasising safety awareness as critical in reducing workplace accidents.

Notably, some areas warrant further attention. For example, items like "Confident in my ability to identify safety hazards on my worksite" and "Comfortable speaking up if I see a coworker violating safety regulations" received lower mean scores and higher response variability. This suggests that while workers are generally safety-conscious, there may be gaps in their ability to identify hazards or report violations. These findings resonate with the observations of Agyekum et al. (2018), who noted that workers' experience levels influence safety compliance and confidence.

The responses to statements such as "Believe that construction companies should prioritise safety over cost" and "Would report a safety violation to my supervisor, even if it meant getting someone in trouble" reveal a potential tension between safety and economic priorities, a concern also raised by Quartey (2017). This highlights the need for construction companies to foster an environment where cost-saving measures do not compromise safety.

While the construction workers demonstrate a solid foundation in safety knowledge and positive attitudes towards safety practices, there are significant areas for improvement, particularly in hazard identification, reporting violations, and ensuring that production concerns do not overshadow safety. By addressing these gaps through targeted safety training and more transparent communication from management, construction firms in Ghana can strengthen their overall safety culture.

Perception of Safety Practices on Their Worksite

Analysing construction workers' perceptions of safety practices provides important insights into the industry's safety culture. The data gathered explains how well safety measures are implemented on worksites and identifies areas for improvement. Table 2 summarises the collected data, highlighting workers' views on various safety practices.

The data shows a generally positive safety culture in the worksites under study, with the strict enforcement of safety regulations being the most highly ranked item. This is consistent with prior research by Sunindijo & Zou (2013) that pointed to the need for strict enforcement of safety policies in the

construction industry to mitigate the risk of accidents. The availability of PPE also ranks highly, reinforcing the critical role of adequate safety gear in ensuring worker safety, as emphasised by Smallwood (2015).

The perception that workers who violate safety regulations are held accountable and positive attitudes towards safety among coworkers further indicate that safety enforcement is a well-established norm. These findings resonate with Almaskati et al. (2024), who argued that accountability and positive safety attitudes are key components of a robust safety culture.

However, the results indicate areas that need improvement. One of the lower-ranked items was the provision of clear safety instructions from supervisors. This suggests that while supervisors provide some level of instruction, there is room for enhancement, particularly in tailoring safety guidelines to specific tasks, as noted by Henshaw et al. (2007). Additionally, safety meetings and the design of worksites to minimise risks were also ranked lower, indicating some inconsistencies in safety protocols across different projects or departments, which is a challenge previously highlighted in the informal sectors of construction industries, such as in Ghana (Agyekum et al., 2018).

Table 2: Perception of safety practices on their worksite

	Mean	Std. Deviation	Rank
Safety regulations are strictly enforced on my worksite.	4.76	0.651	1st
There are adequate supplies of PPE available on my worksite.	4.50	0.729	2nd
Workers who violate safety regulations are held accountable on my worksite.	4.49	0.769	3rd
My coworkers have a positive attitude towards safety.	4.49	0.686	4th
New workers receive proper safety training before starting work on my worksite.	4.45	0.727	5th
Feel comfortable raising safety concerns with anyone on my worksite.	4.43	0.683	6th
Observe most workers on my worksite following safety regulations.	4.43	0.683	6th
The management team on my worksite prioritises safety in decision-making.	4.43	0.739	8th
I am satisfied with the level of safety measures implemented on my worksite.	4.43	0.752	9th
There are clear procedures for reporting accidents and injuries on my worksite.	4.42	0.790	10th
Feel comfortable reporting safety concerns to my supervisor without fear of retaliation.	4.39	0.692	11th
Feel confident that my supervisor would address any safety concerns I raise.	4.39	0.706	12th
Safety training is provided regularly on my worksite.	4.32	0.692	13th
Safety incentives are offered to encourage safe work practices on my worksite.	4.41	0.665	14th
Unsafe work practices are corrected promptly on my worksite.	4.41	0.737	15th
There is a culture of open communication about safety issues on my worksite.	4.37	0.771	16th
The worksite layout is designed to minimise safety risks.	4.37	0.703	17th
Believe that my worksite provides a safe working environment for all workers.	4.37	0.689	18th
Safety meetings are held regularly on my worksite to discuss safety hazards and procedures.	4.38	0.759	19th
My supervisor provides clear instructions on safety procedures for each task.	4.17	0.567	20th

Source: Authors (2024)

The strict enforcement of safety regulations and the consistent availability of PPE across the worksites are strengths that highlight a strong commitment to worker safety. These findings are crucial as they align with global best practices in occupational safety (Sunindijo & Zou, 2013; Smallwood, 2015). The enforcement of regulations ensures a standard approach to safety, which is vital in high-risk industries like construction.

On the other hand, the need for improvements in safety communication is apparent. Lower scores related to supervisor-provided safety instructions and the frequency of safety meetings suggest that while a safety framework exists, communication about these measures is not always adequate. As Henshaw et al. (2007) noted, this could lead to gaps in worker understanding of task-specific risks. Addressing these issues through more frequent and tailored safety meetings and improving the clarity of instructions provided by supervisors could help bridge these gaps and enhance the overall safety culture.

Furthermore, the lower ranking of worksite design for risk minimisation highlights the need for better integration of safety considerations in the early stages of construction planning. This aspect is critical, as worksite layout significantly reduces the ability to mitigate on-site hazards (Agyekum et al., 2018). Addressing these inconsistencies could help create a more uniform approach to safety across different worksites.

While the study identifies a generally positive safety culture in the construction industry, particularly regarding enforcing regulations and providing PPE, there are notable areas for improvement in communication and worksite design. Ensuring regular, task-specific safety communication and a more consistent approach to risk minimisation through worksite design will be essential to achieving a more comprehensive and effective safety culture.

Frequency of Observing Safety Regulation Discrepancies

The current study highlights several concerning behaviours in addressing the discrepancies in safety regulation compliance among construction workers. These findings underscore the pervasive non-compliance with safety measures, reflecting broader industry challenges and the need for targeted interventions to promote safety adherence. As summarised in Table 3, the data presents a range of observed risky behaviours, with particularly alarming trends in areas such as working without proper fall protection, PPE discomfort, and inadequate safety communication.

One of the most notable findings is the widespread neglect of fall protection equipment. The data suggests this is a common issue, as indicated by the high frequency of responses regarding working at heights without proper safety gear. This aligns with Shiralí et al. (2024) assertion that unsafe behaviours are a leading cause of accidents in the construction industry. Frequently removing PPE is equally troubling due to discomfort, consistent with Zhang et al. (2022) conclusions that discomfort can lead to lower compliance rates. This reinforces the need to improve the design of PPE to enhance comfort while ensuring workers are adequately trained on its importance.

The data also reflects negative attitudes towards safety communication and reporting. The high frequency of respondents indicating that they fail to report safety hazards due to perceived inaction suggests a breakdown in safety culture, corroborating the findings of Sabbir & Hussain (2014). This, coupled with peer pressure to ignore safety protocols, highlights the critical role of leadership in fostering a positive safety culture, as Agyekum et al. (2018) recommended.

Further analysis reveals significant non-compliance in other areas, such as skipping safety meetings and inappropriate handling of PPE, including consuming food from contaminated equipment. These behaviours may indicate deeper cultural or attitudinal issues within the workforce, suggesting that some workers may not fully appreciate the importance of preventive measures or may view them as inconvenient.

The issue of PPE theft also emerged as a variable area, with responses indicating a broader range of perceptions. The higher variability in responses regarding stealing PPE suggests that this may be more context-dependent, potentially influenced by the work environment or individual worker experiences. In contrast, the relatively low mean score for using faulty or damaged tools is encouraging but still highlights an area that requires ongoing attention to ensure safe equipment practices.

Table 3: Frequency of Observing Safety Regulation Discrepancies

	Mean	Std. Deviation	Rank
I work at heights without proper fall protection equipment.	4.71	0.829	1st
I remove PPE when it becomes uncomfortable.	4.45	0.865	2nd
Inadequacy of safety training provided.	4.43	0.739	3rd
PPE makes it difficult to perform some tasks efficiently.	4.42	0.803	4th
I skip safety meetings because I think they are a waste of time.	4.41	0.802	5th
I eat from my helmet, head pans.	4.41	0.827	6th
I feel pressured by colleagues to ignore safety regulations.	4.40	0.813	7th
I fail to report safety hazards because I don't think anyone will take action.	4.40	0.837	8th
Pressure to meet productivity targets or deadlines.	4.40	0.837	9th
Deadlines are tight, and following all safety rules can slow down progress.	4.39	0.799	10th
Poor communication channels for addressing safety concerns or reporting violations.	4.38	0.811	11th
Taking shortcuts to complete tasks faster sometimes feels necessary.	4.38	0.798	12th
Complexity or difficulty of job tasks.	4.37	0.758	13th
I believe that safety regulations are not practical for all situations.	4.34	0.765	14th
I steal PPE from the site.	4.34	0.887	15th
My supervisor does not wear PPE, so I don't feel the need to either.	4.34	0.816	16th
I am not familiar with the safety procedures for the task I am doing.	4.32	0.787	17th
The PPE provided is not of good.	4.32	0.848	18th
There is pressure from colleagues or supervisors to finish work quickly, even if it compromises safety.	4.32	0.799	19th
I feel using my PPE for fashion after work.	4.30	0.807	20th
I take my PPE home without returning them.	4.31	0.822	21st
Perception of management's attitude towards safety.	4.31	0.758	22nd
Unclear and inconsistency of safety policies and procedures.	4.30	0.819	23rd
I forget to wear PPE sometimes.	4.25	0.816	24th
I take shortcuts to complete tasks faster, even if it means compromising safety.	4.24	0.777	25th

I use faulty or damaged tools or equipment.

4.07

0.711

26th

Source: Authors (2024)

The results of this study provide strong evidence of non-compliance with safety regulations among construction workers, highlighting key areas that require immediate attention. The most significant findings relate to the high rates of unsafe behaviours, such as working without fall protection and removing PPE due to discomfort. These behaviours pose substantial risks to worker safety and reflect broader challenges within the industry regarding safety culture and training. Additionally, the reluctance to report safety hazards and the pressure from colleagues to ignore safety protocols suggest that the current safety culture may need to be more supportive of open communication and accountability, which are essential for reducing workplace accidents.

The variability in responses regarding PPE theft and the relatively lower score for using faulty tools suggest areas where perceptions of safety and actual practices may diverge. Further research is necessary to understand the contextual factors that influence these behaviours, including the role of management and peer pressure.

These findings reinforce the need for construction companies to invest in safety training that emphasises compliance and addresses the underlying attitudes and perceptions that lead to risky behaviours. Furthermore, improving the design and comfort of PPE could reduce the likelihood of workers removing protective gear due to discomfort. Addressing these issues through targeted interventions can help improve overall safety compliance in the industry.

Lived Experiences and Underlying Reasons Behind Non-Compliance

While the quantitative analysis provided valuable insights into the discrepancies between construction workers' safety knowledge and adherence to safety regulations, the qualitative interview data offers a deeper understanding of the lived experiences and underlying reasons behind non-compliance. The thematic analysis followed in this study was not random. It was a structured process guided by both existing literature and participant responses. Initially, the data was coded, and recurring patterns were identified, consistent with Braun and Clarke's (2006) guidelines for thematic analysis. Six (6) recognisable patterns and themes were identified. Themes like "The Normalisation of Risk", "Inadequate Training and Communication", and "The Influence of Peer Pressure" were directly tied to previous research, such as studies on risk habituation in construction environments observation that the lack of competency-based safety training is a gap between theory and practice and social influence theory in safety behaviour (Choi et al., 2017; Handoko et al., 2022; Nielsen et al., 2022). Other themes, like "PPE Discomfort", "The Need for Recognition and Positive Reinforcement", and "Fear of Retaliation," emerged from the interviews themselves, reflecting first-hand accounts of construction workers' experiences. These themes shed light on key socio-cultural and practical barriers to safety compliance.

The Normalisation of Risk

Admittedly, the HSE culture, especially the risk tolerance in the construction, was among the topics that emerged from the interview. Some of the workers mentioned that safety measures were always overlooked to ensure that the organisation ran as required. This is in tandem with the works of Chukwuemeka and Uduma (2022), who also examine the impact of economic factors on safety practices for contractors in the construction industry. This aspect also fostered fearlessness among the workers, who could not consider the ramifications of taking reckless actions. This is consistent with other work by

Handoko et al. (2022), who showed that risk exposure results in risk habituation; no risk is perceived after repeated exposure.

Inadequate Training and Communication

The interviews also provoked the subject to provide details regarding questions touching on the quality and effectiveness of the safety training provided to the workers. Some of the workers complained that they did not receive adequate training or training that focused on their responsibilities. This affirms Nielsen et al.'s (2022) observation that the lack of competency-based safety training is a gap between theory and practice. In addition, clashes between workers and supervisors in terms of communication were identified as a theme. Employees stated that safety directives were sometimes unclear or contradictory, confusing them on how to conduct work safely. This is in line with the quantitative findings where the mean score for safety instructions by supervisors was low compared to the other safety practices.

The Influence of Peer Pressure and Group Dynamics

Interviews revealed that peers and group members were critical in determining safety compliance. For instance, the workers mentioned that their counterparts ignore safety standards, making them conform and avoid being labelled as slow or unproductive. This aligns with social norms theory in that individuals follow the behaviours practised in a society (Choi et al., 2017). The study implies the necessity of intervention to create safety leadership and reinforcement.

Discomfort and Impracticality of personal protective equipment

Some employees stated that they felt unsafe when they wore PPE. PPE non-use concerns such as high internal temperatures and restricted movement were given for not donning PPE. This is consistent with the present quantitative results where the mean score for “removal of PPE due to discomfort” is high.

Fear of Retaliation and Job Insecurity

One concern was that many respondents reported feeling at risk of being fired if they reported a safety issue. This fear could be because the construction industry is relatively more informal in some regions highlighted (Gómez-Bull et al., 2023; Liang et al., 2023). Employees may fail to report issues out of fear of being dismissed from work or dismissed as ‘troublemakers’. This goes a long way toward suggesting that there is a need to take a stand on matters relating to cultures of ‘neutrality’ in the construction workplace, where nobody is protected when they report on safety matters without intruding on their job security status.

The Need for Recognition and Positive Reinforcement

There was also, from the interviews, the feeling that employees wanted to receive applause and some form of token for observing the safe working measures. Participants argued that others should apprehend safety action in the company to express employee commitment to the activity. This is in consonant with the notion of psychological safety, which is a state in which individuals are allowed to express themselves freely and take certain risks without the negative consequence of effectively being fired (Li et al., 2022; Wang et al., 2021). This has provided a basis to suggest that safety compliance would be attainable through safety reward systems or promoting a culture that acknowledges safe working conditions.

Bridging the Gap Between Knowledge and Practice

The improved quantitative data set complements the qualitative findings across issues such as participants' experience and the social nature of safety compliance in constructions. As a result, knowledge translation is a significant issue, and the research reveals a gap between the amount and extent of knowledge that workers have about safety and the actual application of safety practices at the workplace. These areas can be closed by a concentration of interventions within the themes postulated in this study. These interventions could include:

- (i) **Enhancing safety training programs:** This involves identifying the performance competencies relevant to the workers' tasks and developing and selecting competency-based training programs (CBTPs) that can be effectively implemented (Bes & Strzałkowski, 2024).
- (ii) **Improving communication:** Supervisors' conduct in implementing safety practices and proactively communicating these to the employees (Curcuruto & Griffin, 2022; Xu et al., 2022).
- (iii) **Promoting a culture of safety leadership:** The workers should also be allowed to speak out loud on the safety measures rather than having them compromise on safety to increase production (Xu et al., 2022; Cheung et al., 2020).
- (iv) **Investing in comfortable and practical PPE:** Designing and providing engineered products that make the employees secure yet comfortable during their working period (Dowdle et al., 2021; Keng et al., 2021).
- (v) **Addressing fear of retaliation:** Ideally, a culture should be designed where employees can freely report any safety concerns without punishment (Claxton et al., 2022; Haga et al., 2024).
- (vi) **Implementing safety recognition programs:** Money rewards imply acknowledging workers' compliance with safety measures in handling their work (Buniya et al., 2021; Shafa & Susilawati, 2024).

By addressing these factors and implementing targeted interventions, construction companies can create a work environment that emphasises safety knowledge and fosters a culture of safety compliance, ultimately leading to a safer work environment for construction workers.

CONCLUSION AND RECOMMENDATIONS

The aim and objective of this research were to determine the level of safety consciousness and safety practicable among construction workers in Ghana. Thus, the study's conclusions and recommendations employ the quantitative and qualitative modes of research that are dear to advancing safety culture in the construction industry in Ghana. The quantitative component revealed a lack of harmony between workers' theoretical understanding of safety and the practical approach towards workplace safety. The qualitative interviews offered insights into why this gap exists, including normalisation of risk, lack of training and communication, peer pressure, discomfort in wearing PPE, fear of repercussions, and lack of appreciation of safe work practices. These findings point towards the need for both knowledge-based and behaviour-based safety interventions. These include competency-based training, better communication, safety leadership, more comfortable personal protective wear, encouragement of discussion, and rewarding safe

behaviours. This will ultimately lead to a safer work environment for construction workers in Ghana. This study acknowledged limitations such as the sample size and geographic location, potentially limiting generalisability. Future research could explore the identified themes across a wider demographic and incorporate mixed methods approaches to better understand safety compliance in the Ghanaian construction industry. By addressing the identified knowledge-practice gap and its underlying social and practical factors, construction companies can create a safer work environment for their workforce. Finally, exploring the perspectives of supervisors, safety officers, and other stakeholders could offer a richer understanding of the challenges and solutions for promoting safety culture within the Ghanaian construction industry.

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CONFLICT OF INTEREST STATEMENT

The authors agree that this research was conducted without any self-benefit commercial or financial conflicts and declare the absence of conflicting interests with the funders.

AUTHORS' CONTRIBUTIONS

Chris Kurbom Tieru and Thomas Abilgah conducted the research and wrote and revised the article. Chris Kurbom Tieru and Zakari Mustapha conceptualised the central research idea and provided the theoretical framework. Zakari Mustapha and Benjamin Boahene Akomah designed and supervised the research progress; Zakari Mustapha and Benjamin Boahene Akomah anchored the review, made revisions, and approved the article submission. Chris Kurbom Tieru completed the final review and editing for the article submission.

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