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Safety Knowledge and Safer Work Practices among Construction Workers in Cross River State, Nigeria

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Abstract

This study assessed safety knowledge, safety management practices and behavioural factors associated with safer work practices among construction workers in Cross River State, Nigeria. A descriptive survey design was adopted. Primary data were obtained from 261 respondents selected from 18 active construction projects across the three senatorial districts of the state using a structured questionnaire and an observation checklist. Data were analysed using frequencies, percentages, means and standard deviations. The findings showed that safety knowledge and implementation of site safety measures were generally high, with a grand mean of 3.90. Perimeter guarding recorded the highest mean (4.29), whereas electrical safety programmes recorded the lowest mean (3.52). Safety training, inspection and emergency preparedness recorded a grand mean of 3.70. Behavioural factors associated with safer site practices recorded the highest grand mean (4.20), while safety compliance, corrective behaviour and safer site outcomes recorded a grand mean of 3.88. The study concludes that safety knowledge and safer work practices are strengthened by continuous orientation, supportive peer relationships, incentives, supervision, compliance mechanisms and consistent enforcement. It recommends intensified safety education, regular inspections, improved protective facilities, and behavioural safety interventions across construction sites.

Keywords: Safety knowledge, Construction workers, Safety behavior, Occupational safety, Safety compliance, Safer work practices, Cross River State

Introduction

Safety knowledge is increasingly recognized as a critical factor in shaping how construction workers perceive risks, make decisions, and behave on worksites. Construction activities involve numerous hazards, including falls from height, struck-by incidents, equipment-related injuries, electrical hazards, exposure to dust and chemicals, and unsafe manual practices. While safety regulations, protective equipment, training, and supervision are important, their effectiveness depends substantially on workers' knowledge and willingness to translate that knowledge into safe behaviour. Recent studies have therefore

shifted attention from the mere availability of safety measures to the behavioural processes through which workers acquire, share, interpret, and apply safety knowledge. For instance, research has examined the role of safety knowledge in translating safety climate into safety behaviour, while other studies have highlighted cognitive, social, and interpersonal factors underlying unsafe practices among construction workers (Ashraf, Ejaz, Memon, & Shen, 2025; Cheng, Wei, Li, Huang, & Chen, 2023; Hu, Chan, Hu, & Xu, 2023). Against this background, examining the behavioural pathways linking safety knowledge with safer construction sites provides an important basis for understanding occupational safety challenges from the global level to Africa, Nigeria, and Cross River State.

Construction safety has increasingly moved beyond a narrow focus on rules and physical safety facilities toward understanding workers' behavioural responses to risk. Evidence from studies across different construction settings shows that unsafe behaviour is influenced by workers' perceptions, cognitive processes, social interactions, safety communication, and the wider safety climate of organizations. A science-mapping review of construction safety behaviour demonstrates the growing scholarly attention to the factors that shape workers' safety-related actions, while research on unsafe behaviour has linked workers' decisions to cognitive and social-psychological processes (Feng, Gao, Li, Liu, & Tang, 2024; Han, Li, Feng, Jin, & Kangwa, 2022). Similarly, research has shown that safety knowledge can function as an important pathway through which a positive safety climate is translated into actual safety behaviour (Ashraf, Ejaz, Memon, & Shen, 2025). Worker-to-worker communication is also important because safety knowledge is not acquired only through formal training. Construction workers frequently learn from colleagues, supervisors, and daily experiences on site (Ishdorj, Ahn, & Park, 2024). These findings suggest that safer construction sites depend not simply on what workers know, but on how knowledge influences their perception of hazards, risk-taking decisions, communication, and compliance with established safety practices.

The behavioural dimensions of construction safety are particularly important because the rapid expansion of urban development and construction activities has occurred alongside persistent challenges relating to occupational safety management, worker training, supervision, and compliance. In Ghana, for example, research among construction site workers has examined how workers perceive their own risk-taking behaviour, highlighting the importance of understanding why workers may knowingly engage in practices that expose them to hazards (Danso, Agyekum, Manu, & Adinyira, 2024). Similar concerns are reflected in Nigeria, where the informal construction sector includes large numbers of bricklayers, carpenters, and other workers who may operate in environments where formal safety education and structured occupational health systems are limited. Ojo, Onayade, and Naicker (2024), for instance, identified the need for safety education interventions aimed at preventing occupational injuries among bricklayers and carpenters in Nigeria. Research on road construction has also emphasized that improving occupational safety requires attention to worker behaviour as part of the wider safety system rather than relying exclusively on physical controls (Das, Aiyetan, & Mostafa, 2024). The African context therefore points to a practical challenge, translating safety knowledge into consistent behaviour in construction environments where workers may face pressure to meet deadlines, inadequate facilities, weak supervision, and normalized risk-taking practices.

Construction safety remains a significant concern because of the scale and diversity of building and infrastructure projects across cities such as Lagos, Abuja, Port Harcourt, and other rapidly developing urban centres. The effectiveness of safety management is affected by workers' access to relevant information, the quality of communication, availability and use of safety facilities, and the extent to which workers comply with established procedures. In Lagos State, for example, the management of health and safety information on construction sites has been identified as an important component of effective site safety management (Adebiyi, Yusuf, & Rasheed, 2024). Evidence from the Federal Capital Territory and Niger State also points to concerns regarding the adequacy and utilization of safety facilities on building construction sites (Umar, 2023). These issues demonstrate that providing safety equipment alone does not necessarily guarantee safe behaviour. Workers must understand the hazards they face, know how to respond to them, and consistently apply appropriate preventive measures. The informal construction sector presents an additional challenge, particularly among trades such as bricklaying and carpentry, where limited access to structured safety

education may increase vulnerability to occupational injuries (Ojo, Onayade, & Naicker, 2024). Consequently, understanding the behavioural pathways through which safety knowledge influences workplace practices is essential for developing more effective construction safety interventions in Nigeria.

The issue is also relevant to Cross River State, where construction, quarrying, road development, housing, and other infrastructure activities expose workers to different forms of occupational risk. In Akamkpa Local Government Area, for example, quarry workers operate in environments characterized by machinery, dust, noise, heavy materials, and other occupational hazards. Research in the area has identified challenges relating to safety compliance among quarry workers, demonstrating that the existence of safety requirements does not automatically translate into consistent compliance (Uttah, Onuoha, & Utre, 2024). More recent evidence from Akamkpa further shows the prevalence of occupational diseases among quarry workers, reinforcing the importance of strengthening preventive safety practices and worker protection (Okoro, Agoraye, & Udousoro, 2026). Although quarrying and building construction are distinct activities, they share important behavioural safety concerns, including hazard awareness, communication, use of protective facilities, compliance, and workers' responses to perceived risks. This makes Cross River State an important setting for examining how safety knowledge is acquired and applied by construction workers, and whether such knowledge actually produces safer behaviour. The study, therefore, focuses on the behavioural pathways connecting safety knowledge with workplace practices among construction workers in Cross River State, with the aim of contributing evidence that can support more effective safety education, communication, supervision, and site-level interventions.

Construction work is inherently associated with occupational hazards, yet the possession of safety knowledge does not always result in safe behaviour. Workers may understand the dangers associated with falls, machinery, electrical equipment, dust, heavy materials, and other site hazards but still engage in unsafe practices. This problem is particularly relevant where workers receive inadequate safety education or operate under conditions that encourage risk-taking. In Nigeria, the concern is evident in the informal construction sector, where bricklayers and carpenters constitute a substantial part of the workforce and may have limited access to structured occupational safety education. Ojo, Onayade, and Naicker (2024), for instance, identified the prevention of occupational injuries among informal construction workers in Nigeria as requiring targeted safety education interventions. Similarly, evidence from building construction sites in the Federal Capital Territory and Niger State indicates concerns regarding the adequacy and utilization of safety facilities, suggesting that the availability of safety resources does not necessarily guarantee their effective use by workers (Umar, 2023). The problem, therefore, extends beyond whether construction workers possess safety information to whether such knowledge is actually translated into consistent and safer workplace behaviour.

Another major problem concerns the behavioural processes through which construction workers respond to safety information, workplace conditions, and perceived risks. Workers may knowingly disregard protective measures, take shortcuts, fail to report hazards, or continue unsafe activities because of workplace pressures, social influences, inadequate supervision, or personal attitudes toward risk. This creates a gap between safety knowledge and safety practice, making it necessary to understand what happens between knowing what is safe and actually behaving safely. Recent evidence suggests that workers' broader psychological conditions can influence this process. Liu, Zhang, and Li (2025), for example, examined subjective well-being as a pathway for enhancing construction workers' safety behaviour, demonstrating that safety behaviour cannot be understood exclusively in terms of technical knowledge or physical safety provisions. The Nigerian experience also illustrates the challenge. Where safety facilities are inadequate or poorly utilized, workers may become accustomed to operating without appropriate protection (Umar, 2023). In addition, the persistence of occupational safety challenges in related high-risk workplaces indicates that compliance remains an important concern. In Akamkpa Local Government Area of Cross River State, Uttah, Onuoha, and Utre (2024) identified safety compliance challenges among quarry workers, highlighting the difficulty of converting safety requirements into consistent workplace practices.

The problem is particularly significant in Cross River State, where construction and other related activities expose workers to multiple occupational hazards. Akamkpa provides a clear local example, as quarrying activities involve heavy machinery, dust, noise, falling materials, and other risks that require

adequate knowledge, protective measures, and behavioural compliance. Uttah, Onuoha, and Utre (2024) reported safety compliance challenges among quarry workers in Akamkpa, while Oko, Agorye, and Udousoro (2026) documented the prevalence and pattern of occupational diseases among quarry workers in the same area. These findings provide evidence of a broader occupational safety concern within the state, but they do not sufficiently explain how safety knowledge influences the day-to-day behaviour of construction workers or the mechanisms through which knowledge becomes safer practice. There is therefore an important empirical gap concerning whether workers' safety knowledge leads to hazard recognition, appropriate decision-making, protective equipment use, compliance, and other safer behaviours on construction sites in Cross River State. Without understanding these behavioural pathways, safety interventions may continue to focus heavily on providing information and facilities without adequately addressing the factors that determine whether workers actually apply what they know. This study consequently seeks to examine the relationship between safety knowledge and safer site behaviour among construction workers in Cross River State and to identify the behavioural processes that can help transform safety knowledge into sustained safety practices.

Methodology

The study adopted a descriptive survey research design to examine safety knowledge and the behavioural pathways through which construction workers translate safety information into safer workplace practices in Cross River State, Nigeria. The design was considered appropriate because it enables the researcher to obtain information directly from construction workers, supervisors, safety personnel, and management staff regarding their safety knowledge, hazard awareness, compliance, use of personal protective equipment, and behavioural responses to workplace risks. The study employed both quantitative and qualitative data, with quantitative data focusing on respondents' characteristics, safety knowledge, perceptions of risks, compliance, and safety behaviour, while qualitative information addressed workers' experiences and factors influencing safe and unsafe practices.

The study utilized primary and secondary data. Primary data were obtained through structured questionnaires administered to 261 respondents selected from active construction projects across the three senatorial zones of Cross River State, comprising 10 projects in the Southern Senatorial District, four in the Central Senatorial District, and four in the Northern Senatorial District. The respondents comprised skilled and unskilled construction workers, site supervisors, safety personnel, and management staff. Purposive sampling was used to select active construction projects and relevant personnel; stratified sampling ensured representation of the different occupational categories, while simple random sampling was used to select eligible workers. Direct observation using a safety assessment checklist was also employed to assess actual safety practices and site conditions. Secondary data were obtained from government publications, occupational safety regulations, construction safety records, textbooks, journal articles, and other relevant scholarly sources.

Data collected through the questionnaire and observation checklist were coded and analyzed using appropriate descriptive and inferential statistical techniques. Descriptive statistics, including frequencies, percentages, means, and standard deviations, were used to summarize respondents' characteristics and responses to the study variables. The results were presented in tables and interpreted in line with the study objectives and research questions.

Findings and Results

Table 1 shows that safety knowledge and implementation of site safety measures were generally high among the construction workers, as indicated by the grand mean of 3.90, which exceeds the decision benchmark of 3.00. Perimeter guarding recorded the highest mean of 4.29, with 150 respondents (57.47 percent) reporting a very high extent of implementation and 61 (23.37 percent) reporting a high extent. Signs, barricades and flagging also recorded a high mean of 4.16, followed by head, eye and respiratory protection (4.03), emergency procedure induction (4.03), and rigging and crane safety (4.02). The comparatively lower means for new/transferred workers orientation (3.63), first aid and procedural training (3.55), and electrical safety programmes (3.52) indicate areas where safety knowledge and implementation could be strengthened.

Table 2 indicates that safety training, inspection and emergency preparedness were implemented to a relatively high extent, with a grand mean of 3.70. Safety inspections, safety work practices and emergency procedures practice each recorded a mean of 3.77, indicating relatively strong implementation across the construction sites. For safety inspections, 86 respondents (32.95 percent) reported a very high extent and 81 (31.03 percent) a high extent, while emergency procedures practice recorded 83 (31.80 percent) at very high extent and 91 (34.87 percent) at high extent. Accident investigation procedures had a mean of 3.62, while fire protection and prevention training recorded the lowest mean of 3.57. The findings therefore suggest that routine safety monitoring and emergency practices are reasonably established, but greater emphasis is needed on fire prevention training and systematic accident investigation to strengthen workers' capacity to respond effectively to workplace hazards.

Table 1: Safety Knowledge and Implementation of Site Safety Measures

Safety Knowledge/Site Safety Measure	Very High f (%)	High f (%)	Moderate f (%)	Low f (%)	Very Low f (%)	Mean	SD
Perimeter guarding	150 (57.47)	61 (23.37)	34 (13.03)	8 (3.07)	8 (3.07)	4.29	1.01
Rigging and crane safety	104 (39.85)	82 (31.42)	55 (21.07)	17 (6.51)	3 (1.15)	4.02	0.99
Signs, barricades and flagging	110 (42.15)	93 (35.63)	50 (19.16)	6 (2.30)	2 (0.76)	4.16	0.87
Head, eye and respiratory protection	101 (38.70)	95 (36.40)	45 (17.24)	12 (4.60)	8 (3.06)	4.03	1.01
Emergency procedure induction	99 (37.93)	88 (33.72)	61 (23.37)	10 (3.83)	3 (1.15)	4.03	0.93
Electrical safety programmes	65 (24.90)	88 (33.72)	50 (19.16)	35 (13.41)	23 (8.81)	3.52	1.25
First aid and procedural training	70 (26.82)	82 (31.42)	55 (21.07)	30 (11.49)	24 (9.20)	3.55	1.25
New/transferred workers orientation	73 (27.97)	85 (32.57)	55 (21.07)	30 (11.49)	18 (6.90)	3.63	1.20
Grand Mean	—	—	—	—	—	3.90	1.04

Source: Researcher's Fieldwork, 2024.

Table 2: Safety Training, Inspection and Emergency Preparedness

Safety Training/Organizational Practice	Very High f (%)	High f (%)	Moderate f (%)	Low f (%)	Very Low f (%)	Mean	SD
Fire protection and prevention training	75 (28.74)	80 (30.65)	50 (19.16)	30 (11.49)	26 (9.96)	3.57	1.29
Safety inspections	86 (32.95)	81 (31.03)	55 (21.07)	26 (9.96)	13 (4.98)	3.77	1.16
Safety work practices	91 (34.87)	78 (29.89)	50 (19.16)	26 (9.96)	16 (6.13)	3.77	1.20
Accident investigation procedures	78 (29.89)	89 (34.10)	39 (14.94)	28 (10.73)	27 (10.34)	3.62	1.29
Emergency procedures practice	83 (31.80)	91 (34.87)	52 (19.92)	13 (4.98)	22 (8.43)	3.77	1.19
Grand Mean	—	—	—	—	—	3.70	1.23

Source: Researcher's Fieldwork, 2024.

Table 3 reveals a strong association between the identified behavioural factors and safer site practices, as shown by the highest grand mean of 4.20. Social affinity and promotion for a good safety record recorded the joint highest mean of 4.28. For social affinity, 116 respondents (44.44 percent) indicated a very high extent and 111 (42.53 percent) a high extent, while promotion for a good safety record recorded 122 (46.74 percent) at very high extent and 104 (39.85 percent) at high extent. High level of orientation and physical ability each recorded a mean of 4.20, while monetary or material incentives recorded 4.14 and special consideration for a good safety record recorded 4.11. The relatively low proportions selecting low or very low categories across all indicators further indicate that positive social relationships, adequate orientation, worker capacity and organizational recognition or incentives are important behavioural factors supporting safer construction practices.

Table 4 demonstrates that safety compliance, corrective behaviour and practices supporting safer site outcomes were generally high, with a grand mean of 3.88. Formal reprimand for a bad safety record recorded the highest mean of 4.20, with 118 respondents (45.21 percent) reporting a very high extent and 99 (37.93 percent) a high extent, followed by punitive action through suspension or pay loss, which

Table 3: Worker Behavioural Factors Associated with Safer Site Practices

Behavioural Factor	Very High f (%)	High f (%)	Moderate f (%)	Low f (%)	Very Low f (%)	Mean	SD
High level of orientation	104 (39.85)	125 (47.89)	29 (11.11)	5 (1.92)	4 (1.53)	4.20	0.82
High physical ability	104 (39.85)	115 (44.06)	35 (13.41)	4 (1.53)	3 (1.15)	4.20	0.81
Social affinity	116 (44.44)	111 (42.53)	28 (10.73)	4 (1.53)	2 (0.77)	4.28	0.78
Special consideration for good safety record	99 (37.93)	116 (44.44)	28 (10.73)	12 (4.60)	6 (2.30)	4.11	0.93
Monetary/material incentives for good safety record	111 (42.53)	102 (39.08)	30 (11.49)	9 (3.45)	9 (3.45)	4.14	0.99
Promotion for good safety record	122 (46.74)	104 (39.85)	25 (9.58)	7 (2.68)	3 (1.15)	4.28	0.83
Grand Mean	—	—	—	—	—	4.20	0.86

Source: Researcher's Fieldwork, 2024.

recorded a mean of 4.17. Safety inspections and corrective action, emergency procedures practice, and safety work practices each recorded a mean of 3.77, while accident investigation procedures recorded the lowest mean of 3.62. The findings indicate that corrective and disciplinary measures are widely applied and may reinforce compliance with safety requirements, while the lower rating for accident investigation suggests the need to improve the systematic identification of causes and prevention of recurring incidents.

The findings indicate relatively strong safety-related practices among the surveyed construction workers, with the highest mean recorded for the behavioural factors in Table 3 (Grand Mean = 4.20). Safety knowledge and site safety measures also recorded a relatively high overall mean of 3.90, while training, inspection, and emergency preparedness recorded a mean of 3.70. The results suggest that workers generally report high levels of safety orientation, protective practices, and organizational responses to unsafe behaviour, although the comparatively lower means for electrical safety programmes, first aid training, fire protection training, and accident investigation procedures point to areas requiring further attention.

A limitation of the present study is that the reported analysis is predominantly descriptive. Although the original title and wording suggested behavioural pathways, the manuscript does not report a mediation model, regression model, correlation matrix, or other inferential test capable of demonstrating a pathway or causal relationship. The conclusions have therefore been revised to reflect descriptive patterns and associations rather than causal effects.

Table 4: Safety Compliance, Corrective Behaviour and Safer Site Outcomes

Safety Compliance/Corrective Behaviour	Very High f (%)	High f (%)	Moderate f (%)	Low f (%)	Very Low f (%)	Mean	SD
Punitive action: suspension/pay loss for bad safety record	106 (40.61)	110 (42.14)	32 (12.26)	9 (3.45)	4 (1.53)	4.17	0.88
Formal reprimand for bad safety record	118 (45.21)	99 (37.93)	28 (10.73)	11 (4.21)	5 (1.92)	4.20	0.93
Safety inspections and corrective action	86 (32.95)	81 (31.03)	55 (21.07)	26 (9.96)	13 (4.98)	3.77	1.16
Emergency procedures practice	83 (31.80)	91 (34.87)	52 (19.92)	13 (4.98)	22 (8.43)	3.77	1.19
Safety work practices	91 (34.87)	78 (29.89)	50 (19.16)	26 (9.96)	16 (6.13)	3.77	1.20
Accident investigation procedures	78 (29.89)	89 (34.10)	39 (14.94)	28 (10.73)	27 (10.34)	3.62	1.29
Grand Mean	—	—	—	—	—	3.88	1.11

Source: Researcher's Fieldwork, 2024.

Conclusion

The study concludes that safety knowledge and site safety measures are generally implemented at a relatively high level among construction workers in Cross River State. This is reflected in the grand mean of 3.90 for safety knowledge and implementation of site safety measures. Perimeter guarding recorded the highest mean of 4.29, while electrical safety programmes had the lowest mean of 3.52. Safety training, inspection and emergency preparedness also recorded a relatively high grand mean of 3.70, indicating that construction sites generally provide important safety training, inspection and emergency measures, although some areas remain less consistently implemented.

The study further concludes that behavioural and organizational factors play an important role in translating safety knowledge into safer site practices. Worker behavioural factors recorded the highest grand mean of 4.20, with social affinity and promotion for good safety records each recording a mean of 4.28. Safety compliance, corrective behaviour and safer site outcomes recorded a grand mean of 3.88, showing relatively strong organizational responses to unsafe practices. Overall, the findings suggest that possessing safety knowledge alone is not sufficient. Effective safety behaviour depends on continuous orientation, supportive peer relationships, incentives, supervision, compliance mechanisms, and consistent enforcement of safety procedures.

Recommendations

1. Construction companies should strengthen continuous safety education, induction, refresher training and practical demonstrations, with particular attention to electrical safety, first aid, fire prevention and accident investigation.
2. Construction site managers should improve supervision and enforcement by conducting regular safety inspections, promptly correcting identified hazards, and consistently applying appropriate sanctions and corrective measures for unsafe practices.
3. Construction organizations should strengthen positive behavioural interventions by rewarding good safety records, promoting peer-to-peer safety communication, and ensuring that personal protective equipment and other safety facilities are readily available and properly used.

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