Research Paper

Impact of Regulatory Compliance on Safety Performance in Ghana's Manufacturing Sector: Mediated by Safety Training

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Abstract: *Regulatory compliance is widely recognized as a mechanism for improving workplace safety and reduction of occupational accident, limited empirical evidence exists on how it influences safety performance and the extent to which safety training explains this relationship within Ghana's manufacturing sector.This study examines the effect of regulatory compliance on safety performance and the mediating role of safety training among manufacturing firms in Ghana. A quantitative cross-sectional design was employed using stratified random sampling across sixteen manufacturing subsectors. Data were collected from 863 employees in large-scale firmsand analysed using R and Python. Hypotheses were tested using Pearson correlation, multiple regression, and bootstrapped mediation analysis.The results revealed a strong positive relationship between regulatory compliance and safety performance (r = 0.88, p < 0.001), with regulatory compliance significantly predicting safety performance (β = 0.956, p < 0.001) and also significantly predicted safety training (β = 0.524, p < 0.001), while safety training positively influenced safety performance (β = 0.448, p < 0.001). Mediation analysis indicated a statistically significant but partial indirect effect (β = 0.022, 95% CI [0.002, 0.052]), suggesting that safety training partially mediates the complianceperformance relationship. This study contributes to OHS by demonstrating that safety performance in Ghana's manufacturing sector is predominantly compliance-driven, with training serving asa supportive but secondary role.*
Keywords: *Regulatory Compliance, Safety Training, Safety Performance, Manufacturing*

I.   Introduction

Occupational health and safety (OHS) remain a critical concern in the global manufacturing sector, where exposure to hazardous equipment, chemicals, and complex processes frequently results in elevated injury and fatality rates (Mixafenti et al., 2025). The goal of OHS is to safeguard workers by preventing injuries, illnesses, and fatalities while ensuring compliance with regulatory frameworks and promoting a strong safety culture (Shabani et al., 2025).Manufacturing is central to Ghana's industrialization agenda, contributing significantly to employment and national output, it sectors spans 16 of the 33 industry groups under the International Standard Industrial Classification (ISIC), covering subsectors such as motor vehicles, food processing, petroleum products, electronics, metals, apparel, and furniture (Nti, 2015). However, the sector continues to record high accident rates driven by inadequate hazard controls, weak compliance systems, and gaps in safety knowledge (Asiedu et al., 2024; Ghahramania et al., 2022). Globally, an estimated 2.78 million workers die annually from work-related injuries and diseases, while 374 million others sustain non-fatal injuries (International Labour Organisation, 2023). Strengthening safety performance has therefore become essential for sustaining both worker well-being and organisational productivity (Ranganathan & Sujatha, 2022).

Safety performance is increasingly conceptualized as a multidimensional construct thatincorporates both proactive (leading) indicators such as hazard reporting and safety inspections and reactive (lagging) indicators such as injuries and near misses (Pawłowska, 2015). Safety performance is defined as to the extent to which organizations implement measures that protect employees from workplace accidents and occupational diseases (Bayram, 2018). Within this framework, employee responsibility has emerged as a behavioural element central to safety outcomes.

Regulatory compliance has emerged as a central driver of improved safety outcomes, with the ILO (2011) emphasizing that meaningful progress occurs when regulators, employers, and workers act collectively. Compliance reduces workplace accidents, protects employees, and minimizes the financial burden of injury-related costs (Ajmal et al., 2022). It is broadly defined as adherence to mandated laws and industry standards, and empirical studies consistently associate strong compliance with enhanced safety performance, strengthened safety cultures, and better risk management (Obute et al., 2024). In addition to preventing regulatory penalties and reputational damage, compliance helps organizations maintain operational continuity.Enforcement mechanismsincluding inspections and legislative oversight further reinforce its impact (Tompa et al., 2016).Evidence from high-risk sectors demonstrates that regulatory-driven safety practices, such as process

hazard analysis, updated operating procedures, and safety training, enhance mechanical integrity and audit performance, leading to improved safety outcomes (Hesham et al., 2025). Compliance also operates through behavioral pathways, mediating the influence of safety management practices on incident reduction (Ajmal et al., 2022). However, compliance levels are shaped by contextual factors: while strong leadership and regulatory enforcement improve adherence (Morales & Mendoza, 2021; Olanipekun et al., 2022), weak enforcement systems contribute to persistent gaps.

In Ghana, OHS regulation is anchored by the Factories, Offices, and Shops Act (FOSA) 328 of 1970, which outlines requirements for workplace registration, inspections, and safety training. Although foundational, the Act is widely considered outdated and inadequately enforced, creating compliance challenges within modern manufacturing operations (Mensah & Appiah, 2020). This study adopts the regulatory compliance scale by Ghahramani et al. (2023), which assesses adherence to OSH laws, conformity with legal standards, and audit regularity.

Safety training is recognized as a key mechanism through which compliance translates into safe behavior. It strengthens worker knowledge, skills, and attitudes, enhancing hazard recognition and supporting adherence to safety procedures (Bayram, 2019; Awais-E-Yazdan et al., 2022; Andersen et al., 2019). In Ghana, safety training is legally mandated under FOSA 328 (1970) and has been shown to improve accident prevention (Adei &Kunfaa, 2007). Scholars recommend further investigation into how training interacts with organizational factors across different contexts (Obong et al., 2021). Effective safety training improves safety attitudes and responsible behaviors (Olanipekun et al., 2022) and significantly reduces injury rates when workers are fully engaged in inspections, accident investigations, and hazard analyses (Paul & Dhas, 2014; Vinodkumar & Bhasi, 2010). Although safety training has been widely studied, its mediating role between regulatory compliance and safety performance within Ghana's manufacturing sector remains empirically unexplored.

Given Ghana's rising workplace accident trends, limited empirical focus on regulatory compliance, and the underexplored mediating role of safety training, this study examines how regulatory compliance influences safety performance and assesses whether safety training mediates this relationship in the manufacturing sector. Addressing this gap contributes valuable evidence to OHS scholarship and supports policy reforms aimed at strengthening compliance and safety training systems in Ghana's manufacturing industry. Future research should focus on the collective impact of the tripartite role of employee responsibility, employer safety policies and regulatory compliance on safety performance in manufacturing.

1.1 RESEARCH HYPOTHESIS
H1: Regulatory compliance positively predicts safety performance.
H2: Safety training mediates the relationship between regulatory compliance and safety   performance
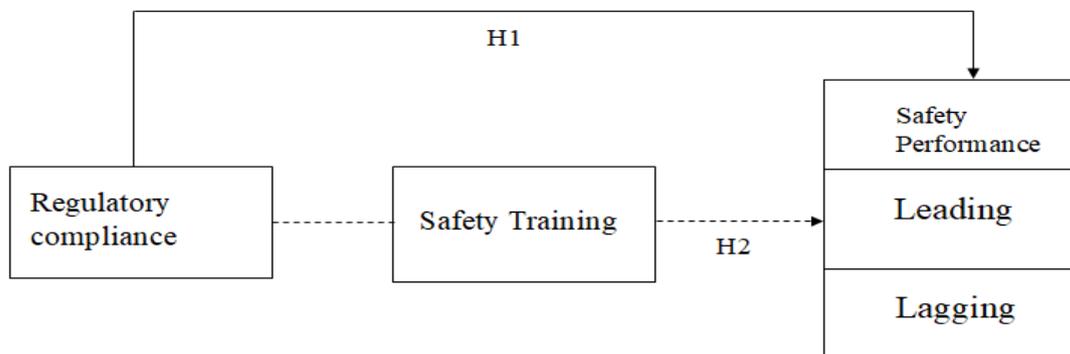
figure 1: Conceptual Framework

II.   Methodology
This study adopts a quantitative approach with a cross-sectional research design, utilizing a structured questionnaire survey to collect data from manufacturing firms in Ghana. According to (Creswell, 2009), the cross-sectional approach is appropriate because it enables the collection of data at a single point in time, allowing for the examination of relationships among variables. Several studies have employed this design in Occupational Health and Safety (OHS) research. For instance, Nordlöf et al., (2017) used a cross-sectional

design to investigate factors influencing OHS practices among Swedish companies. This design enables an in-depth analysis of relationships among key OHS variables such as Regulatory Compliance, Safety Training, and Safety Performance. Furthermore, the quantitative approach supports generalization of findings across the manufacturing sector and allows for the use of statistical techniques to test the hypotheses systematically.The methodology was designed to capture a broad spectrum of data while ensuring comparability across enterprises of similar sizes and across various industry types. Finally, this design ensures methodological rigor, enabling the quantification of variables and the establishment of statistical significance, thereby enhancing the study's validity and reliability (Yamoah and Nsowah, 2024).

1.1. Target Population

According to Uma Sekaran and Roger Bougie, (2016) a population refers to the entire group of people, events, or things of interest that the researcher wishes to investigate and must include elements, geographical boundaries and time. The target population for these studies includes the factory workers and middle level management of selected 16 active manufacturing companies in Ghana totalling 4315, the survey was conducted between (October to December 2025). Manufacturing enterprises were considered because of the important role they play in the regional economy and because occupational risks are higher compared to other industries (Mixafenti et al., 2025).

2.2 Sample Selection

A sample is defined as a subset of the population and comprises some members selected from it, One major limitation identified in previous studies is the use of convenience sampling, which often produces non-representative samples and limits the generalisability of findings (Uma Sekaran and Roger Bougie, 2016). To overcome this limitation, this study adopts a stratified random sampling technique (Creswell, 2013). Stratified sampling involves dividing the population into distinct subgroups or strata based on relevant characteristics such as company size, industry type (e.g., food processing, textiles, chemicals etc), Also several studies have successfully employed stratified sampling approach in Occupational Health and Safety (OHS) research (Naji et al., 2022; Obute, Hayat and Gull, 2024; Yamoah and Nsowah, 2024; Mandowa, Matsa and Jerie, 2025; Mixafenti et al., 2025). By stratifying the population, this study minimises the risk of over or under representation of any subgroup, providing a more accurate assessment of how Occupational health and safety factors operate across the manufacturing industry (Mixafenti et al., 2025). This approach addresses limitations observed in earlier studies, such as (Quagraine et al., 2020), which focused narrowly on sachet water manufacturing firms and relied on easily accessible participants. To further enhance representativeness and reliability, this study integrates stratified random sampling techniques (Uma Sekaran and Roger Bougie, 2016).

2.3 Stratified Random Sampling

A stratified random sampling approach has been used to attain maximum representation of the sample, this involves a process of stratification or segregation, followed by random selection of subjects from each stratum. The population is first divided into mutually exclusive groups that are relevant, appropriate, and meaningful in the context of the study (Uma Sekaran and Roger Bougie, 2016).

According to the Ghana Statistical Service Report (GSS, 2020), an estimated 7,000 manufacturing firms operate across Ghana. To ensure representativeness, this study adopted a stratified sampling approach grounded in the Ghana Statistical Service Industrial Classification System of 2024 and informed by (Nti, 2015) adaptation of the International Standard Industrial Classification (ISIC). Sixteen distinct manufacturing categories were identified, each constituting a separate stratum. These strata included: motor vehicle manufacturing; food and beverages; coke and refined petroleum products; electronics; paper products; basic metals; furniture; machinery; textiles; wood products (excluding furniture); tanning, luggage and footwear; printing and reproduction; chemicals and chemical products; fabricated metal products; and electrical machinery. From each stratum, subjects are selected, resulting in a total of 863 participants out of a total population of 4315.

Table 1. Proportionate Stratified Random Sampling (Uma Sekaran and Roger Bougie, 2016)

No.	Stratum	Number Of Elements Population	Proportionate Sampling (20% Of the Element)
1	Vehicle Manufacturing	135	27
2	Food And Beverages	780	156
3	Electrical Machinery	195	39
4	Coke And Refined Petroleum Products	240	48
5	Electronics	210	42
6	Paper Products	165	33
7	Basic Metals	305	61

8	Furniture	270	54
9	Machinery	290	58
10	Textiles	225	45
11	Rubber And Plastic Products	370	74
12	Wood Products (Excluding Furniture)	310	62
13	Tanning, Luggage and Footwear;	180	36
14	Printing And Reproduction	140	28
15	Chemicals And Chemical Products	315	63
16	Fabricated Metal Products	185	37
	Total	**4,315**	**863**

This approach minimizes sampling bias, enhances representativeness across heterogeneous manufacturing sectors, and strengthens the generalizability of the study findings. In the IBES (integrated business establishment survey) reports in 2024, the Ghana statistical services defines establishment size bands across manufacturing as Large firms as having more than 100 employees similar to Ghana enterprise regulatory classification in 2023 as more than 100 employees, furthermore for this study the controlled size for all selected firms qualified as large-scale entities, as defined as having more than 100 employees (Nti, 2015; Mandowa, Matsa and Jerie, 2025). To qualify as a selected firm, it must be registered with the Department of Factories Inspectorate, Ghana's primary occupational health and safety regulatory body. In addition, engagement was sought with four key OSH-related institutions: the Ghana Standards Authority, Environmental Protection Agency, Ghana National Fire Service, Labour Department, Ghana Employers' Association, and the Registrar General's Department.Participation in the study was entirely voluntary, with assurances provided regarding confidentiality, anonymity, and data protection. Informed consent procedures were rigorously observed; participants were briefed on the purpose of the research and given opportunities to seek clarification prior to completing the questionnaire. Adherence to these ethical standards was crucial in building respondent trust and supporting the integrity and validity of the data collected

2.4 Sample Size Calculation

Memon et al., (2020) define sample size as the total number of participants involved in a study, emphasizing that determining an appropriate sample size is fundamental to drawing valid and generalizable conclusions. According to Asiamah et al.,(2017), larger sample sizes are particularly important in analytical techniques, as they enhance the precision and stability of statistical estimates.

An A Priori Power Analysis was conducted using G*Power 3.1.9.4 to determine the sample Size conducted to determine the minimum number of respondents required to ensure the reliability and validity of the study's findings. Kang, (2022) further underscores that A Priori Power analysis is a vital procedure in hypothesis testing, as it enables researchers to estimate the sample size necessary to detect significant effects at a specified power level. The significance of A Priori Power analysis in determining sample size adequacy has also been widely acknowledged in several empirical studies (Beck, 2013; Valaei, 2017; Kuvaas, Buch and Dysvik, 2020; Memon et al., 2020;). Following the recommendations of (Cohen, 1988) the analysis was based on an F-test for linear multiple regression (fixed model; R^2 increase), $\alpha = 0.05$, power = 0.95, and a small effect size ($f^2 = 0.02$), the minimum required sample size was 863 respondents.

The computation generated a required minimum sample size of participants, ensuring sufficient power to detect even modest relationships among the study variables. Moreover, employing G*Power 3.1.9.4 in this context allows for precise estimation of sample adequacy tailored to the model's complexity, which is crucial for studies employing Structural Equation Modelling (Uma Sekaran and Roger Bougie, 2016; Bayram, 2018; Bayram Metin, 2019; Sulong and Hassan, 2020; Taha et al., 2020; Memon et al., 2020; Arslan and Wong, 2021; Obong et al., 2021; Kessy and Raymond, 2022; Naji et al., 2022; Zhang, Liu and Chu, 2023; Kadher et al., 2024; Otitolaiye, 2025; Slil et al., 2025; Hesham et al., 2025).

2.5 Methods of Data Collection

Consistent with the recommendations of Creswell, (2013) and Uma Sekaran and Roger Bougie, (2016), this study employed personally administered questionnaires as the primary data collection method. This approach is particularly suitable where a survey is confined to a defined geographical area, as it enables the researcher to distribute and retrieve completed questionnaires within a relatively short period. Personally, administering the questionnaires also allowed the researcher to clarify any ambiguities encountered by respondents, adequately introduce the research objectives, and motivate participants to provide frank and accurate responses. Compared with interviews, questionnaire administration is less time-consuming, more cost-effective for large samples, and requires fewer specialised skills, making it an efficient data collection technique for quantitative research. Although personally administered questionnaires may introduce bias if explanations

vary across respondents, this risk was minimised through standardised instructions and consistent administration procedures across all study sites.

The questionnaire consisted of two main sections. The first section collected demographic and work-related characteristics, including age, sex, level of education, size of organisation, job title, and years of work experience. The second section measured the key constructs of the study, namely Regulatory Compliance, health and safety (OHS) training, and safety performance, using both leading and lagging indicators.

The questionnaires were manually administered by the researcher through on-site visits to sixteen (16) selected manufacturing companies in Ghana. This approach enabled immediate clarification of questions and encouraged timely completion, which significantly improved the response rate and enhanced the overall quality of the data collected. Participation in the study was strictly voluntary, and respondents were clearly informed of their right to withdraw from the research at any stage without any consequences. To minimise response bias and enhance data validity, anonymity and confidentiality were assured. At the end of the data collection exercise, a total of 863 valid and fully completed questionnaires were retrieved from the sixteen manufacturing firms and used for subsequent statistical analysis.

The choice of personally administered questionnaires was further justified by the quantitative cross-sectional research design and the stratified sampling strategy adopted for the study. Quantitative research requires standardised data collection instruments to ensure comparability of responses and support rigorous statistical analysis and hypothesis testing (Creswell, 2013). Personally, administering the questionnaires ensured that respondents across the different manufacturing strata were adequately represented and that enough usable responses were obtained from each stratum, thereby strengthening the effectiveness of the sampling strategy. Although electronic questionnaires are widely used in contemporary research, this option was considered inappropriate for the present study because a substantial proportion of factory-floor workers were not conversant with electronic survey platforms. The use of electronic forms could therefore have resulted in low participation rates, incomplete responses, and potential measurement errors. Consequently, manual administration was deemed the most appropriate and inclusive approach for achieving a high response rate, improving data accuracy, and ensuring the reliability of the findings within the manufacturing context in Ghana.

Regulatory Compliance: This scale has seven items adopted from (Ghahramani, Ebrahimi and Hajaghazadeh, 2023); This variable measure the extent to which firms comply with national and international OHS regulations, the regularity of safety audits, and their adherence to legal standards. Participants rate their firm's compliance on a 5-point Likert scale.This scale has been widely applied in OHS research.(Ghahramani et al., 2025)

Safety training was assessed using a seven-item instrument from Ghahramani, Ebrahimi, and Hajaghazadeh (2023), This construct measured the frequency, relevance, and effectiveness of safety training programs within firms, assessing how well these programs equip employees with the necessary skills and knowledge to prevent accidents. Researchers has referred to this scale (Otitolaiye, 2025)

Safety performance was measured using a combined set of leading (nine items) and lagging (eight items) indicators adapted from Pawłowska (2015). The data were collected through the same structured questionnaire, ensuring consistency of measurement across constructs. Both leading and lagging indicators of safety performance were measured to provide a comprehensive view of safety outcomes. Leading indicators included proactive safety behaviors (e.g., frequency of inspections, audits, and safety meetings), while lagging indicators captured the number of workplace accidents, near misses, and injuries. Researchers has widely used this scale (Moore et al., 2022)

To examine the direct impact of Regulatory compliance on safety performance, the Pearson Product Moment Correlation Coefficient was used to determine the strength and direction of the bivariate relationship between employee responsibility and safety performance. These analyses were conducted using R software.
To evaluate whether safety training mediates the relationship between Regulatory compliance and safety performance, Mediation was tested using a bootstrapped indirect effect approach using Python software.

III.   Results

3.1 Sample Characteristics

Out of the 863 respondents, 603 (69.9%) were males, and 260 (30.1%) were females. Most respondents were between the ages of 35 and 44 years (52.6%), followed by those aged 45–54 years (22.1%) and 25–34 years (17.8%), with only small proportions aged 55 years and above (7.1%) and 18–24 years (0.3%). In terms of education, the largest groups had secondary education (32.4%) or diploma qualifications (30.1%), followed by bachelor's degree holders (15.8%), respondents with basic education (10.9%), and those with postgraduate qualifications (10.8%). Regarding job roles, supervisors formed the largest group (40.3%), closely followed by factory hands (37.2%), while managers represented 20.2% and other roles accounted for 2.3%. Work experience was generally high, with nearly half of respondents having 6–10 years of experience (47.3%), followed by 1–5 years (30.5%) and more than 10 years (16.3%), while only 5.9% had less than one year of experience.
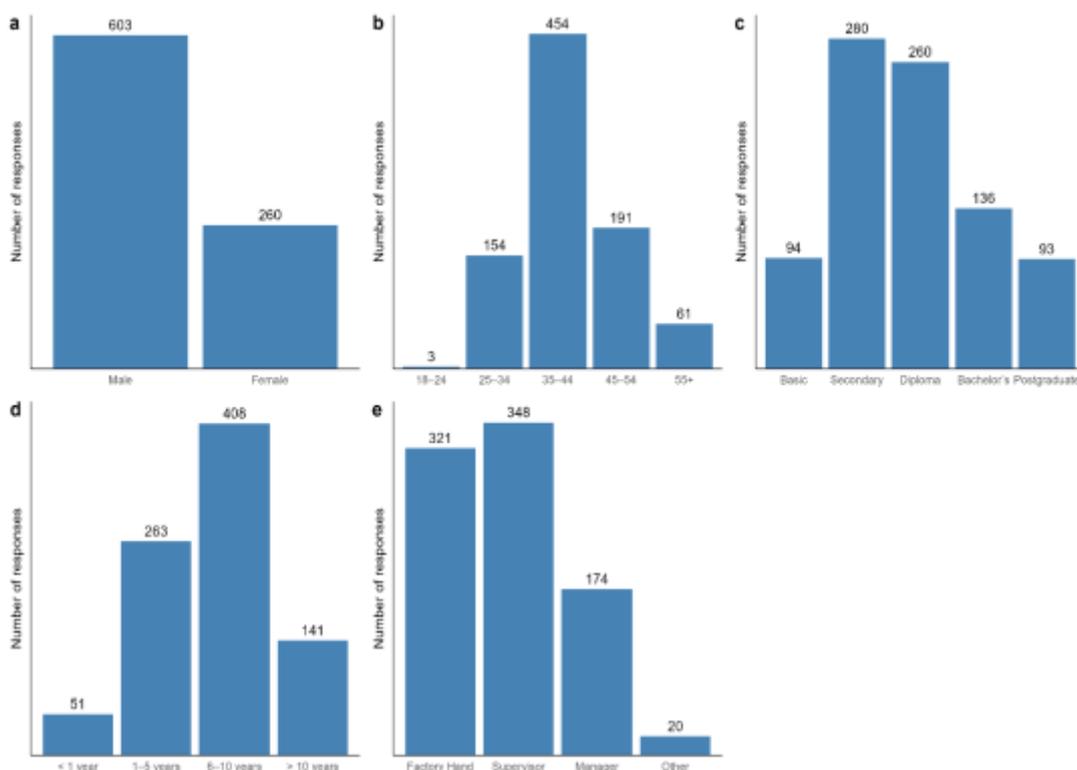
Figure 1. Demographics of employees interviewed (N=863): (a) Gender, (b) Age, (c) Educational level, (d) Years of working experience, and (e) Job title

3.2 Measurement Model Assessment

The measurement model was evaluated to establish the reliability and validity of the study constructs: Regulatory Compliance (RC), Safety Training (ST), and Safety Performance (SP). Internal consistency reliability was assessed using Cronbach's alpha and composite reliability (CR), while convergent validity was examined using factor loadings. As shown in Table 2, Cronbach's alpha values ranged from 0.73 to 0.80, exceeding the recommended threshold of 0.70, indicating acceptable internal consistency reliability. Composite reliability values were also satisfactory (CR $\geq$ 0.74), confirming construct reliability. All retained indicators loaded strongly on their respective constructs, with factor loadings above 0.70 and statistically significant t-statistics, confirming indicator reliability. AVE values exceeded 0.50, confirming convergent validity. Discriminant validity was established using the Fornell–Larcker criterion, as the square root of AVE for each construct exceeded inter-construct correlations.

Table 2. Psychometric characteristics of structures and variables

Variable	M	SD	Factor Loading	t-statistics	Cronbach's Alpha	CR
RC					0.80	0.84
RC4	4.18	0.71	0.87	101.81		
RC5	4.19	0.68	0.95	270.39		
RC6	4.18	0.67	0.97	376.37		
RC7	4.18	0.67	1.00	765.38		
SP					0.74	0.79
SP10	4.16	0.73	0.95	268.52		
SP11	4.14	0.72	0.97	432.10		
SP12	4.14	0.72	1.00	862.45		
ST					0.73	0.74
ST3	4.22	0.74	0.99	409.68		
ST4	4.22	0.74	0.96	272.24		
ST5	4.22	0.75	0.93	174.86		

3.3 Descriptive Statistics of Study Variables

Descriptive statistics for the construct-level variables are presented in Table 3. Respondents reported relatively high levels of Regulatory Compliance (M = 4.18, SD = 0.66), Safety Training (M = 4.22, SD = 0.72), and Safety Performance (M = 4.14, SD = 0.71).

Table 3. Descriptive Statistics of Study Constructs (N = 863)

Construct	Mean ± SD
Regulatory Compliance	4.18 ± 0.66
Safety Training	4.22 ± 0.72
Safety Performance	4.14 ± 0.71

3.4 3.5 Correlation Analysis

Pearson correlation analysis was conducted to examine the relationships among the key study variables. As shown in Table 4, Regulatory Compliance was strongly and positively correlated with Safety Performance (r = 0.88, p < 0.001) and Safety Training (r = 0.48, p < 0.001). Safety Training was also positively correlated with Safety Performance (r = 0.45, p < 0.001).

Table 4. Correlation Matrix

Variables	r	p-value
Regulatory Compliance ↔ Safety Performance	0.88	<0.001
Regulatory Compliance ↔ Safety Training	0.48	<0.001
Safety Training ↔ Safety Performance	0.46	<0.001

3.5 3.6 Total Effect of Regulatory Compliance on Safety Performance

A regression analysis (without inclusion of the mediator) was conducted to examine the total effect of Regulatory Compliance on Safety Performance. The results in Table 5 indicate that Regulatory Compliance had a positive and statistically significant total effect on Safety Performance (β = 0.956, p < 0.001). This coefficient represents the overall predictive influence of Regulatory Compliance prior to accounting for the mediating role of Safety Training.

Table 5. Total Effect of Regulatory Compliance on Safety Performance

Predictor	Coef.	Std. Err.	t	p-value	95% CI
Constant	0.144	0.073	1.97	0.049	[0.001, 0.288]
Regulatory Compliance	0.956	0.017	55.42	<0.001	[0.922, 0.990]

3.6 Mediation Analysis of Safety Training

A mediation analysis was performed to examine whether Safety Training mediates the relationship between Regulatory Compliance and Safety Performance. When Safety Training was included in the model, the direct effect of Regulatory Compliance on Safety Performance reduced from β = 0.956 to β = 0.934, indicating partial mediation. As presented in Table 6, the path from Regulatory Compliance to Safety Training was positive and statistically significant (β = 0.52, p < 0.001), and the path from Safety Training to Safety Performance was also positive and statistically significant (β = 0.45, p < 0.001). The indirect effect of Regulatory Compliance on Safety Performance through Safety Training was statistically significant, as the bootstrapped confidence interval did not include zero. The direct effect of Regulatory Compliance on Safety Performance remained significant.

Table 6. Mediation Analysis Results

Path	Coefficient	SE	p-value	95% CI	Supported
Regulatory Compliance → Safety Training	0.524	0.033	<0.001	[0.459, 0.588]	Yes
Safety Training → Safety Performance	0.448	0.03	<0.001	[0.390, 0.507]	Yes
Total Effect	0.956	0.017	<0.001	[0.922, 0.990]	Yes
Direct Effect	0.934	0.02	<0.001	[0.895, 0.972]	Yes
Indirect Effect	0.022	0.012	0.047	[0.002, 0.052]	Yes

IV. Discussion

This study examined the effect of regulatory compliance on safety performance and tested the mediating role of safety training within Ghana's manufacturing sector. The findings supported both hypotheses and quantitatively demonstrate that regulatory compliance emerge as the strongest predictor of safety performance in the sampled firms.

The results showed a very strong positive relationship between regulatory compliance and safety performance ($\beta = 0.956$, $p < 0.001$; $r = 0.88$). This effect size is substantially larger than those commonly reported in previous studies. For instance, regulatory compliance has previously been found to significantly improve occupational safety outcomes in high-risk industries (Obute et al., 2024; Otitolaiye and Aziz, 2025), but typically at moderate levels. Similarly, inspection and enforcement mechanisms improve safety outcomes (Tompa et al., 2016), and firms with stronger compliance records experience fewer workplace incidents (Olanipekun et al., 2022; Morales & Mendoza, 2021). Compared with these findings, the magnitude observed in this study indicates that compliance explains a much larger proportion of safety performance variance in the present context.This suggests that, rather than acting as a supporting administrative requirement, regulatory compliance functions as the primary operational safety control. In other words, safety outcomes appear to depend more on adherence to legal requirements than on internally embedded safety practices. The strength of the relationship therefore indicates a compliance-dependent safety system where performance is driven mainly by regulatory pressure rather than organisational safety culture.

The mediation analysis showed that safety training significantly mediated the relationship between regulatory compliance and safety performance (indirect effect = 0.022, $p = 0.047$), while the direct effect remained significant, indicating partial mediation. Thus, regulatory compliance improves safety performance through two mechanisms: directly by constraining unsafe conditions and indirectly by promoting training that improves worker behaviour.Prior studies consistently report that safety training improves compliance behaviour and reduces accidents (Vinodkumar & Bhasi, 2010; Ajmal et al., 2022). Training enhances hazard recognition and safe procedures (Bayram, 2019), increases adherence to safety precautions (Afework et al., 2024), and improves safety performance when workers understand rules and procedures (Awais-E-Yazdan et al., 2022; Asare et al., 2019). The present findings confirm these behavioural effects but show that their contribution is comparatively small relative to the direct compliance pathway.

Therefore, while training significantly contributes to safety performance, it does not replace regulatory influence. Instead, compliance appears to trigger training implementation, and training then improves behavioural conformity. The small indirect effect indicates that safety behaviour in the studied firms is still externally enforced rather than internally internalised. Compared with previous behavioural safety studies where training plays a stronger explanatory role, the present results show that regulatory control remains the dominant mechanism.

V. Conclusion

This study examined the relationship between regulatory compliance, safety training, and safety performance in Ghana's manufacturing industry. Regulatory compliance emerged as the strongest predictor of safety performance, demonstrating that safety outcomes in the sector are primarily enforcement driven. Safety training partially mediated this relationship, confirming that compliance improves safety both directly and indirectly through worker competence and behaviour.The comparatively large direct effect and small indirect effect indicate that safety performance depends more on adherence to regulations than on embedded safety culture. While regulatory systems effectively reduce workplace risk, long-term improvement requires strengthening behavioural safety capacity beyond legal compliance.

Accordingly, regulatory enforcement should be maintained while training programs are redesigned to build hazard recognition and proactive safety participation. Without this transition, safety performance improvements may plateau once minimum compliance levels are achieved. The study therefore shows that regulatory frameworks provide the foundation for safety performance, but sustainable accident reduction will depend on progressing from compliance-driven safety to competence and behaviour-driven safety management.The limitation of the study included self reported data and the specific context of Ghana.

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