



Original Article

Safety and Health Perceptions in Work-related Transport Activities in Ghanaian Industries



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ABSTRACT

Background: With the recent rapid industrialization, occupational safety and health (OSH) has become an important issue in all industrial and human activities. However, incidents of injuries and fatality rates in the Ghanaian industry sector continue to increase. Despite this increase, there is no evidence regarding the element of OSH management in transport activities in Ghanaian industries. Thus, this study aims to examine the perceptions regarding the importance of safety and health in work-related transport activities in Ghanaian industries.

Methods: A survey data collection technique was used to gather information on best safety practices over a 5-month period. We randomly selected 298 respondents from industries to answer structured questionnaires. The respondents included drivers, transport managers, and safety engineers. Standard multiple regression model and Pearson product–movement correlation were used to performed the analysis. **Results:** The result shows that for interventions to improve safety and health, concentration has been on drivers' safety practice with less attention to safe driving environments and vehicle usage. Additionally, the respondents are aware of the importance of OSH in transport activities, but the level of integration does not measure up to the standard to reduce operational accidents and injuries. Finally, strong commitment to changing unsafe practices at all levels of operations appears to be the effective way to improve safety situations.

Conclusion: OSH culture is not fully complied in industries transport activities. This study, therefore, supports the use of safety seminars and training sessions for industry workers responsible for transport operations for better integration of safety standards.

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1. Introduction

With the recent rapid industrialization, occupational safety and health (OSH) has become an important issue in all industrial and human activities. It has a great bearing on the analysis of risk and its associated consequences. To ensure the safety of industry personnel and properties, safety and health has to be the main focus. The best safety practices of industries, include making sure that everybody is protected from accidents, all hazards, health related diseases, and illnesses emanating from daily activities. However, in developing countries, industries have been labeled as

being highly hazardous working environments, and suffering from huge economic and personnel costs because of high incidence of occupational injuries and diseases related to work [1,2]. To recognize the importance of safety at the workplace, safety-related policies and programs should include employee perceptions [3].

In developed countries, the incidence of occupational injuries and diseases associated with industrialization has significantly declined [4]. However, considerable reports revealed that each year within the industries working environment, an average of ~10 people die as a result of being knocked down by moving vehicles [5]. In the European Union (EU) of the people who are killed every

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year in industries, about one-third is related to transport [6]. These accidents usually involve people being run over by moving vehicles during reversing; falling from vehicles; being struck by objects falling from vehicles; or vehicles overturning.

On a global scale, reports show that workplace accidents were the fourth leading cause of death after heart disease, cancer, and strokes [7]. Every year ~2 million people lose their lives through accidents and diseases in the performance of their duties [8]. Additionally, there are ~270 million occupational accidents and ~160 million occupational diseases each year, causing US\$2.8 trillion in costs for lost working time and treatment expenses, payment, and reintegration [8].

In Ghana, the Labor Act of 2003 has a section on occupational safety, health, and environment. The Department of Factories Inspectorate was also established to ensure industries comply with the best safety and health standards to minimize or eliminate accidents in the working environment. Despite all these regulatory bodies, incidents of accidents, injuries, and fatality rates in the Ghanaian industry sector continue to increase as a result of poor implementation of occupational safety and health measures. According to statistics and analysis information in Ghana, from 2006 to 2011 a total of 64,961 people sustained various degrees of injuries and 498 of these were fatal [9]. This implies that the OSH management system is a neglected area and a function that has not been pursued systematically in industries in Ghana. For instance, Amponsah-Tawiah and Dartey-Baah [10] researched key issues and concerns of occupational health and safety in Ghana. Their findings reveal that lack of comprehensive OHS policy, poor infrastructure, and lack of adequate safety information are among the drawbacks to the provision of occupational health and safety service in Ghana. In another study carried out by Tulashie et al [11], a work was presented on exposure assessment and preventive process in managing workplace safety and health challenges. It was unveiled that the preventive process was not applied adequately and hazards were not properly identified at workplaces in Ghana. Amponsah-Tawiah and Mensah [12] further conducted a study on occupational health and safety and organizational commitment in the Ghanaian mining industry. They concluded that for workers to feel a sense of obligation to their organization, management must invest and be committed to safety and health needs by instituting good and sound policy measures. Finally, Annan et al [13], carried out a study on action to improve occupational health and safety in Ghana with a critical look at the existing legal requirements and legislation. The study identified fragmented legal requirements concerning OSH, with unclear responsibilities and accountabilities. As a result, workers in Ghana are sometimes involved in accident and injuries in carrying out their daily activities, making the report on accidents in industries intimidating. Meanwhile, effective management and integration of safety and health culture in all operational activities can prevent the number of accidents, fatalities, and injuries at a workplace that involves workers and properties.

Safety and health culture within a company is closely associated to the workforce attitudes with respect to safety [14], which is as an important critical factor of safety [15]. Safety culture has been described as a set of beliefs, norms, attitudes, and social, technical practices that are concerned with minimizing the exposure of individuals, within and beyond an organization to conditions considered dangerous or injurious [16]. The role of management and employee's involvement in safety and health culture is important to cultivate the positive beliefs, attitude, practices, and norms in all industrial activities. In an organization with total safety culture, everyone feels responsible for safety and pursues it on a daily basis. Strong safety culture within the organization leads to safer employees in general [17,18]. However, because building safety culture is related to human behavior, attitude, and diversities

of operations, it is not possible to control all the hazardous activities, in industries. Therefore, there should be measures to improve safety and health culture in all operations.

In order to improve safety and health culture in transport operations, Newnam et al [19], indicated that the driving performance can be improved when appropriate training is organized for drivers to be professional on the job they perform. The results of Cooper and Phillips [20] demonstrated that perceptions of the importance of safety training were predictive of actual levels of safety behavior. Öz et al [21], also found that error and violation frequencies of professional drivers were negatively related to perceptions concerning giving priority to safety. Perceptions regarding clear safety policies, training, and practices of organizations may have direct impact on driving outcomes and reduction of accident rates [22,23]. A safety perception of workers in an organization is accepted as a predictor of safety outcomes for different industries. As competency of drivers plays an important role in achieving safety, the condition of the vehicles also contributes to improving safety. Safe and suitable vehicles are required to be used to perform the job they are designed for. According to Khan et al [24], one of the measures that can also be undertaken to improve the good image of industries is to provide a safe working environment. Besides, maintaining a safe working environment is one of the most effective strategies to minimize accident exposure [25]. Training can be used to motivate and modify behavior and attitude to provide a safe working environment [26]. This can have a positive effect on the productivity couple with decreased operating costs, better time performance, and increased profitability [14]. Improving safety in industries also relies on implementing and managing safety [26,27]. Management has been recognized as a major entity to play a role in promoting and providing adequate resources and implementation of safety activities [28]. All activities require risk assessment and safe systems of work under health and safety legislation [29], for which vehicle activities are part. Therefore, if safety and health are not integrated into vehicles' activities, managers, workers, visitors to sites, and members of the public can all be at risk. Vehicle accidents in the industry sector can be prevented by effective management of transport operations [30]. However, even when safety regulations are provided, it is necessary for workers to have good behavior and perceptions to comply appropriately.

Statistics relating to workplace injuries and fatalities in Ghana raise serious questions on how workers and the management are committed to applying safety measures in their daily activities, the extent to which workers are educated to follow safety procedures and how often the safety procedures are implemented. To effectively address these questions, there is a need to carry out researches to understand the safety and health situations in all industrial activities. However, studies relating to safety and health in Ghanaian industries are few and did not extend to the safety and health issues in the transport activities. In view of this, the present study aims to examine the relationship between components of safety measures and safety and health perceptions in industry's work-related transport activities in Ghana. The study further aims to predict the integration of safety and health perceptions in industrial transport activities. The unique contributions of each item in safety measure variables that best predict the safety and health perceptions in industrial transport activities were also examined.

2. Materials and methods

2.1. Survey design

Refined written and printed questionnaires comprising a series of structured questions were used to capture the data over a

5-month period. The questions were mainly close-ended ones where the participants were asked to read each item carefully and tick appropriate responses that suit them. The survey included three sections. The first part addressed the respondent's demographic characteristics. Information regarding safety and health perception in the transport activities was gathered in the second section. The third section comprised items relating to safety measures that may improve safety in transport activities. All the responses were measured on a 5-point Likert scale. A high score indicated a positive attitude towards safety and health perception in transport activities.

2.2. Safety and health perceptions

The items used to assess the participants' safety and health perceptions were adapted from 50-items Work Safety Scale (WSS) developed by Hayes et al [31]. The WSS consists of five different constructs which includes: job safety (e.g., "Could get hurt easily"), supervisors' safety (e.g., "Keeps workers informed of safety rules"), coworkers' safety (e.g., "Look out for others' safety"), safety program (e.g., "Doesn't apply to my workplace"), and management safety practice (e.g., "Responds quickly to safety concerns") with internal consistency Cronbach α of 0.79, 0.83, 0.81, 0.80, and 0.78 respectively. Each of these constructs contains 10 items. The responses were measured from 1 = "strongly disagree" to 5 = "strongly agree".

2.3. Components of safety measure

According to the Health and Safety Executive (HSE) [32], to manage workplace transport effectively, safe vehicle usage, safe driving environment, and drivers' safety practice are the three key areas to consider when carrying out risk assessment. Based on this, the above mentioned key areas were used as safety measure variables and the items in the variables were extracted from the HSE [33], on safe use of transport at the workplace. The safe vehicle usage was measured with seven items, e.g., "Regular and timely vehicle maintenance". Safe driving environment was measured with 11 items, e.g., "Vehicles and pedestrians kept safely apart". The drivers safety practice was also measured with 11 items, e.g., "Drivers possess the necessary licenses for the vehicles they are authorized to drive". The responses were measured from 1 = "not very important" to 5 = "very important".

2.4. Survey procedure

The random sampling method was used in selecting 298 participants from four construction and six production industries and they adequately represent the construction and production industries in Ghana. These participants included transport managers, safety engineers, and drivers who are directly linked to the transport activities in the industries. Prior to conducting the study, the questionnaire was initially pretested on a few participants in an industry which is not part of the sampling site. This was done to assist fine tuning of the items to remove any ambiguity to enable respondents to understand the questions and give useful answers to address the objective of the study.

In both the pilot stage and the main study, permission was sought from the management and the participants of the industries to answer the questionnaire. The participants who agreed to participate were given the questionnaire to answer. The respondents were informed regarding the confidentiality and anonymity. The participation was done voluntarily without any compensation.

The study was conducted in two regional cities in Ghana, where there are several constructions and production industries. These

cities were selected because it was highly possible to get the necessary information in addressing the study objectives. State and privately owned industries were the types considered in the study area. Additionally, all data were analyzed in aggregate to avoid individual participant's identification.

2.5. Research model framework

The safety and health perception in transport activities was modeled with multiple linear regression model (MLRM). In this model the likelihood of safety and health perceptions in transport activities can be predicted. The general model framework is given as:

$$\hat{Y} = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 \cdot \cdot \cdot + \beta_k X_k$$

$$\hat{Y} = \beta_0 + \sum(\beta_k X_k)$$

where \hat{Y} = predicted value on the outcome variable Y ; β_0 = predicted value on Y when all $X = 0$; X_k = predictor variable; β_k = regression coefficient; $\hat{Y} - Y$ = residual (prediction error); and k = the number of predictor variables. The goal of the regression was to arrive at the β values.

2.6. Model R and R^2

R = multiple correlation coefficient; $R = r \hat{Y}Y$ (correlation between the predicted scores and the observable scores)
 R^2 = percentage of variance in Y explained by the model.

2.7. Statistical analysis

The data were analyzed using SPSS version 17 (SPSS Inc., Chicago, IL, USA). Data were categorized and tabulated accordingly in order to address the purpose of the study. Descriptive statistics was applied to investigate demographic characteristics of the respondents. Cronbach α was used to investigate the internal consistency of the scales. To establish the relationship between the components of safety measures variables (independent variables), and safety and health perceptions (dependent variables), Pearson product-moment correlation coefficient was performed. In order to identify the unique contribution of the independent variables and the items in these variables that best predict the integration of safety and health perceptions, standard multiple regression analysis was also performed. A mean score on each measure was computed on the basis of the items within each measure.

3. Results

3.1. Participants characteristics

In this research, 330 randomly selected Ghanaian industry workers in the transport and safety department were the targeted participants. Out of the 330 questionnaires distributed, 298 were retrieved representing 90% of the total questionnaire administered. The volunteered participants in the study included 250 (84%) drivers, 30 (10%) transport managers, and 18 (6%) safety engineers. The majority of the workers involved in transport activities in the industries were drivers. This implied that awareness through education on the importance of safety and health for these categories of workers will help reduce hazards and provide a healthy working environment. The participants had different amounts of working experience with the majority 89 (30%) having experience ranging from 2 years to 5 years and

109 (36.6%) were aged between 26 to 35 years, suggesting that there are more young workers in industries. Therefore, emphasizing intensively on awareness of safety and health issues among these young workers will drastically reduce or eliminate the risk of accidents in the transport activities in the near future. The participant category of industry included 203 (68%) production industry and 95 (32%) construction industry. The majority 167 (56%) of the participants were within privately owned industries and 203 (68%) of the selected industry had 20 years and above working experience.

3.2. Reliability test

Cronbach α was used to investigate the internal consistency of the scales. In general, the accepted Cronbach α value of 0.7 and above is acceptable for research [34]. The result in Table 1 shows that the Cronbach α for all the scales were sufficiently reliable (> 0.7). This implies that all the variables were reliable and could further be used for the analysis. The mean value for all the scales were within neutral levels.

3.3. Correlations between the components of safety measures variables and safety and health perceptions

Preliminary analyses were performed to ensure no violation of the assumptions of normality, linearity, and homoscedasticity. The result in Table 2 shows that the positive significant relationship between safety measures variables: safe vehicle ($r = 0.49$, $p < 0.001$), safe driving environment ($r = 0.71$, $p < 0.001$), drivers safety practices ($r = 0.75$, $p < 0.001$), and safety and health perceptions range from medium to large.

3.4. Predicting safety and health perceptions in transport activities

The standard multiple regression was used to examine the unique contribution of safety and health perceptions in transport activities. In Table 3, the result indicates that driver's safety practice, safe driving environment, and safe vehicle usage all made significant contributions ($\beta = 0.42$, $p < 0.001$, $F = 384.57$, $p < 0.001$; $\beta = 0.18$, $p < 0.05$, $F = 263.93$, $p < 0.001$; and $\beta = -0.25$, $p < 0.05$, $F = 144.43$, $p < 0.001$, respectively). The variance explained indicate that drivers' safety practice accounted for 57% of safety and health perceptions in transport activities, 7% in a safe driving environment, and 2% in safe vehicle usage. The model as whole predicted 66% ($R^2 = 0.66$) of safety and health perceptions in transport activities.

3.5. Predicting the unique contributions of items in safety measure variables

This part of the study focuses on predicting the unique contribution of items in safety measure variable that best predict safety and health perceptions in industrial transport activities. Only significant predictors are reported.

Table 1
Reliability test and descriptive analysis

No	Variables	No of items	α	Mean/SD*	Range	Median	Mode
1	Safety & health perceptions	50	0.80	2.88/0.66	2.92	2.88	2.37
2	Safe vehicle usage	7	0.71	2.98/0.78	3.43	3.00	2.90
3	Safe driving environment	11	0.76	2.72/0.73	3.00	2.73	2.73
4	Drivers safety practices	11	0.88	2.59/0.92	3.18	2.36	4.27

* A higher mean value indicates a higher possibility of integrating health and safety perceptions in transport activities.
 α , Cronbach α ; SD, standard deviation.

Table 2
Correlation between safety measures variables and safety and health perceptions*

Item	1	2	3	4
1. Safe vehicle usage	–			
2. Safe driving environment	0.52 [†]	–		
3. Drivers safety practice	0.59 [†]	0.74 [†]	–	
4. Safety & health perceptions	0.49 [†]	0.71 [†]	0.75 [†]	–

* The correlations between the variables were scaled scores based on the average of items contained in each latent variable.

[†] $p < 0.001$ (2-tailed).

3.6. Safe vehicle usage

In Table 4 the statistical results (mean and standard deviation) for the items on safe vehicle usage indicate that the majority of the respondents reported neutral on the importance of safety and health practices in transport usage. The total mean for these items is 2.98 indicating average level of safety and health practices in vehicle usage to prevent accidents and injuries. The respondents ranked "Vehicle maintenance", [mean (M) = 3.17, standard deviation (SD) = 1.29] as the most important indicator to consider for safe vehicle whiles "Protection devices for the driver" (M = 2.91, SD = 1.35) and "Reverse-in-safety systems" (M = 2.3, SD = 0.96) as the least important indicators among the variables.

With regards to the unique contribution of the items, four items made positive significant contribution to the prediction of safety and health perceptions in transport activities. Except for "Records kept relating to a vehicle's maintenance history" ($\beta = 0.31$, $p < 0.001$) making a moderate significant contribution, the rest of the items made weak predictions. "Reverse-in-safety systems" ($\beta = -0.11$, $p < 0.05$) was related to a lower level of health and safety perceptions. This suggests that measures practiced in vehicle reversing do not conform to the safety standard.

3.7. Safe driving environment

The mean and standard deviation result presented in Table 5 shows that the negative attitude toward safety and health practices in the driving environment to a large extent influenced the causes of transport accidents in industries. This was largely associated with "Suitable roads and footways for vehicle and pedestrian traffic" and "Provision of a designated area for reversing operations" (M = 2.26, SD = 0.94; M = 2.03, SD = 0.95, respectively). The respondents ranked "The provision of signs", (M = 3.35, SD = 1.44) as the most important indicator when considering safe driving environment. The total mean value of the items was 2.72 representing the average state of safety and health practices.

The result further showed that the items which had significant β -weights made weak to moderate unique contributions to safety and health perception in transport activities. Among the items "The provision of signs" and "Adequate numbers of suitable parking

Table 3
Standard regression analysis for predicting safety and health perception ($N = 298$)

Variables	B	SE	β	R ²	ΔR^2	Adj.R ²	F
1 Drivers safety practice	0.37	0.05	0.42*	0.57	0.57	0.56	384.57*
2 Safe driving environment	0.20	0.08	0.18 [†]	0.64	0.07	0.63	263.93*
3 Safe vehicle usage	-0.23	0.07	-0.25 [†]	0.66	0.02	0.65	144.43*

* $p < 0.001$.

[†] $p < 0.05$.

SE, standard error; B, unstandardized regression coefficient; β , standardized regression coefficient; AdjR², Adjusted R square.

places" ($\beta = 0.34, p < 0.001$; $\beta = 0.31, p < 0.001$ respectively) made the strongest significant contribution with the remaining significant items making weak predictions.

3.8. Drivers' safety practices

In Table 6, the mean and standard deviation indicate that for "Driver safety practice" the respondents ranked "adequate check on driver tiredness and fatigue" ($M = 3.18, SD = 1.60$) and "Random drugs and alcohol tests for drivers" ($M = 3.15, SD = 1.59$) as the most important indicators to promote safety. The "Pedestrian awareness of vehicle capabilities" ($M = 1.87, SD = 0.96$) was ranked as the least important indicator. The total mean value was 2.59, which is also within the average level.

Among the items, nine had significant β -weights and four had moderate significant β -weights with "Role for drivers to check their vehicle and report any problems", "Supervision of drivers" and "Providing site specific training on how to perform the job" ($\beta = -0.47, p < 0.001$; $\beta = 0.45, p < 0.001$ and $\beta = 0.43, p < 0.001$ respectively) making the strong prediction. However, the "Role for drivers to check their vehicle and report any problems" and "Provision of personal protective equipment (PPE)" ($\beta = -0.32, p < 0.001$) were negatively related to the prediction of safety and health in transport activities indicating that these items were associated with lower levels of safety and health perception. Therefore, the best safety practices with regard to the drivers' role in maximizing safety and the use of protective equipment are not observed in the Ghanaian industry sector. The remaining items made weak unique contributions (see Table 6).

4. Discussion

In this study, we examined safety and health perceptions in work-related transport activities among industries in Ghana. The relationship between the components of safety measure variables

and safety and health perceptions were examined. The result shows that there was a positive significant correlation between safety measure variables and safety and health perceptions indicating the respondents' level of agreement and perceptions on safety and health practices in industrial transport activities. This could be linked to the gradual raising of health and safety standards and increased awareness of the benefits of safety practices at the workplaces. This result implies that educating the population in the risks in working environments would improve perceptions regarding safety and health over time. In line with previous research, the result confirms that industry with organized safety related information and measurement safety performance could bring people together to learn how to work more safely [14].

In predicting safety and health perceptions in transport activities, all the safety measure variables in the study model made significant unique contributions. However, the positive significant association were not strong and safe vehicle usage was also related to a lower number of safety and health perceptions in industrial transport activities, suggesting that commitment to the best safety methods are not enough to reduce the rate of transport related accidents. Additionally, the model as a whole predicted 66% and out of this driver safety practice accounted for 57% of the safety and health perceptions in transport activities. These findings show that for intervention to improve safety and health, focus may have been on driver's safety practice, with less attention to safe environments and vehicle usage. Thus, the majority of accidents in the industrial transport activities in Ghana could be attributed to the poor commitment in ensuring safe vehicle usage and safe working environment. This implies that to eliminate occupational accidents, Ghanaian industries need to have a strong commitment to changing unsafe practices at all level of operations. More so, in support of previous research, safety perceptual of workers should be directed toward achieving maximum safe working environments, the best safety practices, and most especially safe transport operations [25,30].

Table 4
The mean and standard deviation (in brackets) of safe vehicle usage items, in predicting safety and health perception

Variables	Mean (SD)*	Rank	r^{\dagger}	β
Estimate to indicate your response toward the following safety practice for safe vehicle usage.				
1 Suitable means of access to & from cabs.	3.02 (1.41)	5	0.50 [‡]	0.16
2 Comfort of the driver in the vehicle cab (i.e., vibration damping, noise reduction, adjustable seating, good ventilation, & weather protection)	3.12 (1.33)	3	0.05	-0.01
3 Protection device for the driver (e.g., seatbelts, rollover protection system, guards, exposed exhaust pipes)	2.91 (1.35)	6	0.50 [‡]	0.20 [§]
4 Condition of the vehicle in good working order	3.16 (1.39)	2	0.28 [‡]	0.22 [‡]
5 Reverse-in-safety systems (e.g., CCTV, wide angle mirrors, sirens)	2.39 (0.96)	7	0.06	-0.11 [§]
6 Regular & timely vehicle maintenance	3.17 (1.29)	1	0.12 [§]	-0.06
7 Records keeping relating to a vehicle's maintenance history	3.07 (1.39)	4	0.50 [‡]	0.31 [‡]
Total mean	2.98			

* A higher mean value indicates a positive attitude toward safety and health standards.

[†] Indicate the correlations between the items in the safe vehicle usage and safety and health perceptions.

[‡] $p < 0.001$.

[§] $p < 0.05$.

CCTV, closed circuit television; SD, standard deviation; β , standardized regression coefficient.

Table 5

The mean and standard deviation of safe driving environment items, in predicting safety and health perceptions

Variables	Mean (SD)*	Rank	r^{\dagger}	β
Estimate to indicate your response toward the following safety practice for safe driving environment.				
1 The roads & footways are suitable for the types & volumes of vehicular & pedestrian traffic.	2.26 (0.94)	10	0.41 [‡]	-0.03
2 Vehicles & pedestrians kept safely apart.	2.66 (1.27)	6	0.30 [‡]	0.06
3 Safe pedestrian route that allows visiting drivers to report for instruction when entering the workplace.	2.60 (1.39)	7	0.30 [‡]	-0.01
4 Adequate numbers of suitable parking places for all vehicles.	3.19 (1.52)	2	0.52 [‡]	0.31 [‡]
5 The level of lighting in each area is sufficient for the pedestrian & vehicle activity.	3.18 (1.51)	3	0.52 [‡]	0.13 [‡]
6 Vehicle routes are free from obstructions & congestion.	2.72 (1.35)	5	0.35 [‡]	0.12 [‡]
7 The provision of signs (i.e., directional, speed limit, give-way, no-entry).	3.35 (1.44)	1	0.54 [‡]	0.34 [‡]
8 Vehicle activity at peak pedestrian times is minimized (e.g., shift change, meal times).	3.11 (1.53)	4	0.52 [‡]	0.12 [‡]
9 The provision of a 1-way system, speed bumps, & a speed limit.	2.50 (1.26)	8	0.47 [‡]	0.12 [‡]
10 Pedestrian routes are free from obstruction & congestion.	2.29 (0.85)	9	0.28 [‡]	0.09 [§]
11 Provision of a designated area for reversing operations.	2.03 (0.95)	11	0.37 [‡]	0.14 [§]
Total mean	2.72			

* A higher mean value indicates a positive attitude toward safety and health standards.

[†] Indicate the correlations between the items in the safe driving environment and safety and health perceptions variable.[‡] $p < 0.001$.[§] $p < 0.05$.SD, standard deviation; β , standardized regression coefficient.

The unique contribution of items in the safety measure variables that best predicts safety and health perceptions in industrial transport activities was also examined. The overall results of the statistical mean values were average in magnitude indicating the extent safety and health is observed in transport activities. There were moderate correlations between safety and health perceptions and items contained in the safety measure variables. The results show that among the items in the safe vehicle usage variables that reached statistical significant level “records keeping relating to vehicle maintenance history” made the strongest contribution to the prediction of the safety and health perception in transport activities. The results further show that “reverse-in-safety systems” was negatively related to safety and health perceptions. To a large extent the results suggested that the participants recognized the importance for vehicles to remain mechanically sound and the need to be given the highest priority. They appear to be aware of their responsibilities to use protective devices and the right vehicle

for a particular purpose by taking into account the working conditions and risks. However, there is a negative attitude toward the need to conform to safety standard related to vehicle reversing. In congruent with previous research HSE [30], this could be that the laws that regulate public transport activities are not applied to transport usages in the industries hence, relaxed behaviors toward safety standards.

With regard to the items in a safe driving environment, the result revealed that “provision of signs” and “suitable parking places” made the strongest predictions to safety and health perceptions in transport activities, suggesting that focusing more on providing safety facilities, good infrastructures, and controlling the vehicle movement in the sites of the industries will enhance worker’s safety. However, the result further shows that the remaining items that made significant contribution to prediction of safety and health perception were weak, indicating less commitment in creating a safe working environment (e.g., area

Table 6

The mean and standard deviation (in brackets) of drivers’ safety practice items, in predicting safety and health

Variables	Mean (SD)*	Rank	r^{\dagger}	β
Estimate to indicate your response toward the following safety practice for driver’s safety				
1 Drivers possess the necessary licenses for the vehicles they are authorized to drive.	2.12 (0.93)	8	0.61 [‡]	0.26 [‡]
2 Checking the previous experience of drivers & assess them to ensure their competence.	2.11 (0.95)	9	0.63 [‡]	0.28 [‡]
3 Providing site specific training on how to perform the job, & information regarding particular hazards, speed limits, the appropriate parking & loading areas, etc.	2.80 (1.54)	6	0.48 [‡]	0.43 [‡]
4 Planned program of refresher training for drivers to ensure their continued competence.	1.96 (0.97)	10	0.50 [‡]	0.10 [‡]
5 Checking drivers’ tiredness & fatigue.	3.18 (1.60)	1	0.47 [‡]	0.02
6 Pedestrian awareness of vehicle capabilities.	1.87 (0.96)	11	0.49 [‡]	0.04
7 The supervision of drivers.	2.84 (1.51)	4	0.54 [‡]	0.45 [‡]
8 Following safe driving procedures (e.g., drive within speed limit, park within designated areas).	2.84 (1.51)	4	0.54 [‡]	0.24 [‡]
9 Provision of personal protective equipment (e.g., high visibility clothing, safety shoes etc.).	2.80 (1.54)	6	0.48 [‡]	-0.32 [‡]
10 A role for drivers to check that their vehicle is safe and report any problems.	2.85 (1.51)	3	0.54 [‡]	-0.47 [‡]
11 Random drugs & alcohol tests for drivers.	3.15 (1.59)	2	0.51 [‡]	0.22 [‡]
Total mean	2.59			

* A higher mean value indicates positive attitude toward safety and health standards.

[†] Indicate the correlations between the items in the drivers’ safety practice and health and safety perceptions.[‡] $p < 0.001$.[§] $p < 0.05$.SD, standard deviation; β , standardized regression coefficient.

for vehicle operation and pedestrians) necessary to erase high risk images closely associated with the industries transport activities. Meanwhile, the development of safety and the reduction of injury rates greatly depend on commitment to creating healthy and safe working environment (e.g., distancing pedestrian routes away from areas of vehicle activity) [15,32].

In the prediction of health and safety perceptions in driver's safety practice, the industries show some level of good behavior toward an inspection program and supervisions to detect unsafe conditions and behaviors that may lead to accidents. However, it appears there are still some vital areas that are not properly managed. The responsibility of management ensuring that both new and experienced employees receive the appropriate training to enhance safe driving procedures and situation awareness to make better decisions to avoid violations, errors, and potential hazards to themselves and others are truncated, thus, increasing the possibilities of accidents occurring and making the environment unsafe. Meanwhile, previous researchers have found that employee perceptions of safety systems are related to management's commitment to safety which is associated with injury rates [15]. The results further revealed that the role of drivers to check the safe use of vehicles and the use of protective equipment was negatively associated with safety and health perceptions, indicating the extent industries violate the best safety practice when it comes to driver participation in ensuring safety. However, attempts to eliminate accidents will not be effective unless accompanied with a positive safety culture [4]. As the organization of training and formulation of safety rules for all workers is the key responsibility of management, the above results imply that even though management has some good behavior toward achieving safety, they still lack commitment to provide safe working conditions for workers.

This study has several strengths. Despite the existence of previous studies relating to safety and health in Ghanaian industries, there is no study conducted on industrial transport activities in Ghana. Therefore, the results of this study can be used to design self-awareness exercises that provide feedback to all stakeholders, including the management and drivers regarding the safety situations in Ghanaian industry. Such an approach will improve both drivers' and management's awareness of risks of accidents and help modify their behavior toward safety standards and practices. Furthermore, the study has highlighted the ideas and tools that can make transport accident prevention part of standard operating procedure. Additionally, the study has provided an insight and identified some safety problems for common vehicle operations, which have informed the developmental countermeasures to promote safety and health among industries in Ghana.

Notwithstanding the extensive contributions, the present study has some notable drawbacks. The results were obtained based on self-reported measures. This data collection technique may lead to the possibility of obtaining distorted responses due to the participants being wary to fully disclose information. However, the anonymous and confidentiality nature of the questionnaire expectantly minimized this socially desirable bias. Additionally, the present study focused on the activities of transport operations, however, there are other equally important activities in industries with safety and health implications which need to be investigated. Further efforts should be made to examine other operational activities in future research to get a broader view on safety and health practices in industries. More so, both an observation and questionnaire approach should be used and focus on using a moderated regression or structural equation model to examine whether the safety and health practices in Ghanaian industries correlate with subscales of the Work Safety Scale (job safety, coworker safety, supervisor safety,

management safety, and safety program), safety performance and occupational accidents.

5. Conclusion

The idea of introducing OSH in industrial settings is to ensure the safety of properties and personnel in the performance of daily activities. However, the OSH management system is a neglected area and a function that has not been pursued systematically in industries in Ghana. As a result, industrial transport workers in Ghana are from time to time involved in accident and injuries in carrying out their daily activities. Perceptions regarding the importance of safety policies, training, and practices at workplace may have positive effects on driving outcomes and reduction of accident rates. In spite of the previous studies conducted on Ghanaian industries, no study regarding safety and health perceptions in transport activities in industries has been conducted in Ghana. Therefore, the present study investigated the perceptions regarding the importance of safety and health in work-related transport activities in Ghanaian industries.

The results show that for interventions to improve safety and health concentration has been on drivers' safety practice with less attention to safe driving environments and vehicle usage. The respondents are aware of the importance of occupational safety and health culture in transport activities, however, the level of integration is not fully implemented. To a large extent, the results imply that causes of vehicle accidents in industries are militated by the behavior of the drivers, conditions of vehicles, the movement of the vehicles, the design of the working environment, and lack of management commitment to safety. Efforts to improve safety and health performance will not be achieved until safety and health culture is fully applied in the activities of the industries. Therefore, to prevent transport related accidents, injuries, and fatalities in industry settings there is a need for a major shift regarding attitudes toward safety and health in transport operations. These require legislative bodies, employers, and workers to actively participate in securing safe and healthy working environment through commitment and efficient implementation for accident prevention at all levels of operations. Therefore, safety seminars and training sessions should be organized for industry workers responsible for transport operations to improve attitude toward safety and health.

Conflicts of interest

The authors have no conflicts of interest to declare.

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References

- [1] Kim WY, Cho HH. Unions, Health and safety committees, and workplace accidents in the Korean manufacturing sector. *Saf Health Work* 2016;7:161–5.
- [2] Dorman P. The economics of safety, health, and well-being at work [Internet]. Geneva: International Labour Organisation; 2000 [cited 2015 Feb 15]. Available from: <http://www.ilo.org/public/english/protection/safework/papers/index.htm>.
- [3] Barling J, Hutchinson I. Commitment versus control-based safety practices, safety reputation, and perceived safety climate. *Can J Adm Sci/Revue Canadienne Des Sciences De L'administration* 2000;17:76–84.

- [4] Kim Y, Park J, Park M. Creating a culture of prevention in occupational safety and health practice. *Saf Health Work* 2016;7:89–96.
- [5] Health and Safety Commission. Health & Safety at Work Etc. Act 1974, some Legal aspects and how they will affect you [Internet]. 1974 [cited 2015 Feb 15]. Available from: http://www.legislation.gov.uk/ukpga/1974/37/pdfs/ukpga_19740037_en.pdf.
- [6] Dupré D. Accidents at work in the EU in 1996: statistics in focus. *Pop Soc Con* 2000;3:1–4.
- [7] Goetsch DL. Occupational safety and health for technologists, engineers, and managers. 5th ed. New Jersey: Pearson Prentice Hall; 2005. 912 p.
- [8] World day for safety and health at work. Workplace stress: a collective challenge [Internet]. 2016 [cited 2016 Aug 15]. Available from: <http://www.un.org/en/events/safeworkday>.
- [9] Appiah, SO. The state and workplace safety in Ghana: examining the role of the Department of Factories Inspectorate in the Tema industrial area [Internet]. 2014 [cited 2016 Aug 14]. Available from: <https://www.academia.edu/8098541>.
- [10] Amponsah-Tawiah K, Dartey-Baah K. Occupational health and safety: key issues and concerns in Ghana. *Int J Bus Soc Sci* 2011;2:119–26.
- [11] Tulashie SK, Addai EK, Annan JS. Exposure assessment, a preventive process in managing workplace safety and health, challenges in Ghana. *Saf Sci* 2016;84: 210–5.
- [12] Amponsah-Tawiah K, Mensah J. Occupational health and safety and organizational commitment: evidence from the Ghanaian mining industry. *Saf Health Work* 2016;7:225–30.
- [13] Annan JS, Addai EK, Tulashie SK. A call for action to improve occupational health and safety in Ghana and a critical look at the existing legal requirement and legislation. *Saf Health Work* 2015;6:146–50.
- [14] Bakri A, Mohd ZR, Misnan MS, Mohammed AH. Occupational safety and health (OSH) management systems: towards development of safety and health culture. *APSECC* 2006;6:19–28.
- [15] O'Toole M. The relationship between employees' perceptions of safety and organizational culture. *J Saf Res* 2002;33:231–43.
- [16] Misnan MS, Mohammed AH. Development of safety culture in the construction industry: a conceptual framework. *ARCOMC* 2007;23:3–5.
- [17] Öz B, Özkan T, Lajunen T. Trip-focused organizational safety climate: investigating the relationships with errors, violations and positive driver behaviours in professional driving. *Transp Res Part F: Traffic Psychol Behav* 2014;26: 361–9.
- [18] Guldenmund FW. Understanding and exploring safety culture. TU Delft, Netherlands: Delft University of Technology; 2010. 270 p.
- [19] Newnam SA, Watson BC, Murray W. A comparison of the factors influencing the safety of work-related drivers in work and personal vehicle [Internet]. Road Saf Res, Pol Edu Con. 2002 [cited 2015 Jun 20]. Available from: http://eprints.qut.edu.au/2169/1/RS2002_Final_Paper_2.pdf.
- [20] Cooper MD, Phillips RA. Exploratory analysis of the safety climate and safety behavior relationship. *J Saf Res* 2004;35:497–512.
- [21] Öz B, Özkan T, Lajunen T. An investigation of professional drivers: organizational safety climate, driver behaviours, and performance. *Transp Res Part F: Traffic Psychol Behav* 2013;16:81–91.
- [22] Lin J, Mills A. Measuring the occupational health and safety performance of construction companies in Australia. *Facilities* 2001;19:131–9.
- [23] Yule S, Flin R, Murdy A. The role of management and safety climate in preventing risk-taking at work. *Int J Ris Ass Man* 2006;7:137–51.
- [24] Khan MKJ, Yusof AA, Chew NAA. Occupational safety and health in the organization. Malaysia: Pearson Prentice Hall; 2005. p. 5–15.
- [25] Mohd SM, Abdul HM, Sulaiman K, Zakaria MY, Wan YWM, Ahmadon B. Development of safety culture in construction industry. *The Mal Sur* 2007;42: 20–33.
- [26] Misnan MS, Mohammed AH, Mahmood WYW, Mahmud SH, Abdullah MN. Development of safety culture in the construction industry: the leadership and training roles. *ICBEDC* 2008;2:1902–20.
- [27] Root DF. Creating a culture of safety on construction sites. *Risk Mang* 2005 Nov 1;52:56.
- [28] DeJoy DM, Schaffer BS, Wilson MG, Vandenberg RJ, Butts MM. Creating safer workplaces: assessing the determinants and role of safety climate. *J Saf Res* 2004;35:81–90.
- [29] Health and Safety Authority. Guidelines on risk assessments and safety statements [Internet]. Dublin; 2006 [cited 2015 Aug 20]. Available from: http://www.hsa.ie/eng/Publications_and_Forms/Publications/Safety_and_Health_Management/Guidelines_on_Risk_Assessments_and_Safety_Statements.pdf.
- [30] Health and Safety Executive (HSE). The safe use of vehicles on construction sites: a guide for clients, designers, contractors, managers, and workers involved with construction transport [Internet]. 2009 [cited 2015 Sep 30]. Available from: <http://www.hse.gov.uk/pUbns/priced/hsg144.pdf>.
- [31] Hayes BE, Perander J, Smecko T, Trask J. Measuring perceptions of workplace safety: development and validation of the work safety scale. *J Saf Res* 1998;29: 145–61.
- [32] Health and Safety Executive (HSE). Workplace transport safety: an overview [Internet]. 2005 [cited 2015 Aug 20]. Available from: <http://www.hse.gov.uk/pubns/indg199.pdf>.
- [33] Health and Safety Executive (HSE). Driving at work: Managing work-related road safety [Internet]. 2013 [cited 2015 Feb 20]. Available from: <http://www.hse.gov.uk/pubns/indg382.pdf>.
- [34] Streiner DL. Starting at the beginning: an introduction to coefficient alpha and internal consistency. *J Per Ass* 2003;80:99–103.