



Research article

Psychosocial work factors affecting safety incidents of long-distance bus drivers in Ghana: Mediating role of psychological well-being

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ABSTRACT

Background: Improving psychosocial work environment of long-distance bus drivers is essential for their psychological well-being and on-the-road safety. Despite the importance of the work environment of bus drivers, it has received little research attention in Ghana and other developing nations. Hence, this study examined the influence of psychosocial work factors (job demands and job resources) on safety incidents of long-distance bus drivers and how psychological well-being mediates this association.

Methods: This cross-sectional survey sampled 7315 long-distance bus drivers who commute from the cities of Accra and Tema to other parts of Ghana and other cities in the West Africa sub-region. Partial least squares structural equation modelling (PLS-SEM) was used to test four hypotheses.

Findings: The results suggest that job demands and job resources have direct association with safety incidents of the long-distance bus drivers. The psychological well-being of the bus drivers played a partial mediation role in the association between psychosocial work factors and safety incidents of the drivers.

Conclusion: The job demand-resource model provides a useful model for understanding the impact of the work environment on driving performance among these long-distance bus drivers. Providing the drivers with high job control and supportive work culture can equip and support them to value the critical roles they play in the transport sector. Managers of bus transport companies and individual bus owners should implement effective communication strategies like the bottom-up communication approach, conduct periodic assessments to identify and address drivers' precarious work conditions, create safety on the road, and reduce crashes and associated fatalities.

1. Introduction

Long-distance bus drivers play a vital role in the transportation system in Ghana and other developing nations, because they ensure the movement of people and goods inter-city and to neighbouring countries. This category of drivers inject life into the country's

Abbreviations: JD-R, Job demand-resource model; JD, Job demands; JR, Job resources; PWB, Psychological well-being; SI, safety incidents; PLS-SEM, Partial least squares structural equation modelling; JCQ, Job content questionnaire; DBQ, Driver behaviour questionnaire; AVE, Average variance extracted; CR, Composite reliability; WHO, World Health Organisation.

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economy by powering the movement of people, products and services. However, the work environment of this vulnerable occupational group (drivers) is inherently demanding, which involves long hours of driving, irregular shift work, lone and monotonous driving, and high physical and psychological demands that expose such workers to various unhealthy psychosocial work factors [1,2]. For instance, commercial drivers in Ghana operates in challenging work conditions, which are marked by hazardous road infrastructures because of inadequate maintenance of the road, i.e. potholes, and limited signage. These poor road conditions contribute significantly to accidents and amplify driver stress [1,3]. Evidence shows that public buses in Ghana account for about 25% of vehicular crashes and about 36% of the total road traffic casualties in the country [4].

Furthermore, major cities like Accra grapple with severe traffic congestion, which necessitates extending the working hours by drivers to meet tight schedules and financial obligations. These long working hours, which often exceed recommended limits, lead to driver fatigue that compromise on-the-road safety [1]. Unfortunately, many of these drivers operate older vehicles with insufficient maintenance, that heightens the risk of maintenance costs, vehicular breakdown, and accidents [2]. Regrettably, like many developing nations, Ghana also faces a high rate of road traffic crashes, which disproportionately affect commercial drivers, resulting in injuries, fatalities, and vehicle damage. Fatigue-related incidents that stem from extended working hours and low job control contribute to accidents, while non-compliance with safety regulations, inadequate training, and limited access to healthcare further jeopardize drivers' well-being [1,3]. Besides, bus transport activities are predominantly informal in Ghana where buses are owned by individuals' and few bus transport companies [2]. These bus owners may prioritise productivity over the safety of the drivers, which in turn compromise the safety of the other road users. This signals a poor integration of occupational health and safety standards in the road transport activities.

The impacts of negative or precarious work environment on drivers' psychological well-being and safety outcomes are dire [3–8]. In this study, psychological well-being refers to bus drivers' subjective evaluation of their emotional and mental state regarding positivity, stability, and overall mental health status [9]. The concept of psychological well-being has several facets and includes people's emotional, cognitive, and social functioning [9,10]. Psychological well-being is affected by the interaction of worker traits and the work environment [11]. To ensure the safety of passengers and other road users, long-distance bus drivers need to maintain high levels of psychological well-being and fitness [3,12]. Decreased concentration, increased weariness, and impaired decision-making may contribute to highway safety events when psychological strain and psychological well-being of drivers are compromised [13–19].

Despite the importance of the work environment and its impact on the psychological well-being and risky driving behaviours of long-distance bus drivers, it has received limited research attention in developing countries like Ghana [1]. This knowledge gap hinders the development of evidence-based interventions and strategies to improve the well-being and safety of these drivers, prevent road traffic crashes, and save costs [20]. Unfortunately, most of the initiatives in Ghana's road safety campaigns have concentrated on preventing risky driving, neglecting the working conditions for this vulnerable occupational group, perhaps, due to a lack of data on how drivers' working conditions [2,21] influence on-the-road accidents. Hence, this study aims to investigate the relationship between psychosocial work factors (job demands and job resources) and how such factors influence safety incidents among long-distance bus drivers in Ghana. We also examined the mediating role of psychological well-being on this interaction. This may help provide evidence-based recommendations for promoting the well-being and safety of this occupational group and reduce road accidents and associated injuries, fatalities and costs.

1.1. Job demand-resource (JD-R) model

The JD-R model is a widely recognised framework used in occupational stress research to understand factors influencing workers' well-being and job performance [22]. The JD-R model suggests that every job has specific demands (such as workload, time pressure, and emotional demands) and resources (like social support, autonomy, and opportunities for development). The model posits that high job demands, when not balanced by sufficient job resources, can lead to stress, burnout and reduced health among workers. On the other hand, when employees have access to adequate job resources, their motivation, engagement, and overall work performance including safety can be enhanced. Thus, the JD-R model emphasises job design and considers a broader range of demands and resources in predicting and explaining workers' well-being, engagement and performance [22].

The argument is that high job demands lead to the wearing away (exhaustion) of long-distance bus drivers' energy which becomes a risk factor that increases driver psychological distress and on-the-road safety incidents [22]. The long run of exhaustion leads to heightened risk of depressive disorders, chronic fatigue and other health conditions such as cardiovascular diseases, musculoskeletal disorders, that impair driving performance and associated road crashes [5,6,20]. This is the health erosion hypothesis. Demerouti et al. further argued that adequate resources such as social support, job control and job security motivate long-distance bus drivers [22], and to improve their psychological well-being and organisational outcomes such as increased productivity and safe driving performance. The second hypothesis is the motivational process [23–25].

Studies have consistently shown that high job demands like long working hours, time pressure, and extended periods of concentration are associated with increased likelihood of safety incidents and accidents among commercial bus drivers [19,26,27]. The demanding nature of their profession, characterised by prolonged driving hours and the need to adhere to tight schedules, heighten the risk of driver fatigue, lapses in attention, and increased tendency of errors while on the road [1]. Consequently, these demanding job requirements are hypothesised to have a positive relationship with road traffic crashes. Hence, we hypothesised that:

H1. High job demands is positively related to increase in safety incidents of long-distance bus drivers.

Job resources play a pivotal role in mitigating the risk of safety incidents among long-distance bus drivers. Empirical research has

consistently demonstrated that access to job resources such as social support, job control, and opportunities for development are protective factors that reduce the likelihood of accidents and on-the-road safety-related incidents [28,29]. For instance, a supportive work environment and adequate rest breaks alleviate the adverse effects of high job demands, which promote driver alertness and overall well-being. Thus, job resources are expected to exhibit a negative relationship with safety incidents, which reinforces the importance of these resources in ensuring safe driving practices. Hence, we hypothesised that:

H2. Job resources are negatively related to the safety incidents of long-distance bus drivers.

Previous researchers have explored the mediating role of well-being in the relationship between job demands and work engagement [30–32], job demands and job performance [33–35] and job resources and job engagement [32]. Though few studies have explored the mediating role of well-being on the association between psychosocial work factors and performance outcomes, they confirmed the argument of the JD-R model [22]. Hence, we hypothesised that:

H3. Psychological well-being will mediate the association between job demand and safety incidents of long-distance drivers.

H4. Psychological well-being will mediate the association between job resources and safety incidents among long-distance bus drivers.

The hypotheses proposed in this study are on the JD-R model's foundational concepts, the aim is to establish empirical links between job demands, job resources, psychological well-being, and safety incidents among long-distance bus drivers. Specifically, the hypotheses suggest that high job demands (H1) positively influence safety incidents, while job resources (H2) have a negative relationship with such incidents. Additionally, psychological well-being is expected to play a mediating role, which channels the impact of high job demands (H3) and improves that of job resources (H4) on safety incidents. These hypotheses align with a growing body of evidence that job demands and resources are robust predictors of job performance and driving safety [19,26–29], and underscore the critical role of psychological well-being as a mediator in these relationships [30–35]. This may help provide evidence-based recommendations for promoting the psychological well-being and safety of commercial drivers, that eventually may reduce on-the-road crashes. Fig. 1 presents the structural mediation path model where psychological well-being (PWB) mediates the effects of job demands (JD) and job resources (JR) on safety incidents (SI) of the drivers.

2. Materials and methods

2.1. Participants and procedures

About 10,900 long-distance bus drivers were scattered in about 38 bus stations and terminals within the cities of Accra and Tema in Ghana. These drivers commute at least 140 km or 3 h from Accra and Tema to other parts of Ghana and cities in other West African countries [36]. Of the 10,900 drivers, 7315 participated in this cross-sectional survey [37]. The bus drivers who were waiting for their buses to be loaded or who had returned from a trip were approached by their station masters and administrators for this study. Bus drivers who had been active six months before data collection (confirmed by their “station masters” or station managers and administrators) were recruited for this study. The drivers also gave informed consent orally or by signing the consent form before taking part in the study. However, bus drivers who owned their buses were excluded since the independent variables of interest (job demands and job resources) are largely organisational context variables and may be less perceived by such drivers. Bus drivers who could speak, understand and write the English language were given the questionnaire to fill and return, in three days, to their station masters and administrators for collection. Survey interviews in Akan Twi (a widely spoken language in Ghana) were conducted for other bus drivers who could not speak, understand and write in English or for those who did not have enough time to complete the interview. The questionnaire was translated into Twi and back to English to ensure translation accuracy.

A questionnaire was used in this study. The questionnaire was pretested among 60 long-distance bus drivers in the Cape Coast Metropolis. Two independent researchers rated the survey interviews conducted during the pretesting of the instrument to ensure the field research officers were asking the right questions and the responses from respondents were reliable. Data collection lasted two

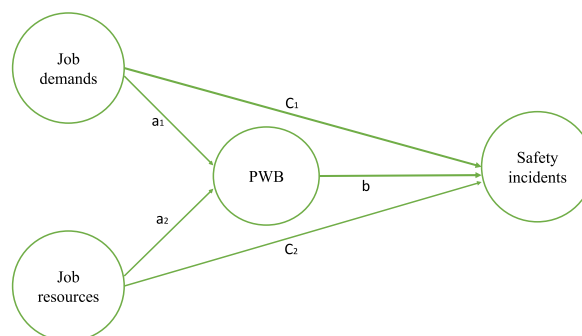


Fig. 1. Structural path model.

months (December 2022 and January 2023), and survey interviews took between 15 and 30 min to complete. Bus drivers who participated in the study were not compensated. Twenty trained field research officers supported the data collection. Before data collection began, researchers obtained ethical approval from the University of Cape Coast Ethical Review Board (ID: UCCIRB/CES/2022/82). This was done to ensure that the rights of the bus drivers were preserved and protected while their dignity was upheld.

2.2. Measures

2.2.1. Job demands and job resources

The job content questionnaire (JCQ) by Karasek et al. [38] which is validated among professional drivers [29] was used to measure job demand and job resources. JCQ (the measurement tool of the JD-R) has been widely adopted and validated in studies that deal with professional drivers, and it is a good instrument that has high predictive validity for the assessment of risky behaviours and crashes of professional drivers [29]. Twelve items (7 items measuring job demands and five items measuring job resources [social support]) were used. The items in the JCQ are reliable (alpha 0.86–0.92; composite reliability 0.91 and 0.95) [29,39]. Sample items include “My job requires hard work all the time”. “People I work with are competent to do their job”. The responses on the JCQ were strongly disagreed (1) to strongly agree (4), where higher scores mean availability of higher job demands and job resources.

2.2.2. Psychological well-being

The World Health Organisation (WHO-5) [40] was used to estimate the psychological well-being of long-distance bus drivers. WHO-5 is a reliable measure of perceived psychological well-being of workers, which has an alpha reliability of 0.91 and composite reliability of 0.95 [41]. Items in the WHO-5 are “I have felt cheerful and in good spirit”, “I have felt calm and relaxed”, “I have felt active and vigorous”, “I woke up feeling fresh and rested” and “My daily life has been filled with things that interest me”. Responses range from “at No time” (0) to “All of the time” (5). Higher scores on the WHO-5 indicate higher perception of psychological well-being of the bus drivers.

2.2.3. Safety incidents

Safety incidents are conceptualised as risky driving behaviours in the form of driving errors and violations. The driver behaviour questionnaire (DBQ) [27] was adapted for this study [28]. Three items measuring violations and two items measuring errors were used. Sample items include: “Fail to check your rearview mirror before pulling out, changing lanes, etc.” measured driving error, while “Take a chance and cross on red lights”, measured violation on the road. The scale is reliable (alpha = 0.839, composite reliability = 0.93), with responses ranging from hardly ever (1) to nearly all the time (5). Higher scores indicate higher levels of driving errors and violations.

Table 1

Item listings, CR, AVE and outer loadings for JD, JR, PWB and SI.

Latent Constructs	Outer loadings			
	JD	JR	PWB	SI
JD (CR = 0.96; AVE = 0.80)				
JD_1	0.89			
JD_2	0.91			
JD_3	0.94			
JD_4	0.86			
JD_5	0.92			
JD_6	0.90			
JD_7	0.82			
JR (CR = 0.94; AVE = 0.81)				
JR_1		0.93		
JR_2		0.96		
JR_3		0.90		
JR_5		0.80		
PWB (CR = 0.96; AVE = 0.88)				
PWB_1			0.96	
PWB_2			0.93	
PWB_3			0.95	
PWB_5			0.91	
SI (CR.95; AVE = 0.82)				
SI_1				0.87
SI_2				0.94
SI_4				0.91
SI_5				0.92
SI_6				0.91

JD, job demands; JR, job resources; PWB, psychological well-being; SI, safety incidents.

2.3. Analytical procedures

Partial Least Squares Structural Equation Model (PLS-SEM) was used to test the hypotheses. The procedures start from model specification, assessment of the reliability of the indicators and their constructs in the model, evaluation of model fit, assessment of the path coefficients through bootstrapping, evaluation of the direct and indirect path, concluding with the mediation effect of psychological well-being.

2.3.1. Model specification

Job demands and job resources were the exogenous constructs in the model. The mediator was psychological well-being, and safety incidents were considered an endogenous latent variable. All four the latent variables were quantitatively measured. The indicators were reflectively modelled; thus, arrows move from the constructs towards the indicators.

2.3.2. Assessment of reliability of indicators and their constructs

Internal consistency reliability was assessed for latent constructs in the path model. Composite reliability (CR) of ≥ 0.70 was acceptable for all indicators based on the recommendation of Hair et al. [42]. Initial analysis found that an indicator (item 4) on psychological well-being had an outer loading < 0.70 . Hence, item 4 on the WHO-5 was removed from further analysis. The reliability for all the constructs were established (Composite reliability between 0.94 and 0.96).

2.3.3. Assessment of validity of constructs

Convergent and discriminant validity were assessed using average variance extracted (AVE) of ≥ 0.50 [42]. With AVE between 0.80 and 0.88, convergent validity was established for the constructs in the path model. See Table 1 for item loadings, composite reliability and AVE. Using the Fornell and Larcker [43] criterion and the Heterotrait-Monotrait (HTMT) ratio of correlation (HTMT value < 1), the discriminant validity was assessed [42]. Fornell and Larcker's [43] criterion holds that the AVE for each construct should be higher than the squared correlation between that construct and other constructs. Thus, discriminant validity was established for the constructs in our path model. See Table 2 and Table 3 for details.

2.3.4. Assessment of multicollinearity

Fornell and Larcker's [43] criterion was further used to assess multicollinearity since the constructs in the model were reflectively modelled [42]. Based on the criterion, issues of multicollinearity did not exist in the structural model. Furthermore, variance inflation factor (VIF) values between 0.10 and 5 [42] were used to examine whether multicollinearity exists in the constructs in the path model. With VIF values between 1.005 and 1.032, issues of multicollinearity did not exist [42]. See Table 4 for VIF values.

2.3.5. Assessment of model fit, predictive ability and predictive relevance of the model

Standardised root mean square residual (SRMR) was used to determine the fit for the path model. With SRMR value of 0.07 below the recommended criterion of ≤ 0.10 by Hair et al. [42], the model fit is attained. In addition, the adjusted R^2 (R^2_{adj}) was used to assess the predict relevance of the inner model. The combination of job demands, job resources and psychological well-being explained 53.7% of the variance in safety incidents [$R^2_{adj} = 0.537$]. Based on the recommendation of Hair et al. [42], the inner model has a moderate explanatory power (R^2 between 0.3 and 0.7). Finally, the predictive ability of the inner model was assessed using Q^2 through the blindfolding approach in the Smart PLS, with $Q^2 > \text{zero}$ as the criterion [42]. The analysis found that Q^2 of the endogenous construct, safety incidents, was 0.44 which is greater than zero as recommended by Hair et al. [42].

2.3.6. Evaluation of path coefficients

In the path model (Fig. 1), the effect of job demands and job resources on long-distance bus drivers' safety incidents was expected to be absorbed by their level of psychological well-being, via evaluating both the direct (C_1 and C_2) and the indirect paths ($a_1 \rightarrow b$, and $a_2 \rightarrow b$) in the PLS model. The bootstrapping approach was then used to determine the significance of the path coefficient with and without the mediator (psychological well-being).

2.3.7. Evaluation of the mediation role of psychological well-being

The path coefficient was considered significant if the t-value was higher than 1.96 at p-value of ≤ 0.05 [42]. Meanwhile, the direct paths need to be significant to establish the basis for assessing the mediator (psychological well-being), either partial or full mediation of the association between psychosocial work factors and safety incidents of the drivers. Full mediation occurs if the direct path is no

Table 2
Fornell and larcker (1981) criterion for discriminant validity.

Latent construct	JD	JR	PWB	SI
JD	0.891			
JR	0.168	0.901		
PWB	-0.047	0.039	0.939	
SI	0.721	0.08	-0.164	0.908

JD, job demands; JR, job resources; PWB, psychological well-being; SI, safety incidents.

Table 3
Heterotrait-monotrait ratio of correlations of the mediation model.

Latent construct	JD	JR	PWB	SI
JD				
JR	0.147			
PWB	0.065	0.074		
SI	0.751	0.067	0.16	

JD, job demands; JR, job resources; PWB, psychological well-being; SI, safety incidents.

Table 4
Collinearity statistics (VIF) for the mediation model.

Latent Construct	JD	JR	PWB	SI
JD			1.029	1.032
JR			1.029	1.031
PWB				1.005
SI				

JD = job demands, JR = job resources, PWB = psychological well-being, SI = safety incidents.

more significant in the presence of the mediator (psychological well-being) in the path model [42]. A partial mediation occurs if the path coefficients of the direct paths are still significant but reduced in the presence of the mediator (psychological well-being) [42].

3. Results

3.1. Socio-demographic information

Table 5 presents the descriptive statistics of socio-demographic variables of the long-distance drivers in this study. A sample of 7,315, comprising 0.7% females and 99.2 males, participated in the study. The rest (0.1%) did not identify their sex. The age of the bus drivers ranged from 19 to 64 years ($M = 39.07$, $SD = 7.85$), with a majority (49.8%) having basic education, while 13% had no formal education and 3.1% attained tertiary education. Also, 1.3% of the bus drivers were driving without a driver's license, whereas 6.4% used expired licenses as of the time of data collection. On average, the drivers were driving 9.5 h a day. The majority of the drivers (63.1%) were working on permanent contracts, while 23.5% were working as casual drivers. It is worth noting that in Ghana, casual

Table 5
Descriptive statistics of socio-demographic variables of participants.

Variable	Categories	Mean	SD	Participants	Percentage
Gender:	Male			7256	99.2%
	Female			53	0.7%
	Others			6	0.1%
Age	(Range = 19–64)	39.07	7.85		
Education level:	No formal education			952	13.0%
	Basic education			3647	49.8%
	Vocational training			1265	17.3%
	Secondary education			1227	16.8%
	Tertiary education			224	3.1%
Driving experience (years)	(Range = 1–47)	12.07	6.83		
Type of bus:	Minibus			5260	71.9%
	Long bus			2055	28.1%
Daily driving hours	(Range = 5–19)	9.48	3.62		
Weekly driving days	4 days/week			774	10.6%
	5 days/week			1931	26.4%
	6 days/week			3456	47.2%
	7 days/week			1154	15.8%
Employment status	Permanent			4617	63.1%
	Fixed-term			982	13.4%
	Casual			1716	23.5%
Expired license:	Yes			466	6.4%
	No			6849	93.6%
Shift work:	Yes			2954	40.4%
	No			4361	59.6%
Lone driving:	Yes			4814	65.8%
	No			2501	34.2%
Accidents (past two years)	(Range = 0–5)	1.08	1.26		

SD, Standard deviation.

drivers are not directly employed by bus owners or companies but are engaged by other drivers who are employed by these bus owners and companies. Most of the drivers (53.7%) had experienced at least one or more road traffic crashes two years before the data collection period.

3.2. Hypothesis testing

Hypothesis 1 suggests that high job demands will have a positive association with safety incidents. This hypothesis was confirmed ($r = 0.728$, $t = 103.817$, $p < 0.001$). Hypothesis 2 was also confirmed, and that job resources had a negative and significant association with safety incidents of the drivers ($r = -0.043$, $t = 9.451$, $p < 0.001$).

The path analysis found that all the paths in the mediating model were significant ($t > 1.96$ at $p < 0.05$). Thus, all the direct paths (JD→SI and JR→SI) and the indirect paths (JD→PWB→SI and JR→PWB→SI) were significant (See Table 6 for details). The bootstrapping approach indicated a significant direct effect of high job demands ($t = 103.337$, $p < 0.001$) and job resources ($t = 9.451$, $p < 0.001$) on the occurrence of safety incidents of the drivers (see Table 6). However, the direct effects of JD→SI ($t = 103.817$, $p < 0.001$) and JR→SI ($t = 7.373$, $p < 0.001$) were still significant in the presence of the mediator (psychological well-being), which signals a partial mediation.

Though there was a reduction in the strength of the direct effects of high job demands and job resources on safety incidents of the drivers, an evaluation of the indirect effects (JD→PWB→SI and JR→PWB→SI) was needed to conclude on the mediation role of PWB. The indirect paths, JD→PWB→SI ($t = 5.230$, $p < 0.001$) and JR→PWB→SI ($t = 3.790$, $p < 0.001$), were significant at $t > 1.96$ at $p < 0.05$ (see Fig. 2, Fig. 3). Since job demands and job resources still had a significant effect on safety incidents in the presence of PWB, then PWB played a partial mediation role in the path model. Thus, the psychological well-being of the long-distance bus drivers partially mediated the effect of high job demands and job resources on safety incidents, confirming hypotheses 3 and 4.

4. Discussion

4.1. Summary of findings

Findings from this cross-sectional survey suggest that high job demands and job resources have a direct impact on safety incidents of the long-distance drivers. Moreover, the psychological well-being of the bus drivers reduced the impact of high job demands and low job resources on the occurrence of on-the-road safety incidents of the drivers.

4.2. Direct effect of job demand and job resources on safety incidents

The direct impact of high job demands and job resources on risky driving behaviours or safety incidents confirms hypotheses H1 and H2. The empirical evidence from various studies, including those conducted within the Ghanaian context by Sam et al. [4] and Boateng [2], underscores the undeniable correlation between high job demands, low job resources, and the manifestation of risky driving behaviors or safety incidents. These findings affirm the validity of hypotheses H1 and H2. In particular, within the Ghanaian setting, both high job demands and inadequate job resources have been identified as direct contributors to impaired driving performance [2,4]. Moreover, these observations are not limited to the Ghanaian context alone; similar conclusions have been drawn from studies conducted outside of Ghana, adding weight to the argument. The studies conducted beyond Ghana's borders [5,7,13,18,28] consistently reinforce the notion that elevated job demands coupled with insufficient job resources exert a detrimental influence on drivers' performance. A comprehensive scoping review, delving into the impact of psychosocial work factors on driving performance, has further solidified this understanding [1]. The culmination of evidence from various sources, both within and outside Ghana, unequivocally establishes the direct impact of high job demands and low job resources on driving performance. These insights not only contribute to our understanding of the intricate relationship between occupational factors and driving behaviors but also highlight the universality of these effects across diverse cultural and geographical contexts.

Table 6

Mediation effect of PWB on the effect of JD and JR on SI.

Paths	Path Coefficient	SD	t-value	p-value
Direct effect (without the mediator)				
JD→SI	0.728	0.007	103.817	<0.001
JR→SI	-0.043	0.005	9.451	<0.001
Direct effect (with the mediator)				
JD→SI	0.721	0.007	103.337	<0.001
JD→PWB	-0.057	0.012	4.880	<0.001
JR→PWB	0.050	0.013	3.879	<0.001
JR→SI	-0.037	0.005	7.373	<0.001
PWB→SI	-0.128	0.009	13.598	<0.001
Specific Indirect Effect				
JD→PWB→SI	0.007	0.001	5.230	<0.001
JR→PWB→SI	-0.006	0.002	3.790	<0.001

JD, job demands; JR, job resources; PWB, psychological well-being; SI, safety incidents; SD, standard deviation.

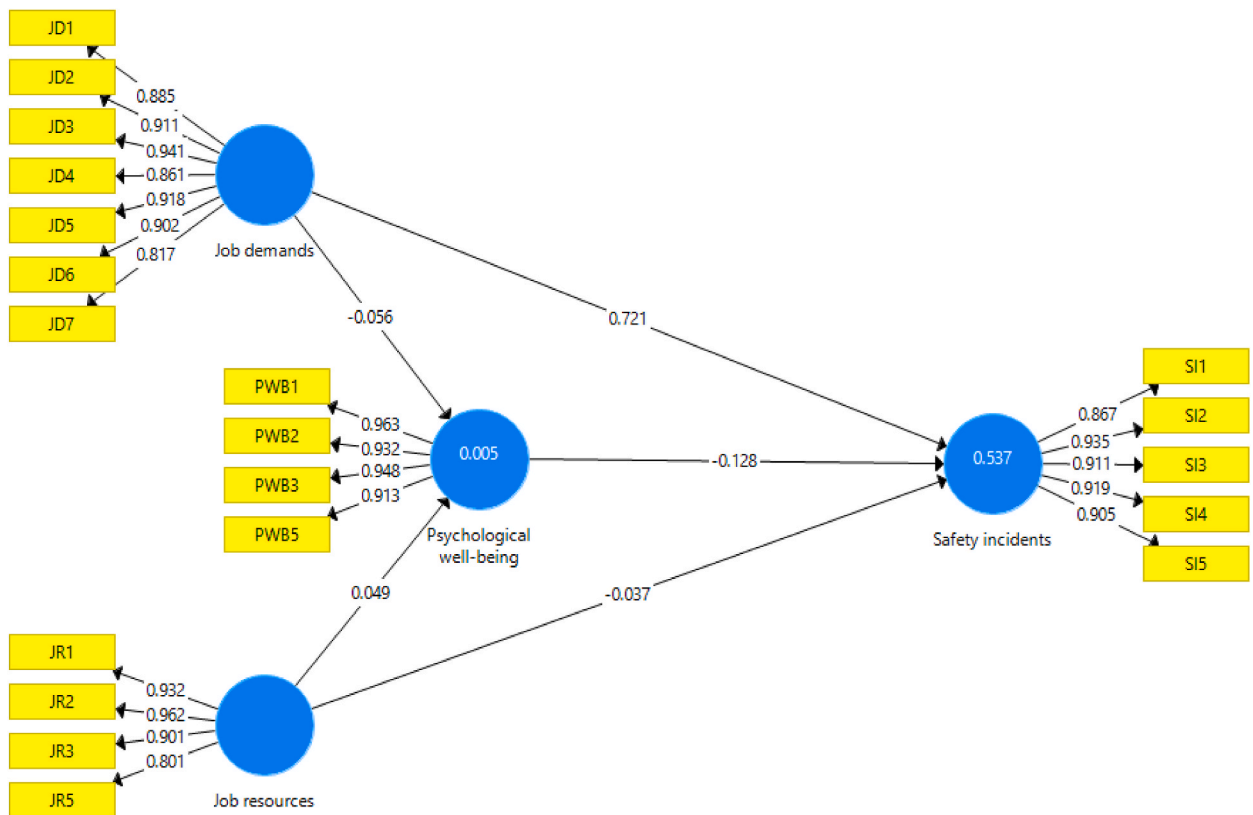


Fig. 2. PLS-SEM reflective model predicting PWB and SI from JD and JR

The combination of factors such as long working hours, time pressure, fatigue, irregular work shift, and the need for coping strategies in the absence of adequate job resources can lead to stress and risky driving behaviours. However, the availability of psychosocial job resources, such as social support from colleagues and supervisors and coping-enhancing training programmes, can mitigate the negative impact of these demands. This finding implies that stations masters and administrators, bus owners and managers of bus transport companies need to prioritise the provision of adequate and relevant job resources such as rest breaks, adequate recovery periods after shifts, social support from colleagues and supervisors, and provision of training programmes to enhance coping abilities and psychological well-being of these drivers [1,3]. It is worth noting that road safety interventions that target risky driving behaviours should consider the role of job demands and resources such as giving more control to drivers over working decisions and less interference by supervisors, which are believed to promote on-the-road safety behaviours [1,2,21]. This finding accentuates the importance of creating safe and decent work through implementing policies and interventions that prioritise driver psychological well-being to reduce safety incidents and promote safer transportation for both drivers and passengers.

While the study primarily examined the impacts of job demands and job resources on safety incidents among long-distance bus drivers, it is essential to acknowledge that the challenges faced by bus drivers in Ghana extend beyond psychosocial work factors. The broader context of bus driving in developing countries encompasses various conditions that significantly influence driver safety. One crucial aspect also is the unique traffic context in Ghana, characterized by complex interactions with other road users, diverse road conditions, and a high volume of passengers [2]. For instance, unlike bus driving in some European countries, navigating the Ghanaian road system can be particularly demanding due to congestion, varying road quality, and the need to adapt to unpredictable traffic situations [2,8]. Additionally, the commission-based pay system and high workload add further layers of stress to the driving job [2]. The pay structure of earnings based on commissions, coupled with the demanding workload, significantly amplify stress experienced by commercial drivers in Ghana. Their income directly relies on their performance or sales, which intensifies the pressure alongside the already demanding nature of their job, leading to heightened stress levels. These conditions create a challenging work environment for these drivers, a situation that impacts safety and well-being of the drivers negatively.

Unfortunately, our findings which focus on individual psychosocial work factors, revealed that different drivers may experience this challenging work context differently. While the working conditions provide a common backdrop, long-distance drivers' psychological responses and coping mechanisms can vary [9]. Some drivers may adapt well to these conditions, while others struggle to manage the stress and demands of the job. This highlights the importance of considering both the external context and individual factors when addressing road safety issues in Ghana.

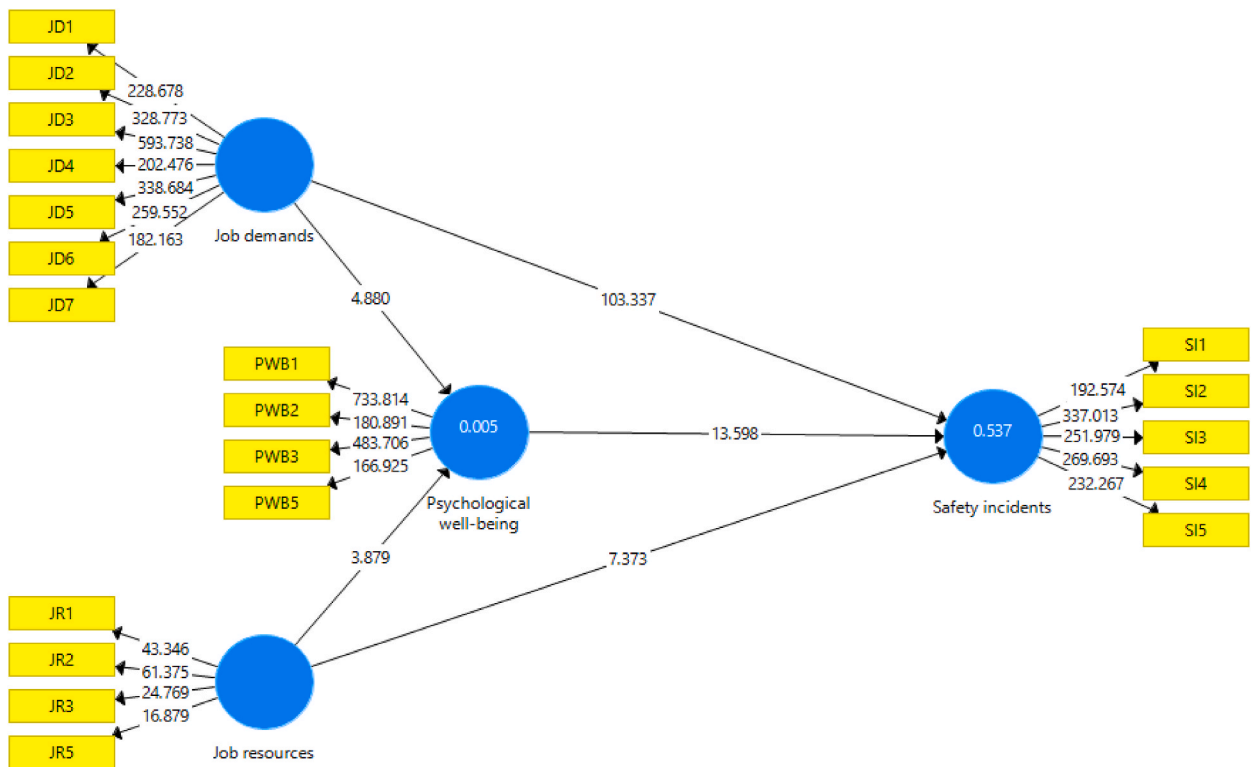


Fig. 3. Results of the bootstrapping procedure predicting PWB and SI from JD and JR

4.3. The mediating role of psychological well-being in JD-R model

We further found that psychological well-being partially mediates the influence of job demands and job resources on the occurrence of safety incidents of the drivers. This finding confirms the hypotheses H3 and H4. This finding aligns with previous research that has explored the mediating role of employee well-being in the impact of high job demands and low job resources on job performance within the general working population [30,31,33,35], as well as among teachers [32]. Furthermore, our findings echo the findings of a similar study that has highlighted the partial mediating role of subjective well-being in the relationship between job insecurity (akin to job demands) and job performance within the general working population [34]. This consistency across various sectors and contexts reinforces the robustness of our findings and suggests a commonality in the mediating mechanism of psychological well-being. In essence, this current study contributes to the growing body of evidence that supports the notion of psychological well-being as a key mediator in the complex interconnection between occupational demands, resources, and consequential safety incidents among drivers. This not only advances our understanding of the underlying mechanisms but also underscores the broader applicability of such mediating roles across different occupational domains.

The finding implies that high job demands may compromise safe driving ability of the drivers. However, in the presence of psychological well-being, either positive or negative, the influence of high job demands and low job resources would be reduced but not totally eliminated. Perhaps, there is a high presence of job demands and a low level of job resources in these transport companies, which worsen psychosocial well-being among these drivers. This suggests that psychological well-being plays an important role in explaining the impact of high job demands and low job resources on risky driving behaviours.

Furthermore, this finding offers valuable insights into the complex interplay of psychosocial factors in occupational safety. It suggests that while high job demands and low job resources are directly related to safety incidents, their effects are not isolated but rather channeled through the psychological well-being of the drivers [9]. The implications are that a driver’s mental and emotional state, which can be affected by factors like stress, fatigue, and social support, play a pivotal role in shaping their behaviour on the road. When drivers experience high job demands without sufficient resources, it can lead to psychological distress, which potentially increases the likelihood of unsafe on-the-road driving actions [9,30,35]. Conversely, adequate job resources can enhance psychological well-being, which acts as a protective factor against on-the-road risky driving behaviours [31–34]. Therefore, interventions aimed at improving bus-driver safety should not only target external work conditions but also consider drivers’ mental health and well-being as integral components for a comprehensive safety strategy.

4.4. Practical implications of findings

One practical implication drawn from the findings of this study is the importance of a holistic approach that is needed to enhance bus driver safety in Ghana. While addressing individual psychosocial work factors such as high job demands and high job resources is crucial, it is equally essential to acknowledge and address the broader context in which these drivers work. These may include strict enforcement of road safety regulations and integration of occupational health and safety standards into road transport activities. There is also the need to recognise the unique traffic conditions, road quality, passenger volume, and the commission-based pay system that contribute to the challenges faced by these bus drivers. Policy makers, industry stakeholders, and road-safety organisations need to collaborate to develop comprehensive interventions that encompass both external work conditions and drivers' psychological well-being. By implementing evidence-based interventions to manage high job demands, provide necessary resources, and support drivers' coping abilities, the country can promote safer transportation for both drivers and passengers while improving the overall work environment for these bus drivers.

The findings also highlight the importance of considering psychological well-being as a crucial factor in understanding and addressing risky driving behaviours among these long-distance bus drivers [30,35]. Thus, policies, strategies and other interventions that are aimed at promoting safer driving and improving road safety to reduce fatalities should focus on psychosocial work factors of these drivers. Also, a critical attention needs to be paid to drivers' psychological well-being or mental health. Our findings further suggest that improving psychosocial work factors of long-distance bus drivers, such as reducing excessive job demands and enhancing job resources, can improve psychological well-being, which may in turn reduce risky driving behaviours and associated road crashes and attendant losses [31]. Moreover, providing drivers with adequate rest breaks and recovery periods after long work shift, to have job control and fostering supportive work culture can make these drivers feel more equipped, supported, and valued in their roles. Hence, managers of bus transport companies and individual bus owners should implement bottom-up communication strategies, conduct periodic assessments to identify and address precarious work conditions and provide stress management and resilient training to help create a safe work environment for improved well-being to drive safety performance of these drivers.

Modern occupational health and safety interventions and best practices in the commercial road transport business are needed to create a safe work environment for the improved psychological well-being of these drivers. However, it is worth noting that the effect of safe work on psychosocial well-being is dynamic. Efforts are needed, especially from top management of bus transport companies, driver unions, the Road Safety Commission in Ghana and individual vehicle owners, to train and encourage these drivers to utilise the available job resources in their work environment [44].

5. Conclusion

Our data on job demands and job resources have a direct relationship with safety incidents among long-distance bus drivers in Ghana. The data in this study further suggest that job demands and job resources can affect safety incidents through the psychological well-being of the bus drivers. In essence, this study's findings align with the core argument of the JD-R model, which highlights the interplay among job conditions, psychological well-being, and safety outcomes in the transportation industry in developing nations, like Ghana.

5.1. Limitations and recommendations

A variance-based model like PLS-SEM, unlike the co-variance-based model, may not be the ideal choice when strict model fit assessments are required, as it tends to provide relatively liberal fit indices. Additionally, PLS-SEM prioritises predictive accuracy over hypothesis testing, which might limit theory or model confirmation. Furthermore, PLS-SEM is sensitive to data quality, such as missing values or outliers, and may require careful data pre-processing. Using PLS-SEM offers several advantages in data analysis, including its ability to handle complex models and non-normal data. Additionally, PLS-SEM focuses on prediction and explanation, which is advantageous since we aimed at understanding the direct and indirect effects of job demands, job resources, and psychological well-being on safety incidents among the long-distance bus drivers.

This study is a cross-sectional survey; hence, the associations found among the constructs do not imply cause-and-effect relations. This study also focused on only long-distance bus drivers; therefore, the findings may not apply to other driver groups. Moreover, measurements used in this study are self-reported which may introduce some response bias. Psychosocial work factors such as job demands, job resources, and psychological well-being were reported based on the perception of the bus drivers. However, the researchers used validated measurements, robust statistical tools and a large sample size which might help generalise the findings to the target population of long-distance bus drivers in Ghana and other developing nations. Future studies should use qualitative designs for an in-depth understanding of the precarious working conditions of long-distance bus drivers in Ghana. Future studies are also needed to explore other driver groups, such as haulage drivers, urban bus drivers, rapid bus drivers and drivers of hazardous goods.

Ethical approval and consent to participate

This study was reviewed and approved by Institutional Review Board of University of Cape Coast, ID: UCCIRB/CES/2022/82. All participants/patients (or their proxies/legal guardians) provided informed consent to participate in the study.

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Data availability statement

The data associated with this study has not been uploaded into a publicly available repository. However, data will be made available on reasonable request.

CRedit authorship contribution statement

Mustapha Amoadu: Writing – original draft, Resources, Project administration, Methodology, Investigation, Formal analysis, Conceptualization. **Edward Wilson Ansah:** Writing – review & editing, Methodology, Conceptualization. **Jacob Owusu Sarfo:** Writing – review & editing, Methodology, Conceptualization.

Declaration of competing interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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Appendix A. Supplementary data

Supplementary data to this article can be found online at <https://doi.org/10.1016/j.heliyon.2024.e26878>.

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