Journal of Environmental and Occupational Science
www.jenvos.com
DOI: 10.5455/jeos.20170202074636

Original Research

Burnout, Job strain and road accidents in the field of public transportation: The case of city bus drivers

Sergio A. Useche[1], Francisco Alonso[1], Boris E. Cendales[2], Renata Autukevičiūtė[3], Andrea Serge[1]

[1]DATS (Development and Advising in Traffic Safety) Research Group, INTRAS (Traffic and Road Safety Institute). University of Valencia, Spain. [2]Faculty of Economic and Administrative Sciences, Universidad El Bosque, Colombia, [3]Department of Transport Technological Equipment, Vilnius Gediminas Technical University, Vilnius, Lithuania

Address for correspondence: Sergio A. Useche, University of Valencia, Valencia, Spain. E-mail: sausecheh@gmail.com

Received: November 22, 2016
Accepted: January 20, 2017
Published: April 09, 2017

ABSTRACT

Introduction: The widely documented relationship between psychosocial work factors and occupational accidents has not been translated into intervention strategies in some high-risk occupational groups, such as public transport drivers. According to the recent scientific evidence, city bus drivers tend to present high levels of occupational stress, burnout, and accidents at work. **Aim:** The aim of this study was to characterize the job strain/burnout profile of professional bus drivers, and associate their stress/burnout profile with their road incidents (road accidents + fines) reported in the past 2 years. **Materials and Methods:** The study sample was formed by 222 Colombian male city bus drivers with an average of 41.36 years of age, a mean of driving experience of 18.63 years and, in average 6.82 years working in their current transport company. The study participants had a mean of 0.51 road accidents and 1.19 traffic fines in the past 2 years. It was designed a questionnaire composed by four sections: (a) Demographics, (b) job strain (Karasek's job content questionnaire), (c) burnout (Maslach Burnout Inventory), and (d) self-reported health. Data collection process was conducted in 2014-2015 and analyzes along 2016. **Results:** A high proportion of city bus drivers report job strain (40.5%). The average scores of emotional exhaustion ($X = 21.01$) and cynicism ($X = 17.88$) were also high. Cluster analysis was used to characterize the job strain/burnout profile of professional bus drivers. Two job strain/burnout profiles significantly different were found (low job strain/burnout: $n = 34.3\%$ and high job strain/burnout: $n = 65.7\%$). The bus drivers with high job strain/burnout profile reported significantly more accidents than those with low job strain/burnout profile ($F_{(2.216)} = 269.1$, $P = 0.00$). **Conclusions:** This study confirms that the prevalence of occupational stress and burnout are significantly high among Colombian bus drivers. In addition, it was found that the bus drivers' job strain/burnout profile is related to their performance behind the wheel. Therefore, the intervention on these factors represents a potentially successful strategy for the prevention of road accidents and risk behaviors that lead to penalties and fines.

KEY WORDS: Burnout, bus drivers, job strain, prevention, professional drivers, public health, road accidents, road safety

INTRODUCTION

Traffic crashes use to be defined as a major public health concern [1], considering that this phenomenon causes a high number of deaths and injuries every year, and worldwide [2]. Nowadays, there is a growing number of occupational groups classified as at high psychosocial risk. Among them are professional drivers, especially those who perform public transport services such as urban and inter-urban bus drivers [3,4]. In this occupational group, several studies have found very high rates of work stress, burnout, and occupational accidents, including traffic crashes [5,6].

Work stress has been associated with worker morbidity and mortality in numerous epidemiological studies [7-9]. Besides, growing evidence in bus drivers and mixed occupational groups associates psychosocial work factors with burnout, poor physical and mental health, counterproductive work behaviors, increased risk for accidents, and poor job performance [10-15].

Work Stress and Professional Driving

Work stress is one of the factors more frequently associated with the occurrence of accidents and occupational injuries [9,13]. The demand-control (DC) model [16] associates work stress with a problematic interaction between high psychological demands and low decision latitude (decision authority and skill discretion) named job strain [17]. There is abundant research linking job strain with negative health outcomes and job performance, including studies on bus drivers [18-20]. In this occupational group, driving inexperience, work overtime, shift work, emotional labor, low decision latitude, and lack of

social support (from colleagues and supervisors) have been documented as highly prevalent stressors [21,22].

Burnout in the Field of Professional Driving

Burnout is a psychological syndrome, which increases as a response to the chronic exposure to work-related stressors [23-26]. Theoretically, burnout includes 3 main components: Emotional exhaustion, or the feeling of emotional overwhelming at work, cynicism (also known as depersonalization or disengagement), defined as detachment from others or indifference at work, and reduced professional efficacy (also referred to as professional accomplishment), which is the tendency to evaluate one's efforts and achievements in a negative manner [27,28].

Burnout is associated with negative health outcomes such as anxiety [29], depression [29,30], sleep disturbances [31-33], headache [34], gastrointestinal disease [35], hypertension [36], muscle tension [34], and chronic fatigue [37], and especially in the case of professional drivers, with poor job performance [38,39]. Burnout is also associated with negative organizational outcomes such as absenteeism and high turnover intention [40,41]. Intervention research has found that the continuous task evaluation and improvement, [42-45] and the socioemotional support from co-workers and family are key factors in the management and prevention of burnout.

Professional Drivers' Health and Road Safety

Early research findings suggesting that professional drivers are at high-risk for different types of occupational illness remain true today [46]. For instance, recent studies report that drivers' illness is associated with sickness absence, turnover intention, and accidents [3,47]. Research on bus drivers also report that fatigue, shift work [38,48], age, driving experience, previous accidents and their severity, the type of vehicle (public light bus/charter bus/school bus/minibus), and route are correlated with the risk of being involved in road accidents [49,50].

In practical terms, a professional driver who suffers health problems, such as cardiovascular disease or obesity, may have up to twice the risk of have an accident while driving [51,52] and increase the impact of subjective determinants on risky driving behavior [53]. This increased risk for road accidents compromises the health and safety of not only professional drivers but also other users of the road, such as their passengers, other drivers, and pedestrians [8].

Empirical evidence collected over the past 50 years suggests that compared with other occupational groups, professional drivers tend to have a higher prevalence of cardiovascular [54,55], musculoskeletal [46], and gastrointestinal diseases [35]. Regarding with mental health problems, it was found that depression, anxiety, and post-traumatic stress disorders are highly prevalent in professional drivers, and are contributing factors for work-related accidents [6,8,54].

Road Accidents

In the context of professional driving, accidents are not planned events in the road, which causes material damages and/or injuries. The potential health damage to the road users makes road accidents a public health concern [2,49]. Age and experience are documented predictors of the risk of road crash [3,51,56,57]. However, little research had investigated the association between psychosocial risk at work and driving performance [58].

One of the factors most frequently used to explain traffic accidents are the drivers' risk behaviors. Unsafe driving behavior has been associated with work stress in several studies, especially in the case of public transport drivers. For instance, Kontogiannis found that behaviors on the road significantly predict traffic accidents in professional drivers [14,59]. Taking into account that the safe operation of motor vehicles depends on a combination of psychomotor skills and environmental factors, variables such as work stressors [58,60,61], cognitive overstimulation [55], weather, road conditions [62], driving performance [51,33], and prolonged interaction with other road users [63] are key factors to consider in the management of safety issues in the transport industry [6].

Regarding to accident prevention, previous research results suggest that healthy drivers working under optimal conditions are less prone to road crashes [3]. Furthermore, occupational stress prevention programs may be beneficial for both the employee and transport companies, taking into account the potential accident cost reduction [3,64].

Study Framework

Researches in job strain and burnout among drivers have increased [65,66]. Due to the high influence of public transport drivers on road safety, issues such as their work stressors, mental, and physical health need careful consideration. It is known that physical and psychological health of the bus drivers is a critical factor in their performance [67,68]. Any impairment can have undesirable consequences for passengers and bus operating companies in the form of health problems, economical, and occupational costs [50,69].

Taking into account that bus transportation is one of the most popular modes of public transport worldwide, the need to address the psychosocial work environment of bus drivers for improvement should be a priority.

Objective of the Study

The aim of this study was to (a) characterize the job strain/burnout profile of professional bus drivers, and (b) associate their stress/burnout profile with their road incidents reported in the past 2 years.

MATERIALS AND METHODS

Sample

The sample was composed by $n = 222$ Colombian city bus drivers between 20 and 79 years of age, with a mean of $X = 41.36$ (standard deviation [SD] = 11.13) years. The average driving experience of these bus operators was $X = 18.63$ (SD = 9.816) years. On average, this sample of professional drivers had $X = 6.82$ (SD = 6.59) years working in their current transport company. Furthermore, over the past 2 years, participants of this study had $X = 0.51$ (SD = 1.18) occupational accidents at the wheel and $X = 1.19$ (SD = 1.59) traffic fines while driving during working shifts. Women ($n = 4$, not included in the final sample) were excluded due to their very low representation in the bus drivers' occupational group.

The number of participants represents an error margin for the general data of ± 2.65 with a 95% confidence interval in the most unfavorable case of $P = Q = 50\%$.

Procedure, Design, and Ethics

Participants have completed the questionnaire, designed in a paper version, at the facilities of the transport companies that agreed to participate in the study. The survey was conducted guaranteeing the anonymity of the participants and emphasizing on the fact that the data would only be used for research purposes. It was used an informed consent statement, signed by both parties before the participants answered the questionnaire. Surveys were completed for 220 drivers, and the response rate was approximately 97%.

Description of the Questionnaire

The questionnaire was administrated in Spanish language and consisted of four sections. In the first section, demographic variables (age, driving experience) and road incidents (accidents + traffic tickets or "fines" in the past 2 years) were collected.

The 2 section included the 27 items of the Colombian job content questionnaire (JCQ) [70]. The JCQ has been widely used to assess psychosocial factors in the workplace and their effects on health. The response scale includes a 4-point Likert scale (1 = "totally disagree" and 4 = "totally agree"). The 27 items of the JCQ are grouped in 6 sub-scales: Support from supervisors (4 items, $\alpha = 0.87$), peer support (4 items, $\alpha = 0.79$), skill discretion (6 items, $\alpha = 0.75$), decision authority (3 items, $\alpha = 0.69$), psychological demands (6 items, $\alpha = 0.66$), and job insecurity (4 items, $\alpha = 0.53$). Decision latitude was calculated as de sum of skills discretion and decision-making. Job strain was computed as the ratio between psychological demands and decision latitude (demands/decision latitude).

The 3th section was composed by the Spanish version of the Maslachs' Burnout Inventory (MBI) [71,72].This questionnaire consists of 16 questions (1-7 scale) grouped in 3 subscales: Emotional exhaustion (5 items, $\alpha = 0.88$), depersonalization/cynicism (5 items, $\alpha = 0.67$), and professional efficacy (6 items, $\alpha = 0.78$) [73].

Finally, the 4th part consisted of questions about height and weight and self-reported physical health: Do you smoke (yes/no)? are you physically active (yes/no)? do you suffer (a) diabetes, (b) hypertension, or (c) cancerous illness?.

Data collection process was conducted in 2014-2015 and analyzes along 2016.

Data Processing

Descriptive analyses and one-way analysis of variance (ANOVA) tests were used, respectively to characterize and compare mean scores of working variables. Further, K-means cluster analysis was used to characterize the job strain/burnout profile of professional bus drivers. The scores of job strain, emotional exhaustion, cynicism, and professional efficacy were used as clustering variables. The effect of the bus drivers' job strain/burnout profile on their road incidents was tested using one-way analysis of covariance (ANCOVA). All statistical analyses were performed using[a]IBM statistical package for social sciences, version 22.0.

RESULTS

Descriptive Statistics and Bivariate Correlations

Table 1 summarizes the descriptive statistics of the variables included in the study and the bivariate correlations between them. It was found that this sample of Colombian city bus drivers had an average of job strain slightly below the risk score (values >1.0 indicates an unfavorable imbalance between demands and decision latitude). The average levels of exhaustion and cynicism were relatively high, but the average professional efficacy was not under averages presented by other studies. Job strain was negatively and significantly associated with professional efficacy. Indeed, professional efficacy was, at the same time, inversely correlated with cynicism and emotional exhaustion, the other two indicators of the MBI model.

Job Strain, Health Indicators, and Working Hours of City Bus Operators

Within the sample of bus drivers who participated in the study, it was found that 40.54% of them have job strain (occupational stress indicator used by D/C model). The average age of drivers who present job strain is X = 41.64 (SD = 11.04) years. Through ANOVA it was determined that, in terms of this variable, there are no statistically significant differences between drivers who present job strain and those without this risk factor ($F_{(1,220)} = 0.96$; $P = 0.754$).

In the case of this population, the mean of working hours was X = 15.25 (SD = 1.82) hours per day. It were no significant differences between average hours weekly worked by drivers who

Table 1: Descriptive statistics and Pearson correlations between the study variables

Study variable	Mean	SD	1	2	3	4	5	6	7	8	9	10	11	12
1. Driving experience	18.40	9.42		0.835**	0.105	−0.239**	0.000	−0.094	0.117	−0.051	−0.084	0.094	0.137*	0.076
2. Age	41.16	11.02			0.108	−0.179**	−0.004	−0.137*	0.075	−0.134*	−0.082	0.102	0.105	0.108
3. BMI	26.58	3.07				−0.083	0.005	0.082	0.072	0.052	0.146*	0.102	0.086	0.198**
4. Road incidents	1.53	1.47					0.080	0.130	0.086	−0.149*	0.046	0.113	−0.004	0.013
5. Job strain	0.99	0.25						0.171*	0.044	0.052	0.014	−0.030	−0.144*	0.028
6. Emotional exhaustion	21.01	7.29							0.502**	−0.397**	0.024	−0.017	−0.027	0.035
7. Cynicism	17.88	7.48								−0.317**	−0.029	−0.016	0.097	−0.051
8. Professional efficacy	31.99	8.86									−0.069	−0.044	−0.057	0.073
9. Sedentarism (yes %)	59											0.035	0.142*	0.045
10. Hypertension (yes %)	8												0.264**	0.242**
11. Diabetes (yes %)	3													0.039
12. Dyslipidemia (yes %)	24													

*$P<0.05$, **$P<0.01$. BMI: Body mass index

have job strain was X = 100.12 (SD = 12.66), versus X = 97.82 (SD = 14.33) hours worked on average per week for drivers not presenting job strain ($F_{(1,220)} = 1.51$; $P = 0.22$).

Regarding health indicators studied, some important findings should be mentioned there: First, only 20.8% of the sample of city bus operators perform constantly some type of physical activity, implying that 79.2% of them keep a sedentary lifestyle. It is identical to that of smokers (20.7%) percent. Nearly, 7.7% of participants suffering from hypertension; 2.7% of diabetes (without discriminating whether Type 1 or 2), and 1.4% from cancerous diseases.

Cluster Analysis

The cluster analysis produced two groups significantly different (low job strain/burnout: $n = 34.3\%$ and high job strain/burnout: $n = 65.7\%$). The solutions with a greater number of clusters did not show significant differences for all the classification variables, nor did form theoretically definable clusters. Figure 1 shows the means (centers of the clusters k) of the classification variables used in the cluster analysis. The averages of job strain and cynicism were significantly lower in the profile named low job strain/burnout ($F_{(1.216)} = 1.228$, $P = 0.04$ and $F_{(1.216)} = 74.27$, $P = 0.00$, respectively). Meanwhile, the average of professional efficiency was significantly higher in the low job strain/burnout profile than in the profile named high job strain/burnout ($F_{(1.216)} = 269.1$, $P = 0.00$).

Bus Drivers' Job Strain/Burnout Profile and Road Incidents

ANCOVA revealed a significant main effect of the bus drivers' job strain/burnout profile on road incidents, after controlling for driving experience ($F_{(2.216)} = 269.1$, $P = 0.00$). Other documented covariates (age, sedentary behavior, hypertension, diabetes, dyslipidemia, and body mass index) were excluded from the analysis due to their non-significant associations with road incidents. In particular, the average of incidents was significantly higher in the high job strain/burnout profile (X = 1.7, SD = 1.5) than in the low job strain/burnout profile (X = 1.2, SD = 1.4) [Figure 2].

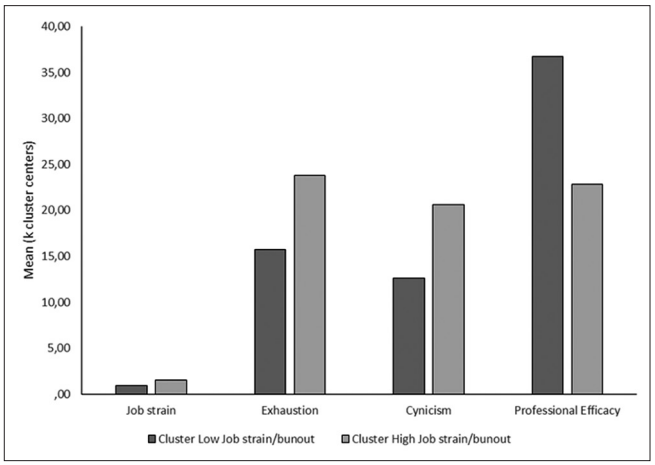

Figure 1: Job strain/burnout profiles of city bus drivers

Figure 2: Road incidents by job strain/burnout profiles

DISCUSSION

This study was aimed to investigate the job strain/burnout profile of bus drivers, and the association between their stress/burnout profile and the occurrence of road incidents. Interestingly, it was found that most of the Colombian bus drivers (65.7%) have a High job strain/burnout profile and that this group reports more road incidents (accidents + fines) in

comparison with the group of bus drivers with a low job strain/burnout profile. This results are consistent with the literature that points to the high psychosocial risk at work of bus drivers in comparison with other occupational groups [3,4], and with the evidence on the association between work stress, burnout, and negative organizational outcomes [10,37]. In particular, the aforementioned findings support the evidence that job strain and burnout are risk factors for road incidents in the public bus transport systems [5,8,47], occupation in which long working hours (as observed in the results) explain a risk increasing in terms of objective risk factors at work, such as in other high vulnerable groups [74-76].

Previous studies have found significant relationships between job strain and burnout [24]. However, little research has addressed the association between burnout and safety issues in the transport industry. Particularly, among the reviewed sources, only in one study it has been reported a significant direct effect of burnout on accident involvement among large vehicle drivers [77]. This study complements the findings by Chung and Wu providing specific evidence for the bus drivers' occupational group.

With regard to the relationship between the job DC model and road incidents, some research has found a positive association between job strain and road incidents in professional drivers. However, previous researches have failed to detect the association between job strain and driving performance in bus operators [58]. Other studies found indirect effects of work stress on road accidents through mediators such as fatigue [58,78-80] and health problems [5,81]. This study suggests that, in combination with burnout, job strain is significant as risk factor for road accidents among bus drivers.

In terms of accidents prevention, it has been found that the intervention of work stress can plays a crucial role in the improvement of occupational safety [51,58,82-84]. However, occupational driving stress is a difficult issue to address, taking into account factors such as (a) the reluctance of transport companies to accept that some of their typical working conditions are associated with high work stress, and (b) the low perception of stress-related risk among professional drivers, linked to their high sense of personal efficacy in the driving tasks. Indeed, some studies have found that even being aware of presenting stress-related symptoms, and even disease, drivers tend to persist in the performance of their jobs [85,86].

Finally, it is worth discussing the health outcomes of the drivers who participated in the study. Numerous studies have discussed the relationship between physical and mental health indicators and road safety outcomes of city bus drivers [3,23,87]. Furthermore, some specific components of health such as individual habits (e.g. sleep, alcohol consumption, physical exercise) have been characterized as critical in coping with work stressors [5,8,82]. As observed in this study, there is a high prevalence of city bus drivers with adverse health habits, such as low physical inactivity (79.2%). These proportions result very high with respect to other occupational groups [88,89], factor which may be addressed also, to promote the occupational health of workers, especially in occupations with a high prevalence of sedentary lifestyles, such as professional drivers [8,90,91].

In this sense, some studies have shown the interference of the physical and mental diseases on the performance of professional operators of public transport vehicles, proposing that occupational health promotion can substantially improve both traffic and safety in the transport industry [58,92,93]. Furthermore, it remains to mention that health promotion at work cannot only be understood as a positive discretional action but as mandatory by law in the case of Colombian drivers. Health promotion and intervention of psychosocial factors at work should be adopted as a strategic action, aiming not only to reducing operational, economic costs (as traditionally it has been conceived), but also approaching to the protection and wellbeing of transport workers, road users, and transport systems' customers.

CONCLUSION

This study confirms that the prevalence of occupational stress and burnout are significantly high among Colombian bus drivers. In addition, it was found that the bus drivers job strain/burnout profile is related to their performance behind the wheel. Therefore, the intervention on these factors represents a potentially successful alternative for the prevention of accidents and risk behaviors that lead to penalties and fines and represent very high costs for transport companies and the health systems.

Limitations of the Study

Although the questionnaires used in this research have good reliability, remain vulnerable to self-report bias. The cross-sectional design did not allow inferring causality from the association between job strain/burnout and road incidents in bus drivers. Furthermore, the sampling strategy and sample size of the study limits the generalizability of the findings. The homogeneity of the sample does not allow the examination of demographic and occupational variables potentially associated with the bus driver's stress/burnout profile and traffic accidents such as gender, job position, and vehicle type [6]. In particular, gender has been poorly studied in bus drivers. The low female representation in the occupational group makes it difficult to design studies focused on gender differences. The limited evidence available suggests that women are more reactive to traffic and negative interactions with passengers [9], and have a higher rate of work absence [94]. On the other hand, abundant evidence suggests that men are more likely to take risks [95], and have a greater risk of traffic accidents than women [96]. In recent years, the number of women in the workforce has increased in both developed and developing countries. Therefore, more studies on gender, psychosocial risk factors at work and road incidents are required in female bus drivers.

ACKNOWLEDGMENTS

The authors would like to thank to the transportation companies that participated in the study and to Bandaranaike Pardo

and Giovanni Cadena for their assistance in data collection. In addition, thanks to Mayte Duce for her comments to the manuscript.

REFERENCES

1. World Health Organization (WHO). Global Status Report on Road Safety 2013: Supporting a Decade of Action; 2013. Available from: http://www.who.int/violence_injury_prevention/road_safety_status/2013/en. [Last accessed on 2016 Oct 14].
2. World Health Organization (WHO). Global Status Report on Road Safety: Time for Action; 2009. Available from: http://www.apps.who.int/iris/bitstream/10665/44122/1/9789241563840_eng.pdf. [Last accessed on 2016 Oct 16].
3. Albright CL, Winkleby MA, Ragland DR, Fisher J, Syme SL. Job strain and prevalence of hypertension in a biracial population of urban bus drivers. Am J Public Health 1992;82:984-9.
4. Tse JL, Flin R, Mearns K. Facets of job effort in bus driver health: Deconstructing "effort" in the effort-reward imbalance model. J Occup Health Psychol 2007;12:48-62.
5. Cendales B, Useche S, Gómez V. Psychosocial work factors, blood pressure and psychological strain in male bus operators. Ind Health 2014;52:279-88.
6. Tse J, Flin R, Mearns K. Bus driver well-being review: 50 years of research. The Industrial Psychology Research Centre. Transp Res 2005;9:89-114.
7. Carrere S, Evans G, Palsane M, Rivas M. Job strain and occupational stress among urban public transit operators. J Occup Psychol 1991;64:305-16.
8. Taylor AH, Dorn L. Stress, fatigue, health, and risk of road traffic accidents among professional drivers: The contribution of physical inactivity. Annu Rev Public Health 2006;27:371-91.
9. Aronsson G, Rissler A. Psychophysiological stress reactions in female and male urban bus drivers. J Occup Health Psychol 1998;3:122-9.
10. Iacovides A, Fountoulakis KN, Kaprinis S, Kaprinis G. The relationship between job stress, burnout and clinical depression. J Affect Disord 2003;75:209-21.
11. Sarsangi V, Motallebi M, Khodadadi R, Shajari M, Keyvani S, Yousefzadeh M. Correlation between occupational stress and burnout in rehabilitation center employees of Kashan, Iran. Q Int Arch Health Sci 2015;2:13-8.
12. Burnout MC. A multidimensional perspective. In: Schaufeli B, Maslach C, Marek T, editors. Professional Burnout: Recent Developments in Theory and Research. Washington, DC: Taylor & Francis; 1993. p. 19-32.
13. Cooper D. Human factors in accidents. Institute of Quarring, North of England. Durham: Ramside Hall; 2002.
14. Kontogiannis T. Patterns of driver stress and coping strategies in a Greek sample and their relationship to aberrant behaviors and traffic accidents. Accid Anal Prev 2006;38:913-24.
15. Machin M, De Souza J. Predicting health outcomes and safety behavior in taxi drivers. Transp Res 2004;7:257-70.
16. Karasek R. Demand/control model: A social, emotional, and physiological approach to stress risk and active behavior development. ILO Encyclopedia of Occupational Health and Safety. 4th ed. Geneva: Princeton; 1998.
17. Schechter J, Green LW, Olsen L, Kruse K, Cargo M. Application of Karasek's demand/control model a Canadian occupational setting including shift workers during a period of reorganization and downsizing. Am J Health Promot 1997;11:394-9.
18. Ardito C, d'Errico A, Leombruni R. Exposure to psychosocial factors at work and mental well-being in Europe. Med Lav 2014;105:85-99.
19. Ahola K, Gould R, Virtanen M, Honkonen T, Aromaa A, Lönnqvist J. Occupational burnout as a predictor of disability pension: A population-based cohort study. Occup Environ Med 2009;66:284-90.
20. Tsai SS, Lai CH, Shih TS, Lin MH, Liou SH. High job strain is associated with inflammatory markers of disease in young long-haul bus drivers. J Occup Health Psychol 2014;19:336-47.
21. Oramas A, González A, Vergara A. El desgaste profesional: Evaluación y factorialización del MBI-GS [Professional exhaustion. Evaluation and factorial analysis of the MBI-GS]. Rev Cubana Salud Trab 2007;8:37-45.
22. Raggatt PT. Work stress among long-distance coach drivers: A survey and correlational study. J Organ Behav 1991;12:565-79.
23. Chung YS, Wu HL. Stress, strain, and health outcomes of occupational drivers: An application of the effort reward imbalance model on Taiwanese public transport drivers. Transp Res Part F Traffic Psychol Behav 2013;19:97-107.
24. Couto MT, Lawoko S. Burnout, workplace violence and social support among drivers and conductors in the road passenger transport sector in Maputo City, Mozambique. J Occup Health 2011;53:214-21.
25. Gandi JC, Wai PS, Karick H, Dagona ZK. The role of stress and level of burnout in job performance among nurses. Ment Health Fam Med 2011;8:181-94.
26. Khamisa N, Oldenburg B, Peltzer K, Ilic D. Work related stress, burnout, job satisfaction and general health of nurses. Int J Environ Res Public Health 2015;12:652-66.
27. Maslach C. Comprendiendo el Burnout. Cienc Trab 2009;11:37-43.
28. Taris TW, Schreurs PJ, Schaufeli WB. Construct validity of the Maslach Burnout Inventory - General Survey: A two-sample examination on its factor structure and correlates. Work Stress 1999;13:223-37.
29. Pereira-Lima K, Loureiro SR. Burnout, anxiety, depression, and social skills in medical residents. Psychol Health Med 2015;20:353-62.
30. Schonfeld IS, Bianchi R. Burnout and depression: Two entities or one? J Clin Psychol 2016;72:22-37.
31. Pagnin D, de Queiroz V, Carvalho YT, Dutra AS, Amaral MB, Queiroz TT. The relation between burnout and sleep disorders in medical students. Acad Psychiatry 2014;38:438-44.
32. Shad R, Thawani R, Goel A. Burnout and sleep quality: A cross-sectional questionnaire-based study of medical and non-medical students in India. Cureus 2015;7:e361.
33. Philip P, Sagaspe P, Moore N, Taillard J, Charles A, Guilleminault C, *et al.* Fatigue, sleep restriction and driving performance. Accid Anal Prev 2005;37:473-8.
34. Khamisa N, Peltzer K, Oldenburg B. Burnout in relation to specific contributing factors and health outcomes among nurses: A systematic review. Int J Environ Res Public Health 2013;10:2214-40.
35. Huerta-Franco MR, Vargas-Luna M, Tienda P, Delgadillo-Holtfort I, Balleza-Ordaz M, Flores-Hernandez C. Effects of occupational stress on the gastrointestinal tract. World J Gastrointest Pathophysiol 2013;4:108-18.
36. Komissarova EM, Ermakova MA. Characteristics of arterial hypertension in psychoemotional burnout of emergency medical staffers. Med Tr Prom Ekol 2011;:19-23.
37. Huibers MJ, Beurskens AJ, Prins JB, Kant IJ, Bazelmans E, Van Schayck CP, *et al.* Fatigue, burnout, and chronic fatigue syndrome among employees on sick leave: Do attributions make the difference? Occup Environ Med 2003;60 Suppl 1:i26-31.
38. Kee S, Mohd SB, Goh YM. Driving fatigue and performance among occupational drivers in simulated prolonged driving. Glob J Health Sci 2010;2:167-77.
39. Demerouti E, Bakker AB, Leiter M. Burnout and job performance: The moderating role of selection, optimization, and compensation strategies. J Occup Health Psychol 2014;19:96-107.
40. Ahola K, Toppinen-Tanner S, Huuhtanen P, Koskinen A, Väänänen A. Occupational burnout and chronic work disability: An eight-year cohort study on pensioning among Finnish forest industry workers. J Affect Disord 2009;115:150-9.
41. Garrosa E, Moreno-Jiménez B, Liang Y, González JL. The relationship between sociodemographic variables, job stressors, burnout, and hardy personality in nurses: An exploratory study. Int J Nurs Stud 2008;45:418-27.
42. Awa WL, Plaumann M, Walter U. Burnout prevention: A review of intervention programs. Patient Educ Couns 2010;78:184-90.
43. Lepore SJ, Allen KA, Evans GW. Social support lowers cardiovascular reactivity to an acute stressor. Psychosom Med 1993;55:518-24.
44. Ozbay F, Johnson DC, Dimoulas E, Morgan CA, Charney D, Southwick S. Social support and resilience to stress: From neurobiology to clinical practice. Psychiatry (Edgmont) 2007;4:35-40.
45. Quick JC, Quick JD, Nelson DL, Hurrell JJ. Preventive Stress Management in Organizations. Washington, DC: American Psychological Association; 1997. p. 277-300. Available from: http://www.dx.doi.org/10.1037/10238-014.
46. Honkonen T, Ahola K, Pertovaara M, Isometsä E, Kalimo R, Nykyri E, *et al.* The association between burnout and physical illness in the general population - Results from the Finnish Health 2000 Study. J Psychosom Res 2006;61:59-66.
47. Winkleby MA, Ragland DR, Fisher JM, Syme SL. Excess risk of sickness and disease in bus drivers: A review and synthesis of

epidemiological studies. Int J Epidemiol 1988;17:255-62.
48. Hervas A, Tortosa F, Ferrero J, Civera C. Effects of fatigue on simulated high speed driving for prolonged periods. Univ Psychol 2011;10:897-907.
49. Gopalakrishnan S. A public health perspective of road traffic accidents. J Family Med Prim Care 2012;1:144-50.
50. Refaat H. The Contribution of Medical Conditions to Passenger Vehicle Crashes. Technical Report. Washington, DC: National Highway Traffic Safety Administration, NHTSA; 2009.
51. Useche SA, Serge A, Alonso F. Risky behaviors and stress indicators between novice and experienced drivers. Am J Appl Psychol 2015;3:11-4.
52. Tervo T, Jaakkola T, Sulander P, Holopainen J, Neira W, Parkkari K. The driver's illness as a cause of traffic accidents. Duodecim 2011;127:1147-53.
53. Tronsmoen T. Associations between driver training, determinants of risky behavior and crash involvement. Saf Sci 2009;48:35-45.
54. Wang PD, Lin RS. Coronary heart disease risk factors in urban autobus drivers. Public Health 2001;115:261-4.
55. Belkic K, Savic C, Theorell T, Rakic L, Ercegovac D, Djordjevic M. Mechanisms of cardiac risk among professional drivers. Scand J Work Environ Health 1994;20:73-86.
56. Greiner BA, Krause N. Observational stress factors and musculoskeletal disorders in urban transit operators. J Occup Health Psychol 2006;11:38-51.
57. Pokorny ML, Blom DH, van Leeuwen P. Shifts, duration of work and accident risk of bus drivers. Ergonomics 1987;30:61-88.
58. Cendales-Ayala B, Useche SA, Gómez-Ortiz V, Bocarejo JP. Bus operators' responses to job strain: An experimental test of the job demand-control model. J Occup Health Psychol 2016.
59. Kontogiannis T, Kossiavelou Z, Marmaras N. Self-reports of aberrant behaviour on the roads: Errors and violations in a sample of Greek drivers. Accid Anal Prev 2002;34:381-99.
60. Friesen AR, Schube PG. Behavioral characteristics of dangerous drivers: Importance of correction. Calif Med 1960;92:274-6.
61. Paxion J, Galy E, Berthelon C. Mental workload and driving. Front Psychol 2014;5:1344.
62. Jägerbrand AK, Sjöbergh J. Effects of weather conditions, light conditions, and road lighting on vehicle speed. Springerplus 2016;5:505.
63. Thomas P, Morris A, Talbot R, Fagerlind H. Identifying the causes of road crashes in Europe. Ann Adv Automot Med 2013;57:13-22.
64. Kompier MA, Aust B, van den Berg AM, Siegrist J. Stress prevention in bus drivers: Evaluation of 13 natural experiments. J Occup Health Psychol 2000;5:11-31.
65. Lamb S, Kwok KC. A longitudinal investigation of work environment stressors on the performance and wellbeing of office workers. Appl Ergon 2016;52:104-11.
66. Thayer JF, Verkuil B, Brosschot JF, Kampschroer K, West A, Sterling C, *et al*. Effects of the physical work environment on physiological measures of stress. Eur J Cardiovasc Prev Rehabil 2010;17:431-9.
67. Gee GC, Takeuchi DT. Traffic stress, vehicular burden and well-being: A multilevel analysis. Soc Sci Med 2004;59:405-14.
68. Rowden P, Matthews G, Watson B, Biggs H. The relative impact of work-related stress, life stress and driving environment stress on driving outcomes. Accid Anal Prev 2011;43:1332-40.
69. Knipling RR, Hickman JS, Bergofen G. Effective Commercial Truck and Bus Safety Management Techniques. Washington, DC: Transportation Research Board, TRB; 2003.
70. Gómez V. Assessment of psychosocial stressor at work: Psychometric properties of the Spanish version of the JCQ (Job Content Questionnaire) in Colombian workers. Rev Latinoam Psicol 2011;43:329-42.
71. Maslach C, Jackson SE. Maslach Burnout Inventory. 2th ed. Palo Alto: Psychologists Press; 1986.
72. Maslach C, Jackson SE, Leiter MP. Maslach Burnout Inventory Manual. 3th ed. Palo Alto: Consulting Psychologists Press; 1996.
73. García JM, Herrero S, León JL. Validez factorial del Maslach Burnout Inventory (MBI) en una muestra de trabajadores del Hospital Psiquiátrico Penitenciario de Sevilla [Factor validity of the Maslach Burnout Inventory (MBI) in a sample of workers at the Penitentiary Psychiatric Hospital of Sevilla]. Apunt Psicol 2007;25:157-74.
74. Hu NC, Chen JD, Cheng TJ. The associations between long working hours, physical inactivity, and burnout. J Occup Environ Med 2016;58:514-8.
75. Stimpfel AW, Sloane DM, Aiken LH. The longer the shifts for hospital nurses, the higher the levels of burnout and patient dissatisfaction. Health Aff (Millwood) 2012;31:2501-9.
76. Barnett RC, Gareis KC, Brennan RT. Fit as a mediator of the relationship between work hours and burnout. J Occup Health Psychol 1999;4:307-17.
77. Chung YS, Wu HL. Effect of burnout on accident involvement in occupational drivers. Transp Res Rec J Transp Res Board 2013;2388:1-9.
78. Biggs H, Dingsdag D, Stenson N. Fatigue factors affecting metropolitan bus drivers: A qualitative investigation. Work 2009;32:5-10.
79. ETSC. The Role of Driver Fatigue in Commercial Road Transport Crashes. Brussels: European Transport Safety Council; 2001.
80. Dodge RE. Fatigue and circadian rhythm: Effects on performance. In: Buela-Casal G, Navarro JF, editors. Avances en la Investigación del Sueño y Sustrastornos. Madrid: Siglo XXI; 1990.
81. de Lange AH, Kompier MA, Taris TW, Geurts SA, Beckers DG, Houtman IL, *et al*. A hard day's night: A longitudinal study on the relationships among job demands and job control, sleep quality and fatigue. J Sleep Res 2009;18:374-83.
82. Alonso F, Esteban C, Sanmartin J, Useche SA. Consistency between the subjective perception of feeling indisposed, the decision to drive and driving performance. Sci J Public Health 2016;4:482-8.
83. Heimstra NW. The effects of "stress fatigue" on performance in a simulated driving situation. Ergonomics 1970;13:209-18.
84. Norza EH, Granados EL, Useche SA, Romero M, Moreno J. Componentes descriptivos y explicativos de la accidentalidad vial en Colombia: Incidencia del factor humano [Descriptive and explanatory components of road accident rate in Colombia: Influence of the human factor]. Rev Criminalidad 2014;56:157-87.
85. Alonso F, Esteban C, Calatayud C, Alamar B, Egido A. Salud vial: Teoría y Prácticas de los Trastornos Físicos y Psíquicos en la Conducción. Valencia: INTRAS, University Research Institute on Traffic and Road Safety; 2008.
86. Alonso F, Sanmartín J, Esteban C, Alamar B, López E. Salud Vial. Diagnóstico de los Conductores Españoles. Valencia: University Research Institute on Traffic and Road Safety, INTRAS, 2008.
87. Alonso F. Road safety science and practice: Portrait of an unwanted divorce. Securitas Vialis 2012;4:29-30.
88. Rose S, Wojcik JR. The health habits and physical activity of student truck drivers. Winthrop McNair Res Bull 2015;1:68-76.
89. Schneider S, Becker S. Prevalence of physical activity among the working population and correlation with work-related factors: Results from the first German National Health Survey. J Occup Health 2005;47:414-23.
90. Vieria MC, Sperandei S, Reis A. Physical activity overcomes the effects of cumulative work time on hypertension prevalence among Brazilian taxi drivers. J Sports Med Phys Fitness 2015.
91. Sangaleti CT, Trincaus MR, Baratieri T, Zarowy K, Ladika MB, Menon MU, *et al*. Prevalence of cardiovascular risk factors among truck drivers in the South of Brazil. BMC Public Health 2014;14:1063.
92. Matthews G, Desmond PA. Task-induced fatigue states and simulated driving performance. Q J Exp Psychol A 2002;55:659-86.
93. Lal SK, Craig A. A critical review of the psychophysiology of driver fatigue. Biol Psychol 2001;55:173-94.
94. Greiner BA, Krause N, Ragland DR, Fisher JM. Objective stress factors, accidents, and absenteeism in transit operators: A theoretical framework and empirical evidence. J Occup Health Psychol 1998;3:130-46.
95. Byrnes JP, Miller DC, Schafer WD. Gender differences in risk taking: A meta-analysis. Psychol Bull 1999;125:367-83.
96. Oltedal S, Rundmo T. The effects of personality and gender on risky driving behaviour and accident involvement. Saf Sci 2006;44:621-8.

Source of Support: Nil, Conflict of Interest: None declared.