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Original Article

Working Conditions, Job Strain, and Traffic Safety among Three Groups of Public Transport Drivers

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ABSTRACT

Background: Working conditions and psychosocial work factors have acquired an important role explaining the well-being and performance of professional drivers, including those working in the field of public transport. This study aimed to examine the association between job strain and the operational performance of public transport drivers and to compare the expositions with psychosocial risk at work of three different types of transport workers: taxi drivers, city bus drivers, and interurban bus drivers.
Method: A sample of 780 professional drivers was drawn from three transport companies in Bogota (Colombia). The participants answered the Job Content Questionnaire and a set of sociodemographic and driving performance questions, including age, professional driving experience, work schedules, and accidents and penalties suffered in the last 2 years.
Results: Analyses showed significant associations between measures of socio-labor variables and key performance indicators such road traffic accidents and penalties. Furthermore, multiple linear regression analysis contributed to explain significantly suffered accidents from key variables of the Job Demand-Control model, essentially from job strain. In addition, throughout *post-hoc* analyses, significant differences were found in terms of perceived social support, job strain, and job insecurity.
Conclusion: Work stress is an issue that compromises the safety of professional drivers. This research provides evidence supporting a significant effect of job strain on the professional driver's performance. Moreover, the statistically significant differences between taxi drivers, city bus drivers, and interurban bus drivers in their expositions to work-related stress suggest the need for tailored occupational safety interventions on each occupational group.

1. Introduction

Road accidents are considered one of the leading causes of death and injury around the world [1]. Therefore, road safety is considered by different international agencies as a key factor of public health [1–3]. Furthermore, road accidents are a source of high economic costs for transportation firms and represent a serious safety risk for professional drivers and other users of the road [4].

Recently, some psychosocial work factors, such as driving stress, work overtime, and job strain, have acquired an important role explaining occupational health and safety problems in professional drivers population [5,6]. Particularly, work stress is one of the factors more frequently associated with accidents or injuries at work [7,8]. The Job Demand-Control (JDC) model conceives *job strain* as the main job stress indicator. In brief, this approach suggests that high strain conditions, which imply a combination of high psychological demands and low decision latitude (skill discretion and

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decision authority) at work, are the leading factor of occupational stress, as described in different occupational groups [9–11]. In addition, the most important developments on the JDC model suggest that the negative effect of job strain is stronger under conditions of low social support from colleagues and supervisors and high job insecurity [12]. Lately, several research experiences have documented the association between job strain and health outcomes in professional drivers [13–15]. However, the association between the JDC model and professional drivers' performance has been scarcely researched [16,17]. Indeed, to the best of our knowledge, there are just two studies on the association between the JDC model and driving performance, and one of them found null results on the effect of high strain conditions in driving errors [18,19].

A recent empirical study [18] found a significant negative association between social support (key component of the JDC model) and the risk of road accidents among bus drivers. However, this study did not find significant results for the effects of job demands, decision latitude, and job strain on the professional drivers' performance. To this extent, the evidence on the association between the JDC model and professional drivers' performance is still insufficient. This research is specifically addressed to fill this gap in the literature. Moreover, most of the evidence on work stress and drivers' health and performance came from single occupational groups such as city bus and other professional drivers [19,20], although there is a significant amount of road crashes involving other heavy vehicles [21]. In contrast, this research includes different types of professional drivers (taxi drivers, city bus drivers, and interurban bus drivers), which on one hand increases the variability of working conditions on the sample and the likelihood of find a significant association between the JDC model and occupational outcomes [18,22] and on the other hand allows comparisons between occupational groups exposed to different levels of psychosocial risk at work.

Job strain has also been related to different negative health outcomes among professional drivers. Some studies have found that job strain is associated to mental and physical health, such as cardiovascular and ergonomic problems [16,23,24], overweight, acute and chronic fatigue [25,26], and risk behaviors such as sedentary lifestyles [23,27], smoking, and frequent alcohol consumption [27–29]. It is also well known that stress-related overactivity in the hypothalamic pituitary adrenocortical axis and the sympathetic nervous system causes cognitive and psychomotor disturbances [30,31], which in turn reduce the drivers' ability to operate vehicles safely [23,32,33]. In addition, the high exposure to environmental stimulation (e.g., noise, cold, hot, traffic) [34–36], combined with work overload factors such as passenger demands, shift work, and work overtime [13,37–40], significantly increases the risk of road accidents in the professional drivers occupational group [41,42]. These factors are apparently common to all public transport drivers in densely populated urban areas, considering some typical adverse working conditions of professional drivers in this field [43]. However, there exist important differences in the work activities performed by different types of public transport drivers, such as taxi drivers, city bus drivers, and interurban bus drivers [39]. Therefore, despite the lack of comparative evidence on the work stress expositions of these occupational groups, there are practical reasons to suspect differences in the perception of psychosocial risk factors associated with the type of vehicle operated.

It is expected that the evidence collected by this research will contribute to extend the knowledge on the stressors of public transport drivers and serve as empirical basis for the design of specific occupational interventions in the field of road safety.

2. Materials and methods

2.1. Participants

For this study, a sample of 780 professional drivers working in public transport companies of Bogotá (Colombia) was used: 448 (57.4%) city bus drivers, 195 (17.6%) taxi drivers, and 137 (25%) operators of interurban bus. Women were excluded from the analysis due to their underrepresentation in the public transport drivers' occupational group (98% of the total sample was composed by males).

2.2. Measures

In this research, the exposition to work stress conditions was measured using the Colombian version of the *JCQ* [9,44,45]. The JCQ is composed of 27 items grouped in six 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 the sum of use of skills and decision-making, and job strain was calculated as the ratio between psychological demands and decision latitude (demands/decision latitude). In addition, the participants responded a brief demographic questionnaire which asked for their age, seniority and driving experience, type of vehicle operated, educational background, work schedule (driving hours per week, weekdays driving and weekend days driving), and road crashes (accidents) and penalties (fines) suffered in the last 2 years.

2.3. Procedure, design, and ethics

For this cross-sectional study, participants have been selected through a nonrandom selection. Public transport drivers from different Colombian transport companies were invited to participate. The contact with the transport companies and the data collection processes lasted 10 months. All professional drivers were asked to voluntarily complete the questionnaires in a paper form during an approximately 1-hour period provided by the companies. The participants were always accompanied by a research assistant during the administration of the questionnaire. They were informed of their rights and the protection of their personal information in an informed consent form, emphasizing on the fact that the data would only be used for research purposes. The global response rate was approximately 92%.

2.4. Statistical analysis

In addition to descriptive analyses, a correlation analysis to establish potential relationships between the study variables was performed. Furthermore, hierarchical multiple regressions were used to predict the participants' accidents reported in the last 2 years (dependent variable) through different explaining variables: In the first step of the models, driving experience, educational background, driving hours per week, weekdays driving, and weekend days driving were included as predictors. In the second step, the factors of the JDC model (support from supervisors, peer support, use of skills, decision-making, psychological demands, and job insecurity) were introduced. In the third step, job strain was introduced in the model as the interaction term of demands and decision latitude. To compare the exposition with psychosocial risk at work between taxi, city bus, and interurban bus drivers, after revising the compliance with minimum parameters and criteria for comparative tests, one-way analysis of variance and *post-hoc*

analyses (Tukey) were performed. Once the data were obtained, statistical analyses were performed using IBM SPSS (Statistical Package for Social Sciences), version 23.0, developed by IBM corporation (Armonk, NY, USA).

3. Results

3.1. Descriptive data

The mean age of participants was $X = 41.13$ [standard deviation (SD) = 11.3; (18–76)] years. The average antiquity of drivers in their companies was $X = 7.9$ (SD = 7.58), and the mean of driving experience was $X = 18.38$ (SD = 9.87) years. Regarding epidemiological research indicators, an average of accidents of 0.48 [SD = 1.02; (0–11)] and traffic penalties or fines of 1.51 [SD = 1.91; (0–22)] registered in the last 2 years was found in the study sample.

3.2. Correlational analysis

Through bivariate correlation analysis, a set of relevant significant associations between the JDC model and epidemiological variables was found. These correlations are shown in Table 1, in which the following variables are crossed: demographic information, occupational data, and factorial components of the scales contained in the JCQ.

The age of drivers is negatively associated with accidents and traffic penalties; ergo, participants with older age report experiencing fewer accidents or traffic penalties in the last 2 years. This variable has a positive association with antiquity in organization.Also, age presented a negative association with perceived job insecurity, psychological demands at work and job strain, factors measured by the JCQ. Regarding accidents and fines, self-reported rate of accidents in the past 2 years was positively correlated with the number of reported traffic penalties. The driving accident rate has also been significantly associated with all indicators obtained using the JCQ. First, social support at work and control at work have a negative association. Furthermore, job insecurity, psychological demands at work, and job strain indicator are positively associated with the number of accidents reported by operators. In other words, the rate of accidents reported is higher among drivers who receive less social support and control over their tasks. On the other hand, the people with more accidents reported have a greater perception of job insecurity, stress, and work demands.

A positive association with the number of hours worked per week was found for traffic penalties (or *fines*). In this sense, it could be inferred that those professional drivers with greater intensity load or weekly time have, also, a higher number of traffic penalties. By contrast, the association between driving intensity and the number of traffic accidents is not significant. Similar to traffic accidents, the rate of traffic penalties in the past 2 years was negatively correlated with the social support from work colleagues and work control. For its part, replicating the findings with traffic accidents, the variables "job insecurity", "psychological demands" and the job strain indicator were positively correlated with the number of reported driving penalties.

Besides presenting a positive association with the rate of traffic penalties, the number of working hours weekly driving was positively correlated with job insecurity, psychological demands, and job strain. However, a positive association was also determined across the perceived control at work.

Table 1
Variable means and correlations (Pearson) between study variables

	Study variable	Mean	SD	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
1	Age (years)	41.13	11.302	—														
2	Accidents (last 2 years)	0.48	1.023	−.114*	—													
3	Penalties (last 2 years)	1.51	1.913	−.160*	.219*	—												
4	Weekdays driving	4.94	0.334	−.015	.054	.069	—											
5	Weekend days driving	2.37	0.858	−.076†	−.004	.038	.046	—										
6	Driving hours per week	72.58	9.154	−.031	.011	.076†	.045	.386*	—									
7	Years in company	7.90	7.580	.445*	.010	−.085†	−.032	−.051	.056	—								
8	Supervisor support	11.58	3.317	.060	−.118*	−.061	−.048	−.125*	−.065	−.043	—							
9	Peer support	11.28	2.924	.070	−.096*	−.083†	.004	−.040	−.060	.008	.513*	—						
10	Social support at work	22.87	5.439	.072	−.125*	−.081†	−.027	−.099*	−.071	−.021	.887*	.851*	—					
11	Job insecurity	6.78	2.299	−.130*	.185*	.174*	.077†	.145*	.080†	−.002	−.392*	−.313*	−.407*	—				
12	Use of skills	36.8	5.261	.007	−.210*	−.082†	.024	.034	.132*	−.052	.323*	.295*	.355*	−.194*	—			
13	Decision-making	39.25	8.401	.048	−.153*	−.088†	.008	−.002	.153*	−.002	.294*	.298*	.338*	−.221*	.579*	—		
14	Control at work	76.05	12.217	.032	−.196*	−.093†	.015	.012	.163*	−.028	.339*	.331*	.383*	−.238*	.828*	.936*	—	
15	Psychological demands	32.36	7.422	−.148*	.107*	.204*	.028	.200*	.220*	−.019	−.228*	−.210*	−.255*	.364*	.027	−.012	.005	—
16	Job strain	0.88	0.278	−.106*	.229*	.203*	.004	.135*	.082†	.023	−.400*	−.386*	−.453*	.426*	−.535*	−.612*	−.652*	.701*

SD, standard deviation.
* Correlation is significant at level 0.01 (two tailed).
† Correlation is significant at level 0.05 (two tailed).

3.3. Multiple regression analysis

The linear regression analysis showed the existence of a relationship between studied individual and socio-labor variables and traffic accidents suffered in the last 2 years (dependent variable), which is explained by the equation $Y = -3.850 - 0.10X_1 + 0.46X_2 - 0.115X_3 + 0.049X_4 + 0.004X_5 + 5.048X_6$, Y being the accidents suffered in the past 2 years; X_1 is the years of driving experience; X_2 is the perceived control at work; X_3 is the job psychological demands; X_4 is the perceived job insecurity; X_5 is the social support at work; and X_6 is the job strain. The typified regression coefficients and their probability values are presented in the Table 2. The fixed coefficient of determination was $R^2 = 0.165$, 16.5% being the percentage in that the dependent variable is predictable using the independent variables included in the model. Finally, a relatively low mean square error of 0.93 was found.

The regression assumptions were assessed according with the procedures of Osborne and Waters [46] and Williams, Grajales, and Kurkiewicz [47]. Partial plots and scatter plots of the predictors introduced in the model (not showed) confirm the assumptions of linearity and homoscedasticity. High tolerance and low variance inflator factors (see Table 2) were found for all the predictors. Therefore, multicollinearity was discarded. A scatter plot (not showed) of the standardized residuals (y axis) and the standardized predicted values (x axis) suggest that the assumption of homoscedasticity of the residuals was satisfied. Similarly, a Durbin–Watson statistic of 1.87 confirmed that there is no linear autocorrelation in the data. Finally, a significant deviation of normality in the distribution of the residuals (Shapiro–Wilk = 0.726, $p = 0.00$; Kolmogorov–Smirnov = 0.191, $p = 0.00$) was found. This assumption violation suggests that the results of the regression analysis should be interpreted with precaution. However, compliance with the assumption of normally distributed errors is not required to obtain consistent and unbiased regression coefficients, especially when the other assumptions are met (Williams, Grajales, and Kurkiewicz, 2013). Furthermore, in large samples (>200), the central limit theorem ensures that the distribution of the residuals will approach a normal distribution (Osborne and Waters, 2002; Williams, Grajales, and Kurkiewicz, 2013). In this sense, regression models are relatively robust to the assumption of normally distributed residuals (Williams, Grajales, and Kurkiewicz, 2013).

3.4. Comparisons between three types of professional drivers

The Table 3 summarizes the analyses of variance that compare the expositions to psychosocial risk at work of taxi, city bus, and interurban bus drivers. It was found that social support from supervisors was significantly higher in taxi drivers than in city bus drivers. The perceived social support from peers was significantly higher in taxi drivers and interurban bus drivers than in city bus drivers. Use of skills and decision-making were significantly lower in interurban bus drivers than in taxi and city bus drivers. Similarly, use of skills and decision-making were significantly higher in taxi drivers than in city bus drivers. Psychosocial demands were significantly higher in city bus drivers than in taxi and interurban bus drivers and significantly higher in interurban bus drivers than in taxi drivers. The job insecurity was higher in city bus drivers than in taxi and interurban bus drivers. Finally, job strain was significantly higher in city bus operators than in interurban bus and taxi drivers.

4. Discussion and conclusion

The main reason that encouraged this research is the growing need to develop empirical studies that contribute to generating accurate knowledge about a problem that transcends the individual, social, and organizational spheres, as addressed in other studies [20,48]. Although Colombia, as in other Latin American countries, has shown a substantial progress in terms of training and road safety education, there still seems to be a lot that should be addressed in terms of recognition, intervention, and control of risk and protective factors that help explain the occurrence of accidents and traffic violations for the prevention and management of fatigue and promotion of occupational health [14,49]. From these initial estimates, this research experience was based on the study of the relationship between psychosocial variables and two of the most important epidemiological indicators of occupational transport companies: the prevalence of high rates of road accidents and traffic penalties or fines.

Most of the results of the present manuscript can support empirically some theoretical assumptions contained in the international literature. The results of this study were compared with those of other studies encountered in the international literature, most of them related with job stress, health, and accident causation factors in professional drivers. Some specific coincidences with other research experiences were found, suggesting that age and experience, psychosocial factors at work, and health indicators are among the main explanatory variables of driving accidents and penalties among public transport drivers [5,18,50,51].

Regarding the multiple linear regression model that was developed to provide a statistical explanation for accidents suffered by professional drivers in the last 2 years, it was found that several variables of the work environment contained in the JDC model are highly important in explaining traffic accidents suffered in the last 2 years among this population.

Without any doubt—and keeping in mind the statistical result of the third model obtained— within the variables analyzed in this study, job strain turns out to be the most powerful factor to explain the occurrence of traffic accidents in the occupational context of professional driving. According to some previous studies, it should

Table 2
Regression coefficients*

Step	Variables	Unstandardized coefficients		Standardized coefficients	Significance	Tolerance	VIF
		B	Standard error	Beta			
1	(Constant)	0.766	0.085				
	Years of experience	−0.014	0.004	−0.130	0.001	1,000	1,000
2	(Constant)	1.401	0.392		0.000		
	Control at work	−0.021	0.004	−0.219	0.000	857	1,167
	Psychological demands	0.013	0.006	0.090	0.025	840	1,191
	Job insecurity	0.061	0.02	0.131	0.002	757	1,321
	Social support	0.002	0.009	0.012	0.787	744	1,344
3	(Constant)	−3.850	0.813				
	Job strain	5.048	0.693	1.167	0.000	749	1,233

B, Unstandarized Coefficient Beta; VIF, Variance Inflation Factor.
* Dependent variable: accidents (2 years).

Table 3
Descriptive analysis of JCQ and accident rates by type of vehicle driven

Factor	City bus		Interurban bus		Taxi		F	*p*
	Mean	SD	Mean	SD	Mean	SD		
Supervisor support	11.28_a	3.257	11.61_{ab}	2.878	12.24_b	3.643	5.585	<0.05
Peer support	10.82_a	2.890	11.84_b	2.714	11.93_b	2.968	12.684	<0.01
Social support at work	22.12_a	5.244	23.45_b	5.083	24.16_b	5.839	10.272	<0.01
Use of skills	36.68_a	5.005	35.22_b	6.337	38.15_c	4.674	12.677	<0.01
Decision-making	38.89_a	8.050	34.65_b	8.791	43.21_c	7.033	46.160	<0.01
Control at work	75.57_a	11.344	69.80_b	13.608	81.35_c	10.849	39.013	<0.01
Psychological demands	35.33_a	6.352	30.08_b	6.540	27.24_c	6.894	111.25	<0.01
Job insecurity	7.26_a	2.320	6.88_{ab}	2.030	5.58_b	1.989	37.310	<0.01
Job strain	0.95	0.248	0.91	0.323	0.68	0.203	78.648	<0.01
Accidents (2 years)	0.59	1.186	0.53	0.898	0.24	0.605	7.555	<0.01
Penalties (2 years)	1.76	2.130	1.65	1.720	0.78	1.064	18.874	<0.01

Means with different sub letters are different at the <0.05 and <0.01 level according with the Tukey test.
F, F-value; JCQ, Job Content Questionnaire; SD, standard deviation.

be mentioned that the management of work stress has been documented as one of the prevailing needs for the occupational level [52,53], with the aim of promoting both worker health and safety [54], especially in such a vulnerable occupational group in these two levels, as in the case of professional drivers [20,55]. However, it should be mentioned that other variables present in the work environment for professional drivers have a significant impact on the security or, in other words, in the prevention of traffic accidents in the working population of drivers.

First of all, it should be mentioned that control at work and psychological demands as relevant factors, which were analyzed separately (but not integrated in the indicator of job strain), allow to demonstrate an incidence of a significant nature in traffic accidents. In the case of model 2 (see Table 2), which does not yet include the coefficient of job strain, the perception of control at work ($\beta = -0.021$) has a negative influence, whereas the psychological demands ($\beta = 0.013$) have a positive influence in the statistical explanation of traffic accidents. However, it draws attention that in the case of the third model (introducing the job strain coefficient), the perception of control explains positively an increased likelihood of accidents ($\beta = 0.046$) and the presence of psychological demands it makes in a negative direction ($\beta = -0.115$) due to a potential interaction with the introduced job strain. Although the obtained beta coefficients for this pair of variables are not quite high in terms of probabilistic incidence, both results are important to predict road crashes among professional drivers.

The perception of job insecurity is similarly relevant in explaining traffic accidents. With minor changes in beta between models 2 and 3, when the job strain is introduced (see Table 2), this variable explains an increase in the probability of reported occupational accidents, consistent with that observed in previous studies developed with professional drivers and other vulnerable occupational groups. On the one hand, it could be related with the impossibility of generating an immersion of workers in an organizational safety culture—a process that takes place over time—and, secondly, by the presence of psychosocial factors at work linked to job insecurity [56,57].

Furthermore, as an individual feature with high variability between drivers, the years of experience in driving appear to play a "protective" role, while each log unit of the variable—additional year of experience—or decreases by 1% ($\beta = -0.10$) mean the probability of being involved in a traffic accident. Although the protective role of driving experience has been discussed as "relative" [56,58], some studies have found that this condition is related with a lower incidence of incidents and accidents at the wheel in several population of drivers [59,60]. Finally, it should be mentioned that social support at work has not been a statistically significant variable for the model. Although some recent studies emphasize the importance of this factor as "positive" and "protective" for the health and safety of workers [57,61,62], in this study (both in the case of correlational analysis as for the regressions), any statistical relationship between social support and traffic accidents has not been established. In any case, rather than the existence of a direct relationship between social support and accident rates, the role of social support at work could be a mediator between job strain and reported accidents (see *limitations of the study*).

In the specific case of social support, however, it is noteworthy that the sample of taxi drivers has significantly higher rates of social support at work and, at the same time, significantly lower accident rates and traffic penalty records among the three groups of reference (see Table 3). Furthermore, in the case of the group with the lowest scores of perceived social support at work (city bus drivers), higher rates of both accidents and fines than in the other two groups were found, which is consistent with the results of other studies, without exploring the mechanism (as in this study), which has established the importance of social support in the safety of workers [51,52]. Low rates of social support among city bus drivers have already been documented. For instance, Useche, Cendales, Alonso, and Serge [63] found that unlike other groups of professional drivers, such as Bus Rapid Transit (BRT) operators, Colombian city bus drivers tend to report a clear lack of social support from their bosses and peers, and a greater proportion perceived possibility of losing their work (i.e., *job insecurity*), considering that most of them have limited-time contracts or, in the worst cases, are subcontracted by transport companies. These specific facts, combined with high physical demands, overexposure to multiple stressors, and a very limited capacity for making substantial decisions, can explain the prevalence of higher rates of job strain, with respect to the other two groups studied.

Another ulterior factor worth discussing, regarding the comparative analyses, is the hourly labor intensity among professional drivers: 96% of study participants work every day of the week. In reviewing institutional policies of some of the public transport organizations (essentially city bus companies), operators were found to have a break day every 2 weeks. In addition, 78% of the participants (94.9% of city bus, 30.7% of interurban bus, and 74.1% of taxi drivers) drive more than 10 hours per working day, which suggests the presence of a fatigue factor related to the perception of demands at work and exposure to environmental stressors (e.g., traffic jams, interaction with passengers and other drivers, adverse road conditions), theoretically associated with higher rates of risk behaviors and driving accidents [23,32]. Regarding the potential presence of work-related fatigue linked to

the high hour intensity of this sample of Colombian public transport drivers, it is important to remark that several studies dealing with professional drivers have shown that fatigue from work is associated to different health problems, less driving performance, errors and violations at the wheel [25,32,64], and even absenteeism and sick leave [65,66]. In addition, health issues and fatigue have been negatively associated with poor management of social issues at job, considering its proven influence on information processing, mood, impulsiveness, and decision-making under pressure, especially in professions affected by factors such as recurrent sleep losing, insufficient rest periods, and shift work [25,67,68].

Finally, we suggest some ways to intervene on the risk factors identified by the study and guidelines to the improvement of occupational health in Colombian transportation companies. Principally, is important to improve the role of constant training, monitoring, and organizational support on the occupational accidents prevention inside and outside transportation companies, to enhance more control at work, and to study the workload in public transportation organizations. It is important to mention that this kind of research experiences could help to improve the spectrum of decision-taking, risk management, and professional driver's training in the Colombian and Latin American contexts. Based on the study and appreciation of other research experiences using samples of public transport drivers with similar working conditions, the results of this study are not "innovative" regarding the problems encountered at the level of psychosocial factors at work and job strain, specifically. However, this study represents an advance insofar as the relationship between the aforementioned factors and traffic accidents is described, the fact which should mean a substantial advance in the recognition of the importance of designing more and better intervention models (based on evidence, principally) to strengthen occupational safety of professional drivers.

4.1. Limitations of the study and recommendations for future research

This study was conducted using self-reported methodologies. This guideline was defined in the research design phase, considering the expected sample size (initially 500 operators) and human resources available for data collection. However, it is pertinent to ask some limitations of research with self-reported measures:

The exclusive use of self-reported measures can bring biases that can range from acquiescence (total agreement with the questions) to insincerity. In addition, positive or negative affectivity may influence the participant's response style [69]. We suggest using negative or confirmatory items (in the case of the construction of a new scale) or include shorter instruments designed to control affective bias and social desirability in the set of complementary scales [70].

Regarding statistical analysis, the violation of the assumption of normality in the distribution of errors in the regression model restricts the generalization of the results. In addition, it can be remarked by the lack of depth of the analysis in the case of the role of social support as a possible mediator between job stress and traffic accidents through more complex models (i.e., Structural Equation Models—SEM), so that it can be given a deeper and more accurate appreciation of this issue. This should be a topic to be addressed in a future article.

Other issue that should be highlighted both as a limitation and as a suggestion for future research with public transport drivers is work-related fatigue. In addition to some previous studies documenting the presence of high levels of fatigue among professional drivers, the obtained results allow to describe a context that gathers the prototypical conditions for the appearance of high rates of labor fatigue, which play an important role as predictor of road crashes. In addition to fatigue, it is worth mentioning the need of assessing supplementary factors that may strengthen a statistical explanation of road crashes, such as work-related fatigue, driver's performance, health indicators, and vehicle and road-related issues, for providing a more holistic explanation of the dependent variable, considering that traffic crashes are a multicause phenomenon influenced by several variables [71].

Finally, it is worth suggesting the usage of complimentary objective measures and qualitative information (e.g., other physiological measures and interviews), which allow to a) make the crossing of self-reported measures unobservable indicators through questionnaires, such as of cardiovascular or endocrine activity; b) perform the analysis of the phenomenon in working or operation conditions, as might be taking action (as physiological measures) while driving (with the highest possible methodological control); and c) make additional interpretations using qualitative methods for data collection and analysis.

Conflicts of interest

The authors of the article have no conflicts of interest to declare.

Ethical statement

To realize this study, the ethical approval from the Ethics Committee of the University of los Andes (Dept. of Psychology) was previously obtained. In addition, even though participation in the research was anonymous, an informed consent was used in which the parameters of the use of information were established and privacy issues on personal or sensible information of participating drivers have been guaranteed.

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