

Comparing Job Stress, Burnout, Health and Traffic Crashes of Urban Bus and BRT Drivers

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Abstract Professional driving is a very demanding task. According to the recent scientific evidence, Bus drivers tend to report high levels of occupational stress, burnout and occupational traffic accidents. With the implementation of new transportation modes, some substantial benefits and adverse circumstances for public transport operators have been documented. BRT (Bus Rapid Transit) systems have been implemented in different cities worldwide as an efficient alternative to fulfill difficulties and limitations related to traditional Urban Bus systems. However, in order to compare the efficiency of different public transport modes, it is important to assess, in addition to objective indicators, the incidence of psychosocial factors and other work-related issues over its operators. **Aim:** The aim of this study was to compare job stress, burnout, health indicators and traffic accidents suffered between two samples of professional bus drivers: Urban/City Bus and BRT (Bus Rapid Transit) drivers. **Methods:** The study sample was composed by 361 Colombian male Bus drivers with a meanage of 41.46 years, 222 of them working in Urban Bus companies, and 139 in BRT companies. It was designed a questionnaire composed by four sections: a) demographics and accident rates, b) job stress, c) burnout, and d) health indicators. **Results:** Significant differences were found between urban and BRT drivers for the case of different work-related variables, i.e., occupational stress, burnout and traffic accident rates, being these results more adverse, in all cases, for Urban Bus operators. Furthermore, both BRT and urban bus drivers reported elevated prevalence of adverse health habits and results. **Conclusions:** This study showed that the prevalence of work-related stress and burnout are significantly elevated among Colombian bus drivers. In addition, it was found that the bus drivers' job stress is related to burnout indicators. Comparatively, BRT drivers tend to present better outcomes in terms of occupational stress, burnout and occupational accidents than Urban Bus operators. The intervention on these factors represent a potentially successful alternative for the prevention of occupational traffic accidents and negative health outcomes in Bus drivers.

Keywords: public transport drivers, job stress, urban bus drivers, BRT drivers, burnout, traffic accidents, prevention, road safety, public health

Cite This Article: Sergio Useche, Boris Cendales, Francisco Alonso, and Andrea Serge, "Comparing Job Stress, Burnout, Health and Traffic Crashes of Urban Bus and BRT Drivers." *American Journal of Applied Psychology*, vol. 5, no. 1 (2017): 25-32. doi: 10.12691/ajap-5-1-5.

1. Introduction

Traffic accidents are a worldwide public health issue [1]. This assumption becomes relevant considering that traffic crashes cause high number of deaths and injuries every year, affecting different sectors of the population, especially the people who is more frequently exposed to the road environment [2]. In this sense, there is a growing number of occupational groups classified as at high psychosocial risk, such as professional drivers. Among them, public transport drivers tend present several occupational and extra-occupational risks such as work stress, burnout and traffic accidents [3,4,5,6].

Numerous epidemiological studies associates work stress with psychosocial risk, morbidity and mortality [7,8,9]. Furthermore, the recent scientific evidences in the

particular context of bus drivers associates psychosocial work factors with adverse health and organizational outcomes, such as burnout, poor physical and mental health, counterproductive work behaviors, increased risk for accidents and poor job performance [10-15].

Work stress Models and professional driving

Work stress is one of the factors more frequently associated with accidents and occupational injuries [9] [13]. The Effort-Reward Imbalance model (ERI) [16] associates work stress with a problematic disequilibrium between the efforts performed to accomplish work tasks and the rewards (salary, esteem and promotion) received as retribution. Moreover, the ERI model states that high levels of over-commitment (a motivational pattern that imply inability to detach from work) increase the risk of poor health outcomes [17]. Moreover, On the other hand, the Job Demand-Control model (JDC) states that work stress is generated by the combination (known as job

strain) of high psychological demands and low job control (skill discretion and decision authority) [18,19]. Additionally, the JDC model suggest that the negative outcomes associated with job strain are stronger in situations of low social support and job insecurity. There are abundant research on the association between the ERI-JDC models and negative health and job performance outcomes, including some studies on Bus drivers [20,21,22]. In this occupational group, low control, work overtime, irregular working schedules, shift work, emotional labor, low decision capacity and the lack of social support and low have been identified as highly prevalent stressors [23,24]. Furthermore, it is known that bus drivers are in high risk for work stress related diseases such as hypertension [25,26,27,28,29], metabolic syndrome and ergonomic problems [5,30], and health risk behaviors such as smoking and drinking [31,32].

Burnout and professional driving

Burnout is a psychological syndrome, which raises in response to the chronic exposure to work-related stressors [33,34,35]. Burnout is composed by three components: *emotional exhaustion* or the feeling of emotional overwhelming at work; *cynicism* (also known as *disengagement* or *depersonalization*), defined as the detachment from others or indifference at work; and *professional efficacy* (also named *professional accomplishment*), which is the tendency to evaluate one's efforts and achievements in a negative way [36,37].

Burnout has been widely related to different negative health outcomes, such as anxiety [38], depression [38] [39], sleep disturbances [40,41,42], headaches [43], gastrointestinal disease [44], hypertension [45], muscle tension [34], chronic fatigue [37], and especially in the case of professional drivers, with poor job performance [46,47]. In the organizational field, burnout has been also associated with absenteeism and high turnover intention [48,49]. Intervention studies have shown that the continuous task evaluation and improvement [50,51,52,53], and the socio-emotional support from co-workers and members of micro-social environment (such as family members and friends) are relevant factors in the management and prevention of burnout.

Professional drivers' health and road safety

Previous research suggest that professional drivers are at higher risk occupational illness, in comparison with other occupational groups [54]. Recent studies have found that professional drivers' health problems are associated with sickness absence, turnover intention and accidents [3,55]. Research on bus drivers also report that fatigue [56], shift work [46,57], age, driving experience, previous accidents and their severity, the type of vehicle (urban/city bus, taxi, BRT bus) and route are correlated with the risk of being involved in road accidents [58,59].

In other words, a professional driver who experiences health problems (e.g. cardiovascular and musculoskeletal diseases, obesity, mental problems), may have up to twice the risk of have traffic crashes [60,61]. Health problems also increase the effect of subjective variables (e.g. age, experience, burnout, stress) on risky driving behaviors (both driving errors and traffic violations) [62,63]. This increased risk for road accidents compromises the health and safety of both professional drivers and other users of the road, such as their passengers, pedestrians and other

drivers who share the road with public transport vehicles [8].

The cumulative scientific evidence collected over the past five decades suggests that, comparing professional drivers with workers belonging to other occupational groups, the first tend to report a higher prevalence of different illnesses or diseases, such as cardiovascular [64], musculoskeletal [54] and gastrointestinal problems [35]. Regarding mental health issues, it has been concluded that different psychological disorders such as depression, anxiety, and post-traumatic stress disorders are highly prevalent among active professional drivers, and constitute risk factors for suffering occupational-related accidents [6,8,64,65].

Risky behaviors, traffic accidents and public health

In the context of professional driving, road crashes are unplanned events, which causes material damages or injuries. The potential health damage to the road users makes traffic accidents a public health issue [2,66]. Age and experience are documented predictors of the risk of road crash [3,59,67,68]. However, little research had investigated the association between psychosocial risk at work and driving performance [69].

One of the factors most commonly employed to predict traffic accidents are risk behaviors. Unsafe driving behavior has been associated with work-related stress, especially in the case of Bus operators and other groups of public transport drivers. For instance, Kontogiannis found that risk behaviors on the road predict traffic accidents on professional drivers [14,68]. Therefore, variables such as work stressors [67,70,71], cognitive overstimulation [64], weather, road conditions [70,72], driving performance [59,73] and prolonged interaction with other road users [74,75] are relevant factors in the management of safety issues in the transport industry [6].

Regarding accident prevention in professional drivers, some previous experiences suggest that healthy employees working under optimal conditions have a less probability to suffer road crashes [3]. Furthermore, several programs designed for stress prevention at work have shown to be useful for both the employee and transport companies, taking into account the potential accident cost savings and the substantial reduction in terms of psychosocial and health risks for operators and passengers [3,76].

1.1. Study Framework

Research in job strain, effort-reward imbalance and burnout among professional drivers have been increasing along the last two decades [77,78]. Taking into account the association between the performance of public transport drivers and the safety of all road users, the occupational stressors in this occupational group gain importance. It is known the physical and psychological health of Bus drivers play a determinant role on their driving performance [79,80]. Any impairment in the bus drivers' performance can generate undesirable consequences for passengers and transport operating companies in form of negative health and economical outcomes [59,81].

Bus transportation is one of the most used modes of public transport worldwide. Therefore, the need to address the psychosocial work environment of bus drivers for improvement should be a priority. However, there are

differences between the working conditions of public transport drivers that should be considered for the prevention of accidents and promotion of road safety. This study focuses on the differences between the working conditions of Urban (or *City*) Bus drivers and BRT operators. According with Deng & Nelson [82], Bus Rapid Transit (BRT) is a system characterized by modern vehicles, dedicated or semi exclusive bus lanes and applications of ITS (Intelligent Transportation Systems) technologies to the monitoring and improving of service. This mode of public transport has been growing worldwide, thanks to its cost-benefit efficiency [56,69]. BRT systems have been implemented in Bogota, Colombia since 2000 [82] as an alternative to the traditional Urban Bus system. The Bogotá case is interesting, because the implementation of BRT systems considerably reduced the vehicular congestion, gas emissions and travel times of the citizens. [69,82]. However, different problems related to the BRT operation have been documented, such as excessive passenger demand, road deterioration and work-overload for its operators [82].

1.2. Objective of the Study

The aim of this study was to compare job stress, burnout, health outcomes and traffic accidents between Urban/City Bus drivers and BRT drivers. Moreover, some guidelines useful for preventing negative occupational outcomes and reducing accidents in the transportation industry are proposed.

2. Methods and Materials

2.1. Sample

The study sample was composed by 361 Colombian bus drivers ($n=222$ Urban Bus drivers [83] and $n=139$ BRT operators [5]) between 20-79 years of age, with a mean of $X=41.46$ ($SD=9.68$) years. The average driving experience of these bus operators was $X=17.5$ ($SD=9.836$) years. On average, this sample of professional drivers had $X=7.20$ ($SD=6.41$) years working in their current transport company.

Women 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 ± 2.75 with a 95% confidence interval in the most unfavorable case of $p=q=50\%$.

2.2. Procedure, Design and Ethics

The participants completed a questionnaire in 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. The final response rate was superior than 95%.

2.3. 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 last two years) were collected.

The second section of the questionnaire collected information about the ERI and JDC models. The JDC model was measured using the *Job Content Questionnaire* (JCQ), validated by Gómez for Colombian workers [84]. The JCQ has been widely used to assess psychosocial factors in the workplace and their effects on health. It's response scale consists of a 4-point Likert scale (1= "totally disagree" and 4= "totally agree"). The 27 items (full scale) of the JCQ are grouped in six 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. Social support was calculated as the sum of support from supervisors and peer support. And Job strain was computed as the ratio between psychological demands and decision latitude (demands/ decision latitude). The ERI model was measured using the 23-item version of the *Effort-Reward Inventory* [85,86]. This questionnaire consist of three sub scales: extrinsic effort (6-item, $\alpha=0.73$; $\alpha=0.74$), rewards (11-item, alpha $\alpha=0.77$; $\alpha=0.79$ original) and over-commitment (6-item; $\alpha=0.78$). This version of the ERI questionnaire was previously been validated in Colombia by Gómez [87].

The third section the Spanish version of the *Maslachs' Burnout Inventory* (MBI) [88,89] was administrated. This questionnaire consists of 16 questions [0-6 scale] grouped in three subscales: emotional exhaustion (5 items, $\alpha=0.88$), depersonalization/cynicism (5 items, $\alpha=0.67$), and professional efficacy (6 items, $\alpha=0.78$) [90].

Finally, the fourth section consisted of questions about height and weight (with the aim to build BMI in an objective manner), and self-reported physical health: Do you smoke (Yes/No)? Do you have a sedentary lifestyle (Yes/No)? Do you suffer a) diabetes, and b) hypertension?

2.4. Data Processing

First, descriptive statistics and Pearson' (bivariate) correlational analysis were performed. An analysis of Variance (ANOVA) was conducted in order to compare the work conditions and health outcomes of Urban Bus drivers and BRT operators. All statistical analyses were performed using ©IBM SPSS (Statistical Package for Social Sciences), version 23.0.

3. Results

3.1. Descriptive Statistics and Bivariate Correlations

Table 1 presents the descriptive statistics of the study variables (full sample) and the Pearson correlations

between them. The full sample had an average of job strain slightly below the risk score (greater value than 1 are indicator of unfavorable imbalance between demands and control). On the other hand, the ERI score was relatively high. The average levels of the MBI (i.e. exhaustion and cynicism) were relatively high, except for

average of professional efficacy. Job strain was positively associated with emotional exhaustion at work and cynicism, and negatively with professional efficacy and accidents. The ERI score correlated positively with emotional exhaustion, and negatively with professional efficacy.

Table 1. Descriptive statistics and Pearson correlations between the study variables (full sample).

Variable	Mean	SD	2	3	4	5	6	7	8	9	10	11	12	13	14	15
1 Age	41,46	9,68	,112*	-0,038	,196**	0,056	0,022	-0,081	-0,024	-0,079	,108*	0,026	-,192**	-,147**	0,069	-0,061
2 BMI	26,16	2,99	1	-0,055	-0,04	0,044	0,098	0,055	0,056	0,076	,234**	,124*	-,156**	,125*	0,105	-0,088
3 Accidents (Last 2 years)	0,38	0,96	1	-0,053	-0,03	,138**	0,041	,113*	,145**	,122*	0,035	0,067	0,078	0,09	-0,052	
4 Social Support	23,48	4,81	1	,330**	-,172**	-,357**	-,395**	-,251**	-,189**	-,105	-0,042	-,249**	-,124*	-0,014		
5 Control	72,14	14,07	1	,151**	0,002	-,600**	,137*	0,004	,177**	,125*	0,003	0,045	-,183**			
6 Demands	33,21	7,33	1	,278**	,644**	,526**	,414**	,436**	,116*	,412**	,217**	-,324**				
7 Job Insecurity	7,23	2,12	1	,227**	,233**	,255**	,206**	-0,012	,171**	0,078	-,125*					
8 Job Strain	0,96	0,28	1	,305**	,323**	,206**	-0,022	,307**	,128*	-,115*						
9 Efforts	14,82	5,77	1	,608**	,481**	,412**	,580**	,391**	-,121*							
10 Rewards	20,47	8,46	1	,351**	-,407**	,422**	,314**	-,243**								
11 Over-Commitment	15,07	3,60	1	,141**	,360**	,235**	-,332**									
12 E/R Imbalance	1,28	0,45	1	,162**	0,096	,135*										
13 Emotional Exhaustion	14,62	7,42	1	,514**	0,073											
14 Cynicism	12,15	6,56	1	,133*												
15 Professional Efficacy	30,39	9,46	1													

*p< 0,05, **p<0,01.

Table 2. Descriptive data and mean differences between the two groups of drivers.

Variable	City bus drivers (n=222)		BRT drivers (n=139)		Mean comparisons		
	Mean	SD	Mean	SD	F	p-value	Sig.
<i>Demographic variables, BMI and accident records</i>							
Age	41.19	11.12	41.90	6.65	0.436	0.510	N/S
BMI	26.58	3.10	25.40	2.63	12.414	0.000	**
Accidents (2 years)	0.49	1.16	0.20	0.40	7.629	0.006	**
<i>Demand-Control Model</i>							
Social Support	23.14	5.08	24.03	4.30	2.865	0.091	N/S
Control	75.42	12.49	66.83	14.89	33.560	0.000	**
Demands	36.35	6.13	28.29	6.28	142.416	0.000	**
Job Insecurity	7.75	2.02	6.41	2.01	37.571	0.000	**
Job Strain	0.998	0.270	0.885	0.278	13.938	0.000	**
<i>Effort-Reward Imbalance Model</i>							
Efforts	16.64	5.37	11.80	5.13	68.249	0.000	**
Rewards	22.89	7.89	16.47	7.85	54.268	0.000	**
Over-Commitment	16.52	3.19	12.71	2.92	124.584	0.000	**
E-R Imbalance	1.292	0.486	1.263	0.383	0.327	0.568	N/S
<i>Burnout [0-6 scale]</i>							
Emotional Exhaustion	16.01	7.28	12.40	7.10	20.868	0.000	**
Cynicism	12.88	7.48	10.93	4.42	7.357	0.007	**
Professional Efficacy	25.99	9.01	37.63	4.30	196.383	0.000	**

*p< 0,05, **p<0,01.

3.2. Comparisons between Groups: Age, BMI and Accident Records

Although both groups of drivers report a similar mean of age, there are statistically significant differences in the BMI ($F_{(1,333)}=12.414$; $p<0.01$) and the number of traffic accidents suffered in the last two years ($F_{(1,351)}=7.629$; $p<0.01$). In particular, City Bus drivers have a higher average body mass index and have suffered significantly more road accidents in the last two years than the BRT drivers.

3.3. Comparisons: Psychosocial Factors at Work and Job Stress

3.3.1. Demand-Control Model

Comparisons between the two groups of professional drivers have shown that Urban Bus drivers have, in average, more control at work than the BRT drivers ($F_{(1,347)}=33.560$; $p<0.01$), but also more psychological demands ($F_{(1,352)}=142.416$; $p<0.01$). Regarding job strain (job stress indicator of the model), the mean scores are significantly higher for City Bus drivers ($F_{(1,346)}=13.938$; $p<0.01$). BRT drivers also perceive less job insecurity than Urban Bus drivers ($F_{(1,352)}=37.571$; $p<0.01$). Finally, no significant differences were found for perceived social support.

3.3.2. Effort-Reward Imbalance Model

Urban/City Bus drivers have shown significantly higher scores regarding perceived efforts realized to accomplish work labors ($F_{(1,344)}=68.249$; $p<0.01$), but also, a higher rate of rewards ($F_{(1,345)}=54.268$; $p<0.01$). In the case of over-commitment, the mean score is higher for Urban Bus drivers than for BRT operators ($F_{(1,346)}=124.584$; $p<0.01$). However, no significant differences were found in terms of Effort-Reward Imbalance (job stress indicator of ERI model).

3.4. Comparisons: Burnout Indicators

The Analysis of variance show significant differences in the scores of emotional exhaustion ($F_{(1,350)}=20.868$; $p<0.01$), cynicism ($F_{(1,345)}=7.357$; $p<0.01$), and being the average scores higher for Urban Bus drivers. Meanwhile, the average of professional efficacy (or “accomplishment”) was higher for BRT drivers ($F_{(1,347)}=196.383$; $p<0.01$). In other words, Urban Bus drivers shows more burnout than BRT drivers do.

3.5. Self-reported Health Outcomes and Behaviors

The prevalence of adverse health behaviors, such as smoking and sedentary lifestyle, is higher (in both cases) for Urban Bus drivers (see Table 3). Furthermore, the prevalence of overweight (Body Mass Index >25) is higher for Urban Bus (67.9%) than for BRT drivers (50.8%). However, in both groups the prevalence of overweight was very high.

Specifically 32.1% of Urban Bus drivers and 48.3% of BRT operators have a BMI between 19 and 25 (“ideal weight”). Meanwhile, 52.1% of Urban Bus drivers and 42,8% f BRT operators are located in the “overweight” category. Further, 15.8% of Urban Bus and 5.0% of BRT drivers suffer obesity (see Figure 1).

Table 3. Frequency of registered prevalence of lifestyle factors and health complains

Variable	City Bus Drivers (n=222)	BRT Drivers (n=139)
	Prevalence (Percent)	Prevalence (Percent)
Smoking	20.4%	10.5%
Diabetes	2.8%	0.8%
Hypertension	7.9%	5.3%
Sedentarism	58.8%	22.1%
Overweight (BMI>25)	67.9%	50.8%
<i>Analysis of BMI Groups</i>		
Underweight	0.0%	0.8%
Ideal Weight	32.1%	48.3%
Overweight	52.1%	42.8%
Obesity	15.8%	5.0%
TOTAL	100%	100%

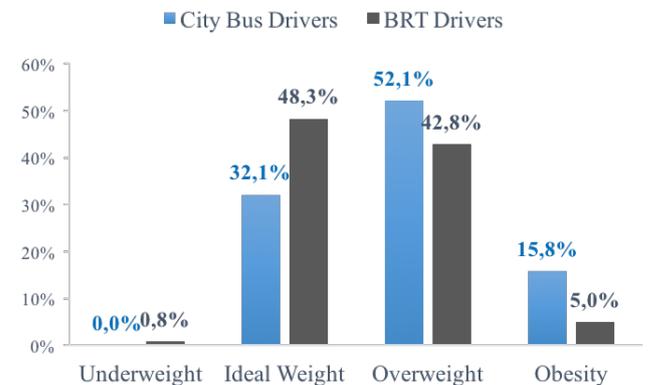


Figure 1. Body Mass-level distribution according to the group of drivers

Regarding self-reported illnesses, it was found that 2.8% of Urban Bus drivers and 0.8% of BRT drivers have been diagnosed with diabetes. Also, 7.9% (Urban Bus) and 5.3% (BRT) suffer hypertension.

4. Discussion

This research was aimed to compare the work-related stressors, health outcomes and accidents of Urban Bus and BRT drivers. As main descriptive result, it was found that Urban Bus drivers present higher stress, burnout and health problems than their BRT counterparts. In general, the existing literature locates public transport drivers as one of the groups with higher psychosocial risk at work [3,4]. Furthermore, the growing evidence on the association between work stress, burnout and negative organizational outcomes (especially accidents) among professional drivers highlights the relevance of studying and intervening on this issues [10,45].

With regard to the relationship between the ERI model and road crashes or penalties, some studies have found a positive association between the effort-reward imbalance and road incidents among professional drivers, not all of them in the field of public transportation, but keeping close similarities regarding work schedules and stress measures. Although some empirical applications have reported not significant associations between work stress

and driving performance in Urban Bus drivers [61], other researchers have found indirect effects of work stress on road accidents through mediators such as fatigue [56,61,83,84,85] and health problems [5,19]. This study suggests that, in combination with burnout, job strain is a significant risk factor for road accidents among bus drivers.

Referring to the prevention of occupational traffic crashes, intervention strategies to manage work stress and burnout may generate positive outcomes for worker's health, safety and welfare, especially in the mid and long term [8,69]. The findings of this study suggest that there are substantial differences between the work conditions of BRT and Urban bus drivers. Although the stressors and burnout of BRT drivers are relatively high, the core characteristics of the BRT systems (exclusive lanes for the transit of the buses, elevated platforms to pick-up passengers and highly controlled itinerates) apparently contribute to enhance driving performance and reduce work stressors [82]. However, the BRT transportation system still present stressing conditions, especially time pressure and lack of job control, which are less prevalent in other public transportation systems [69].

Furthermore, BRT systems remain vulnerable to external risk factors such high amount of passengers, passenger aggression and adverse road conditions [66,71]. These external factors, combined to subjective problems of stress, burnout, may contribute to increase the risk of occupational accidents and poor health [9,79,80].

Finally, it is important to highlight the high prevalence of overweight and sedentary behavior in both BRT and Urban bus drivers [91,92]. Obesity and low physical activity are leading factors for cardiovascular disease, which in turn is associated with road accidents [93,94]. Moreover, work stress is associated with overweight [95,96] and negative lifestyle [97,98] and health outcomes [99,100]. In this sense, intervention programs addressing the occupational and health risks of bus drivers are urgently needed [101,102].

5. Conclusion

This study showed that the prevalence of work-related stress and burnout are elevated among Colombian bus drivers. In addition, it was found that the bus drivers' work stress is associated to burnout. Comparatively, BRT drivers tend to present better health and organizational outcomes than Urban Bus operators. However, both groups show relatively high risk for work stress, burnout and road accidents. Therefore, the intervention on these factors represent a potentially successful alternative for the prevention of occupational traffic accidents and negative health outcomes that represent very high costs for transport companies and the health systems.

5.1. Limitations of the Study

Although the questionnaires used in this research have good reliability, remain vulnerable to self-report bias. The sampling strategy of the study limits the generalizability of the findings. Finally, the cross sectional design did not allow inferring causality from the association between work stress, burnout, health issues and road accidents.

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