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Alcohol Consumption, Smoking, Job Stress and Road Safety in Professional Drivers

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Abstract

Objective: The aim of this study was to describe the prevalence of two addictive behaviours (regular alcohol consumption and smoking) among professional drivers and its relationship to Job Strain (job stress indicator of the Demand-Control model) and self-reported road safety outcomes.

Methods: The study sample was composed by 2445 Colombian professional drivers with an average of 38.01 years of age, a mean of driving experience of 15.81 years and, in average, 7.35 hours of daily driving. Participants of this study had a mean of 0.41 road accidents and 0.50 traffic fines registered in the last two years. It was designed a questionnaire composed by three sections: a) socio-demographic data, including items such as gender, age, and driving habits, b) Job Strain (JCQ), and c) self-reported habits related to addictive behaviors, in particular smoking and alcohol consumption.

Results: It was found that 20.3% of professional drivers have the habit of actively consuming tobacco, and 27.9% of drinking alcohol regularly. Furthermore, 28% of the sample presents Job Strain. Further, significant trends between smoking and: a) gender (i.e., being a male driver), and b) the fact of having Job Strain were found. Regarding alcohol consumption, two-step cluster analysis allowed to establish profiles of drivers when combining the fact of drinking alcohol regularly (or not) and the self-reported rates of fines and traffic accidents registered for the last two years. Finally, significant differences in Job Strain were established between drivers in both clusters, being the mean score higher for drivers reporting regular alcohol consumption and higher rates of fines and crashes.

Conclusion: This research suggests the need for the development of comprehensive interventions on psychosocial factors at work and lifestyle issues among professional drivers, based on the reported rates of the two addressed addictive behaviors and its relationship to adverse health, occupational and safety outcomes.

Keywords: Addictive behaviors; Alcohol consumption; Smoking; Job stress; Job strain; Road safety; Professional drivers

Introduction

Statistically, some habits related to addictive substances, such as regular alcohol consumption, increase not only the probability of suffering a traffic crash, but also the probability of increasing the severity of injuries caused by accidents when impaired by alcohol [1]. In fact, alcohol and psychotropic substances constitute some of the factors better significantly differentiating vehicle collision victims regarding demographic, injury type and/or severity and crash characteristics related to pre-crashes [2].

According to Seppala et al. [3], the association of a growing crash risk linked to the increasing of blood alcohol levels is enough documented, i.e., even at low blood alcohol levels (<0.05 g/dL), an increased crash risk is to be expected [4,5], mostly when there are other risk factors present, such as sleep decreasing or sleep systematic disorders [6,7], fatigue [8-10], stress [11-14], mood disorders [15,16] and/or different types of drugs [17], which tend to increase the risk even more.

Furthermore, psychotropic drugs apart from alcohol have been found to be related very less frequently to the occurrence of traffic crashes. Nevertheless, at glance of existing statistics, there is a non-under estimable potential risk related to drug use [3]. While other substances by itself are not as important as alcohol as a direct crash predictor, it should be kept in mind that the prevalence of drug consumption is very lower to alcohol and tobacco consumption in global terms, so that significant bias can occur in the causal analysis of the occurrence of traffic accidents related to these behaviors [18].

Alcohol consumption, smoking and its relationship to driving performance

Although variable conclusions have been described in the literature in this field, many psychotropic drugs have been systematically and constantly associated with different negative outcomes at work, such as health complains, interpersonal problems [19], absenteeism [20] and, in the field of transportation, to the decreasing of driving performance [21,22]. This is the case of alcohol consumption and the behavior of smoking while driving [23,24].

The evidence shows that poor outcomes in driving performance are related, among other variables, to alcohol, even in low dosage, and too many other drugs are also linked to impairment [1]. These behaviors,

all linked to addictions by years, have been demonstrated to be impairers of different processes needed to perform accurately the driving task [25], such as data processing, attention and rapid response to environmental demands, judgment, fatigue management, and the avoiding of aggression and risky behaviors [1,26].

In brief, recent studies have found that, in some countries, almost 10% of professional drivers use alcohol while driving [27] and several research experiences have documented that a wide amount of drivers use to drive after consuming alcohol and other psychoactive substances [28,29].

The alcohol consumption, even when takes place several hours previous to the driving task, is also related to losses regarding sleep and resting periods, and prolonged effects that use to interact with fatigue and driving demands to facilitate the commission of driving errors or violations [30], essentially when the operator uses to drive for long hours and/or under pressure, as normally happens in the field of professional driving [31]. Furthermore, it can continue affecting the driver when the breath alcohol level has fallen to near-zero [32]. In short, Barrett et al. [7] have concluded that there is no 'safe' level of alcohol intake for otherwise sleepy drivers, at any time of the day.

Finally, Drummer et al. [21] have found relevant evidence revealing that drivers dead in vehicle crashes and taking psychoactive drugs or combining two or more, were more likely to be responsible for the suffered accidents than those drivers taking neither drugs nor alcohol.

Associations between job stress and alcohol/tobacco consumption

Psychosocial factors at work and specially job stress have been demonstrated to have a predictive effect on two very relevant health risk-behaviors: smoking and alcohol consumption [33,34]. Nevertheless, the predictive value of job stress on smoking and alcohol consumption is relatively limited, and may largely depend on subjective characteristics such as coping mechanisms [33], the quantity and quality of objective stress factors at work [35], the workplace culture [36] and the perception of supportive factors in the work and/or social environment [35,37-39].

According to Frone [40], the alcohol consumption uses to represent a strategy for regulating negative emotions or thoughts derived from adverse working conditions. Furthermore, the accumulated evidence in the field implies that the relationship between psychosocial factors at work and alcohol consumption could be mediated by individual differences, essentially regarding the fact of using alcohol to cope with work stressors [39,40], In the specific case of Demand-Control model, that uses the concept of Job Strain as stress indicator [41,42], it has been demonstrated in some groups of workers that the presence of Job Strain (i.e., a high amount of demands combined with a low level of control/decision latitude at work) is associated with hazardous drinking habits [43] and frequent alcohol consumption [44]. For the case of the relationship between Job Strain and smoking among workers, the evidence has shown that smoker workers are more likely than non-smokers to report work-related indicators, such as Job Strain in the case of Demand-Control model [45] and the Effort-Reward Imbalance in the ERI model [46] in terms of prevalence and intensity of tobacco consumption. This phenomenon seems to be associated to other factors present in the work environment such as social support and job overload [47].

In the same way than adverse physical [48,49] and mental [50] health conditions, fatigue [8,10], smoking and alcohol consumption [51], job stress, closely linked to typically adverse working conditions, has been systematically associated to poor safety outcomes in the field of public transportation [52,53]. However, several studies dealing with alcohol consumption and job stress have suggested the need of further to clarify the causal nature of the association between stressors at work and addictive habits related to alcohol and other substances [54].

Objective

The aim of this study was to describe the prevalence of two addictive behaviours (regular alcohol consumption and smoking) among professional drivers and its relationship to: a) Job Strain (job stress indicator of the Demand-Control model), and b) self-reported road safety outcomes along the last two years.

Methods

Sampling

For this study, it was used a sample of n=2445 professional Colombian drivers (93.9% men and 6.1% women) between 18 to 77 years of age, with a mean of $\bar{x}$=38.01 (SD=10.22) years. The average driving experience of these professional drivers was $\bar{x}$=15.81 (SD=9.56) years. The mean of week days driving was $\bar{x}$=4.46/5 (SD=1.17). Furthermore, over the last two years, participants of this study had $\bar{x}$=0.41 (SD=0.91) occupational accidents at the wheel and $\bar{x}$=0.50 (SD=1.26) traffic fines or penalties.

Procedure: Design and ethics

For this cross-sectional study, participants have been selected through a convenience sampling in six main cities of Colombia. Both transport companies (public, freight and private transport) as individuals, invited through cooperation of various institutions, were contacted during a period of approximately eight months for data collection purposes. Professional drivers have completed the questionnaire, designed in a paper version, 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 global response rate was approximately 85%.

Description of the Instrument

The first part of the questionnaire asked for socio-demographic data, including items such as gender, age, and driving habits, i.e., driving experience, daily intensity of driving and days driving per week.

Secondly, job stress conditions were assessed according to the Karasek's Job Strain model [55]. For this purpose, it was used the 27 item-scale of the Colombian Job Content Questionnaire (JCQ) [56]. The JCQ has been widely used to assess psychosocial factors in the workplace and their effects on health. The response scale consists of a 4-point likert scale (1="totally disagree" and 4="totally agree"). The 27 items of the JCQ are grouped in six sub-scales: support from supervisors (4 items. α=0.87), peer support (4 items. α=0.79), skill discretion (6 items. α=0.75), decision authority (3 items. α=0.69), psychological demands (6 items. α=0.66) and job insecurity (4 items. α=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). A value of 1.0 or higher in Job Strain indicates the presence of Job Stress in the participant.

Finally, the third part of the survey consisted of questions about a) self-reported habits related to addictive behaviors: Do you smoke (Yes/No)? Do you Drink Alcohol Regularly? (Yes/No), and b) traffic accident and penalty rates along the last two years.

Variable	Mean	SD	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Demographics and Driving-related Variables																
Age (years)	38.01	10.22	0.808**	0.197**	0.038	0.012	0.019	-0.176**	0.067**	0.080**	0.082**	-0.131**	0.005	0.037	-0.108**	-0.187**
Driving Experience (Years)	**15.81**	**9.57**	**1**	**0.243****	**0.052***	**0.020**	**0.033**	**-0.143****	**0.077****	**0.112****	**0.107****	**-0.114****	**0.01**	**0.041**	**-0.072****	**-0.141****
Hours Driving	7.35	2.82		1	-0.03	-0.057*	-0.055*	-0.066*	-0.021	0.048*	0.011	0.004	0.122**	0.084*	0.044*	-0.076**
JCQ Components																
Skill Discretion	36.44	5.50			1	0.649**	0.848**	0.096**	0.393**	0.403**	0.451**	-0.538**	-0.013	-0.026	-0.050*	0.017
Decision Authority	35.75	9.68				1	0.953**	0.122**	0.373**	0.0356**	0.415**	-0.593**	-0.059**	-0.001	-0.041	0.054**
Control	72.28	13.90					1	0.124**	0.417**	0.409**	0.469**	-0.627**	-0.041	-0.011	-0.054*	0.042*
Demands	30.63	7.17						1	-0.102*	-0.028	-0.071*	0.648**	-0.035	-0.067**	-0.016	0.061**
Supervisor Support	11.85	2.84							1	0.580**	0.901**	-0.381**	-0.023	0.018	-0.013	-0.005
Peer Support	12.61	2.56								1	0.876**	-0.302**	-0.013	-0.02	-0.019	0.007
Social Support	24.49	4.78									1	-0.387**	-0.023	0.004	-0.021	-0.003
Job Strain	0.88	0.28										1	0.007	-0.055*	0.021	0.01
Road Safety Outcomes (2 years)																
Accidents Driving	0.41	0.91											1	0.167*	0.036	0.036
Traffic Fines	0.50	1.26												1	0.026	0.046
Smoking and Alcohol Consumption (Habits)	**Valid Frequency**	**Valid %**														
Do you Smoke? (Yes)	447	20.30%													1	0.169**
Do you Drink Alcohol Regularly? (Yes)	624	27.90%														1

Table 1: Descriptive statistics and Pearson correlations between the study variables; **correlation is significant at the 0.01 level (2-tailed); *correlation is significant at the 0.05 level (2-tailed).

Statistical analysis

Descriptive statistics (e.g. mean, standard deviation) and Pearson' (bivariate) correlational analysis were performed to present the global results and associations between the study variables of the general sample of professional drivers. Frequencies were used to obtain the reported prevalence of key addiction-related indicators. For comparing specific trends in alcohol and tobacco consumption (according to gender and other categorical variables), Chi-Square tests were

conducted. Finally, two-step cluster analysis and One Way ANOVA were performed to determine the adjustment of the combination of central study variables and comparing these groups in terms of Job Strain, respectively. All statistical analyses were performed using ©IBM SPSS (Statistical Package for Social Sciences), version 23.0.

Results

Descriptive data and bivariate correlations

Table 1 presents the descriptive statistics of the study and the bivariate correlations between them. Regarding Job Stress, it was found that 28.0% of professional drivers present Job Strain. Although it was found that this sample of professional drivers had an average of job strain below the risk score ($\bar{x}$=0.88; SD=0.28), keeping in mind that values greater than 1.0 represent an unfavorable inequality between demands and control at work, the average self-reports on accidents and traffic fines were relatively high. In other words, in average, four of each ten drivers have reported at least one traffic accident along the last two years, and the average of received sanctions is approximately of 0.5 per driver.

Regarding adverse lifestyle or addictive behaviors (i.e., smoking and alcohol consumption), it was found that 20.3% of the sample of professional drivers has the habit of actively consuming tobacco and 27.9% of drinking alcohol regularly.

Correlational analysis allowed establishing significant measures of association between components of the Demand-Control model (measured by JCQ) and alcohol and tobacco consumption among professional drivers. For instance, tobacco consumption was negatively associated with skill discretion and perceived levels of control at work. On the other hand, regular alcohol consumption was found positively associated with decision authority, perceived control at work and psychological demands present in the work environment. It was also observed that alcohol consumption results negatively and significantly associated with the number of hours driving per week, the age of participants, and their years of experience as professional drivers. Further, it was found a significant and positive association between tobacco consumption and driving hours, and a negative correlation between this behavior and the age and driving experience of participants.

Categorical comparisons

Differential rates on gender regarding the prevalence of alcohol (28.1% men and 25% women) and tobacco (21.0% men and 10.1% women) consumption were found. In general, the obtained rates regarding both issues were higher in terms of relative percentages for men. Trough Chi-Square (X^2) analysis it was possible to establish a significant trend between gender, i.e., the fact of being a male professional driver, and the fact of having the habit of tobacco consumption (X^2=9.441; p<0.001). It was also established that there is an existing association between the fact of presenting Job Strain (Job Stress indicator of DC model) and tobacco consumption (X^2=4.848, p=0.017).

Cluster analysis and mean comparisons

Through a two-step cluster analysis, it was determined the optimum number of clusters for the combination of two continuous variables (i.e., accidents and traffic fines) and a categorical variable (i.e., regular alcohol consumption). Starting from fifteen possible clusters, it was found an optimal combination of the variables for two clusters (e.g. Silhouette measure of cohesion and separation near 0.7), according to the values registered for the aforementioned variables:

Cluster 1: Professional drivers with a higher rate of accidents ($\bar{x}$=0.47; SD=0.92) and traffic fines ($\bar{x}$=0.46; SD=0.86) reported in the last two years, presenting the habit of regular alcohol consumption (99.8%) containing 34.2% of the valid sample.

Cluster 2: Professional drivers with a lower rate of accidents ($\bar{x}$=0.34; SD=0.95) and traffic fines ($\bar{x}$=0.41; SD=0.87) reported in the last two years not presenting the habit of regular alcohol consumption (0.02%) containing 65.8% of the valid sample.

The summary of the two-stage two-cluster model can be seen in the Figure 1 below:

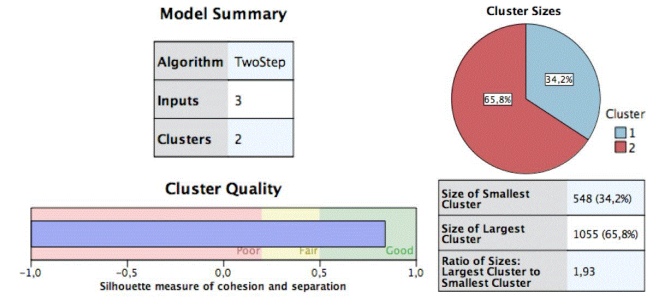

Figure 1: Information of two-cluster model obtained and cluster quality measurement.

It is observed that the number of records of each cluster is representative. So that the two conglomerates are maintained, it has not been considered necessary to apply another method of non-hierarchical analysis, to obtain consistent, representative and epidemiological-oriented results.

Furthermore, when comparing mean scores of Job Strain between groups through Analysis of Variance (ANOVA), it was found that professional drivers in Cluster 1 ($\bar{x}$=0.885; SD=0.27) have a significantly lesser mean for Job Strain than those included within Cluster 2 ($\bar{x}$=0.856; SD=0.26), with F(1.1487)=3.942; p=0.048, as graphically shown in Figure 2.

Discussion and Conclusion

Different studies have described in general the negative influence of alcohol [23,57] and tobacco [58,59] on driving and road safety. However, in the case of developing countries (as the case of Colombia), a considerably minor amount of evidence has been accumulated regarding the impact of substance consumption upon subsequent health and safety outcomes among professional drivers [60,61] and its relationship with working conditions and job stress, even considering the typical adverse working conditions and high prevalence of addictive behaviors and Job Strain registered among professional drivers [8,53,62]. On the other hand, the existing empirical evidence about alcohol and tobacco consumption has addressed different factors modulating the impact of psychosocial factors at work, almost always in the form of increased health and accident risk, as well as with a higher prevalence of risky behaviors at the wheel. Although risky

behaviors are not equivalent to accidents by themselves, do predict an important part of them [26,63]. For the specific case of Colombia, which rate of deaths in traffic accidents have been between 5000 and 6000 persons/year along the last years [64], the registered data for substance consumption among drivers results adverse by itself. The third cause of death and sixth cause of injuries derived from traffic accidents in 2012 were related to the consumption of alcohol and/or other substances considered as psychotropic [63]. Specifically, in the occupational field, Sánchez and Forero [65] have found that injuries related to driving task constitute 25% of all industrial accidents registered. Other studies have found that alcohol and/or substance consumption among Colombian drivers oscillate between 18% and 24% [66] compared to the 27.9% found in this research.

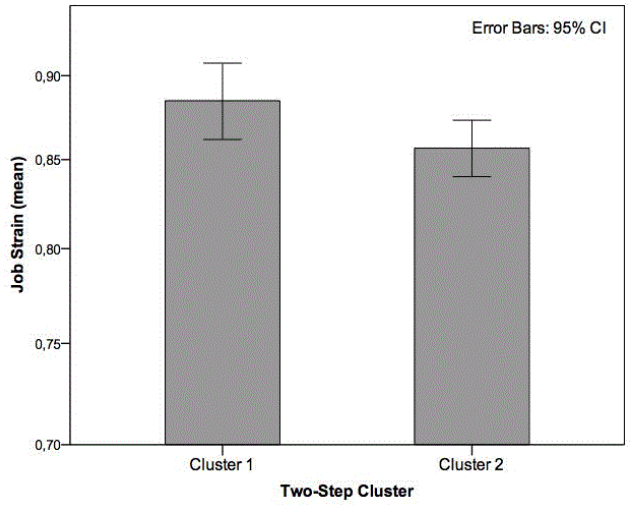

Figure 2: Comparative job strain means between clusters 1 and 2.

In the present study it has been found, in brief, a set of relevant associations between self-reported health habits widely related to addictive behaviors, demographic and work-related variables. In this sense, it is worth mentioning that other empirical studies dealing with professional drivers have also targeted smoking as a classical risk factor, whose interaction with specific occupational stressors. Job Strain and social support could facilitate the development and maintenance of maladaptive habits and behaviors among them (in fact. smoking intensity has demonstrated to be predicted by occupational stress) [67], contributing to show different adverse health symptoms [68,69] and negative occupational outcomes in the mid and long term, both in professional drivers as in a very long list of other groups of workers [70]. On the other hand, alcohol consumption has been largely related to several health complains [71,72] and directly linked to the increasing of incidentallity and accidentality rates in the field of professional driving [73,74]. In this sense, it is striking that approximately one in five Colombian professional drivers currently has the habit of smoking (20.3%) and one in four (27.9%) of them regularly consume alcohol.

Regarding the reported differential trends between men and women in terms of tobacco consumption (21% versus 10.1%, respectively), sex differences in this respect have been documented by international comparative studies determining, for instance, according to Pampel [75], a 39.9% of prevalence among male America's inhabitants and 18% for women, arguing that many biological, social and cultural factors tend to explain a substantial part of this disproportionality [76,77]. Although the found rates are not essentially equivalent to those documented in general population, the approximate ratio of 2:1 (men:women) is maintained almost steadily for the case of professional drivers.

The fact of presenting Job Strain, i.e., the indicator of Job Stress of the Demand-Control approach [41], has been also associated to the fact of being smoker. This suggests, indirectly (taking into account the results of the study and its limited inferential capacity) and directly (keeping in mind the preceding empirical evidence) the need of developing effective and systematic occupational interventions for reducing: a) occupational stress, as a measure for reducing, inter alia, the risk for tobacco consumption [33], and b) the habit of tobacco consumption inside and outside the occupational field, taking into account its implications for physical and mental health [68] and for occupational [70] and safety [59] outcomes of professional drivers.

Finally, it is worth mentioning the importance of addressing the relationship between regular consumption of alcohol and safe driving: two-step cluster analysis allowed establishing profiles of drivers when combining the fact of drinking alcohol regularly (or not) and the self-reported rates of fines and traffic accidents registered for the last two years. The adjustment and quality of the cluster model allow to support the clear difference in terms of these variables between professional drivers who have (or not) the habit of regularly drinking alcohol, in accordance to which has been suggested in several studies assessing the increased risk of misbehaviors and/or accidents at the wheel based on this behavior [1-7,43,77]. Furthermore, obtained differences in terms of Job Strain between drivers in both clusters (i.e., higher Job Strain rates for participants in cluster number 1) result consistent to other empirical research documenting the critical relationships existing between: a) job stress and both addressed addictive behaviors [34,78,79], b) job stress and traffic accidents [49,80,81], and c) addictive behaviors such as alcohol consumption, lifestyle factors and safety outcomes [81,82]. It also suggests the need for the development of comprehensive interventions on psychosocial factors at work, keeping in mind the recent growing evidence on the impact of working conditions and its related processes, such as fatigue [83], burnout [52] and social support [84], contributing to the emergence of new risks for health [85], and welfare of professional drivers [86].

Other factors related to work environments of professional drivers that must be kept in mind are attention/distractions at the wheel [87]. Some suggested interventions have integrated these issues in holistic programs addressing also the prevention of consumption of different substances such as tobacco and alcohol (during and before driving) as a manner to reducing objective risk of occupational accidents [87-89]. In brief, apart from merely confronting intra-organizational factors, this type of actions can play, also, a substantial role contributing for reducing the impact of the typical adverse occupational conditions of professional drivers [53] on public health, through the promotion of safety policies [90], healthier environments and potentially lower rates of injuries and deaths produced by traffic crashes.

Limitations of the Study

Although the questionnaires employed for this research process have a good reported reliability, remain vulnerable to self-report bias. The cross sectional design did not allow inferring causality from the association between job strain/addictive behaviors and traffic crashes

in professional drivers, but only to describe associations and trends related to the study variables. Furthermore, the sampling strategy and geographical covering of the study limits the generalizability of the findings. Also, proportional rates of gender distribution present very differential values between the number of men and women participating in the study. It is mostly related to the predominance of male workers in this sector of the industry. However, for future research it is worth recommending performing convenience samples to address this potential biasing source. Finally, it is important to remark the need to study other aspects of alcohol and tobacco consumption (i.e., frequency, intensity, reasons) to obtain a greater explanatory character of the relation between these behaviors and: a) psychosocial factors at work, including different approaches to job stress, and 2) mid and long term outcomes in terms of occupational health and safety.

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