Serrano-Fernández, M. J., Boada-Grau, J., Robert-Sentís, L., Vigil-Colet, A. (2019). Predictive variables for musculoskeletal problems in professional drivers. *Journal of transport & Health*, *14*, 100576. https://doi.org/10.1016/j.jth.2019.100576

Title: Predictive variables for musculoskeletal problems in professional drivers.

Abstract

Background: Professional drivers are considered prone to health risks with a high prevalence of diverse types of pain. Several authors have analyzed how certain work characteristics can produce musculoskeletal disorders in professional drivers. Drivers usually report back pain as a stressor, but they also report pain in areas such as the neck, shoulders and knees. Physical agents (vibrations and noise), postural stress, high density of traffic, numerous and frequent tasks put professional drivers at high risk of musculoskeletal disorders, fatigue, effects on drivers' mental health. For this reason, we have conducted a predictive study to analyze variables that may be predictors of stress in driving. **Methods:** In the present work we develop a predictive model for musculoskeletal disorders in professional drivers that uses the following indicators: Age, Gender, Seat Comfort, Seat Suspension, Adjustable Lumbar Support for the driver's seat, Driving Hours, Sleep Quality, Driver Stress, Irritation, Hardiness, Burnout, Safety Behaviors and Impulsivity. Participants in the study were 372 professional drivers from various transport sectors recruited via non-probabilistic sampling. For this study we used the SPSS 25.0 program. **Results:** The variables to predict trunk musculoskeletal problems were: Psychophysiological Disorders, Challenge, and ME Extremities. These variables account for 30.6 % of the criterion variable's variance. The variables to predict musculoskeletal problems of the extremities were: Psychophysiological Disorders, ME Truck, Cognitive Irritation, Seat Suspension, Hours, Cynicism and Emotional Irritation. These variables account for 34.3 % of the criterion variable's variance. The best predictor was Psychophysiological Disorders. **Conclusions:** This study helps to extend knowledge of musculoskeletal disorders with the aim of improving the health of professional drivers. The results highlight the importance of designing individual interventions to reduce the incidence of musculoskeletal problems in professional drivers. This would provide greater well-being and lead to a reduction in sick leave.

Keywords: Professionals drivers; musculoskeletal problems; occupational health; ergonomics; psychophysiological disorders; occupational risks.

1. Introduction

1.1. The overall health of drivers and the epidemiological evidence

The health of professional drivers is considered to be potentially at risk, with a high prevalence of diverse types of pain (INSHT, 2013). Physical agents (such as vibrations) put professional drivers at high risk of musculoskeletal disorders. Drivers usually report back pain as a stressor (Rayo, Arias, Álvarez, & Salas, 2007) but they also report pain in areas such as the neck, shoulders and knees (Anderson, 1992; Bonilla & Gafaro, 2016; Tse, Flin, & Mearns, 2006). The most common health symptoms experienced by bus drivers are fatigue, back pain, coughs and colds. Studies by (Anderson, 1992; Tse et al., 2006)), indicate that neck pain is due to the frequent abrupt turns of the head drivers make while driving and loading passengers.

Alperovitch-Najenson, Katz-Leurer, Santo, Golman and Kalichman (2010) reported that the prevalence of neck pain and shoulder pain in the previous 12 months among professional Israeli urban bus drivers was 21.2% and 14.7%, respectively, and that the only area of the body with a high prevalence of pain due to musculoskeletal-related work was the lower back.

In this context, Basantes, Parra, Garcia, Jo de Carvallo and Garcia (2017) assert that the most common risks for professional drivers include: traffic accidents; long periods of driving without rest; physical agents caused by solar radiation, dazzling and vibrations; exposure to adverse weather conditions; physical load; adopting enforced postures and repetitive movements; visual load; and mental load due to factors such as number of hours worked, nocturnality, isolation, monotony and stress. If we add posture to this list, then these workers may suffer from pain in the neck, shoulders, arms and wrists, and remain for hours in a painful and fatiguing position (Gómez, Cremades, & Montoya, 2015).

1.2. The role of work conditions in professional drivers

The conditions in which professional drivers work should be taken into account. For example, Santos and Lu (2016) report that bus drivers work an average of 16 hours a day. Moreover, they engage in risky behaviors such as fast passenger boarding and rushing to avoid being late. Fletcher and Dawson (2001) related fatigue at work to the number of hours worked. It has also been reported that fatigue and the need to recover mediate in the associations between work stress and risky driving and between social support and risky driving (Useche, Ortiz, & Cendales, 2017). Chen and Xie (2014) consider that the number of Driving Hours and the length of breaks are closely related to a truck driver’s fatigue. Fatigue is a major contributor to truck accidents (Castro, Gallo, & Loureiro, 2004; Muñoz-Escobar, 2018).

Effects on drivers’ mental health has also been highlighted (da Silva-Júnior, Nunes de Pinho, de Mello, Sales de Bruin, & Carvalhedo de Buin, 2009; Hilton, Staddon, Sheridan, & Whiteford, 2009; van der Ploeg & Kleber, 2003). Gómez-Ortiz, Cendales, Useche, & Bocarejo (2018) show that increases in drivers' mental health problems are associated with increased work pressure, less support from co-workers, fewer rewards, and more signal conflict while driving.

Moreover, urban drivers are also exposed to high levels of physical load due to the high density of traffic and the constant stops they are required to make. (Rayo et al., 2007). The work of these drivers is also characterized by the simultaneous performance of numerous and frequent tasks while exposed to vibrations and noise (Göbel, Springer, & Scherff, 1998; Rayo et al., 2007).

Several authors have linked driving with Burnout (Arias, Mendoza, & Masias, 2013; Couto & Lawoko, 2011; Olivares, Jélvez, Mena, & Lavarello, 2013; Sanchez, 2016). In this paper we have taken into account the importance of personal factors in the resistance and vulnerability of these drivers. Hardiness is closely related to workers' health since it has been shown that those with a strong personality perceive stressful situations as less threatening and so confront them more actively (Kobasa, 1979, 1982).

1.3. The role of work conditions on musculoskeletal disorders

Rayo et al. (2007) identified various factors that contribute to the appearance and development of back problems, the two most important of which are postural stress and long-term exposure to whole-body vibrations. It has also been observed that lengthy exposure to static postures can lead to problems in the neck and shoulders as well as to pain in the lower back region (Fernández-D'Pool, Vélez, Brito, & D'Pool, 2012; Galindo-Estupiñan, Maradei-García, & Espinel-Correal, 2016; Hannerz & Tüchsen, 2001; Okunribido, Shimbles, Magnusson, & Pope, 2007; Rayo et al., 2007).

Fernández-D'Pool, Vélez, Brito, & D'Pool, (2012) associate the occupational handling of vehicles with a high prevalence of lower back pain. Robb and Mansfield (2007) assert that factors causing pain are diverse and include a prolonged sitting posture, poor posture, exposure to whole-body vibration, as well as other factors not related to the driving of vehicles, such as lifting objects, poor diet, and other psychosocial factors. The drivers are restricted to small cabins with little space for flexibility or leg movements. This static posture and poor freedom of movement aggravate the muscular tension that is accumulated during work (Evans, 1994; Tse et al., 2006).

Important factors that minimize the occurrence of musculoskeletal problems are social interaction with peers, supervisor support, and a calm work atmosphere (Fernández-D'Pool et al., 2012; Sluiter, Van Der Beek, & Frings-Dresen, 1999). These factors are difficult for drivers to attain because of their low level of interaction with other drivers, the pressure and stress to which they are subjected due to the nature of their work and by their supervisors, and their poor work ergonomics, all of which promote musculoskeletal problems (Ahlberg-Hulten, Theorell, & Sigala, 1995; Fernández-D'Pool et al., 2012; Sluiter et al., 1999).

1.4. General aim and hypothesis

The general aim of this study is to develop a predictive model for the musculoskeletal disorders of professional drivers using the following indicators: Age, Gender, Seat Comfort, Seat Suspension, Adjustable Lumbar Support for the driver's seat, Driving Hours, Sleep quality, Driver Stress, Irritation, Hardiness, Burnout, Safety Behaviors and Impulsivity.

Hypothesis 1: The Age, Gender, Seat Comfort, Seat Suspension, Adjustable Lumbar Support for the driver's seat, Driving Hours, Sleep quality, Driver Stress, Irritation, Hardiness, Burnout, Safety Behavior and Impulsivity, can predict the musculoskeletal disorders of the trunk.

Hypothesis 2: The Age, Gender, Seat Comfort, Seat Suspension, Adjustable Lumbar Support for the driver's seat, Driving Hours, Sleep quality, Driver Stress, Irritation, Hardiness, Burnout, Safety Behaviors and Impulsivity, can predict the musculoskeletal disorders of the extremities.

2. Method

2.1. Participants

Our sample comprised 372 Spanish professional drivers (93.4 % men, 6.6 % women) with an average age of 40.9 (*SD*= 10.54). Passenger drivers accounted for 33.3 %, freight drivers for 28.0 %, ambulance drivers for 2.4 % and taxi drivers for 36.3 %. The average years' experience of these drivers was 10.46 (SD=13.05). Of the drivers, 70.8% were married or living with their partner, 21% were single, and 8.0% were divorced, separated, or widowed. With regard to level of education, 20.6% had not completed primary education, 55.2 % had completed higher secondary education, the first level of vocational training or compulsory secondary education, 21% had completed middle school, the second level of vocational training or Prep School, and 3.2% had taken university studies. The average number of hours worked per week is 44.22 (SD = 16.9) and the average number of minutes spent per day sitting in the vehicle is 374.93 (SD = 237.30).

2.2. Procedure

The data were collected from a Spanish sample of professional drivers. We used non-probability sampling (Hernández, Fernández, & Baptista, 2004), also known as accidental-random sampling (Kerlinger & Lee, 2004), to obtain the sample. The response rate was approximately 80%. The selection of participants was carried out through the social and business network. The participants answered voluntarily and did not receive any form of gratification. Participants were informed that data obtained is totally confidential and anonymous. A protocol was prepared for the participant that included a cover letter, informed consent and the questionnaires to be answered. The questionnaires were answered at their usual workplace.

2.3. Instruments

The Musculoskeletal Problems Scale (MP-9; Robb & Mansfield, 2007), which was adapted for Spanish by Robert-Sentís (2016), evaluates musculoskeletal problems and vibrations. This scale comprises 9 items and two factors: “F1. Musculoskeletal aspects”, which refers to the body (e.g. the shoulders) (α =.72); and “F2. Extremities” (e.g. the knees), where the vibrations considered indicate Seat Comfort and lumbar adjustment (α =.70). The instrument comprises a five-point Likert scale ranging from (1 = Never to 5 = Always).

The Groningen Sleep Scale (GSQS-8; Serrano-Fernández, Boada-Grau, Robert-Sentís, et al., n.d.) is the Spanish version of the GSQS-15 (Meijman, de Vries-Griever, & de Vries, 1988). It evaluates subjective qualities of sleep, such as general quality of sleep, lack of sleep, difficulty in falling asleep, problems sleeping, and not resting. It has a unifactorial structure (α =.90). Each item has six possible answers ranging from 1 (Strongly disagree) to 6 (Strongly agree). An example of an item is: “1. Last night I slept soundly”.

To evaluate stress in driving we used the Trans Driver Stress (TDS-15; Serrano-Fernández et al., 2018), which was created from the 59 items of the Bus Driver Stress (Dorn, Stephen, af Wahlberg, & Gandolfi, 2010). The TDS-38 has a 6-point Likert scale and comprises 5 factors each containing 3 items. The first factor is Relaxed driving (RD; α = .70), which refers to the driver’s state of relaxation or tension during, before and after driving. The second is Preventing Hazards (PH; α = .71), which indicates the effort made while driving and the dangers that may be encountered while driving on the road. The third is Alertness and Vigilance (AV; α = .70), which refers to the ease with which the driver is able to relax while driving or after driving. The fourth is Thrill Seeking (TS; α = .76), which refers to the style of driving (risky vs. prudent). Finally, the fifth factor is Fatigue and Anxiety (FA; α = .70), which indicates the driver’s level of fatigue and state of nervousness while driving. Each item has six possible answers ranging from 1 (Strongly disagree) to 6 (Strongly agree).

The Spanish version (Chico, Tous, Lorenzo-Seva, & Vigil-Colet, 2003) of Dickman’s Impulsivity Inventory Scale (Dickman, 1990) comprises 23 items and 2 subscales and has a dichotomous response format (1 = *true* / 0 = *false*). “F1. Functional impulsivity” assesses impulsiveness that is beneficial and helps one to adapt to unexpected situations that require a quick response. This is made up of 11 items (α = .77) (e.g. “5. Most of the time I can concentrate on my work very quickly”. “F2. Dysfunctional impulsivity” refers to impulsiveness that, far from helping us, may be counterproductive. It is made up of 12 items (α = .76) (e.g. "2. I frequently say the first thing that comes into my head without giving it much thought").

The TRANS-18 Scale (Boada-Grau, Sánchez-García, Prizmic-Kuzmica, & Vigil-Colet, 2012) detects Safety Behaviors (personal and in-vehicle) and psychophysiological disorders. It is made up of 18 items (3 subscales). "F1. Psychophysiological Disorders" of the driver (α = .81) is related to things the driver may suffer from and refers to the appearance of anxiety, stress, digestive and musculoskeletal disorders, depression and hypertension (e.g. "11. I have had bouts of depression caused by my job"). "F2. Personal Safety Behaviors" (α = .80) refers to abstaining from driving after drinking alcohol or eating a big meal as well as to not eating or drinking while driving (e.g. "7. I avoid driving when I'm smoking and I do not hold a cigarette, cigar...in my hand"). "F3. Vehicle Safety Behaviors" (α = .70) refers to putting on work gloves to perform job tasks, knowing how to use extinguishers, being alert while driving, and resting the mandatory number of hours (e.g. "3. I use work gloves when I handle and load freight, change a tire, etc.").

The Hardiness (CPR; Moreno-Jiménez, González, & Garrosa, 2001) scale comprises 21 items and three dimensions each containing 7 items. "F1. Control" is the sensation participants have with regard to influencing events (e.g. "I do all I can to make sure I have control over my work results"; α = .74). "F2. Commitment" is defined as the tendency to develop behaviors that entail personal involvement or the tendency to identify with what one does (e.g. "1. I get seriously involved in what I do because it is the best way to accomplish my own goals"; α = .79). "F3. Challenge" indicates that potentially stressing stimuli are perceived as opportunities for growth (e.g. "5. In my work I am especially attracted to innovations and new developments in procedures"; α =.83). The responses are on a 4-point Likert scale and range from 1 (*totally disagree)* to 4 (*totally agree).*

The Burnout scale (MBI-GS; Salanova, Schaufeli, Llorens, Peiró, & Grau, (2000)) evaluates burnout and comprises 15 items (3 subscales). “Exhaustion” (α = .87) comprises 5 items (e.g. “6. I am ‘burned out’ by work”). “Cynicism” (α = .85) comprises 5 items (e.g. “9. I have lost enthusiasm for my work”). “Professional efficiency” (α = .78) comprises 6 items (e.g. “12. I have achieved many valuable things in this position”) with a 7-point Likert scale ranging from 0 (*Never/ Any time) to* 6 (*Always/every day).*

We also collected data on Age, Seat Comfort, Seat Suspension, Driver’s seat adjustable for lumbar support, and Weekly hours of driving. These data were obtained through specific items.

2.4. Data Analysis

We began our analysis by using Pearson’s correlation coefficients to calculate the correlations between the predictor variables and the criterion variables. We then performed multiple regressions using IBM SPSS Statistics 25 software following the stepwise option (Hinton, McMurray, & Brownlow, 2014).With this method, the variables are incorporated into the regression model. There were twenty-five variables corresponding to: Age, Gender, Seat Comfort, Seat Suspension, Adjustable Lumbar Support, Weekly hours of driving, Sleep quality, Driver Stress, Irritation, Resistant personality, Burnout, Safety and Impulsivity behaviors. The first step was to select the variables which, as well as satisfying the entry criteria, correlated best with the criterion variable (musculoskeletal problems of the trunk and extremities). In the following steps the partial correlation coefficient was used as a selection criterion: the variables were selected one by one provided they not only satisfied the entry criteria but also possessed the partial correlation coefficient with the highest absolute value. Whenever a new variable was incorporated into the model, the previously selected predictive variables were re-evaluated to determine whether they satisfied the exit criteria. If any selected variable did satisfy the exit criteria, it was ejected from the model. The process came to an end when no more predictive variables satisfied the entry criteria and no selected variables satisfied the exit criteria. The aim was to explain the maximum variance with the minimum number of predictive variables.

3. Results

3.1. Reliability analysis

Table 1 shows the instruments used in the present investigation. The indices for internal consistency are appropriate since they range from 0.70 (Relaxed Driving) to 0.87 (Exhaustion).

INSERT TABLE 1 HERE

3.2. Correlation analyses

The correlational study featured below (Table 2) displays only correlations between the criterion variables and the predictor variables in this study. We extracted positive correlations between ME Trunk and the following eight variables: Sleep quality (GSQS8), Fatigue and Anxiety (TDS15.FA), Emotional and Cognitive Irritation (IE/IC), Exhaustion (MBI.A), Cynicism (MBI.C), Thrill Seeking (T18.TP) and Functional impulsivity (IMP.F). We extracted negative correlations between ME Trunk and the following six variables: Seat Comfort, Seat Suspension, Adjustable Lumbar Support, Relaxed driving (TDS15.RD), Preventing Hazards (TDS15.PH) and Implication (CPR.I). We also found positive correlations between ME Extremities and eight variables: Age, Sleep quality (GSQS8), Fatigue and Anxiety (TDS15.FA), Emotional Irritation (IE), Cognitive Irritation (IC), Exhaustion (MBI.A), Cynicism (MBI.C) and Psychophysiological Disorders (T18.TP) and negative correlations between ME Extremities and seven variables: Seat Comfort, Seat

Suspension, Adjustable Lumbar Support , Relaxed driving (TDS15.RD), Preventing Hazards (TDS15.PH), Personal Safety Behaviors (T18.SP), and Vehicle Safety Behaviors (T18.SV).

INSERT TABLE 2 HERE

3.3. Multiple regression

We performed a multiple regression model to test the effects of predictor variables (twenty-five) on criterion variables in connection with musculoskeletal problems. This statistical technique provides an objective way to evaluate the predictive ability of a set of independent variables (Hair, Anderson, Tatham, & Black, 1999). Tables 3 and 4 show the data corresponding to the adjusted R^2 indices and significant typified beta coefficients between the criterion variables and predictive variables in this study. Two multiple linear regression models were used for this purpose.

INSERT FIGURE 1 HERE

The first model was used to identify the degree to which these predictor variables were able to predict trunk musculoskeletal problems. Table 3 shows a summary of the model in which we observe that the predictor variables were: Psychophysiological Disorders (T18.TP), Challenge (CPR.R), and ME Extremities (ME.E). These variables account for 30.6 % of the criterion variable’s variance. Psychophysiological Disorders stands out as the best predictor, accounting for 21.4 % of the variance. Among the most important aspects are the beta coefficient values. If we look at these coefficients, we can see that the predictor variables found to be statistically significant were Psychophysiological Disorders (β= .344), Challenge (β= -.215) and ME Extremities (β= .233), all of which were significant.

INSERT TABLE 3 HERE

The second model was used to identify the degree to which these predictor variables were able to predict musculoskeletal problems of the extremities. Table 4 shows a summary of the model in which we observe that the predictor variables were: Psychophysiological Disorders (T18.TP), ME Truck (ME.T), Cognitive Irritation (IC), Seat Suspension, Hours, Cynicism (MBI.C) and Emotional Irritation (IE). These variables account for 34.3 % of the criterion variable's variance. Psychophysiological Disorders stands out as the best predictor, accounting for 17.8 % of variance. Among the most important aspects are the beta coefficient values. If we look at these coefficients, we can see that the predictor variables found to be statistically significant were Psychophysiological Disorders (β= .219), ME Trunk (β= .270), Cognitive Irritation (β= .149), Seat Suspension (β= -.222), Weekly hours driven (β= .142), Cynicism (β= -.201), and Emotional Irritation (β= .169), all of which were significant.

INSERT TABLE 4 HERE

4. Discussion

4.1. Summary and discussion of the results

The results we present above are in line with the notion that certain variables have predictive power over factors studied in relation to musculoskeletal problems.

The first hypothesis is partially verified since the best predictive model for the musculoskeletal problems of the trunk is one that includes three variables, of which Psychophysiological Disorders and ME Extremities act in a positive way. Some authors indicate that reducing the exposure of truck drivers to vibration by intervening seats can lead to improvements in lumbar back pain, in addition to other health outcomes (Kim, Zigman, Dennerlein, & Johnson, 2018; Rayo et al., 2007; Robb & Mansfield, 2007). In this context, Melin and Lundberg (1997) showed that mental stress induces muscle tension and that individuals at risk of musculoskeletal disorders are characterized by a lack of disconnection and elevated physiological elevation in non-work situations. On the other hand, report that back pain is a stressor that usually occurs in drivers (Fernández-D'Pool et al., 2012; Rayo et al., 2007). In this way, a spiral is entered in which pain leads to tension, which produces more pain. Tse et al. (2006) demonstrated the relationship between physical and psychological aspects of bus drivers, especially musculoskeletal problems and emotional problems such as anxiety and depression.

Challenge is a negative predictor of musculoskeletal disorders of the trunk. This could be because drivers who score high in this dimension are able to see difficulties as opportunities for growth. In this way, the tension that produces musculoskeletal problems is not generated. Kobasa (1979) related hardiness to workers' health, asserting that hardy people perceive stressful situations as being less threatening and so approach them more actively (Kobasa, 1982).

The second hypothesis is also partially verified because the best predictive model for musculoskeletal problems of the extremities is the one that includes seven variables, five of which act in a positive way: Psychophysiological Disorders, ME Trunk, Cognitive Irritation, Weekly hours driven and Emotional Irritation. In line with Carayon, Smith and Haims (1999) assert that stress is the main cause of the symptoms associated with many musculoskeletal disorders of the upper extremities. Mačužić and Lukić (2020) obtained different values of fatigue and discomfort depending on the different angles of the backrest of the seat, during driving and rest in order to determine the discomfort of the driver's body. With regard to Driving Hours, some authors consider that Driving Hours and breaks are closely related to driver fatigue (Chen & Xie, 2014; Fletcher & Dawson, 2001). Lengthy exposure to static postures can lead to problems in the neck and shoulders as well as to pain in the lower back region (Fernández-D'Pool et al., 2012; Galindo-Estupiñan et al., 2016; Hannerz & Tüchsen, 2001; Okunribido et al., 2007; Rayo et al., 2007).

Two variables – Seat Suspension and Cynicism – predicted negatively. Several authors have linked discomfort with seat vibrations to musculoskeletal disorders (Blood, Dennerlein, Lewis, Rynell, & Johnson, 2011; Blood, Ploger, Yost, Ching, & Johnson, 2010; Makhsous, Hendrix, Crowther, Nam, & Lin, 2005; Robb & Mansfield, 2007). Cynicism, on the other hand, refers to negative attitudes such as indifference and distancing oneself from work, whereby the more one distances oneself from work the less one is affected by it. In this context, Olivares Faúndez, Jélvez Wilke, Mena Miranda and Lavarello Salinas (2013) found that Burnout correlates with driver's mental load, which is one of the consequences attributed to Burnout, especially in relation to the Cynicism that is possibly related to cognitive area and is manifested in self-criticism, personal devaluation potentially leading to self-sabotage, distrust, and disregard for work (Maslach, Jackson, & Leiter, 1996).

4.2. Limitations and suggestions for future research

This study is not without limitations. Firstly, the data were obtained through self-reports, which can produce bias ranging from social desirability to lack of sincerity (Razavi, 2001). Secondly, the methodology should also be examined since bias may occur in the results since the participants were unaware of the symptoms or the effects of some of the variables we were measuring. In future research, the use of qualitative information collection strategies that allow a better understanding of the characteristics of the work and the impact that these have, both when generating stress and the characteristics of the job (Seat Suspension of the seat, lumbar support, etc.).

4.3. Practical implications

Our results highlight the importance of designing individual interventions to reduce the incidence of musculoskeletal problems in professional drivers. This would provide greater well-being and lead to a reduction in sick leave. In addition, these findings present important practical implications that transport companies must take into account in the strategic management of human resources to help employees achieve a better psychosocial well-being. It is necessary to take into account certain personality variables during the selection so that a good choice can be made between the job position and the candidate. In addition, it is important that those responsible for Human Resources and Occupational Health evaluate the stress levels of professional drivers beyond what is required by current legislation to reduce both the accident rate and absenteeism.

4.4. Conclusion

This predictive study presents an overview of the predictive variables that affect musculoskeletal disorders (Trunk and Extremities) in professional drivers of road transport. Our results indicate that Psychophysiological Disorders have an important incidence in ME Trunk and Extremities. In addition, the Challenge feature of the hardiness acts as a ME Truck lesser. On the other hand, the Cognitive and Emotional Irritation act a potentiating ME Extremities. However, the Seat Suspension and Cynicism act as reducers of the ME Extremities. Therefore, it is absolutely essential to comply with current legislation in order to protect the workers of this industrial sector from musculoskeletal disorders that is very sensitive to its prevalence. Moreover, companies should write codes of good behavior in order to prevent these disorders, where workers' union representatives could participate in its drafting. Our findings suggest that it would be necessary to design prevention programs to reduce this type of pathologies. Finally, the present investigation increases the literature, in the field of professional drivers, on the link between Psychophysiological Disorders, Personality, Labor Conditions and Musculoskeletal disorders.

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Table 1.

Descriptive statistics and reliability values with Cronbach's alpha coefficient.

Variable	Minimum	Maximum	Mean	*SD*	α
GSQS8	4	36	6.23	8.85	.80
ME.Trunk	4	20	9.84	3.22	.72
ME_Extrem	5	20	8.18	2.99	.71
TDS15_RD	3	12	4.98	3.39	.70
TDS15_PH	3	18	15.92	2.51	.71
TDS15_AV	3	18	14.54	3.13	.72
TDS15_TS	3	18	6.90	3.32	.75
TDS15_FA	3	18	7.36	3.46	.71
IrrE	5	35	11.05	5.33	.82
IrrC	3	21	7.15	4.17	.83
CPR_Impl	10	28	22.14	3.63	.82
CPR_Challenge	7	28	20.69	3.90	.86
CPR_Ctrol	7	28	22.08	3.00	.71
MBI_A	0	28	9.40	6.08	.87
MBI_C	0	21	6.21	5.19	.80
MBI_EP	10	36	28.86	5.14	.71
T18_TP	6	30	11.32	3.71	.74
T18_SP	6	30	22.36	4.90	.75
T18_SV	14	30	24.85	3.80	.74
IMP.F	0	11	5.65	2.44	.75
IMP.D	0	11	3.12	2.50	.74

Variables used in the research: Sleep quality (GSQS8), Relaxed driving (TDS15.RD), Preventing Hazards (TDS15.PH), Alertness and Vigilance (TDS15.AV), Thrill Seeking (TDS15.TS), Fatigue and Anxiety (TDS15.FA), Emotional Irritation (IE), Cognitive Irritation (IC), Implication (CPR.I), Challenge (CPR.R),Control (CPR.C), Exhaustion (MBI.A), Cynicism (MBI.C), Professional efficiency (MBI.EP), Psychophysiological Disorders (T18.TP), Personal Safety Behaviors (T18.SP), Vehicle Safety Behaviors (T18.SV), Functional impulsivity (IMP.F), Dysfunctional impulsivity (IMP.D), Age, Gender, Seat Comfort, Seat Suspension, Adjustable Lumbar Support , Hours driven per week.

Table 2

Correlations between the predictor variables and the criterion variables

PREDICTOR VARIABLES	**CRITERION VARIABLES**	
	ME.Trunk	**ME.Extrem**
Age	0,79	**.106***
Gender	0,03	.008
Seat Comfort	**-.260****	**-.245****
Seat Suspension	**-.217****	**-.330****
Adjustable Lumbar Support	**-.279****	**-.228****
Hours driven per week	-.065	.104
GSQS8	**.239****	**.257****
TDS15_RD	**-.217****	**-.188****
TDS15_PH	**-.133***	**-.105***
TDS15_AS	-.017	.001
TDS15_TS	.084	.091
TDS15_FA	**.284****	**.210****
IrrE	**.226****	**.275****
IrrC	**.238****	**.263****
CPR_Impl	**-.128***	-.082
CPR_Challenge	-.113	-.078
CPR_Ctrol	-.065	-.031
MBI_A	**.409****	**.368****
MBI_C	**.315****	**.207****
MBI_EP	-.068	-.038
T18_TP	**.413****	**.348****
T18_SP	-.006	**-.179****
T18_SV	-.085	**-.189****
IMP.F	**.136***	.080
IMP.D	.011	.086
ME.Trunk	--	**.443****
ME.Extrem	**.443****	--

**. Correlation is significant at level 0.01 (bilateral).
*. Correlation is significant at level 0.05 (bilateral).

Table 3.

Summary of the models, variables and coefficients of regression analysis (stepwise method) for the ME Trunk

	Models						Coefficients				
Models and Variables	R	R^2	R2 Adjusted	R Change	F Change	sig	B	SE	β	t	sig
Model-1	.468	.219	.214	.219	49.785	.000					
T18.TP							.401	.057	.468	7.056	.000
Model-2	.523	.274	.266	.055	13.479	.000					
T18.TP							.378	.055	.441	6.842	.000
CPR.R							-.198	.054	-.237	-3.671	.001
Model-3	.564	.318	.306	.044	11.303	.001					
T18.TP							.295	.059	.344	4.984	.000
CPR.R							-.180	.053	-.215	-3.415	.001
ME.E							.263	.078	.233	3.362	.001

Excluded variables: GSQS8, TDS15.RD, TDS15.PH, TDS15.AS, TDS15.TS, TDS15.FA, CPR.I, CPR.C, MBI.A, MBI.C, MBI.EP, T18.SP, T18.SV, IMP.F, IMP.D, Hours, Seat Comfort, Seat Suspension, Adjustable Lumbar Support , Gender and Age.

Table 4.

Summary of the models, variables and coefficients of regression analysis (stepwise method) for the ME Extremities.

Models and Variables	Models						Coefficients				
	R	R^2	R2 Adjusted	R Change	F Change	sig	B	SE	β	t	sig
Model-1	.428	.183	.178	.183	39.824	.000					
T18.TP							.325	.052	.428	6.311	.000
Model-2	.489	.239	.231	.056	13.116	.000					
T18.TP							.230	.056	.302	4.072	.000
ME.T							.238	.066	.269	3.622	.000
Model-3	.530	.281	.268	.041	10.151	.000					
T18.TP							.157	.060	.206	2.637	.009
ME.T							.238	.064	.268	3.708	.000
IC							.144	.045	.225	3.186	.002
Model-4	.564	.318	.303	.038	9.661	.000					
T18.TP							.114	.060	.150	1.902	.059
ME.T							.222	.063	.251	3.542	.001
IC							.154	.044	.240	3.478	.001
Seat Suspension							-.390	.126	-.204	-3.108	.002
Model-5	.582	.338	.319	.020	5.214	.000					
T18.TP							.131	.060	.173	2.207	.029
ME.T							.224	.062	.253	3.611	.000
IC							.131	.045	.204	2.909	.004
Seat Suspension							-.398	.124	-.208	-3.209	.002
Hours							.022	.010	.145	2.283	.024
Model-6	.594	.353	.331	.015	4.065	.000					
T18.TP							.173	.063	.228	2.770	.006
ME.T							.239	.062	.269	3.856	.000
IC							.145	.045	.226	3.213	.002
Seat Suspension							-.422	.124	-.220	-3.416	.001
Hours							.022	.010	.145	2.297	.023
MBI.C							-.078	.039	-.147	-2.016	.045
Model-7	.608	.369	.343	.016	4.301	.000					
T18.TP							.167	.062	.219	2.684	.008
ME.T							.240	.061	.270	3.906	.000
IC							.095	.051	.149	1.885	.061
Seat Suspension							-.425	.122	-.222	-3.474	.001
Hours							.022	.010	.142	2.267	.025
MBI.C							-.107	.041	-.201	-2.615	.010
IE							.084	.041	.169	2.074	.040

Excluded variables: GSQS8, TDS15.RD, TDS15.PH, TDS15.AS, TDS15.TS, TDS15.FA, CPR.I, CPR.R, CPR.C, MBI.A, MBI.EP, T18.SP, T18.SV, IMP.F, IMP.D, Seat Comfort, Adjustable Lumbar Support , Gender and Age.

Table 5

Summary of the predictive models for the criterion variables

PREDICTOR VARIABLES	Factor 1 ME Trunk		Factor 2 ME Extremities	
	ΔR^2 Corrected	β	ΔR^2 Corrected	β
Psychophysiological Disorders (T18.TP)	.214	.344	.178	.219
Challenge (CPR.R)	.052	-.215	-	-
Extremities (ME.E)	.040	.233	-	-
Trunk (ME.T)	-	-	.053	.270
Cognitive Irritation (IC)	-	-	.037	.149
Seat Suspension	-	-	.035	-.222
Hours	-	-	.016	.142
Cynicism (MBI.C)	-	-	.012	-.201
Emotional Irritation (IE)	-	-	.012	.169
Total explained variance (%)	30.60	--	34.30	--

All the data are significant at $p < .01$ (bilateral).

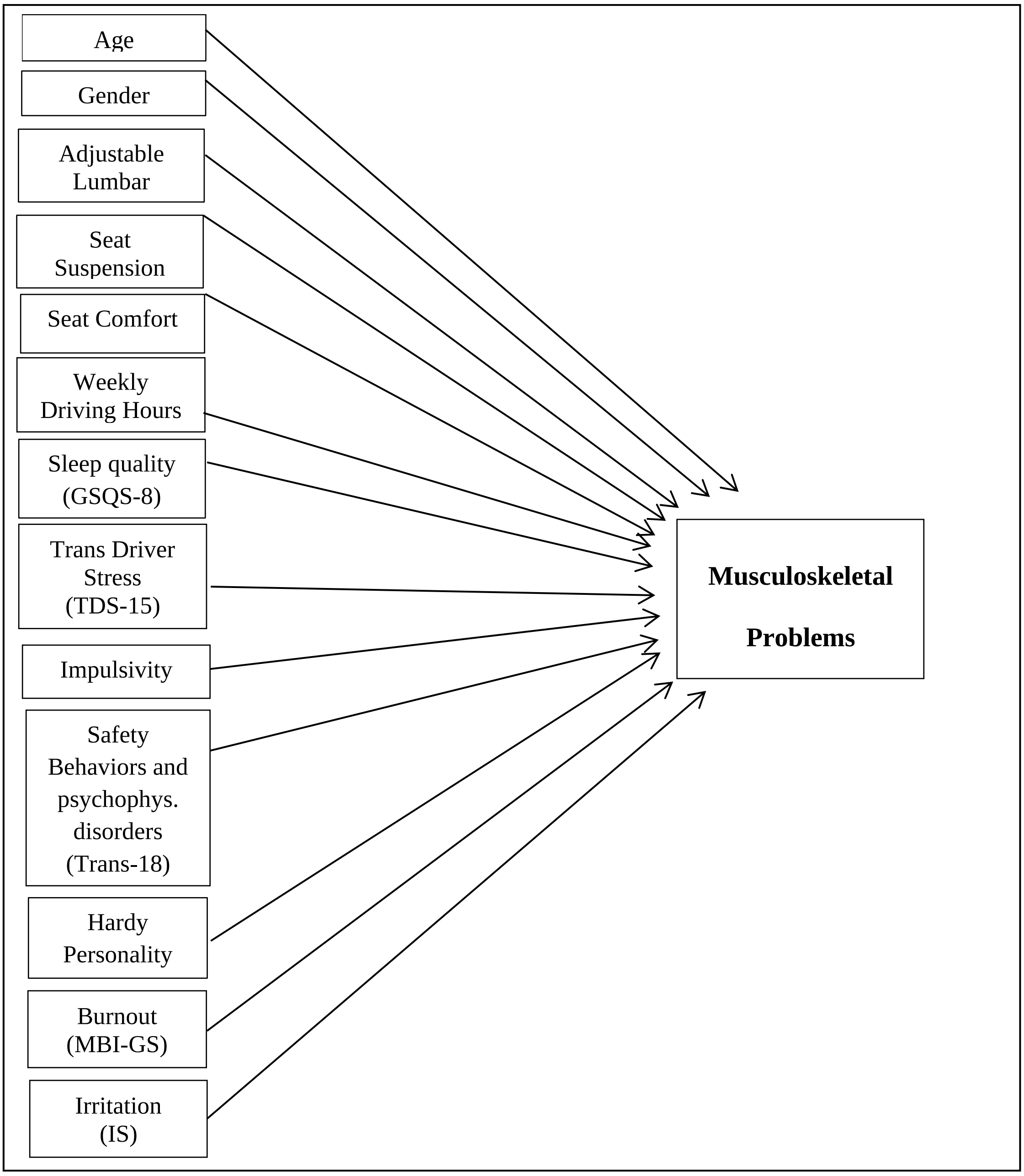

Figure 1. Model followed in this study