Tàpia-Caballero, P., Serrano-Fernández, M.J., Boada-Cuerva, M., Sora, B., & Boada-Grau, J. (2021) Influence that job characteristics, personality, and burnout have on fatigue in professional drivers. *International Journal of Occupational Safety and Ergonomics.* https://doi.org/10.1080/10803548.2021.1888019

Title: Influence that job characteristics, personality, and burnout have on fatigue in professional drivers.

Background: Professional drivers drive for many hours without rest. This factor, in addition to the characteristics of the job, the vehicle, the environment and the driver, causes driver fatigue. Fatigue is one of the most common risk factors when driving because it causes drowsiness, decreases their attention, and may make them fall asleep at the wheel. In this paper we propose a predictive model for professional drivers using the following variables: age, number of children, time spent at work, Time spent inside the vehicle, Personality (OPERAS), Job characteristics (JDS), Job content (JCQ) and Burnout. **Method:** Participants were 509 professional drivers from various transport sectors recruited by non-probabilistic sampling. SPSS version 25.0 was used for statistical analysis. **Results:** The predictive capacity of variables that cause driver fatigue was determined. Exhaustion best predicts fatigue positively, while Openness to Experience best predicts it negatively. Burnout and certain personality characteristics are good predictors, whereas other variables, such as JCQ and JDS, are weak predictors. **Conclusions:** This study extends our knowledge of the factors that cause fatigue in professional drivers and underlines the importance of designing interventions aimed at reducing the incidence of fatigue, promoting greater driver well-being, and lowering the incidence of accidents.

Keywords: Professional drivers; Fatigue; Burnout; Personality; Occupational health; Labor risks

1. Introduction

This work aims to highlight importance and relevance of the study of fatigue in professional drivers. We constantly hear about road safety and this is because every year, according to the World Health Organization, about 1.3 million people die on the world's roads, while a further 20 and 50 million people are injured. These two statistics alone indicate a significant public health problem, as is the fact that traffic accidents are the primary cause of death among young people aged 15 to 29 years old (1).

Among the factors involved in an accident, the human factor is the most important, with driving whilst fatigued among the most important, along with gender, age, abilities, skill training, attitudes, experiences and behaviors (2). In the present study, we want to identify those variables that can help prevent fatigue in professional drivers. Driving as a profession is characterized by driving for many hours without resting and high level of stress caused by job characteristics (e.g. vehicle) and environmental factors. All these factors increase driver fatigue – one of the most common risk factors when driving and one that is closely related to the occurrence of traffic accidents (3–7).

Fatigue is an adaptive mechanism that indicates our need to rest. Phillips described fatigue as a subjective complaint that can cause weakness, a lack of energy, tiredness, and an inability to concentrate, etc. (8). The above author combined various definitions of fatigue to propose this one: "fatigue is a poor psychophysiological condition that is caused by exertion" (p.53). So, fatigue is a complex sensation that displays physical and psychological symptoms ranging from feeling good to feeling exhausted (9). According to Norman fatigue affects the whole organism physically and psychically, but at different way; in other words, people feels fatigue, for example, at different intensities. It seems to depend on situation and personal characteristics (10). Furthermore, fatigue is associated to multiple detrimental outcomes. For example, many accidents are caused by drowsiness while driving when fatigued. Fatigue

reduces a driver's ability to maneuver the vehicle and increases their probability of falling asleep at the wheel (11). Thus, this leads to high mortality rates and the loss of infrastructure (12). Fatigue at work has traditionally been related to the number of hours worked (13). A high level of fatigue increase the risk of drivers exiting their lanes, changing direction, and decreasing their reaction time to sudden braking (14). Mental fatigue also predicts sleep disturbance (15), which contributes greatly to truck accidents (16–18). Some authors (2), in their review of the literature, concluded that there are three main factors that can cause fatigue in vehicle drivers: (a) labor, e.g. working long hours with no time for recovery; (b) sleep factors, e.g. the alteration of circadian rhythms (driving at times when one is usually asleep, or vice versa) and the number of hours slept; and (c) health and lifestyle. Poor sleep influences both general health and certain pathologies. It also impoverishes relationships because it is more difficult to share leisure activities with friends and family). In addition, recently, added other additional factors: lowers work performance, and increases the probability of errors and accidents (19).

In this work, we want to study whether through other types of variables we could prevent fatigue in professional drivers and, consequently, reduce the accident rate caused by an excess of it. These variables are the driver's personality characteristics, burnout or the characteristics and content of the task.

1.1. Driver Characteristics

Increasing age has a negative effect on performance because it decreases our reaction time (20). For example, the initial performance of younger subjects is better than that of older subjects, and younger subjects are significantly better than older subjects when rested. On the other hand, lack of sleep significantly affects younger subjects, while the performance of

older subjects is unaffected (21). In a study of road accidents, young drivers were found to have a 5–10 times higher risk of being involved in an accident at night or in the morning (22).

With regard to personality factors, a relationship has been found in professional drivers between conscientiousness, which predicts the prevention of dangers positively, and agreeableness, which predicts the search for sensations negatively (23). Drivers who score highly in search for experiences and extraversion may also be more sensitive to road monotony, which makes them more prone to fatigue-related driving errors in less demanding road environments (24).

1.2. Job Characteristics

Some authors found that drivers involved in fatigue-related accidents had worked and driven the longest on the days of their accidents (25). Taylor and Dorn asserted that fatigue and stress in bus drivers is related to the risk of having accidents and suffering health problems (26). Driving many hours and being responsible for passenger safety produce stress (27). On average, bus drivers work 16 hours a day (28). Working for more than 12 hours a day, together with excessive daytime sleepiness, is associated with constant risk driving (29), a greater risk of accidents, and more serious accidents than those suffered by non-professional drivers (30–32). Risk behaviors that occur when driving quickly to avoid being late or to load and unload passengers should also be taken into account (28).

Another important factor is the link between accidents involving professional drivers on the one hand and fatigue and shift work on the other (33). Shift work makes driving become severely affected by drowsiness due to a decrease in sustained surveillance and reaction times (30). It has been found, for example, that drivers who work in shifts suffer high rates of stress, exhaustion, exhaustion-related stress, and traffic accidents (34). Work pressures and few

rewards or low support from coworkers can also lead to mental health problems in drivers (35), while sleep dysfunctions have also been related to long working hours (36) and fatigue (15).

With regard to Job content (JCQ), fatigue and the need to recover have been found to mediate between social support and risky driving (37). Husain, Mohamad and Idris also report significant direct and indirect effects between individual and daily emotional demands and self-reported shocks mainly in acute fatigue and safety motivation (38). With regard to job characteristics that influence these results, measured via the Job Diagnostic Survey on professional drivers, it was found that: Task identity positively predicts relaxed driving and hazard prevention; feedback from work negatively predicts fatigue and anxiety; and feedback from agents negatively predicts alertness and vigilance (23).

1.3. Burnout

Several authors have associated the stressors caused by driving with Burnout (39–43). Olivares et al. indicate that Burnout correlates with the driver's mental load and especially with cynicism, which possibly relates to the cognitive area and manifests itself in self-criticism and personal devaluation, causing drivers to distrust and despise their work (44,45). Useche et al. (34) found that among bus drivers work stress and Exhaustion are significantly high and that work stress is related to burnout, both of which are associated with traffic accidents. On the other hand, Mc Vicar suggested that lack of sleep may predict burnout (46). The most potent predictor of mental fatigue is therefore sleep disturbance (15).

1.4. Objective and hypotheses

The general aim of this study is to develop a prediction model for job fatigue in professional drivers using the following Indicators: Age, Children, personality, job

characteristics, time spent at work, time inside the vehicle, job content and Burnout. Our study hypotheses are as follows:

H_1: If Lack of energy among professional drivers is influenced by Age, Children, time spent at work, time inside the vehicle, personality (OPERAS), job characteristics (JDS), job content (JCQ) and Burnout, a good prediction of Lack of energy can be made from a model that incorporates these predictors.

H_2: If Physical exertion among professional drivers is influenced by Age, Children, time spent at work, time inside the vehicle, personality (OPERAS), job characteristics (JDS), job content (JCQ) and Burnout, a good prediction of Physical exertion can be made from a model that incorporates these predictors.

H_3: If Physical discomfort among professional drivers is influenced by Age, Children, time spent at work, time inside the vehicle, personality (OPERAS), job characteristics (JDS), job content (JCQ) and Burnout, a good prediction of Physical exertion can be made from a model that incorporates these predictors.

H_4: If Lack of motivation among professional drivers is influenced by Age, Children, time spent at work, time inside the vehicle, personality (OPERAS), job characteristics (JDS), job content (JCQ) and Burnout, a good prediction of Physical exertion can be made from a model that incorporates these predictors.

H_5: If Sleepiness among professional drivers is influenced by Age, Children, time spent at work, time inside the vehicle, personality (OPERAS), job characteristics (JDS), job content

(JCQ) and Burnout, a good prediction of Physical exertion can be made from a model that incorporates these predictors.

2. Method

2.1. Participants

Participants in this study were 509 professional drivers (90.9% men and 9.1% women) with an average age of 41.3 (SD = 13.15). Their marital status was as follows: married or in a stable relationship (69.5%), single (21.9%), divorced or separated (8.1%) and widowed (.5%). Their educational level was follows: university studies (5.1%), lower secondary school, vocational training-II or prep school (21.4%), upper secondary school, professional training-I or compulsory secondary education (52.3%); and unfinished primary education (21.2%). The sectors in which the participants were employed were: freight transportation (51.3%), machinery transportation (5.8%), passenger transportation (17.7%), ambulances and assistance drivers (7.1%), taxi drivers (14.8%), and others (3.3%). The participants had an average of 12.01 (SD = 12.68) years' experience.

2.2. Instruments

To measure Driver Fatigue, we used the Spanish version (47) of the Swedish Occupational Fatigue Inventory (SOFI) (48), which is used for multidimensional evaluation of work-related fatigue. This inventory comprises five subscales, each of which has three items. These subscales are "F1. Lack of energy", which describes general feelings of decreased strength (α = .92; e.g. 12. Exhausted (e.g. lacking strength)); "F2. Physical exertion", which describes sensations throughout the body that may result from dynamic work and signs of metabolic depletion (α = .87; e.g. 15. Breathing with difficulty (e.g. having difficulty inhaling and expelling air)); "F3. Physical discomfort", which represents the most

localized bodily sensations, which may result from static or isometric workload (α = .81; e.g.: 8. With seized joints (elbows, knees, etc.)); "F4. Lack of motivation", which describes feeling uninvolved or unexcited (α = .92; e.g. 10. Indifferent (e.g. when something does not matter one way or another); and "F5. Sleepiness", which describes feelings of drowsiness (α = .89; e.g. 13. Sleepy (e.g. feeling heavy and clumsy due to sleep)). The items are evaluated using a Likert scale ranging from 0 (*nothing at all*) to 10 (*to a high degree*).

The Overall Personality Assessment Scale (OPERAS; Vigil-Colet, Morales-Vives, Camps, Tous, & Lorenzo-Seva, 2013) comprises 40 items and is based on the Big Five personality traits model. The items are evaluated using a 5-point Likert scale ranging from *1 = totally disagree* to *5 = totally agree*. It is made up of five dimensions: "F1. Extraversion" (α = .86; e.g. 14. I don't speak very much); "F2. Emotional Stability" (α = .86; e.g. 32. My mood changes often"); "F3. Conscientiousness" (α = .77; e.g. 28. I am a perfectionist); "F4. Agreeableness" (α = .71; e.g. 23. I am very critical of others); and "F5. Openness to Experience" (α = .81: e.g. 24. I like to visit museums).

The Spanish language version (50) of the Job Diagnostic Survey (JDS-21; Hackman & Oldham, 1974, 1975) comprises 21 items divided into seven subscales, each of which has three items. This questionnaire evaluates the job characteristics that influence the results. The dimensions are as follows: "F1. Skill variety" (α=.78; e.g. 5. The work is quite simple and repetitive); "F2. Task identity" (α=.78; e.g. 11. The work allows me to completely finish the tasks I undertake); "F3. Significance" (α=.71; e.g. 14. The work itself is not very significant or important in the general context); "F4. Autonomy" (α=.73; e.g. 9. The work does not give me any chance to use my initiative or personal judgment); "F.5. Feedback" (α=.70; e.g. 12. The work itself provides me with very few indications about my performance); "F6. Feedback from agents" (α=.70; e.g. 10. My superiors often let me know what they think about my performance at work); and "F7. Dealing with others in their jobs" (α=.72; e.g. 2.

My work requires a lot of cooperation with other people). The response format is a 7-point Likert scale ranging from 1 (*Very little*) to 7 (*A lot*).

The Job Content Questionnaire (JCQ-25; Karasek & Theorell, 1990) analyzes work situations in which stressors are chronic, and pays special attention to the psychosocial characteristics of the work environment. We used the Spanish version (54), which comprises 28 items divided into three dimensions: "F1. Job Demands", which assesses the amount of work, the intellectual demands, and the pressure of working time (9 items; α=.74; e.g. K19. My work requires a lot of hard work); "F2. Job Control", which assesses the possibility of making decisions creatively and applying and developing one's own abilities, (9 items; α=.74; e.g. K3. My work requires me to be creative); and "F3. Support", which assesses the support received from colleagues and superiors (11 items; α=.87; e.g. K43. The people I work with are nice). The response format is a four-point Likert scale ranging from 0 (*Strongly disagree*) to 3 (*Strongly agree*).

The Maslach Burnout Inventory-General Survey (MBI-GS; Salanova, Schaufeli, Llorens, Peiró, & Grau, (2000)) evaluates burnout and comprises 15 items divided into three subscales that are answered using a 7-point Likert scale ranging from 0 (*Never*) to 6 (*Always/Every day*). This instrument measures the following dimensions: "F1.Exhaustion" (α = .87), which comprises five items (e.g. 6. I am 'burned out' by my work); "F2.Cynicism" (α = .85), which comprises four items (e.g. 9. I have lost my enthusiasm for work); and "F3. Professional efficiency" (α = .78), which comprises six items (e.g. 12. I have achieved many valuable things in this position).

2.3. Procedure

The sample was obtained by non-probabilistic sampling (56), also known as accidental-random sampling (57). The data were collected by telephoning the directors of several

companies and arranging the best time to meet with their employees. Participation was voluntary and no participant received any kind of gratification. The response rate was 87%.

2.4. Data Analysis

Data analyses were performed using the SPSS version 25.0 statistical package. Reliability was obtained using Cronbach's α. We used Pearson's correlation coefficients to calculate the correlations between the predictor variables and the criterion variable. Multiple regressions were also calculated using the stepwise option (58). With this method, the variables were incorporated into the regression model to check the regressions with the criteria variables (Lack of energy, Physical exertion, Physical discomfort, Lack of motivation, and Sleepiness). There were twenty-three variables: Age, Number of children, Hours worked per week, Minutes in vehicle, JDS (Variety, Identity, Significance, Autonomy, Feedback, Agents and Dealing), JCQ (Social Support, Job Demand and Job Control), Burnout (Exhaustion, Cynicism, and Professional efficiency), and Personality (Extraversion, Emotional Stability, Conscientiousness, Agreeableness and Openness to experience).So, we used a multiple regression model to test the effects of the twenty-three predictor variables on the criterion variables in relation to Fatigue.

3. Results

3.1. Reliability analysis

Table 1 shows the instruments we used. The indices for internal consistency were appropriate since they ranged from .70 (JDS.7 Dealing) to .88 (SOFI.S Sleepiness).

INSERT TABLE 1 HERE

3.2. Correlation analyses

Table 2 shows the correlations between the five dimensions of the SOFI (criterion variable) and the twenty-three predictor variables.

Our findings were as follows. Lack of energy correlated positively with four variables (Minutes in the vehicle, Job demand, Exhaustion and Cynicism) and negatively with twelve (Age, Variety, Significance, Autonomy, Dealing, Social Support, Job Control, Professional efficiency, Extraversion, Emotional Stability, Agreeableness, and Openness to experience). Physical exertion correlated positively with three variables (Minutes in the vehicle, Exhaustion, and Cynicism) and negatively with fourteen (Age, Variety, Identity, Significance, Autonomy, Feedback, Dealing, Social Support, Professional efficiency, Extraversion, Emotional Stability, Conscientiousness, Agreeableness, and Openness to experience). Physical discomfort correlated positively with four variables (Minutes in the vehicle, Job demand, Exhaustion and Cynicism) and negatively with twelve (Variety, Identity, Autonomy, Feedback, Dealing, Social Support, Job Control, Professional efficiency, Extraversion, Emotional Stability, Agreeableness, and Openness to experience). Lack of motivation correlated positively with three variables (Job Demand, Exhaustion, and Cynicism) and negatively with fifteen (Age, Variety, Identity, Significance, Autonomy, Feedback, Dealing, Social Support, Job Control, Professional Efficiency, Extraversion, Emotional Stability, Conscientiousness, Agreeableness and Openness to experience). Finally, Sleepiness correlated positively with four variables (Minutes in the vehicle, Job demand, Exhaustion, and Cynicism) and negatively with ten (Age, Number of children, Variety, Identity, Significance, Feedback, Dealing, Job control, Professional efficiency, and Openness to experience).

INSERT TABLE 2 HERE

3.3. Multiple regression

Tables 3 to 7 show the data corresponding to the adjusted *R*2 indices and the significant typified beta coefficients between the criteria variables and the predictive variables in this study, for which our aim was to identify the degree to which these predictive variables can predict the various types of fatigue among professional drivers.

Table 3 shows that the model that best predicts Lack of energy is model 5, accounting for 50% of the criterion variable's variance. Exhaustion is the best predictor variable, accounting for 47.2% of variance. One of the most important aspects are the beta coefficients, which show that the predictor variables found to be statistically significant were: Exhaustion (β= .624), Openness to experience (β= -.094), Job Demand (β= .158), Job Control (β= -.141) and Agents (β= .087).

Table 4 shows that the greatest predictor of Physical exertion is model 6, accounting for 33.2% of the criterion variable's variance. Exhaustion is the best predictor variable, accounting for 27.6% of variance. The beta coefficients show that the predictor variables found to be statistically significant were: Exhaustion (β= .482), Responsibility (β= -.122), Minutes in the vehicle (β= .108), Openness to experience (β= -.103), Agents (β= .093), and Significance (β= -.093).

Model 7 was the best predictor of Physical Discomfort (Table 5), accounting for 41.9% of the criterion variable's variance. Exhaustion was the best predictor, accounting for 38.5% of variance. The beta coefficients show that the predictor variables found to be statistically significant were: Exhaustion (β= .565), Openness to experience (β= -.139), Extraversion (β= -.071), Job Demand (β= .090), Professional efficiency (β= -.133), and Responsibility (β= .104).

Model 8 was best predictor of Lack of motivation, (table 6), accounting for 41.6% of the criterion variable's variance. Exhaustion was the best predictor, accounting for 34.1% of variance. The beta coefficients show that the predictor variables found to be statistically

significant were: Exhaustion (β= .410), Cynicism (β= .200), Openness to experience (β= -.139), Extraversion (β= -.129), Emotional Stability (β= .193), Professional efficiency (β= -.097), Agreeableness (β= -.092), and Number of children (β= -.070).

Model 6 was best predictor of Sleepiness, (table 7), accounting for 34.6% of the criterion variable's variance. Exhaustion was the best predictor, accounting for 31.4% of variance. The beta coefficients show that the predictor variables found to be statistically significant were: Exhaustion (β= .541), Openness to experience (β= -.119), Emotional Stability (β= .144), Age (β= -.107), and Significance (β= -.077).

INSERT TABLE 3 HERE

INSERT TABLE 4 HERE

INSERT TABLE 5 HERE

INSERT TABLE 6 HERE

INSERT TABLE 7 HERE

4. Discussion

Our results show that certain variables have predictive power in relation to fatigue among professional drivers (table 8). In this study we have tested personality variables and work-related variables, as well as others such as age, number of children, hours worked per week, and the number of minutes the driver remains seated inside the vehicle. Our five hypotheses are only partially satisfied since not every research variable was incorporated into the various models.

Age is shown to be a negative predictor of Sleepiness. This is in line with the results of the study by Philip et al. (2004), which found that lack of sleep significantly affects young people, whereas the performance of older subjects is unaffected. Other authors found no

relationship between lack of sleep and age. Among young people this result is probably associated with bad habits (smoking, alcohol, noise, mobile phones, tablets), while older adults have a greater prevalence of illness (59).

The number of children negatively predicts lack of motivation. This may be because the drivers in this group have very long working hours and would like to spend more time with their family. The number of minutes in the vehicle is shown to be a positive predictor of Physical exertion. In this context, Gander et al. found that drivers involved in fatigue-related accidents had been driving for longer on the day they had the accident (25).

Regarding Burnout, we found that Exhaustion best predicts all the fatigue types we analyzed in this study. Several authors have already related driving with Burnout (39,41,42). Åkerstedt et al. (2004) relate Burnout to sleep disturbance, which we also found had a 31.4% influence on Sleepiness. Similarly, Useche, Cendales, et al. (2017) found that Work stress and Exhaustion are significantly high among Colombian bus drivers. The other two dimensions of Burnout have also been shown to be predictive variables. Professional efficiency negatively predicts physical discomfort, while Lack of motivation and Cynicism positively predict Lack of motivation. This is in line with the results of other authors who relate cynicism to distrust and disregard for work (39,44).

With regard to personality variables, Openness to Experience is shown to be a negative predictor in all models. Thiffault and Bergeron (2003) showed that drivers who obtained high scores in the search for experiences may be more sensitive to road monotony and more prone to fatigue-related driving errors in less demanding road environments. Since the environment of the drivers in our sample is demanding, this personality trait acts as a protective variable. Emotional stability is shown to be a positive predictor of Lack of motivation and Sleepiness, while a relationship is also found between Emotional stability and Conscientiousness that positively predicts Physical discomfort and negatively predicts

Physical exertion. Other authors, e.g. Serrano-Fernández et al. (2019), have shown that these variable acts positively in hazard prevention. These authors have also shown that Agreeableness negatively predicts Lack of motivation and that it also negatively predicts the search for sensations in professional drivers, which in turn affects Lack of motivation. Extraversion is shown to be a negative predictor of Physical discomfort and Lack of motivation, while drivers with high extraversion have been shown to suffer fewer accidents (60).

With regard to Job Content (JCQ), we found that Job Demand positively predicts Lack of energy and Physical discomfort. This could be because drivers invest more physical energy in order to meet these demands. On the other hand, we found that Job control negatively predicts Lack of energy, while Social Support does not appear to be a predictor variable. Regarding Job characteristics (JDS), we found that Significance negatively predicts Physical exertion and Sleepiness, possibly because giving greater meaning to the job makes workers feel more active rather than physically tired or sleepy. On the other hand, we found that Feedback from Agents positively predicts Lack of energy and Physical exertion, though Serrano-Fernández et al. (2019) found no relationship between these variables.

INSERT TABLE 8 HERE

5. Conclusion

Our study provides useful information for conducting research into the factors that produce fatigue in professional drivers. Exhaustion best predicts fatigue positively, while Openness to Experience best predicts it negatively. Burnout and personality characteristics were good predictors, while JCQ and JDS were weak predictors. In conclusion, to reduce accidents and ensure that professional drivers have greater well-being, it is important to

design individual interventions aimed at reducing their fatigue. The scales used allow prevention professionals to obtain data. This information may be used for a scientifically based evaluation. In addition, personality measures provide information that can aid detection and help to manage and train these drivers.

These results have important practical implications that should be considered for proper strategic management of human resources within organizations so that the variables that influence fatigue can be detected. Addressing these factors separately may greatly help to identify factors that help workers to improve their health and companies to reduce the number of collisions and traffic violations.

6. Limitations of the study

This study is not without a number of limitations. Fist, few women are professionally engaged in transportation, it would have been interesting to have the female population better represented in order to determine whether gender differences exist. Second, the data were obtained via self-report measures, which can lead to bias ranging from social desirability to lack of sincerity (61). Third, the methodology should be examined because for some variables it may lead to biased results since the drivers may not be aware of the symptoms or the effects of the variable we are measuring. Fourth, it would also have been interesting to use alternative physiological indicators of fatigue. Finally, future research should consider the use of qualitative information collection strategies that would enable better understanding of the characteristics of the work and the impact they may have on fatigue (driving shifts, time pressure, rest periods, performance, etc.).

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Table 1

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

Variable	Minimum	Maximum	Mean	*SD*	α
Lack of energy (SOFI.LE)	0	30	10.94	7.03	.87
Physical exertion (SOFI.PE)	0	30	6.19	5.32	.72
Physical discomfort (SOFI.PD)	0	30	10.14	6.94	.85
Lack of motivation (SOFI.LM)	0	30	8.46	6.30	.83
Sleepiness (SOFI.S)	0	30	10.13	7.12	.88
Variety (JDS.1)	3	21	11.34	41.18	.77
Identity (JDS.2)	3	21	15.81	4.23	.77
Significance (JDS.3)	4	21	15.62	3.91	.71
Autonomy (JDS.4)	3	21	13.91	4.54	.74
Feedback (JDS.5)	5	21	15.59	3.36	.71
Agents (JDS.6)	3	21	10.71	4.22	.72
Dealing (JDS.7)	3	21	13.17	4.10	.70
Social Support (JCQ.SS)	10	40	26.25	6.01	.88
Job Demand (JCQ.JD)	8	32	21.15	3.53	.74
Job Control (JCQ.JC)	7	28	17.91	4.64	.74
Exhaustion (MBI.E)	0	29	9.28	5.91	.88
Cynicism (MBI.C)	0	24	6.43	4.97	.85
Professional efficiency (MBI.PE)	5	36	27.61	6.37	.79
Extraversion (OP.EX)	18	74	49.30	9.87	.86
Emotional Stability (OP.EE)	4	83	48.82	13.70	.87
Conscientiousness (OP.CO)	12	76	48.98	11.98	.77
Agreeableness (OP.AG)	16	81	49.07	11.85	.71
Openness to experience (OP.OE)	11	69	43.75	10.02	.81

583

584 **Table 2**

585 *Correlations between the predictor variables and the criterion variables (SOFI).*
586

PREDICTOR VARIABLE	CRITERION VARIABLE				
	Lack of energy	Physical exertion	Physical discomfort	Lack of motivation	Sleepiness
Age	**-.110***	**-.145****	-.045	**-.114****	**-.161****
Gender	.063	.010	.060	.023	.065
Number of children	-.069	.024	-.038	-.078	**-.095***
Hours worked per week	.010	-.068	.020	-.053	-.028
Minutes in the vehicle	**.104***	**.147****	**.112***	.070	**.093***
Variety (JDS.1)	**-.183****	**-.108***	**-.175****	**-.226****	**-.180****
Identity (JDS.2)	-.078	**-.135****	**-.114****	**-.144****	**-.092***
Significance (JDS.3)	**-.089***	**-.165****	-.083	**-.156****	**-.091***
Autonomy (JDS.4)	**-.119****	**-.104***	**-.123****	**-.122****	-.070
Feedback (JDS.5)	-.027	**-.163****	**-.094***	**-.125****	**-.105***
Agents (JDS.6)	.044	.056	.015	-.030	.052
Dealing (JDS.7)	**-.137****	**-.091***	**-.093***	**-.153****	**-.107***
Social Support (JCQ.SS)	**-.121****	-.067	**-.111***	**-.140****	-.065
Job Demand (JCQ.JD)	**.173****	.038	**.148****	**.121****	**.107***
Job Control (JCQ.JC)	**-.170****	-.073	**-.132****	**-.167****	**-.129****
Exhaustion (MBI.E)	**.688****	**.527****	**.621****	**.585****	**.561****
Cynicism (MBI.C)	**.480****	**.420****	**.434****	**.530****	**.397****
Professional efficiency (MBI.PE)	**-.096***	**-.163****	**-.147****	**-.171****	**-.101***
Extraversion (OP.EX)	**-.110***	**-.116****	**-,151****	**-.179****	-.079
Emotional Stability (OP.EE)	**-.104***	**-.170****	**-,101***	**-.087***	-.015
Conscientiousness (OP.CO)	-.009	**-.210****	-0,037	**-.089***	.002
Agreeableness (OP.AG)	**-.121****	**-.218****	**-,135****	**-.160****	-.028
Openness to experience (OP.OE)	**-.219****	**-.228****	**-,252****	**-.261****	**-.223****

**. The correlation is significant at the .01 level (bilateral).

*. The correlation is significant at the .05 level (bilateral).

587

588 **Table 3**

589

590 *Summary of the models, variables and coefficients of regression analysis (stepwise method) for*
591 *lack of energy (SOFI)*

592

Model and Variable	Model						Coefficient				
	R	R^2	R2 Adjusted	R Change	F Change	sig	B	SE	β	t	sig
Model 1	.688	.473	.472	.473	461.295	.000					
Model 2	.693	.480	.478	.007	7.048	.008					
Model 3	.698	.487	.484	.007	6.925	.009					
Model 4	.705	.498	.494	.011	10.828	.001					
Model 5	.711	.505	.500	.007	7.521	.006					
Exhaustion (MBI.E)							.743	.040	.624	18.631	.000
Openness Exp (OP.OE)							-.066	.023	-.094	-2.928	.004
Job Demand (JCQ.JD)							.314	.079	.158	4.158	.000
Job Control (JCQ.JC)							-.213	.058	-.141	-3.648	.000
Agents (JDS.6)							.145	.053	.087	2.742	.006

Excluded variables: Age, Number of children, Minutes in the vehicle, Hours worked per week, Variety (JDS.1), Identity (JDS.2), Autonomy (JDS.4), Feedback (JDS.5), Agents (JDS.6), Dealing (JDS.7), Cynicism (MBI.C), Professional efficiency (MBI.3), Extraversion (OP.EX), Emotional Stability (OP.EE) and Social Support (JCQ.SS).

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594

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Table 4

Summary of the models, variables and coefficients of regression analysis (stepwise method) for Physical exertion (SOFI)

Model and Variable	Model						Coefficient				
	R	R^2	R2 Adjusted	R Change	F Change	sig	B	SE	β	t	sig
Model 1	.527	.278	.276	.278	197.743	.000					
Model 2	.549	.301	.298	.023	17.144	.000					
Model 3	.561	.315	.311	.014	10.394	.001					
Model 4	.569	.324	.318	.008	6.394	.012					
Model 5	.576	.332	.325	.008	6.230	.013					
Model 6	.583	.340	.332	.008	6.034	.014					
Exhaustion (MBI.E)							.433	.033	.482	13.033	0.000
Conscientiousness (OP.CO)							-.054	.017	-.122	-3.166	.002
Minutes in vehicle							.001	.000	.108	2.954	.003
Openness Exp (OP)							-.055	.020	-.103	-2.719	.007
Agents (JDS.6)							.117	.046	.093	2.562	.011
Significance (JDS.3							-.127	.052	-.093	-2.456	.014

Excluded variables: Age, Gender, Hours worked per week, Number of children, Variety (JDS.1), Identity (JDS.2), Autonomy (JDS.4), Feedback (JDS.5), Dealing (JDS.7), Cynicism (MBI.C), Professional efficiency (MBI.3), Extraversion (OP.EX), Emotional Stability (OP.EE), Agreeableness (OP.AG).

603 **Table 5**

604

605 *Summary of the models, variables and coefficients of regression analysis (stepwise method) for*
606 *Physical discomfort (SOFI)*

Model and Variable	Model						Coefficient				
	R	R^2	R2 Adjusted	R Change	F Change	sig	B	SE	β	t	sig
Model 1	.621	.386	.385	.386	323.480	.000					
Model 2	.635	.404	.401	.017	14.977	.000					
Model 3	.639	.408	.405	.005	3.967	.047					
Model 4	.643	.414	.409	.006	4.843	.028					
Model 5	.648	.419	.414	.006	4.929	.027					
Model 6	.653	.426	.419	.007	5.812	.016					
Exhaustion (MBI.E)							.664	.042	.565	15.912	.000
Openness Exp (OP.OE)							-.097	.024	-.139	-4.021	.000
Extraversion (OP.EX),							-.050	.025	-.071	-1.999	.046
Job Demand (JCQ-JD),							.177	.077	.090	2.287	.023
Professional efficiency (MBI.PE)							-.145	.047	-.133	-3.052	.002
Responsibility (OP.CO)							.060	.025	.104	2.411	.016

Excluded variables: Age, Number of children, Hours worked per week, Minutes in vehicle, Variety (JDS.1), Identity (JDS.2), Significance (JDS.3), Autonomy (JDS.4), Feedback (JDS.5), Agents (JDS.6), Dealing (JDS.7), Social Support (JCQ.SS), Job Control (JCQ.JC), Cynicism (MBI.C), Professional efficiency (MBI.3), Emotional Stability (OP.EE), Agreeableness (OP.AG).

607

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Table 6

Summary of the models, variables and coefficients of regression analysis (stepwise method) for Lack of motivation (SOFI)

Model and Variable	Model						Coefficient				
	R	R^2	R2 Adjusted	R Change	F Change	sig	B	SE	β	t	sig
Model 1	.585	.342	.341	.342	266.898	.000					
Model 2	.613	.376	.373	.034	27.910	.000					
Model 3	,630	.397	.393	.021	17.680	.000					
Model 4	.635	.403	.398	.006	5.285	.022					
Model 5	.639	.409	.403	.006	5.256	.022					
Model 6	.644	.415	.408	.006	5.421	.020					
Model 7	.649	.421	.413	.005	4.817	.029					
Model 8	.652	.425	.416	.005	4.141	.042					
Exhaustion (MBI.E)							.437	.050	.410	8.832	.000
Cynicism (MBI.C)							.253	.060	.200	4.195	.000
Openness to experience (OP.OE)							-.087	.022	-.139	-3.968	.000
Extraversion (OP.EX)							-.082	.024	-.129	-3.456	.001
Emotional Stability (OP.EE)							.089	.023	.193	3.814	.000
Professional efficiency (MBI.PE)							-.096	.044	-.097	-2.178	.030
Agreeableness (OP.AG)							-.049	.022	-.092	-2.245	.025
Number of children							-.396	.195	-.070	-2.035	.042

Excluded variables: Age, Gender, Hours worked per week, Minutes in vehicle, Variety (JDS.1), Identity (JDS.2), Significance (JDS.3), Autonomy (JDS.4), Feedback (JDS.5), Agents (JDS.6), Dealing (JDS.7), Social Support (JCQ.SS), Job Demand (JCQ-JD), Job Control (JCQ.JC), Exhaustion (MBI.E), Cynicism (MBI.C), Conscientiousness (OP.CO), Agreeableness (OP.AG).

620 **Table 7**

621

622 *Summary of the models, variables and coefficients of regression analysis (stepwise method) for*
623 *Sleepiness (SOFI)*

Model and Variable	Model						Coefficient				
	R	R^2	R2 Adjusted	R Change	F Change	sig	B	SE	β	t	sig
Model 1	.561	.315	.314	.315	236.291	.000					
Model 2	.573	.328	.325	.013	10.035	.002					
Model 3	.580	.336	.332	.008	6.334	.012					
Model 4	.589	.347	.342	.011	8.225	.004					
Model 5	.593	.352	.346	.005	4.280	.039					
Exhaustion (MBI.E)							.651	.045	.541	14.549	.000
Openness to experience (OP.OE)							-.085	.026	-.119	-3.260	.001
Emotional Stability (OP.EE)							.075	.020	.144	3.681	.000
Age							-.058	.020	-.107	-2.844	.005
Significance (JDS.3)							-.140	.068	-077	-2.069	.039

Excluded variables: Number of children, Hours worked per week, Minutes in vehicle, Variety (JDS.1), Identity (JDS.2), Autonomy (JDS.4), Feedback (JDS.5), Agents (JDS.6), Dealing (JDS.7), Social Support (JCQ.SS), Job Demand (JCQ-JD), Job Control (JCQ.JC), Cynicism (MBI.C), Professional efficiency (MBI.3), Extraversion (OP.EX), Conscientiousness (OP.CO), Agreeableness (OP.AG), Openness to experience (OP.OE).

624

625

626 **Table 8**

627 *Summary of the predictive models for the criterion variables*
628

PREDICTOR VARIABLE	Factor 1 Lack of energy		Factor 2 Physical exertion		Factor 3 Phys. discomfort		Factor 4 Lack motivat.		Factor 5 Sleepiness	
	ΔR^2 Correct.	β	ΔR^2 Correct.	β	ΔR^2 Correct.	β	ΔR^2 Correct.	β	ΔR^2 Correct.	β
Age									.010	-.107
Number of children							.003	-.070		
Minutes in vehicle			.013	.108						
Exhaustion (MBI.E)	.472	.624	.276	.482	.385	.565	.341	.410	.314	.541
Professional efficiency (MBI.3)					.005	-.133	.005	-.097		
Cynicism (MBI.C)							.032	.200		
Openness Exp (OP)	.006	-.094	.007	-.103	.016	-.139	.020	-.139	.011	-.119
Emotional Stability (OP.EE)							.005	.193	.007	.144
Conscientiousness (OP.CO)			.022	-.122	.005	.104				
Agreeableness (OP.AG)							.005	-.092		
Extraversion (OP.EX)					.004	-.071	.005	-.129		
Job Demand (JCQ.JD)	.006	.158			.004	.090				
Job Control (JCQ.JC)	.010	-.141								
Significance (JDS.3)			.007	-.093					.004	-.077
Agents (JDS.6)	.006	.087	.007	.093						
Total explained variance (%)	50.00		33.20		41.90		41.60		34.60	

629