



# Does a 12-hour Shift Affect Brazilian Workers' Mental and Physical Health?

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**Abstract.** This study aims to analyze the impact of the 12-hour work shift on the indices of physical and mental health, sleep, and work-family conflict of Brazilian road traffic inspectors. This project was run in a Brazilian highway concession company, based on developing a previous organizational diagnosis focused on Quality of Life at Work, which pointed out potential illness risk-carrying work organization aspects. Among them, the work shift was the target of dissatisfaction among operational workers. The project was carried out in three stages: stage 1: demand identification; stage 2: a survey was carried out with workers, based on the application of the Pittsburgh Sleep Quality Index; Physical Health Questionnaire; Work-Related Damage Assessment Scale (WRDAS), and Work-Family Conflict Scale (WAFCS); stage 3: results, diagnoses, and actions presentation. The survey counted on the participation of 42 road traffic inspectors in the company, representing a participation rate of 87.5% of the staff holding this position. All the participants were men, mostly aged 28–37 years (57%), with high school education (55%), married (71%), and with children (67%). As for the variables evaluated by the instruments, a high incidence of poor sleep quality (40%) was observed, while most had a good quality of sleep (57%). As for the variables related to physical, mental health, and social work-life relationship, the tools employed did not show negative impacts. The results obtained with this research were used to suggest preventive actions.

**Keywords:** 12-hour work shift · Mental · Health · Physical

## 1 Introduction

This project was run in a Brazilian highway concession company, based on developing a previous organizational diagnosis focused on Quality of Life at Work, which pointed out potential illness risk-carrying work organization aspects. Among them, the work shift was the target of dissatisfaction among operational workers. The company also presented the possibility of changing the shift to a 12 × 36-hour work/rest shift as a financial strategy. Before the change, traffic inspectors' work schedule was 6 × 2 workdays/rest, with three shifts (morning - from 6 am to 2 pm; afternoon - from 2 pm to 10 pm; night - from 10 pm to 6 am). The new 12 × 36 work/rest shift was implemented in the COVID-19 pandemic, and the project aimed to assess its impacts on workers after a month of change to support organizational decisions and actions.

This work aims to analyze the impact of the 12-hour work shift on the indices of physical and mental health, sleep, and work-family conflict of Brazilian road traffic inspectors.

### 1.1 Impact of 12-hour Work Shift on Workers' Health

The literature points out that long work shifts affect workers, leading to sleep (Ferreira et al. 2017; Wickwire et al. 2017) and circadian cycle imbalance, fatigue (Dorrian et al. 2011; Motamedzadeh et al. 2016), gastrointestinal (Choobineh et al. 2012) and cardiovascular symptoms (Marqueze et al. 2013; Skogstad et al. 2019), work-family relationship disruption (Estryn-Béhar and Van Der Heijden 2012), and other psychological disorders (Bazazan et al. 2014).

## 2 Methodology

### 2.1 Participants

The survey counted on the participation of 42 road traffic inspectors in the company, representing a participation rate of 87.5% of the staff holding this position. All the participants were men, mostly aged 28–37 years (57%), with high school education (55%), married (71%), and with children (67%). Table 1 shows the occupational data of participants.

**Table 1.** Occupational data of participants.

PREVIOUS WORKING HOURS			CURRENT WORKING HOURS		
	f	%		f	%
06h to 14h	14	33%	06h to 18h	19	45%
14h to 22h	11	26%	18h to 6h	23	55%
22h to 06h	12	29%			
Vacation relief worker	5	12%			

  

WORK SENIORITY					
	f	%		f	%
0 to 6 months	13	31%	21 to 26 months	4	10%
7 to 13 months	4	10%	27 to 33 months	6	14%
14 to 20 months	5	12%	34 months and over	10	24%

### 2.2 Procedures

The project was carried out in three stages: In stage 1, demand was identified from meetings with the Board and Human Resources to define the project's scope. In step

2, a survey was carried out with workers, based on the application of the Pittsburgh Sleep Quality Index, to assess possible sleep pattern changes; the Physical Health Questionnaire, derived from the Standard Shiftwork Index (SSI) instrument, to identify the presence of cardiovascular and gastrointestinal symptoms; the Work-Related Damage Assessment Scale (WRDAS), to assess impacts on mental health; and, finally, the Work-Family Conflict Scale (WAFCS). Simultaneously, a systematic review of the literature was carried out to map studies that reported impacts on workers' health due to long work shifts. In step 3, we presented the results, diagnoses, and actions suggested to the Board in meetings to think together which strategies would be relevant to maintain productivity and act preventively.

### 2.3 Instruments

The following instruments were used in step 2: i) The Pittsburgh Sleep Quality Index (PSQI); ii) The Physical Health Questionnaire, derived from the Standard Shiftwork Index (SSI) instrument; iii) The Work-Related Damage Assessment Scale (WRDAS); and iv) The Work-Family Conflict Scale (WAFCS).

## 3 Results

### 3.1 Sleep Assessment

Table 2 shows the frequency of participants according to the assessment of sleep quality obtained with the PSQI instrument scores.

**Table 2.** Frequency of participants according to the score obtained in the PSQI

<i>Score</i>	<i>f</i>	<i>%</i>
<i>Good Sleep Quality</i>	24	57%
<i>Poor Sleep Quality</i>	17	40%
<i>Sleep Disorder</i>	1	2%

The results indicate that most workers (57%) have a good sleep quality. However, a high incidence of poor sleep quality (40%) has been observed. A Student t-test was performed to test the hypothesis of possible differences between shifts (day and night) regarding sleep quality, which did not allow inferring statistically significant differences between the two groups of workers. Therefore, we could not conclude that the different levels of sleep quality of the group of inspectors may be related to the work shift.

### 3.2 Physical Health Assessment

Regarding the results obtained with the Physical Health Questionnaire application, the percentages of responses by category of the frequency of digestive and cardiac symptoms are shown in Table 3.

**Table 3.** Frequency of responses regarding gastrointestinal and cardiovascular symptoms

<b>Gastrointestinal symptoms</b>	<b>Never</b>	<b>Rarely</b>	<b>Sometimes</b>	<b>Often</b>	<b>Always</b>
Has your appetite been disturbed?	<b>83%</b>	17%	0%	0%	0%
Are you careful with what you eat to avoid stomach problems?	<b>48%</b>	19%	14%	7%	0%
Do you feel like vomiting?	<b>95%</b>	2%	2%	0%	0%
Do you suffer from heartburn or stomach pain?	<b>74%</b>	14%	12%	0%	0%
Do you complain about digestion problems?	<b>86%</b>	10%	5%	0%	0%
Do you complain about bloating or gas in your stomach?	<b>76%</b>	14%	10%	0%	0%
Do you complain about stomach pains?	<b>83%</b>	17%	0%	0%	0%
Do you suffer from diarrhea or constipation?	<b>88%</b>	10%	2%	0%	0%
<b>Cardiovascular symptoms</b>	<b>Never</b>	<b>Rarely</b>	<b>Sometimes</b>	<b>Often</b>	<b>Always</b>
Do you feel your heart beating fast?	<b>88%</b>	12%	0%	0%	0%
Do you have chest pain and malaise?	<b>93%</b>	7%	0%	0%	0%
Do you feel dizzy?	<b>88%</b>	10%	2%	0%	0%
Do you feel your blood suddenly rising to your head?	<b>95%</b>	5%	0%	0%	0%
Do you have difficulty breathing when climbing stairs?	<b>88%</b>	12%	0%	0%	0%
Do you have high blood pressure?	<b>88%</b>	7%	5%	0%	0%
Did you feel that your heart was beating irregularly?	<b>88%</b>	10%	0%	2%	0%
Do you suffer from swollen feet?	<b>98%</b>	0%	2%	0%	0%
Do you feel a "tightness" in your chest?	<b>93%</b>	7%	0%	0%	0%

We can observe that, in general, most of the participants reported not feeling these symptoms, except for the question “*Are you careful with what you eat to avoid stomach problems?*”, Which had less than half (48%) of the respondents who pointed out that the symptom never occurred.

### 3.3 Mental Health Assessment

The reference values and interpretations shown in Table 4 are used to assess the scores obtained with the Work-Related Damage Assessment Scale (WRDAS).

**Table 4.** Interpretation of WRDAS scores

Score interpretation		
1-2.2: Low-Risk	2.3-3.6: Medium-Risk	3.7-5: High-Risk
A positive result. Represents low psychosocial risks.	A median result. Represents a state of alert/borderline situation for psychosocial risks at work. Demands short- and medium-term interventions	Negative result. Represents high psychosocial risks. It requires immediate interventions in the causes to eliminate or mitigate them.

The mean score obtained for the Inspection group was  $X = 1.24$ , with standard deviation  $SD = 0.28$ , with a frequency of 100% of participants with scores covered in the LOW-RISK category, indicating, therefore, that there are low psychosocial risks for the work-related psychological damage factor. In general, the participants indicated they never had the problems (more than 90% for all items), except for the item related to bad mood.

### 3.4 Assessing the Perception of Work-Family Conflict

Table 5 presents the range of values for interpreting the scores obtained with the application of the Work-Family Conflict Scale (WAFCS), Table 6 presents the results of the scores. The results indicate that, in general, most workers (90%) perceive no or low work interference with their family life. The mean obtained for the group was  $X = 1.47$ , with a standard deviation of  $SD = 0.9$ , which reinforces a homogeneous group perception.

**Table 5.** Interpretation of WAFCS scores.

Score interpretation
1-2.5: no or low work interference with the family
2.6-4.5: moderate work interference with the family
Above 4.6: high work interference with family

**Table 6.** Frequency of scores regarding the perceived work-family conflict

Score	Frequency	%
No or low interference	38	90%
Moderate interference	3	7%
High interference	1	2%

### 3.5 Work Shift Satisfaction

In the opinion survey, 90% of workers stated that they felt satisfied with the 12 × 36 work schedule, and 38% pointed out that work breaks were not enough for their rest.

## 4 Discussion

The results obtained from the workers' perception did not indicate impacts on the investigated physical, mental health, and family life domains. However, in the sleep domain, we found that 40% of respondents have poor sleep quality, which can worsen if preventive and restoration measures are not taken. It was also shown that most respondents are satisfied with the new 12 × 36 work schedule, but short rest breaks in the working day are perceived.

Preventive actions have been suggested from these findings, such as i) breaks during the working day with greater frequency and duration, especially after the eighth hour of work, when the fatigue increases; ii) promoting guidance on nutrition, based on difficulties related to the lack of care in choosing food that can cause stomach problems; iii) reorganizing working hours, revising the entry-exit hours to avoid operational peak times at the end of the shift, and prevent workers from having to wake up too early, which can interfere with the quality and quantity of sleep; iv) identify tasks with higher cognitive demands that could be redistributed throughout the journey, such as the need to drive vehicles to carry out inspection and suggestion to avoid driving after 8 h of the shift; v) carry out socio-educational actions to raise awareness on the importance of a balanced sleep routine.

The results obtained with this research have limitations in their interpretations concerning sleep and health indices, which must be considered when planning actions to maintain health and quality of life at work. The instruments used to measure health and sleep indices are self-applicable and may suffer from biases in the participants' subjective tendencies to underestimate their symptoms in favor of what they deem to be a more favorable situation. The fact that 90% of the participants were satisfied with the 12 × 36 shift can also be explained by the short time they are submitted to this shift, and the symptoms of fatigue, stress, and impacts on physical health, may appear after a period of exposure to such conditions.

## 5 Conclusion

Organizational strategies to monitor service effectiveness indicators (such as service speed, number of errors), accidents, absenteeism, and assessments of employees' performance are suggested to reduce the effect of subjective biases from the instruments adopted. Another survey was also recommended three months after the first collection and regularly after that to compare the rates over time and detect possible changes that may affect employees' health and performance. Index monitoring is a strategy for preventing illness, along with organizational actions that can be adopted preventively.

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