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THE IMPACT OF INSOMNIA AND FATIGUE ON TRAFFIC SAFETY: AMATEUR AND PROFESSIONAL DRIVERS

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Abstract The rapid progress of motorization has increased the number of severe traffic accident. Fatigue driving has already become a major cause of traffic accidents. It could be said that sleep and insomnia problems are two the biggest of the reasons for driver fatigue. The recommendations for enhanced data collection and the use of modern questionnaire methods for causal inference have the potential to enhance our understanding of the relationship of fatigue and insomnia to traffic safety. For these reasons, this paper sought to evaluate the value of subjective screening methods for detecting insomnia and identifying amateur and professional drivers at risk for poor sleep health and traffic safety relevant performance. A sample comprising 100 adult professional and amateur drivers (aged 18–65 years) was surveyed using the PSQI and several other questionnaires. According to results of this paper, the PSQI score could differentiate healthy drivers from drivers with insomnia.

Keywords: Insomnia; traffic safety; professional drivers; amateur drivers; driver behaviors.

1. INTRODUCTION

There is a lot of discussion about the definition of fatigue [1 - 3] and how it is different from sleepiness [3,4]. Williamson (2014), in his study, believe that “the causes of sleepiness uniquely relate to sleep (i.e., amount, quality, time since awakening and time of the day), whereas the causes of fatigue can relate to task related factors (i.e., duration and workload), as well as sleep related factors” [1, 3]. Many works have touched on the analysis of physiological [5 - 8] and psychological [9 -11] components of fatigue.

It could be said that sleep and insomnia problems are two the biggest of the reasons for driver fatigue. Some amateur and especially professional drivers experience insomnia, and undiagnosed sleep disorders contribute to heightened traffic accident rates. Subjective sleep disorder screening tools may aid in detecting drivers’ sleep disorders. Numerous characteristics of the long-haul trucking profession impact sleep health and insomnia. As a whole, long-haul truck driver endure numerous hazards, many of which are related to the physical and psychological strains associated with the profession [12, 13]. Fatigue driving has already become a major cause of traffic accidents.

According to a country-wide survey, the Traffic Injury Research Foundation of Canada found that more than 50% of drivers have driven under fatigue condition and that 20% (4.1 million Canadian drivers) have fallen half-asleep while driving [14, 15]. Approximately 20% of all traffic accidents

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worldwide are related to fatigue driving [16 - 18]. Moreover, 16.5% of fatal traffic accidents and 12.5% of collisions that lead to injuries in the US are related to fatigue driving [18, 19].

2. METHODOLOGY

2.1. Participants

The recruitment of participants involved researchers using intercept techniques by approaching amateur and professional drivers at the road to invite them to participate in the study. The participating drivers and members of the research team did not know each other [13]. For this study, the sample was filtered by eliminating the use of missing data, ultimately yielding a final sample size of 100. Gender in the structure of the sample was represented as follows: the share of male participants was 86, while females constitute 14 of the total sample [20, 21].

2.2. Procedure

In this study, many variables were studied to analyze driver's insomnia and determine the parameters that influence it. In the following parts, questionnaire is described.

First part: gender, occupation driver (amateur or professional drivers), as well as issues related to participation and the number of traffic accidents.

Second part: The Pittsburgh Sleep Quality Index (PSQI) is a 19-item self-report instrument for assessing sleep disturbance over the month before questionnaire administration [18, 22, 23]. Seven component scores – subjective sleep quality, sleep latency, sleep duration, habitual sleep efficiency, sleep disturbances, sleep medication, and daytime dysfunction – are computed from the items. The scores for these components range from 0 (no difficulty) to 3 (severe difficulty) and are summed to produce a global measure of sleep disturbance, with a higher score denoting poorer sleep quality (range: 0 – 21). Previous validation studies have suggested a cut-off of the global score at $\geqslant$5 for the presence of sleep disturbance [18, 22, 23].

2.3. Data Analyses

Statistical analysis was carried out in the statistical software package IBM SPSS Statistics v. 22. Normality of distribution was tested by inspection of histograms and the Kolmogorov-Smirnov test. Since the data for all measured variables distribution were normally distributed, we used parametric methods. To assess the significance of differences the Independent-Samples T-Test was used.

In this study there are two hypotheses:

- H_0 - The null hypothesis: There is no statistically significant difference between user groups;
- Ha - Alternative hypothesis: There is significant statistical significance between user groups.

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The threshold for statistical significance (α) was set to 5%. Consequently, if probability (p) is smaller or equal to 0.05, H_0 is rejected, and Ha is accepted. On the contrary, if p>0.05, H_0 is not rejected [24, 25].

3. RESULTS

3.1. Descriptive statistics

The descriptive statistics of the sub scores of the PSQI is presented in Table 1. The average PSQI value is 4.48 (standard deviation = 2.93). According to the result of this study, the PSQI has high reliability (Cronbach Alpha = 0.76). The alarming fact is that 45% of the subjections participated in traffic accidents.

Table 1. Descriptive statistics for subscores of the PSQI.

	Mean	Standard Deviation
Subjective Sleep Quality	1	1
Sleep Latency	0 .74	0 .85
Sleep Duration	1 .16	0 .85
Habitual Sleep Efficiency	0 .34	0 .65
Step Disturbances	1 .00	0 .49
Use of Sleeping Medication	0 .11	0 .47
Daytime Dysfunction	0 .37	0 .54

Table 2 shows the overall statistically significant results of PSQI scores according to occupation driver (professional and amateur), gender and participation in traffic accidents. Detailed results are presented in the following sessions.

Table 2. The overall statistically significant results of PSQI scores according to occupation driver (professional and amateur), gender and participation in traffic accidents.

	Occupation driver (professional and amateur)	Gender	Traffic accidents
t	-2.599	2.131	2.192
Sig.	0.011	0.036	0.031

3.2. Differences Between Amateur and Professional Drivers

There was a statistically significant difference in the PSQI total scores and occupation drivers (t = -2.599; p = 0.011) (Table 2). Independent-Samples T-Test revealed a significant difference between professional drivers (M = 3.74) and amateur drivers (M = 5.22) (Figure 1.). According to this

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analysis, the PSQI be able to differentiate healthy drivers (professional drivers) from drivers with insomnia (amateur drivers).

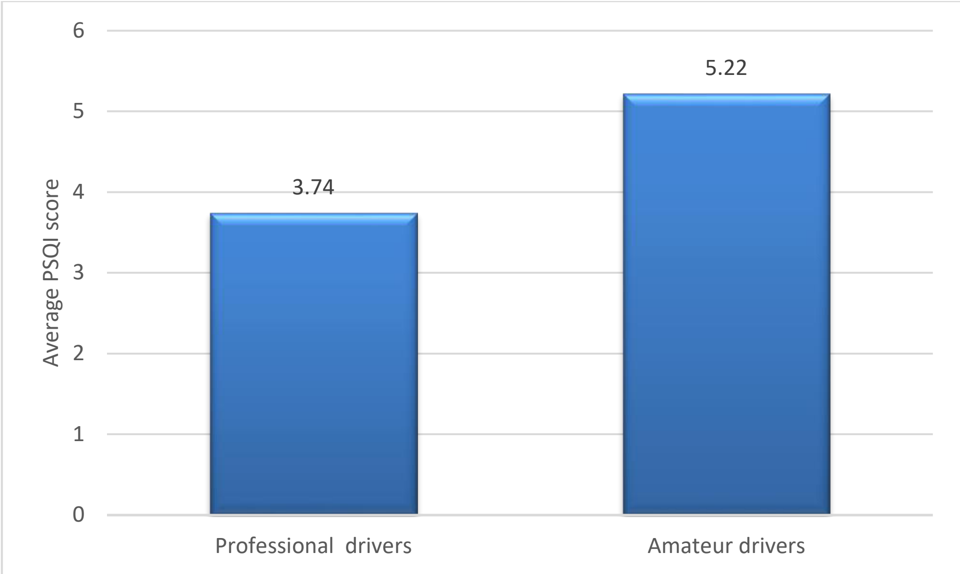

Figure 1. Average PSQI scores - amateur and professional drivers.

3.3. Gender Differences

The results of Independent-Samples T-Test showed statistically significant gender differences for the PSQI total scores ($t = 2.131$; $p = 0.036$) (Table 2). Female respondents have a higher the PSQI score ($M = 6.00$), than male respondents ($M = 4.23$) (Figure 2). According to the results, female respondents have a potential problem with subjective insomnia.

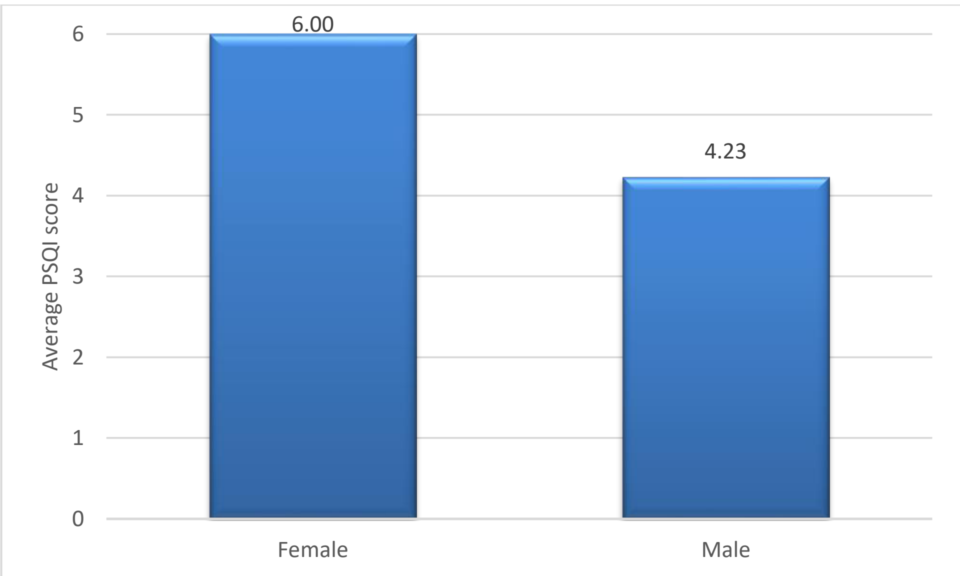

Figure 2. Average PSQI scores – gender.

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3.4. Traffic accidents

This section provides the foundation to understand whether driver who participated in traffic accidents differ from those who had no accidents, in their subjective assessments insomnia. The results to show differences in the PSQI total scores with respect to traffic accidents participation ($t = 2.192$; $p = 0.031$) (Table 2). Independent-Samples T-Test showed a significant difference between drivers who participated at least one traffic accident ($M = 3.53$) and drivers who not participated ($M = 4.87$) (Figure 3). Drivers who not participated in accidents have a higher PSQI scores, and they have a problem with subjective insomnia.

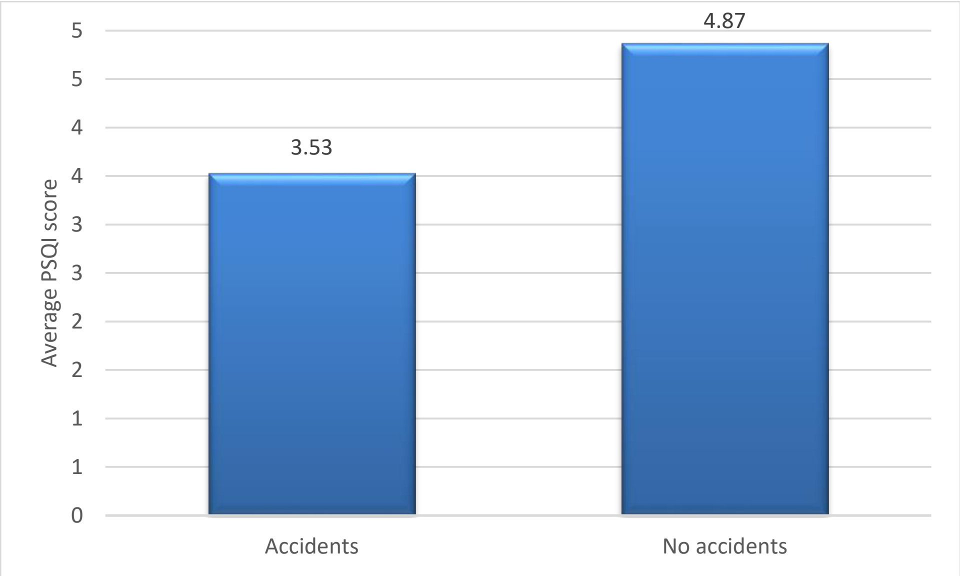

Figure 3. Average PSQI scores – traffic accident.

4. CONCLUSION

Based on the data collected and analyzed in our research, it can be derived several conclusions:

- Amateur drivers suffer from subjective insomnia, unlike professional drivers, who are most likely trained for quality sleep;
- Female respondents have a potential problem with subjective insomnia;
- Drivers who not participated in accidents have a problem with subjective insomnia;
- According to results of this study, the PSQI score could differentiate healthy drivers from drivers with insomnia.

4.1. Recommendations

The results of this research can benefit the development of drowsiness and insomnia prevention and help to manage drowsiness and fatigue to avoid related road accidents. Education and prevention about insomnia and driving could reduce the risk of drowsy driving and associated road trauma in

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amateur and professional drivers, but requires evaluation in a broader sample with assessment of real world driving outcomes.

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