

AN INVESTIGATION OF THE EFFECT OF FATIGUE AND DROWSINESS AMONG YOUNG DRIVERS

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Abstract Young adults differ in the extent to which they get fatigued and in the way they cope with driver fatigue and drowsiness. Fatigue and drowsiness are major factors in a large proportion of traffic accidents. Many studies suggest that fatigue is associated with increased accident risk. Drowsy driving is a serious public health concern and traffic safety. For this reason, a better understanding of the role of individual differences is needed to improve ability to predict fatigue, to better understand the safety implications of fatigue, and to determine the effectiveness of various fatigue countermeasures, especially for young drivers. A sample of 53 young drivers was examined (aged 18–26). The results of this paper can benefit the development of drowsiness prevention and help to manage drowsiness and fatigue to avoid related road accidents.

Keywords: Fatigue; drowsiness; young drivers; traffic safety; driver behaviors.

1. INTRODUCTION

In the science literature many definitions are used for fatigue. The concepts of “fatigue”, “drowsiness” and “sleepiness” are often used alternately. Sleepiness is an aspect of fatigue which is perhaps easiest to define. Sleepiness can be defined as the neurobiological need to sleep [1, 2], resulting from physiological wake and sleep drives [1, 3].

Fatigue driving is a serious public health concern and traffic safety. Fatigue related crashes are often associated with high injury levels. Each year in the United States of America, drowsy driving causes an average of 328,000 traffic accidents, including 6,400 fatal accidents [4, 5]. Fatigue and drowsiness are major factors a large proportion of traffic accidents (range 10-20%). Many studies suggest that fatigue is associated with increased crash risk. Estimates range between a 3 to 8 times accident risk increase due to insufficient sleep in the night before the trip [1]. Drowsy driving makes it more difficult for drivers to pay attention to the road and slows reaction time if you have to suddenly swerve or hit the brakes. Simply put, it affects a driver's overall cognizance and their ability to make good decisions [6 - 8]. The increased risk often results from a combination of biological, lifestyle-and work-related factors. More scientific evidence is needed concerning the exact quantitative relationship between fatigue/drowsy driving and risk [1].

Lyznicki et al. (1998) in his study concluded that the younger drivers are a high-risk group for fatigue related accidents [9]. Young drivers are involved in two-thirds of all sleepiness-related accidents, especially those occurring late at night or early in the morning [1, 10]. Late night driving, together with chronic sleep debt, the poor experience of how to cope with fatigue and the insufficient driving

ability may partially explain the high risk of sleep-related accidents amongst young drivers [1, 9, 11]. The September 2019 survey of 2,003 U.S. adults asked participants if they have ever struggled to stay awake while driving a vehicle. Only 48% of respondents indicated that they have never driven drowsy [4, 5].

2. METHODOLOGY

2.1. Participants

Fifty-three young participants (18–26) were recruited from the Faculty of Transport and Traffic Engineering - University of Belgrade, Republic of Serbia. Young drivers were selected because research shows that this group is the most traffic accident prone group due to sleepiness, all over the world [12, 13]. Gender in the structure of the sample was represented as follows: the share of male participants was 53% (28), while females constitute 47% (25) of the total sample.

2.2. Procedure

The study was based on the young drivers' self-reports. The demographic questionnaire, as well as questions about driver fatigue and drowsiness were employed. Data were collected through on-line questionnaire. Participants were asked to complete the questionnaire at the Laboratory for Traffic Psychology and Ergonomics, while the interviewers' role was limited to the supply of advice and clarifications. Anonymity was ensured by coding all personal data.

The study questionnaire can be divided in two sections as follows:

Demographic questions: gender, age, issues related to the possession of a driving license (category of driving license, the number of years holding a driver's license), as well as issues related to participation and the number of traffic accidents;

Fatigue while driving and drowsiness:

We investigated young drivers' habits, as well as the occurrence of drowsiness and fatigue while driving. In particular, participants were requested to report the rate of dealing with several different traffic situations such as: "Driving time before a desirable/real break", "Drowsiness while driving", "Fall asleep while driving", etc.

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 and was used [14, 15].

The null hypothesis (H_0) was: There is no statistically significant difference between user groups, with alternative hypothesis (H_a) being: There is significant statistical significance between user groups. 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 H_a is accepted. On the contrary, if $p > 0.05$, H_0 is not rejected [16, 17].

3. RESULTS

3.1. Descriptive Statistics

The highest percentage of respondents have a driving license for passenger car (70.2%), while 15% of respondents are in the process of training in driving school. The highest percentage of respondents have a driving license between 1 and 3 years (45%). About 6% of respondents participated in traffic accidents.

3.2. Fatigue While Driving and Drowsiness

The results show that respondents they usually to take a break between 2 – 4 hours of driving (47%), while at least after 6 hours of driving (Figure 1).

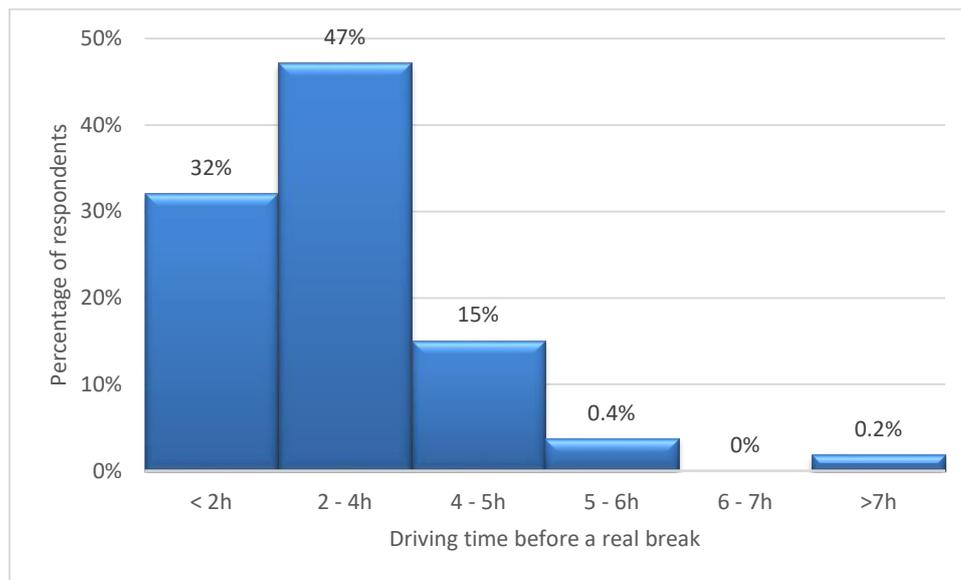


Figure 1. Percentage of respondents by driving time (before the real break).

On the other hand, respondents desirable they needed a break in less than two hours of driving (38%) and between 2 and 4 hours of driving (36%) (Figure 2).

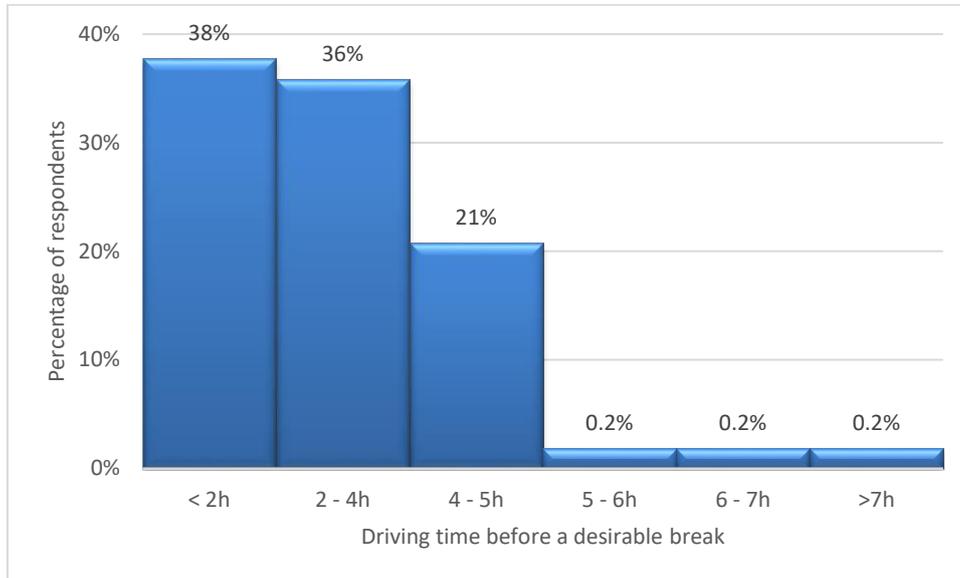


Figure 2. Percentage of respondents by driving time (before the desirable break).

The most important finding and the fact that it is necessary to pay attention to, that the 25% of the respondents were driving drowsy, and 0.9% of young drivers indicated that they had fallen asleep behind the wheel. According this, 77% of respondents think that drowsy driving affects the safe driving (Figure 3).

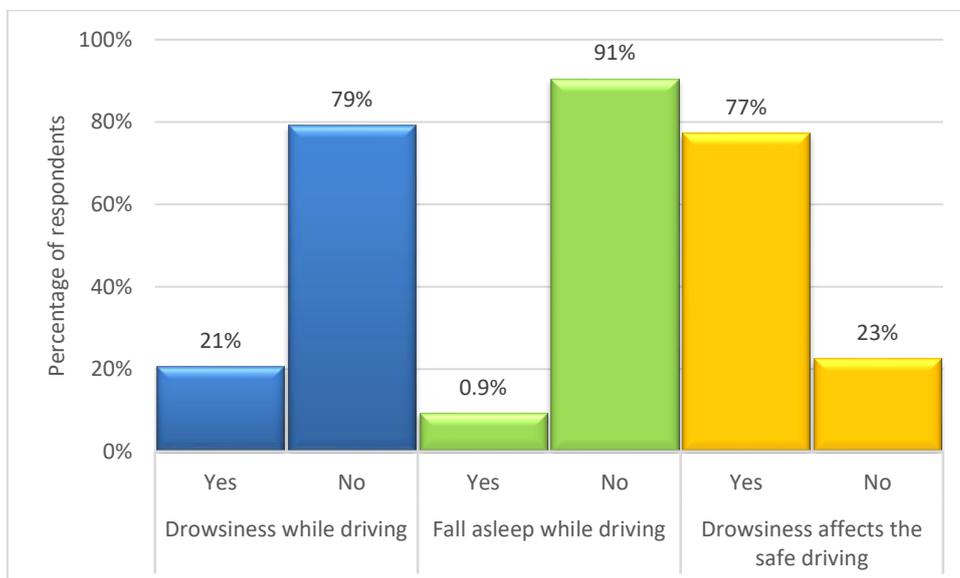


Figure 3. Percentage of respondents by drowsiness (fall asleep) while driving.

3.3. Gender Differences

The results of Independent-Samples T-Test showed statistically significant gender differences for the question "Do you think you ever fell asleep while driving" ($t = 1.274$; $p = 0.09$). 84% of female and 75% male respondents indicated that they have never driven drowsy. No statistically significant differences were found between genders in respect to other issues.

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 young driver fatigue and drowsiness. Although other results from Table 1. are statistically significant, it is not an easy task to deeper understand the mechanism that causes the achieved differences. This should be investigated in further studies. Complete understanding of these phenomena requires additional, separate research [17, 18].

Table 1. The overall statistically significant results of subjective assessments young driver fatigue and drowsiness, according to participation in traffic accidents.

	<i>How much time to drive before you stop and take a desirable break?</i>	<i>How much time to drive before you stop and take a real break?</i>	<i>Have you ever felt drowsiness while driving?</i>	<i>Do you think so drowsiness affects the safe driving?</i>
<i>Sig.</i>	0.000	0.000	0.015	0.007
<i>t</i>	-1.956	-1.622	0.902	-0.955

4. CONCLUSION

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

- Young drivers they usually to take a driving break between 2 – 4 hours of driving;
- 77% of respondents think that drowsy driving affects the safe driving;
- A quarter of the respondents indicated that they drive drowsy;
- 0.9% of the respondents indicated that they had almost fallen asleep behind the wheel at least once in the past year.

4.1. Recommendations

To prevent drowsy driving, the „AAA Foundation for Traffic Safety” recommends that drivers [4,5]:

- Avoid late night driving;
- Divide the driving with a passenger on long trips;

- Ensure that you get enough sleep before driving so that you can stay alert while driving;
- Take a nap if you begin to feel drowsy.

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