



A Study of Influence of Presence of a Passenger on Driving Speed



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ABSTRACT

The large number of victims of road traffic accidents around the world creates a serious problem for the economy, demography, and health care. The value of global social risk calculated according via relevant method, is within 18, in Russia it is of 9.7. Statistical data shows that government activities in the Russian Federation to improve road traffic safety are effective. Over the past ten years, the core values of road traffic accident rate have been decreasing, despite the increasing level of motorisation. Federal regulations stipulate a further decrease of target social risk index by 2030 to the value of 4.

Excessive speed and in conformity of the speed with specific traffic conditions are the most common cause of road traffic accidents (19 % of the total). The ideas of many urbanists (that often are not backed up by specialised research in the field of road traffic safety) to forcibly make abandon cars and reduce speed in cities cannot be implemented to full extent, although they have local positive results.

The likelihood of occurrence of a road traffic accident is significantly influenced by the individual characteristics of drivers, such as age, gender, and general risk propensity. One of the factors causing road traffic accidents, especially by young drivers, is the presence of peers. They can be the cause of dangerous driving, inattention, and the driver's desire to «show off.» Older

drivers, on the contrary, become more attentive and careful in the presence of passengers. However, in the scientific literature contains also opposite results (passengers can have a positive effect on young drivers, but a negative effect on older ones).

In this regard and in the context of developing recommendations on reduction of road traffic accident rate, it is relevant to study feasibility to set some restrictions for younger drivers. The objective of the work is to evaluate the influence of a passenger of the same age on driving speed for a young driver and to compare it with the influence of a passenger on an older driver. The research method was an experiment in which young drivers aged 18 to 25 years and more experienced drivers over 35 years old drove along a set route with and without a passenger, while the speed of a car was recorded. An increase in speed was revealed when most young drivers were driving with a peer passenger. Considering that most young people overestimate their ability to drive a car, violation of the speed limit under the influence of a passenger can affect the occurrence of a road traffic accident. Based on the results of the work, it is proposed to introduce a system of phased access to driving, introduce a ban on transportation of passengers until the drivers reach a certain age or gain relevant experience, and improve drivers' training programs.

Keywords: road traffic accident, driver, speed, driver behaviour, young driver, road traffic safety.

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INTRODUCTION

Every year, many people are killed or seriously injured in road traffic accidents, and, therefore, road traffic accidents pose a serious problem for the economy, demographics, and public health. The WHO European Region, the best performing region for road traffic safety, has a road traffic fatality rate of 8,8 per 100 000 people, compared with the global rate of 18,2 per 100 000 people¹. In Russia, at the end of 2022, the social risk index was 9,68². It is worth noting that in general, the dynamics of three main indicators of road traffic accident rate (the number of road traffic accidents, the number of fatalities and persons injured) has been steadily declining in Russia for more than ten years. At the same time, the level of motorisation is growing (over ten years from 2012 to 2022 it had increased by almost a third). This ratio of indicators is described by Reuben J. Smeed's model, which reflects the fundamental principle of the relationship between the level of motorisation and road traffic mortality (at a certain level of motorisation, there is an increase in transport risk, which subsequently decreases, while the level of motorisation continues to grow) [1; 2]. The federal project «Road Traffic Safety» set the target index to be attained by 2030 as 4.

Several driver's features, such as age and gender, influence the likelihood of crashes, and the risk is higher among younger drivers, especially male drivers [3]. In addition, the general propensity to take risks among young drivers is significantly higher [4; 5]. The presence of passengers is another factor that has different effects on the likelihood of road traffic accidents. There can be both a positive (i.e. protective) effect of driving with passengers (the risk of an accident is higher when driving alone) and a negative effect of driving with passengers. Whether the effect will be positive or negative depends on various situational factors: the age and gender of the driver, as well as the number, age and gender of passengers [6]. Reckless driving and inattention caused by young

passengers are two main forms of behaviour that precede road traffic accidents caused by young drivers [7]. One of the main manifestations of risky behaviour in this situation is speeding [8]. Older drivers, especially those with children as passengers, tend to drive more carefully and at lower speeds than driving alone [9]. At the same time, some studies have found no difference between driving with a passenger and driving alone [10]. The ambiguous results make suppose that there may be specific conditions under which manifestation of risky driving behaviour among young drivers is more often [11].

The relationship between driver age and driving features has been widely studied for a long time. Drivers under 24–25 years of age and inexperienced drivers (especially those with less than three years of driving experience) are most susceptible to accidents [12]. Young drivers are more impulsive, impatient, energetic, and inclined to risk. Such drivers are not able to objectively assess the situation, their instinct of self-preservation is practically absent, and their self-confidence is extremely high. One of the main causes of road traffic accidents is excessive speed [13; 14].

In general, passengers of the same age can influence young driver behaviour by directly encouraging violations as well as by modelling behaviour. They can also influence behaviour through their general attitude, suggesting how acceptable a particular behaviour is. Influence can be direct, for example through verbal and explicit non-verbal expressions of encouragement (or disapproval). Influence can also be applied indirectly through social norms, which can be transmitted through modelling [15]. In Russia, the issue of the influence of a passenger on traffic has been poorly studied and is represented mainly by technical studies on the influence of loading on the dynamics of a car [16; 17].

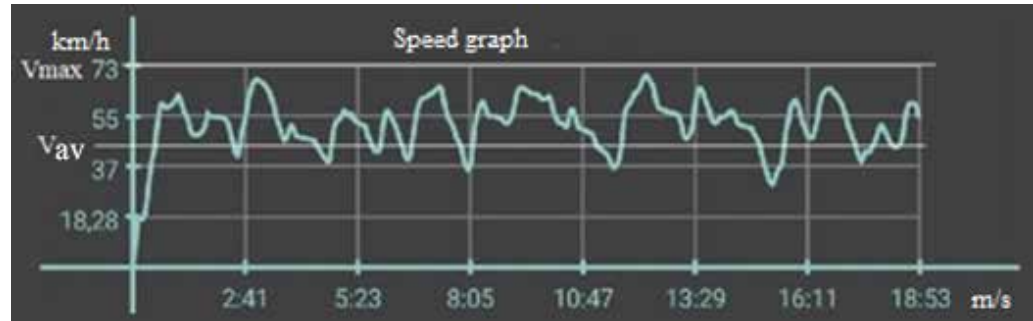
Exceeding the speed limit is one of the most common types of traffic violations and in 2022 was a cause of almost a fifth (19 %) of all road traffic accidents. Road traffic accidents associated with violation of the speed limit include those that occurred due to speed inconsistency with specific traffic conditions (92 %) and exceeding the established speed (8 %). Young drivers aged 20–24 years account for 11 % of such accidents².

In recent years, the ideas of urbanists have been gaining popularity, calling for various methods of discriminating against drivers and

¹ World Health Organization. Regional Office for Europe. (2020). European regional status report on road safety 2019. World Health Organization. Regional Office for Europe. [Electronic resource]: <https://iris.who.int/handle/10665/333758>. Last accessed 05.10.2023.

² Road traffic accident rate in the Russian Federation in 2022. Information and analytical review. Moscow, FKU «NC Road Traffic Safety Centre of the Ministry of Internal Affairs of Russia», 2023, 150 p., P. 5.

Driver's features	Age	Gender	Marital status	Occupation / educational institution
	21	Male	Not married	Cargo transportation / VTI
Car's features	Year of manufacture	Model	Power	
	2005	VAZ-2112	89	
Route	Streets		Time	Date
	Lenin Avenue, Generala Karbysheva street, Olomoutsкая street		12:00–16:00	25.05.2021
Route features	Driving time	Maximum speed	Average speed	Total distance
	18:53	73	44	13,7



Pic. 1. Example of a protocol of a test run [performed by the authors].

completely abandoning the car, reducing speed in cities. Positive experience of reducing speed to 30–40 km/h exists [18–20], but it cannot be applied everywhere. Promoted, for example, by Professor Vukan R. Vučić of the University of Pennsylvania, the ideas of forced complete renouncement to cars and transition to pedestrian traffic in cities [21, P. 382] are, in our opinion, utopian and impracticable, and forcing drivers to deny to use their cars by introducing a fee for each trip [21, P. 509] means discrimination based on property.

On the contrary, using the example of a long-term decline in road traffic accident rates in the Russian Federation, we can conclude on the effectiveness of the measures taken by government agencies within the framework of the state road traffic safety policy.

However, work remains to be done in some areas, including in terms of introducing restrictions for young and inexperienced drivers [22]. *The objective* of this work is to reveal the influence of a peer passenger on driving speed for a young driver and compare it with the influence of a passenger on an older driver. The research *method* is an experiment involving selected young people aged 18 to 25 years and more experienced drivers over 35 years old who have a driver's license and use a personal car.

The study involved two groups of drivers of different age of ten people each. The average

age for respective groups was 21,5 and 41,5 years. To conduct the study by measuring indicators during driving, the following route in the city of Volzhsky was chosen: Lenin Avenue from Builders Square – Olomoutsкая street – Generala Karbysheva street (intersection with Molodezhnaya street). The length of the route is about 13 km. Graphs of dependence of speed on time were compiled using the Geotracker – GPSTracker application (for Android OS).

Each of the ten drivers in the respective group made three drives with and without a passenger. The conditions for conducting the experiment were in conformity with the recommendations for examining the speed of vehicles, established in the Order of the Ministry of Transport of the Russian Federation dated December 27, 2022, No. AK-337-r «On approval of methodological recommendations for monitoring road traffic».

Relevant tests were carried out in April-June 2022.

The results and initial data were recorded in protocols (Pic. 1).

RESULTS

Each driver in relevant age group was attributed a conditional number from 1 to 10. Young drivers 2, 3, 5, 6, 7, 8, 10 exceeded the average speed when driving with passengers. Drivers 1, 4 and 9 had approximately the same



Table 1

Final test data for young drivers

Driver	Test without a passenger, speed in km/h	Average speed per three drives	Test with a passenger, speed in km/h	Average speed per three drives	Age
1	36, 44, 36	38,6	40, 37, 38	38,3	21
2	25, 37, 36	32,6	37, 37, 36	36,6	24
3	46, 46, 42	44,6	47, 52, 44	47,6	21
4	43, 43, 45	43,6	43, 43, 45	43,6	20
5	38, 36, 36	37,3	40, 43, 37	40	22
6	35, 35, 37	35,6	45, 47, 44	45,3	21
7	32, 32, 40	34,6	38, 37, 38	37,6	22
8	40, 40, 29	36,3	41, 47, 37	41,6	20
9	36, 36, 38	37,3	38, 36, 38	37,2	21
10	33, 35, 35	34,3	41, 36, 38	38,3	23
Average age					21,5

Table 2

Final test data for older drivers

Driver	Test without a passenger, speed in km/h	Average speed per three drives	Test with a passenger, speed in km/h	Average speed per three drives	Age
1	40, 37, 37	38	36, 36, 38	36,6	41
2	45, 42, 40	42,3	43, 38, 33	38	46
3	40, 37, 31	36	34, 33, 31	32,6	37
4	39,42,33	38	36, 31, 32	33	36
5	32, 36, 40	36	38,40,38	38,6	45
6	48, 44, 48	46,6	32, 37, 36	35	52
7	36, 36, 36	36	32, 37, 36	35	38
8	43, 33, 37	37,6	38, 34, 39	37	42
9	34, 49, 31	38	40, 43, 42	41,6	35
10	37, 36, 33	35,3	35, 35, 31	33,6	42
Average age					41,4

average speed both with and without passengers (Table 1, Pic. 2).

For older drivers, a decrease in average speed was recorded when driving with passengers for drivers No. 1, 2, 3, 4, 6, 7, 8, 10. The average speed was approximately the same both with and without passengers for drivers 5 and 9 (Table 2, Pic. 3).

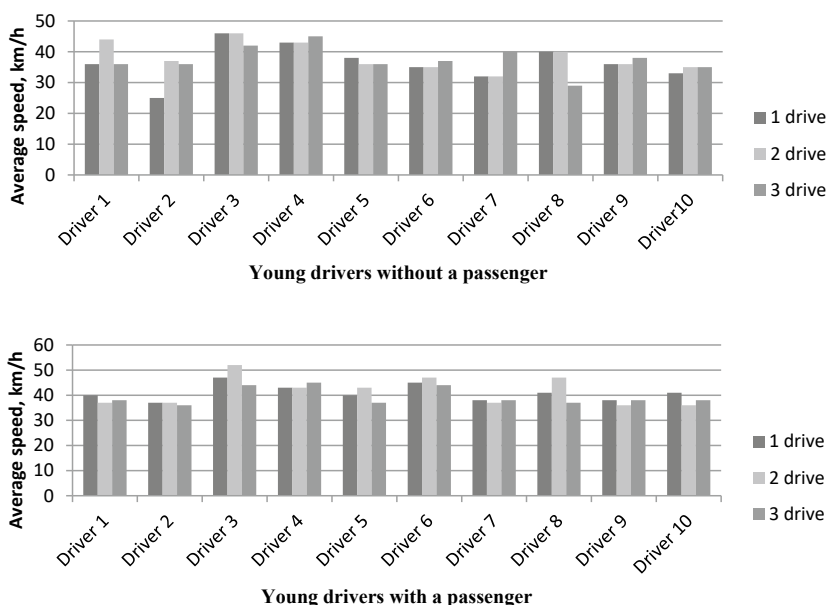
CONCLUSIONS AND PROPOSALS

Thus, the presence of a peer passenger together with a young driver, due to more frequent violations of the speed limit, can be the cause of a significant number of road traffic accidents, including those with fatalities and injuries. Considering the usual overestimation among young people of their capabilities in performance and reaction speed, knowledge about the car and methods of driving it, there is a need to introduce restrictions for young and inexperienced drivers, including on transporting passengers. In the age group of drivers 35 years

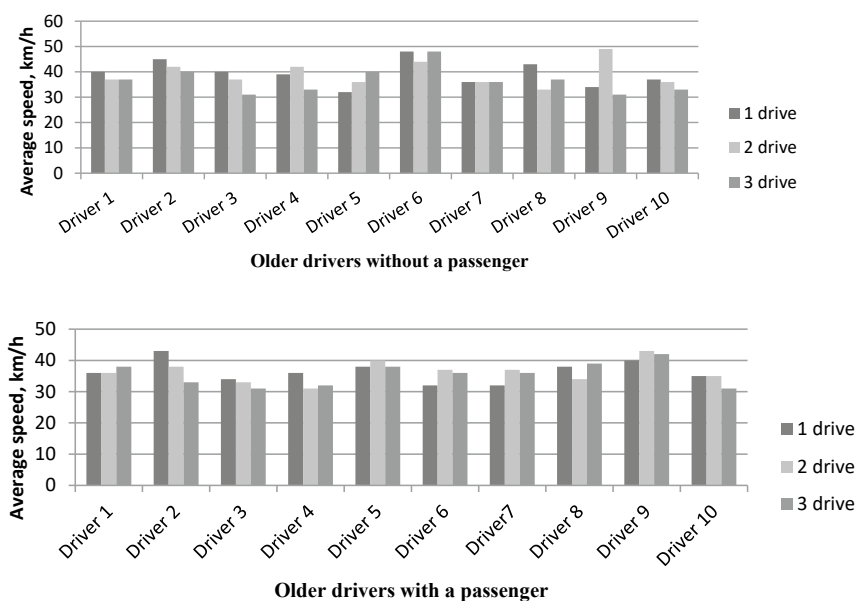
and older, the opposite dynamics is observed, i.e. the presence of a passenger in most cases either does not affect the speed, or the speed becomes lower.

One of the main directions of implementation of the Road Traffic Safety Strategy in the Russian Federation for 2018–2024 is changing the behaviour of road users for they unconditionally comply with the road traffic rules and regulations and improving the organisational and legal mechanisms for admitting vehicles and their drivers to participate in road traffic. As part of implementation of this strategy and achieving the target indicators of the federal Road Traffic Safety project, considering the research results presented in the work, it is possible to take several measures:

1. Maintaining the minimum age for obtaining the right to drive a vehicle within 18 years and introducing a system of phased access to driving a vehicle for persons of all ages who have just received a driver's license, i.e. the system which



Pic. 2. Diagrams of average speed for young drivers [performed by the authors].



Pic. 3. Diagrams of average speed for older drivers [performed by the authors].

has positively proven itself in the most successful countries in terms of road traffic accident rate [23].

2. A ban on transportation of passengers for young drivers until they reach a certain age or gain relevant experience.

3. As part of teaching the subject on psychophysiological foundations of driver activity when training in driving schools, it is necessary to conduct testing for risky behaviour propensity, which might be enshrined in Order

of the Ministry of Education of the Russian Federation dated November 8, 2021, No. 808, «On approval of exemplary professional training programs for drivers of vehicles of relevant categories and subcategories».

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Note of the editors. Considering the importance of the research results proposed in the article, it seems quite relevant to continue the discussion and to obtain additional experimental data.