IMPROPER DRIVER ACTION AS A CAUSE OF ROAD ACCIDENTS

NIEWŁAŚCIWE DZIAŁANIA KIEROWCÓW JAKO PRZYCZYNA POWSTAWANIA ZDARZEŃ DROGOWYCH

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Abstract: Road traffic is inseparably connected with road accident. This is the human-driver whose role in the transportation process safety is of key importance. Driving a motor vehicle requires from the driver not only knowledge but also physical and psychical fitness. They need to have the ability of quick reaction, proper estimation of the road situation and doing maneuvers adequate to it. In this study, an assessment of the impact of improper behaviors of drivers on occurrence of road collisions and accidents, has been analyzed on the basis of literature analysis and the authors' own research. In effect of the carried out tests there has been made a classification of the road events with a division into: cause, place, date, and time of their occurrence as well as drivers' age and their driving experience. The whole study has been performed on the basis of a real transportation company, operating on the territory of an urban agglomeration with the population of 500 inhabitants.

Keywords: safety, transport, driver, accidents, road events

Streszczenie: Nieodłącznym elementem ruchu drogowego są wypadki. Z punktu widzenia bezpieczeństwa realizowanych procesów transportowych najistotniejszą rolę odgrywa w nich człowiek – kierowca. Prowadzenie pojazdu samochodowego wymaga od operatora nie tylko wiedzy i umiejętności ale także sprawności fizycznej i psychicznej. Musi on posiadać umiejętność właściwej oceny sytuacji, wykonywania prawidłowych manewrów i dostosowywania ich do aktualnej sytuacji. W niniejszym opracowaniu, na podstawie analizy literaturowej zagadnienia oraz badań własnych, dokonano oceny wpływu niewłaściwych zachowań kierowców, z punktu widzenia przyczyn powstawania kolizji i wypadków drogowych. W wyniku zrealizowanych badań, dokonano klasyfikacji zaistniałych zdarzeń, z wyszczególnieniem: przyczyny, miejsca, daty i czasu ich występowania oraz wieku i doświadczenia zawodowego sprawcy. Całość rozważań dokonano na przykładzie wybranego przedsiębiorstwa komunikacyjnego, realizującego zadania przewozowe w 500 tysięcznej aglomeracji miejskiej.

Słowa kluczowe: bezpieczeństwo, transport, kierowca, wypadki, zdarzenia drogowe

1. Introduction

The research object of this paper are improper behaviors of drivers as the cause of road accidents. The need to move from place to place in order to reach the intended destination is one of the most important human needs. The reasons for which people travel and try to achieve their goals are of different nature. Substantial human needs, especially the desire to communicate over long distances and move around, can be accomplished by communication, including transportation. Transport is a factor coordinating operation of different industries and at the same time performs a useful service to the community.

Fulfillment of the basic human needs would not be possible without transportation. It plays a special role in integration of particular spheres of life. Transportation is a necessary tool to achieve the goals connected with carrying people, animals and goods. A big number of functions and roles which it performs, reflects its diversified function. The basic factor in this system is a human and the driver is central to its functioning. In order to meet, the often complicated demands, they need to have adequate skills and abilities [5, 6].

2. Role and importance of the driver in performing transport tasks

Thus, this is the human whose influence on the quality of a transportation system functioning is the largest which means that their skills, abilities and knowledge are crucial in the process of driving. The main task of a driver is to cover distances in a safe way. In order to travel safely the, drivers need to have adequate qualifications to drive a vehicle, they also should be able to react properly in untypical situations, which change dynamically on the road during driving. The most important though is the time in which drivers are able to process the data coming to them from the road. This time depends on many factors, such as: the vehicle speed, traffic intensity, weather conditions. The basic task of a driver is to accomplish a given transport task in the possible safest way for themselves and other traffic users [4, 6, 8].

The character traits of drivers, their predispositions and individual abilities are the main factors affecting the process of driving and making proper decisions while driving. The ability of driving a vehicle is in literature referred to as a function of a driver's mental efficiency. Driving a vehicle is a complex process consisting of many simultaneous actions which are taken in response to the stimuli which occur on the road. According to the author of this paper [1], the man's behavior can be of reactive and purposeful character. The first one is the driver's reaction to the stimuli, whereas the second one is a wider notion and applies not only to the reaction to external factors but it in a way it shapes the environment as regards accomplishment of all the transport purposes. The driver's task is to achieve given transport tasks and their accomplishment is different for each driver due to the specificity of their reaction to stimuli. While driving a driver is involved in many simultaneous activities and the way they are performed is different for each driver, due to their different reaction to stimuli. While driving a driver does many things at

the same time – from operation of certain devices that are in the vehicle, through constant observation of the road traffic, to adjusting the speed to the road condition and the way the activities are handled is specific for each driver. In order to acquire the discussed skills a driver goes a training procedure which finishes with appropriate tests.

The author's research object [1] is the connection between the drivers' character traits and their abilities to learn to drive a vehicle. The conclusion of the research process is that driving skills reflect high level of intelligence, the ability of abstract thinking, and mathematical skills. The way a driver reacts to stimuli and perceives the situation on the road has a large influence on the decisions they make during driving. The source of perception are neurons which determine human behavior and proper responses to what happens on the road. The perception is of complementary character which means that events perceived by a driver by means of the senses of sight and hearing. The first one is indispensable for a driver to perform transport tasks. All the complex processes that occur in organs of hearing include: accommodation, adaptation and convergence. Thanks to accommodation the driver's eye adapts in such a way that the driver can see over different distances. The ability of accommodation is different due to individual characteristics and age. The next process which makes it possible for drivers to perform their tasks is adaptation. It involves modification of the degree of lighting which is of great importance for the traffic safety, especially in unfavorable lighting conditions. The biggest problems are connected with changing daytime - dawn and dusk, the latter being specially dangerous [1, 2, 3, 9].

To distinguish the factors conditioning the mode of driving a vehicle, the following division has been introduced [7]:

- psycho-physical traits dependent on: vision, body balance, reflex, health and tiredness,
- external factors – including: state of the vehicle, alcohol consumption, time of year, week, behavior of passengers, talking on the cellphone,
- psychological traits depending on: intelligence level, experience, habits, age, gender, tiredness, stress, private problems, destination, haste.

3. Identification of causes of road events as the effect of improper behavior of drivers

In order to analyze the road accidents it is necessary to present the structure of results and kinds of road events, division of accident casualties and determination of the scope of responsibility of the vehicle drivers.

The concept of road hazards can also be referred to as risk which is determined by the likelihood for a given failure to occur. It can also be defined as the risk of being exposed to negative effects. These negative effects include [7]:

- loss of life,
- loss of health,
- damage to vehicle,
- road event.

A road event is an event in consequence of which at least one person involved in it has suffered damage. The following kinds of road events have been distinguished [7]:

- head crash,
- side crash,
- back crash,
- hitting a pedestrian or a cyclist,
- hitting a stationary vehicle, animal or another obstacle.

There is a variety of statistics which indicate the causes of road events. Analyzing the structure of the causes of road events in one year, there have been identified 30598 events, among which, there have been distinguished [10, 11] (proportional results were rounded to one place accurately to one decimal place):

- failing to adjust speed to the road conditions – 30,1%,
- disrespecting priority of way – 25,3%,
- improper behavior toward pedestrians – 13,9%,
- failing to keep safe distance between vehicles - 6,6%,
- improper overtaking – 6,3%,
- improper turning – 3,1%,
- going on the wrong side of the road – 2,2%,
- improper bypassing – 2,0%,
- improper reversing – 1,9%,
- improper changing the traffic lane – 1,7%,
- exhaustion, falling asleep - 1,6%,
- improper passing – 1,5%,
- entering red light – 1,5%,
- improper turning round - 0,6%,
- sudden braking – 0,5%,
- failing to obey traffic signs and other signs – 0,3%,
- driving without required lighting – 0,1%,
- improper crossing bicycle lanes – 0,1%.

One of the factors which are used for differentiation of road events is gender. Men have caused 77.1% of all the road events. However, women's involvement in road events is significantly lower – they caused only 4.35 of the events, whereas the perpetrators of the remaining events were not identified. Drivers at the age of 25-39 caused the biggest number of accidents. As many as 10 447 accidents were caused by young drivers, which accounts for 34.1% of the total number of accidents. In the discussed events there were reported 898 deaths, whereas 14 017 people were injured. The youngest drivers aged 18-24, caused a significant number of accidents 7 168, which accounted for 23.4 % of the total number occurred by fault of drivers. It should be emphasized that in this group there were many fatal accidents involving deaths as many as – 724 casualties and 10 293 persons sustained injuries. Young drivers are characterized by lack of experience, bravura, and they tend to take unnecessary risk and drive at high speeds. The fact that as many as 43% of

accidents in the discussed age group were caused by excessive speed and failing to adjust it to the conditions on the road is also evident. Additionally, 58 % of casualties of road accidents, caused by young drivers, were fatalities. In 2010 drivers of passenger cars accounted for the most numerous group, being perpetrators of 76.9% of accidents. 23.559 accidents were caused by fault of those drivers. 1933 people died in those accidents, whereas 32342 persons were injured.

4. Evaluation and analysis of carried out research

In the analyzed one year, experimental tests were carried out in one of urban agglomerations with the population of 400 thousand of people. Experimental tests aimed at examining the accomplishment of transport tasks in a municipal bus transportation system [3, 5].

The goal of the carried out tests was to collect and analyze documentation of undesirable road events occurred in the analyzed system of municipal transportation.

On the basis of the analysis of the research results, there have been distinguished 198 events in which:

- 51 – bus driver was the perpetrator,
- 3 - was caused by the vehicle failure,
- 4 - was caused by an outsider,
- 32 – was caused by a passenger,
- 50 –was caused by another vehicle,
- 25 – was caused by vandals,
- 33 – the cause has not been identified.

The result of tests (fig.1) unequivocally indicate the human as the main perpetrator of the reported events. They prove that the society should be made aware of the fact how much depends on them. This applies both to the professional drivers employed in the research object and the remaining participants of road traffic who are likely to contribute to undesirable road events.

Fig. 1. Percentage share of undesirable road events causes.

Improper driver action as a cause of road accidents

Niewłaściwe działania kierowców jako przyczyna powstawania zdarzeń drogowych

After having analyzed the results of carried out tests, it was found that the bus drivers contributed to as many as 26% of all the reported accidents. Drivers of other vehicles caused 25% of them. In the analyzed group of drivers, 98% were men, for 2% it was not possible to identify the cause.

Fig. 2. Percentage share of road events caused by drivers according to age.

The below presented data show the number of drivers from particular age groups: 5 persons aged 20-29, 5 persons aged 30-39, 13 persons aged 40-49, 9 persons aged 50-59, 2 persons aged 60 and more, 17 persons - no data.

Analyzing the research results for particular age groups it can be observed that apart from persons whose age was not established, the most numerous group included persons aged 0-49. It proves that drivers at this age lose the ability to concentrate which often results in occurrence of road accidents.

Fig. 3. Percentage presentation of drivers causing road events due to seniority.

The data presented in fig.3, indicates the most frequent perpetration of drivers with short driving experience. Drivers who had worked not longer than for 5 years, accounted for 38% of perpetrators who were found to have been employed for a certain period of time. Drivers with seniority longer than 5 years up to 32 years caused 21 collisions. The research proved that along with the increase in the years of seniority the number of events caused by drivers decreases. Although the period of 5 years and more is almost 6.5 times longer the number of collisions was only 1,6 times bigger. Lack of experience and bravura are the factors which contribute to recklessness of young drivers making them take wrong decisions. It was not possible to establish the period of seniority for 17 persons.

The above presented results show that on the average, according to the day of week, there occurred 7 road events in result of improper behavior of drivers. Sunday and Monday turned out to be the days in which there were the fewest accidents. On the first day here were reported 3 collisions. The cause of such a result is a reduced traffic during weekends. For most people this day is free of work and school which finds reflection in the intensity of traffic. In turn, a relatively small number of collisions on the first weekday has a different reason. Relaxed drivers after the weekend, tend to be more observant and watchful which is reflected by such a low result.

Fig. 4. Occurrence of undesirable events caused by drivers due to the time of week.

Thanks to having regenerated their strength, their senses and movement coordination work better and more accurately. Between Tuesday and Thursday the number of events increases almost 4 times. Persons who drive vehicles become less and less patient which affects their decisions which become more risky. On Fridays there is a peak of road accidents occurrence. People are tired as it is the fifth weekday. The ability to react and make right decisions is decreased. The value of standard deviation for this situation reflects a divergence of the results in relation to the mean. The below chart shows a difference between the obtained results and the mean value.

Improper driver action as a cause of road accidents

Niewłaściwe działania kierowców jako przyczyna powstawania zdarzeń drogowych

Fig. 5. The presentation of the research results according to the day of a road event occurrence.

This presentation shows a deviation of obtained results from the mean value. On days such as Sunday, Monday and Friday the obtained results do not vary from the mean value. It proves that each day needs to be treated in an individual way as the mean value in this case does not fully reflect the results.

Fig. 6. Presentation of road events caused by fault of the driver according to months.

Road events caused by drivers were more frequent in summer and autumn months. Good road conditions make drives lose their vigilance and carefulness which often ends up in a collision. Although the weather conditions are good the road hazards are higher as drivers develop higher speeds which make it more difficult to make the right decision due to a shorter time for reaction.

The above presentation shows that, on the average, almost 4,5 events were reported each month. However, the arithmetic mean does not render fully the results of the research. Standard deviation for the calculated mean was almost 3,4 which univocally shows that the results are diversified.

Whereas, in figure 7, there has been shown a distribution of events caused by drivers according to the hour of occurrence.

The above data shows that the rush hours, that is, intensified traffic, have a negative influence on the number of road events. When traffic is more intense, drivers are in a hurry and the effect is occurrence of more accidents.

Fig.7. Distribution of road events caused by drivers according to hour of occurrence.

It can also be observed that between 00:00 and 02:00 the number of collisions is larger. Many passengers are under the influence of alcohol and they come back home from parties. Noisy and irresponsible behavior of passengers has a negative influence on driving the vehicle.

Fig. 8. Occurrence of road events in successive hours of driving.

The above chart shows a significant difference between practice and theory which indicates that the driver gets more tired every hour of driving. This is not without an effect on their reflex and ability to make rational decisions. However, during successive hours of driving the driver tends to be less willing to take risky maneuvers. The biggest number of events happened in the first and second hours of driving. The number of events was getting lower over the next successive hours. It should be noted that there was a drop in the number of events between the 7th and the 8th hour of work. However, the last three hours of the driver's work are characterized by a similar number of occurrence of undesirable road events.

Fig. 9. Occurrence of road events due to the weather conditions.

The above presented data shows that there is a regularity of occurrence of undesirable road events both during good – sunny weather and during cloudy and rainy weather. The cause of such a high value of the results during good weather

conditions is overestimation of one's abilities and skills, and due to more self-confidence, an increased disposition to behave in a more risky way. At the same time during bad weather conditions, when driving requires better skills, drivers are more careful.

5. Conclusions

The tests that were carried out in a municipal bus transportation system reveal that, among other road users, bus drivers belong the most numerous group of people who are perpetrators of road events. Proper concentration, perception, ability to predict what can happen on the road, make it possible to drive safely and accomplish the set goals. However, it is good to be aware of other factors which affect the manner of driving. These include: external factors, psychological and psychophysical traits. Summing up, it should be noted that it is not possible to specify a closed catalogue of causes of road accidents. People's actions are of various character and they are variable in time, which makes it impossible to indicate their one concrete source. Therefore, it is necessary to continue the research and statistics in order to provide more knowledge and have a better insight into the subject.

6. References

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