Aggressive and Dangerous Behavior of Car and Motorcycle Drivers in the Czech Republic – Analysis of Floating Cars Records

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Abstract:
The paper deals with problems of aggressive behavior of cars and motorcycles drivers. It describes an evaluation of such behavior from recordings obtained with use of so-called floating cars. It offers basic statistical analyzes based on almost 300 recordings from 11 thousand kilometers driven on various types of Czech roads. The paper presents some of the most interesting (and from a point of safety the most important) results.

Key-Words: - driving safety, aggressiveness behind the wheel, road rage, floating cars

1 Introduction

Human society has been exhibited to various negative impacts since the beginning of its days. These impacts are caused by the tendency of some individuals or groups to express intolerant to aggressive behavior and sometimes is suffers from the changes its specimen from good to worse (sometimes very sudden) of the group that may be caused by internal or outside features. The resulting effect of the subject's tendency to aggressive behavior is in most cases negative.

The issue of aggressive behavior of drivers that is at the same time the cause of reduction of traffic safety is still open. The preliminary analyses confirm it is much more complex and demanding than the remaining two categories of human failures, but at least with the same importance.

Human failures in traffic have various sources, the prevailing ones are the following three:

- lose of attention
- influence of alcohol or other drugs
- intolerance or aggression expressed towards other traffic participants.

The above categories cannot be always strictly separated, as the driver is under combined influence with various mutual links and importance. It can be estimated that the drop of attention is the source of about 50% of all accidents that are caused by human failure, further 25% account for alcohol and drugs and the remaining 25% can be associated to intolerance and aggression during driving.

The causes of accidents in the first category, i. e. drop of attention, can be to some extent by accepted as natural, especially if the driver is exposed to traffic for a longer time. It is thus a kind of elementary human failure in traffic.

2 Aggressive behavior classification

In the state of aggression, especially the information sorting procedure and conclusion forming is changed – the driver stops behaving rationally, his assessment of the situation is not normal. A too frequent occurrence of some (whether they origin in an internal or outer environment, weather situation or distractive sources) can in longer term result in disability to naturally relax when driving and thus acts under the influence of discomfort, anger, intolerance and later aggression). Meanwhile, it must be taken into account that different people react differently and some individuals can already start driving under some psychical pressure.

The manner of vehicle driving is generally prescribed in various directives and Acts, the obedience to them shall assure safe and reliable traveling. The infringement, on the other hand, forms the basis for traffic accidents and incidences (these can be caused as well by various other effects). It is generally known that the sum of all traffic accidents causes extreme losses of health, lives and properties. It must be as well taken into account that the loss of attention is a general trait of all drivers irrespective their age, sex and experience, the drop of attention of human individuals occurs differently at each driver,

other categories of human failures it may be different. The lack of knowledge and shortage of skills are causes of accidents, too, and are only tested during the initial driving tests. As the tests are not repeated as the age of drivers rises, therefore the risk of accidents caused by "loss of skills" is generally widely underestimated. Similar situation occurs in the moments when the driver is experienced enough, but in different region and especially when he is obliged to drive in heavier traffic and more complicated situations. Even in such moments, stress may occur, and the driver further tends to drive aggressively.

The typical feature of present transportation systems is their higher efficiency and speed and the reliable and safe operation imposes higher requirements on driver's abilities (irrespective the ever higher implementation of assistance systems). This of course has something to do with rising traffic density.

The human individual is influenced by wide range of outer stimuli during driving, he is obliged to diagnose it, evaluate and decide when and how is he going to react to it. This influx of information imposes enormous psychical and physical load on driver and if it lasts for longer, it may end up in tiredness, loss of attention, anger, aggression, loss of ability to tolerate the improper behavior of the other drivers, later to conversion of adequate behavior patterns into intolerant and aggressive.

The whole population of drivers copes with such influence in different manner. There are drivers who don't lose their ability to react in rational and tolerant way even after long driving, but there are drivers, who tend to behave aggressively immediately or soon after they get in the car and switch the engine on. Sharper preliminary division is very difficult and non-specific, even though highly required.

There are various psychological tests to find out the tendencies of the people to behave intolerantly or aggressively, but its reliability and differentiation level is generally very low. As well the knowledge of further disturbing factors, alcohol, other drugs, tiredness and stress above all, and their influence on a switch of rational to aggressive behavior is significant.

The basic classification such intolerant (up to aggressive) behavior can be done with use of following criteria:

- Events which can lead to the damage of the road and road signs.
- Events which can cause an accident.
- Events of the direct peril of health/life of other road users.

3 Monitored road segments

The whole set of monitored roads was elected after recommendation of experts from Czech Road Police Headquarters. Each of the floating cars went through the selected road set upon weather and time possibilities. Each of the road segments was passed at least once but the majority of them many times.

4 Measured data analysis

Based on the data detected from the floating cars recordings, a statistical analysis was done. Such parameters as follows were inspected:

- Frequency of different types of incidents
- Frequency of incidents at each road segment
- Types and makes of road vehicles
- Relative incident rate within the road vehicle type and make
- Localized values of incidents
- Time and week day of incident

Some of the statistics were extended in more detailed evaluations. The following chapters describe selected results.

4.1 Overall statistics

The total number of evaluated incidents over all analyzed recordings was almost 300 covering more than 11 thousand kilometers. In the next picture (Fig. 1) there is a histogram of most frequent incidents.

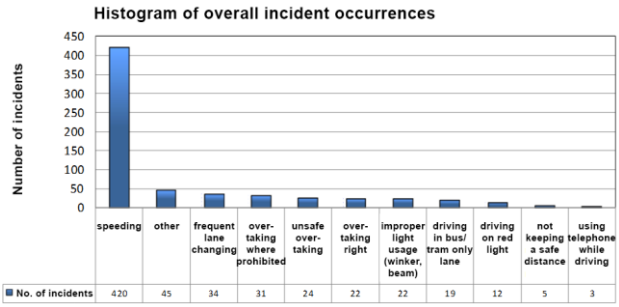
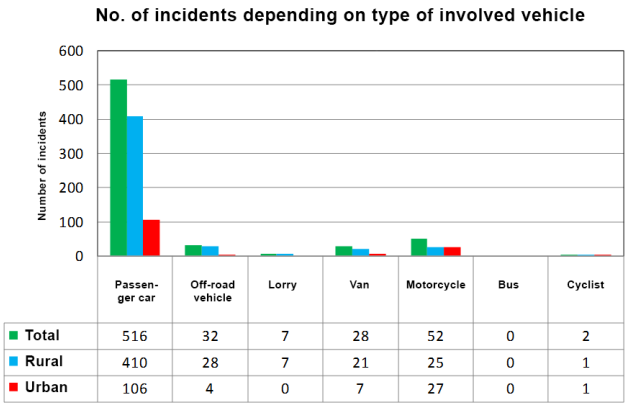


Fig. 1: Histogram of overall incident occurrences

4.2 Vehicle types

The next point of our interest was a relationship between the incidents and types of the vehicles. In the next graph (Fig. 2) There is a histogram of incidents belonging to each of the road vehicle types. The results are then differentiated into in / out urban segments.



	Passen-ger car	Off-road vehicle	Lorry	Van	Motorcycle	Bus	Cyclist
Total	516	32	7	28	52	0	2
Rural	410	28	7	21	25	0	1
Urban	106	4	0	7	27	0	1

Fig. 2: Histograms of incidents by road vehicle type

Going deeper into the incident analysis it is possible also differentiate in most interested road vehicle types. From the following graphs (Fig. 3 and Fig. 4) it is possible to see that the distribution of particular incident types may vary significantly over distinct road vehicle types. For example, in case of passenger cars is the there is majority of incidents is speeding for both in and out urban area, but in the case of motorcycle the situation is totally different.

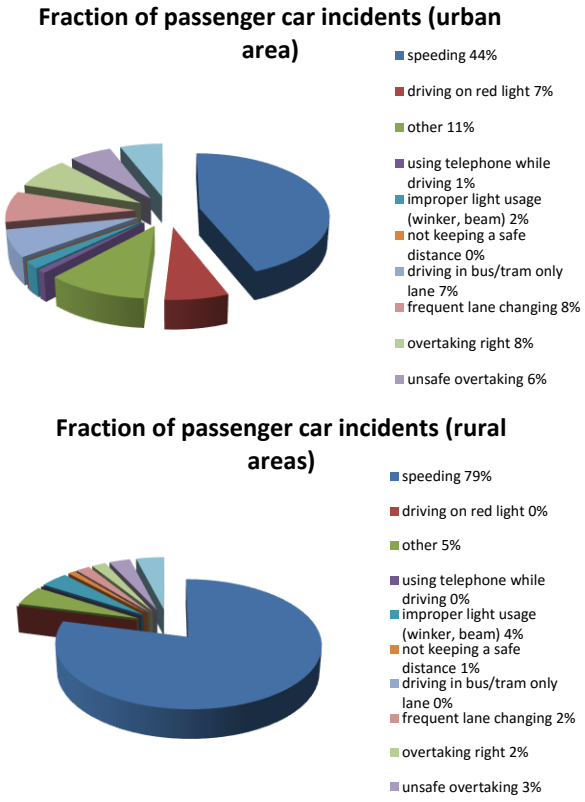


Fig. 3: Fractions of different incident for passenger cars in (upper graph) and out (lower graph) urban area

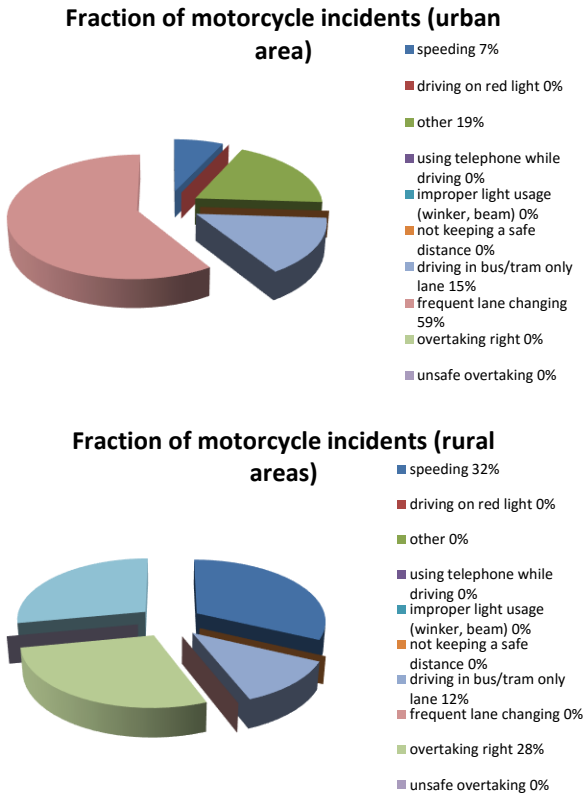


Fig. 4: Fractions of different incident for motorcycles in (upper graph) and out (lower graph) urban area

4.3 Statistics upon car makes

If going deeper into subcategorization of the incidents, it is possible to discover interesting consequences between incidents and car makes (and even particular car class). Coming from the data of state cars register, it is evident that in the Czech Republic there was in the time of research (2009) 4.4 million registered passenger cars. From that number the makes are distributed as follows: 40,54% Škoda, Ford (9.33%), Renault (7.95%), Volkswagen (7.27%), Peugeot (6.88%), Opel (5.72%). Other makes were less than 5%.

In the next picture (Fig. 5) it is possible to see and compare percentage of registered cars of each make (upper graph) with the distribution of recognized incident grouped upon the respective car makes (lower graph).

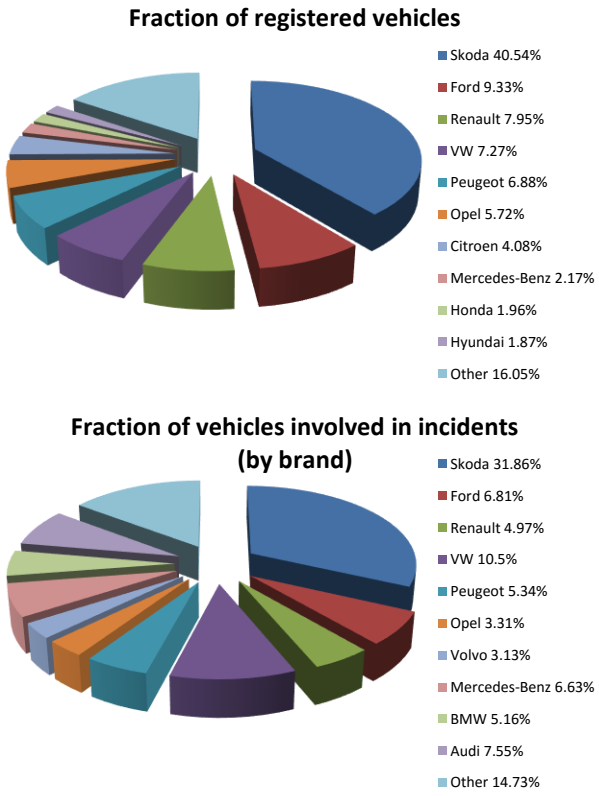


Fig. 5: Graphs of makes in CZ (upper graph – distribution of particular makes over all registered cars, lower graph – distribution of observed incidents over particular car makes)

As it is possible from the lower graph (Fig. 5) there is not a general correlation between car occurrence and accident occurrence. The makes selling sporty, fast and/or luxury cars took higher places in the incident occurrence that they should take (i.e. AUDI, Mercedes, BMW, partially VW etc.). In case of AUDI, for example, it is 1.5% ratio on all registered vehicles, meanwhile, incident ration became 7.55%. To have a better look on the problem, the next graph (Fig. 6) shows the incident occurrence of different makes normalized by the ration on all registered passenger cars.

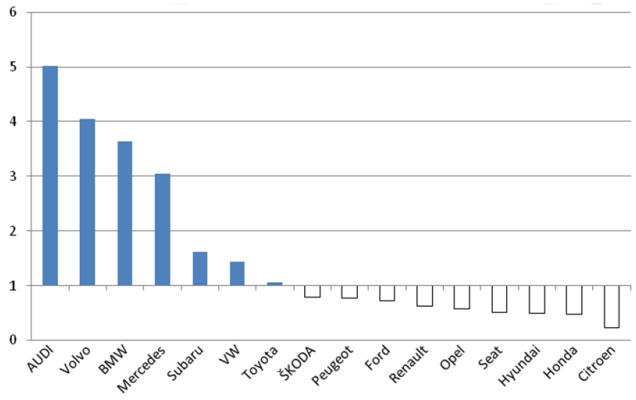


Fig. 6: Incident occurrence rate of makes normalized by ration on all registered ones

The above describe results somehow confirm a generally agreed opinion, that owners/drivers of fast and powerful expensive cars do relatively more aggressive/offensive driving behavior.

5 Discussion

From the analyzed data it was concluded following:

- The most observed incident was speeding.
- Speeding in urban area was 36,55% and out of urban area was 74,59% out of the overall number within each area.
- Passenger car drivers caused 81% of all noticed incidents.

It is possible to say that there is a certain confirmation of generally accepted hypothesis, that there is some positive correlation between the price and power of the vehicle and the relative occurrence of incidents connected to offensive/aggressive driving behavior (especially AUDI, Mercedes, BMW etc.).

6 Conclusion

The experiment was performed in 2009 and partially in 2012 and 2013. It was possible to observe incidents caused by a whole spectrum of road vehicles and during all the year seasons (which is important since some types of vehicles do not operate in winter and bad weather conditions – i.e. motorcycles etc.).

A special focus was put on differentiation of behavior in and out the urban area, thus some of the road segments could be analyzed separately.

From the analyses done, it is possible to derive, that most frequent incident is speeding. This fact is even more serious, taking into account that just speeding makes 16% of all road accident causes.

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