https://doi.org/10.14669/AM/162678

RESEARCH INTO THE OPINION OF PROFESSIONAL DRIVERS ON IMPROVING ROAD SAFETY BY USING THE FRONT BRAKE LIGHT

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Abstract

The European Union has an ambition to achieve zero road deaths by 2050. It is an ambitious target, but not an unachievable one. The installation of a front brake light, which provides information to other road users that the vehicle is braking, can help to achieve this goal. Today, this information is available to road users who can see the rear of the vehicle. Because the brake lights are located at the rear of the vehicle. The information that the vehicle is braking is also important when looking at the front of the vehicle. Whether it is other drivers or other road users such as pedestrians and cyclists. The aim of this paper is to conduct a research among professional road transport drivers on what their opinion about the front brake light is. From their opinion, we will conclude whether such light has the potential to improve road safety or not.

Keywords: safety; road traffic; driver; front brake light

1. Introduction

Communication between road users is a key element for safe traffic. Communication is important, both between drivers and each other, but also between drivers and other road users [13].

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https://doi.org/10.14669/AM/162678

According to [8], interaction between motor vehicles and pedestrians at pedestrian crossings without traffic lights is particularly necessary. The importance of interaction is further increased when vulnerable road users, including children and the elderly, are involved. The authors [9, 12] claim that up to one third of accidents occur at these locations. In the USA, 78% of pedestrian accidents happen at pedestrian crossings outside of intersections [7]. Eye contact also contributes to safe driver–pedestrian communication [5]. Establishing eye contact is often only possible in the immediate vicinity of the vehicle before the pedestrian crossing. However, there are also situations where eye contact cannot be established at all. For example, at night or in bad weather. In such cases it is also very difficult to identify the speed of the vehicle or whether the vehicle is braking or not. According to [6, 15], cyclists on electric bicycles are particularly dangerous. Children and the elderly may have difficulty estimating the distance and especially estimating the speed or deceleration of an approaching vehicle [1, 10].

One way of improving communication between drivers and other road users, as well as between drivers and each other, is using front brake lights. The aim of this research is to identify the opinion of professional drivers on the use of the front brake light.

2. Front brake light identification

The front brake light is technically a green-coloured light located at the front of the vehicle (Figure 1). The choice of the green colour is because there are colours of light that cannot be used:

- Red light – rear brake light,
- Blue light – light giving right of the way,
- Orange light – light indicating the travel direction of the vehicle.

The green colour of the light is also significant because of the nature of the information that the light offers. A green front brake light indicates that the vehicle is braking and reduces the stress for other that a vehicle that does not have the right of way brakes whether a vehicle that the right of way does not have is braking.

Fig. 1. Position of the front brake light

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The front brake light has the potential to reduce traffic accidents in the following cases:

- Turn left – when two vehicles meet in traffic and one turns left giving way to the vehicle proceeding straight ahead, there is a degree of uncertainty for the driver proceeding straight ahead as to whether the left-turning vehicle registers the fact that it must give way to the oncoming vehicle [3, 11]. If the left-turning vehicle starts to brake, the front brake light illuminates and the oncoming vehicle is informed that the vehicle brakes (Figure 2).

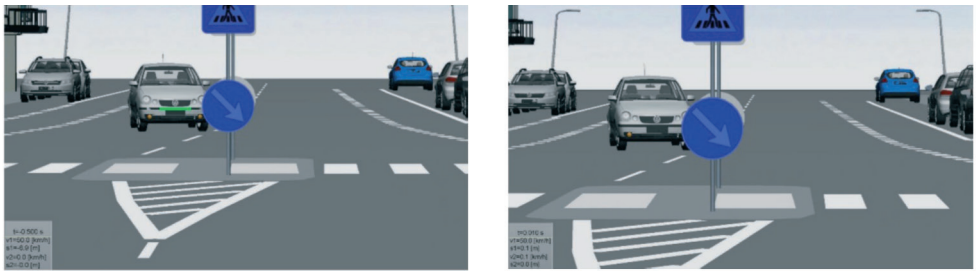

Fig. 2. Comparison of driver awareness when turning left [10]

- Lane change – when changing lanes, the driver often works with a high degree of uncertainty as to whether the driver driving in the lane the driver intends to change into has noticed the vehicle's directional lights and whether the driver will be able to change lanes safely. If a vehicle in the lane brakes to allow the other vehicle to change lanes, the front brake light shall be illuminated. The driver changing lanes will see the front brake light illuminated, reducing the driver's stress as he/she is informed that the vehicle allows him/her to change lanes (Figure 3).

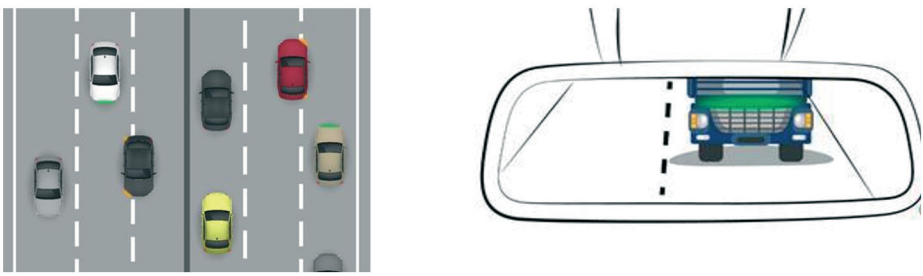

Fig. 3. Lane change

- Narrowed carriageway – a similar situation arises when the carriageway is narrowed, where only one vehicle can drive on a certain section. If a vehicle is informed that the vehicle opposite brakes or is stationary and has its front brake light illuminated, this means that the driver can continue to drive on the narrowed section of roadway.

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- Pedestrian crossing – pedestrians often work with a high degree of uncertainty due to the fact that they have no information whether drivers can see them and whether they give them the right of way [2, 4] The pedestrian often waits for eye contact with the driver, which is often not possible. E.g., at night, in low visibility, etc. [16, 17]. When the front brake light comes on, it means that the driver perceives the pedestrian and has started to brake (Figure 4).

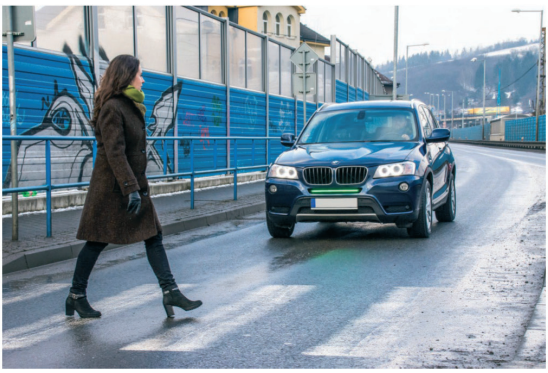

Fig. 4. Vehicle braking information by illuminating the front brake light before a pedestrian crossing

3. Research methodology

The University of Zilina carried out research on the opinions of professional drivers in the period from 13 October 2023 to 17 February 2023, who, according to their experience, answered questions related to the change in road safety due to the impact of the front brake light. A total of 239 drivers took part in the research and were contacted by paper questionnaires. These were drivers who make the following driving performance per year:

- 19.7% – performance more than 100 000 km/year,
- 12.1% – performance from 60 000 km/year to 100 000 km/year,
- 19.7% – performance from 30 000 km/year to 60 000 km/year,
- 32.6% – performance from 10 000 km/year to 30 000 km/year,
- 15.9% – performance to 10 000 km/year.

These were drivers with the following professions:

- 33.7% – truck driver,
- 30.1% – driving is not the driver's main activity,
- 10.1% – bus driver,
- 11.2% – taxi driver,
- 14.9% – driver of another vehicle (e.g. road maintenance, etc.)

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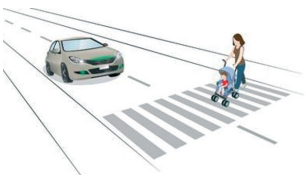
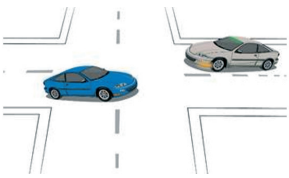
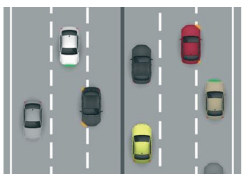
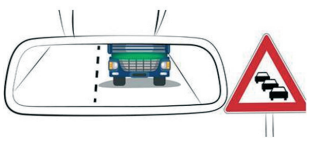
Drivers responded to a questionnaire which included the following traffic situations:

Traffic situations

	When you press the brake pedal, the front brake light comes on so that another road user in front can see if the car brakes. Please indicate what you think the front brake light will do in the following traffic situations?	**MUCH MORE DANGEROUS**	**FBL makes situation ◄----►**			**MUCH SAFER**
1.	In the case of crossing vehicle and pedestrian traffic:	1	2	3	4	5
2.	In the event of crossing traffic of several vehicles:	1	2	3	4	5
3.	When you overtake:	1	2	3	4	5
4.	 On the pedestrian crossing:	1	2	3	4	5
5.	 When turning left:	1	2	3	4	5
6.	 When changing lanes on the highway:	1	2	3	4	5
7.	 When braking in congested traffic:	1	2	3	4	5

If you were to vote on the general introduction of FBL into traffic, would you vote...? ◯ ...for ◯ ...against.

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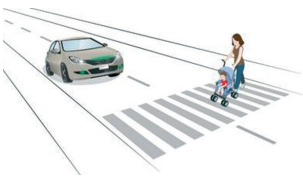
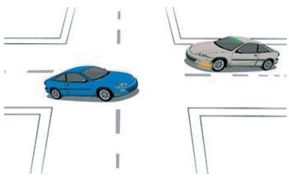
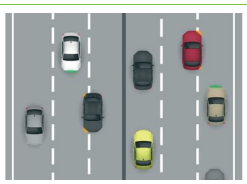
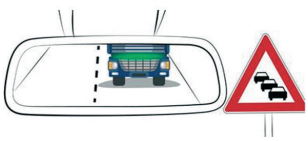
4. Research methodology and discussion

Based on the research carried out on a sample of 293 professional drivers, it can be concluded that drivers expect the installation of a front brake light to improve road safety. On a scale of 1 much more dangerous to 5 much safer, all traffic situations scored above average, i.e., above 2.5 (which would mean that drivers think that the front brake light will have no effect).

Individual traffic situations scored between 3.32 and 4.04, indicating that the front brake light has significant potential to improve road safety. The individual traffic situations achieved the following ratings:

1.		In the case of crossing vehicle and pedestrian traffic:	**3.90**
2.		In the event of crossing traffic of several vehicles:	**3.71**
3.		When you overtake:	**3.32**
4.		On the pedestrian crossing:	**4.04**
5.		When turning left:	**3.75**
6.		When changing lanes on the highway:	**3.34**
7.		When braking in congested traffic:	**3.87**

Overall, drivers were also in favour of the introduction of front brake lights in regular traffic. 77% of drivers thought that the introduction of front brake lights would improve road safety.

5. Conclusion

The European Union has an ambition to achieve a significant reduction in road accidents by 2050. A reduction in the number of accidents can be achieved by reducing road user uncertainty [1, 14]. The front brake light is an application that reduces uncertainty and provides road users with additional information. Research carried out by the authors has shown that the introduction of a front brake light has the potential to improve road safety. Up to 77% of professional drivers would welcome the introduction of such lights on vehicles. The University of Zilina has the ambition to carry out further research in real traffic, where vehicles will be driven with a front brake light and then the actual impact on road safety will be identified.

6. Acknowledgement

This publication was created as a part of research projects the Operational Program Integrated Infrastructure 2014–2020 for the project: Innovative solutions for propulsion, energy, and safety components of means of transport, with ITMS project code 313011V334, co-financed from the resources of the European Regional Development Fund.

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