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# INFLUENCE OF ROADSIDE ILLUMINATED ADVERTISING ON DRIVERS' BEHAVIOUR

## WPŁYW PRZYDROŻNYCH REKLAM ŚWIETLNYCH NA ZACHOWANIA KIEROWCÓW

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### Summary

The aim of this study was the preliminary investigation into whether drivers are aware that roadside luminous advertisements affect their attention and whether this fact is related with the number of accidents and collisions in which they are involved. To this end, a survey was conducted among drivers and their responses were taken forward for analysis. The respondents were asked whether illuminated advertisements were likely to distract them and whether adverts could obstruct or reduce the clarity of traffic signs or signals. Effects of advertising billboards on safe operation of road traffic were searched through the correlation between the questions above and those relating to accidents and collisions at which the respondents were at fault. Results will be used in further study with an extended sample size and scope of the study.

**Keywords:** roadside luminous advertisements, driver, attention, road collision, road accident, research drivers, road traffic safety

### Streszczenie

Celem przeprowadzonej w niniejszym artykule analizy jest wstępne rozpoznanie czy sami kierowcy są świadomi tego, że reklamowe tablice świetlne usytuowane w pobliżu dróg i ulic wpływają na ich koncentrację i czy ma to związek z liczbą wypadków i kolizji drogowych w jakich uczestniczą. Aby stwierdzić powyższe przeprowadzono badania ankietowe wśród kierowców, a następnie analizę udzielonych przez nich odpowiedzi. Ankieta zawierała pytania w których zapytano respondentów według nich czy reklamowe tablice świetlne wpływają na ich koncentrację, czy utrudniają im

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widoczność znaków i sygnałów drogowych. Wpływ takich reklam na bezpieczeństwo ruchu drogowego w niniejszym opracowaniu poszukuje się w zależności, korelacji między pytaniami dotyczącymi wyżej wymienionych zagadnień a pytaniami dotyczącymi zagadnień sprawstwa wypadków i kolizji drogowych popełnionych przez ankietowanych. Otrzymane wyniki stanowią wstęp do dalszych badań dotyczących powyższego, które będą rozszerzone o liczebność próby i obszar badań.

**Słowa kluczowe:** reklamy świetlne, kolizja drogowa, wypadek drogowy, badania kierowców, bezpieczeństwo ruchu drogowego.

## 1. Introduction

Safety of road users depends on a number of factors, divided in the literature into three groups: vehicle factors, road (environmental) factors and human factors (road users) [16].

Analysis of road safety statistics indicates that most accidents or collisions are caused by in-car distractions. According to the report issued by the Office of Road Traffic of Warsaw City Police HQ in 2016, 29 081 accidents, constituting 86.4% of the total number of accidents in Poland, were caused by drivers [17]. This is certainly associated with the fact that many external and internal factors affect their driving capacity and psychophysiological condition. The drivers are rarely aware of this influence.

These include observation of other vehicles and their behaviour on the road, observation of pedestrians, architectural objects, landscape and road advertisements.

The advent of light emitting diode technology has brought to Poland, in particular to agglomerations, large electroluminescent advertising billboards. They are often situated at the vicinity of major traffic areas, at junctions, roundabouts, etc. to capture and keep road user attention. Intentionally located as close as practicable to the road edge, they are to remain in the field of vision of the driver for the longest possible time. Advertising panels of this type are characterized by large size, high luminescence and very dynamic changes of the display (video, animation) [6], which may, especially at night or in adverse weather conditions (low clouds, haze, rain) cause discomfort in drivers leading to poor road observation, disability glare, and disturbed driving. Because of embodied symbols or colour combinations, the screen can be mistaken for, or confused with, traffic signs [18] which, as a result, may lead to an accident.

A number of studies have been devoted to the operation, location and contents of the advertisements and the impact of luminous advertising on the safety of road traffic [1-6, 8-11, 13, 14, 15, 16, 18].

Drivers' attention level was studied based on their accounts and driving behaviour.

For example, in [3], the drivers had a task of reacting to a red traffic light while a series of black and white advertisements was shown on the left-hand part of the computer screen. The author of [8] reports that drivers slow down to look at the advertising panels, take more time to change lanes, and glance at the roadside billboard more frequently than at the road ahead. The impact of roadside advertising was also proved in [2, 13] by examining stimulus-driven eye movements and duration of glances. The authors of those

works demonstrated that drivers were unaware that they had looked at the advertisement. Drivers' behaviours when affected by the content of the display are discussed in [7, 12].

The authors of those articles concluded that the processing of the material in the focus of attention might cause the driver to fail to detect, for example, a pedestrian crossing the street. The drivers were also found to slow down to read the information displayed in the advert.

The literature review performed by the author of this paper has not indicated any studies conducted with Polish drivers assessing the effects of roadside luminous advertising on their attention or the relationship between their distraction and participation in road accidents and collisions. A similar study was carried out in 2008 in the United States of America. The survey revealed that the drivers were distracted most often by adverts with changing displays and by the location of these adverts. No relation to the accident rate was provided. Given that the study took place eight years ago and in the USA, the idea to investigate the same problem in Poland seems warranted.

On a side note, to attract highest possible numbers of addressees to the product advertised, the adverts are designed to be "different" from others, larger, brighter, more illuminated and eye-catching.

## 2. Research materials and methods

The study material used in this paper is a result of the survey conducted in the city of Kielce in November 2015. The respondents were asked to answer the questions in the questionnaire provided, the content of which, basic issues of safe driving, was briefly explained to them beforehand.

The quantitative study was implemented through indirect measurement (survey) with the use of a standardized questionnaire (hard copy). Respondent were randomly selected, with only one condition – they had to possess a valid driving licence. A total of 103 participants (67 male and 36 female) aged 20 to 70 took part in the survey, including 30 professional drivers, 53 students of Kielce University of Technology, Department of Transportation, and 20 other respondents.

The basic tool of the survey, the questionnaire, consisted of two parts: demographics and a set of questions. The first part asked about the sex, age, professional status of the respondent, his or her place of residence, time of holding driving licence and the frequency of driving.

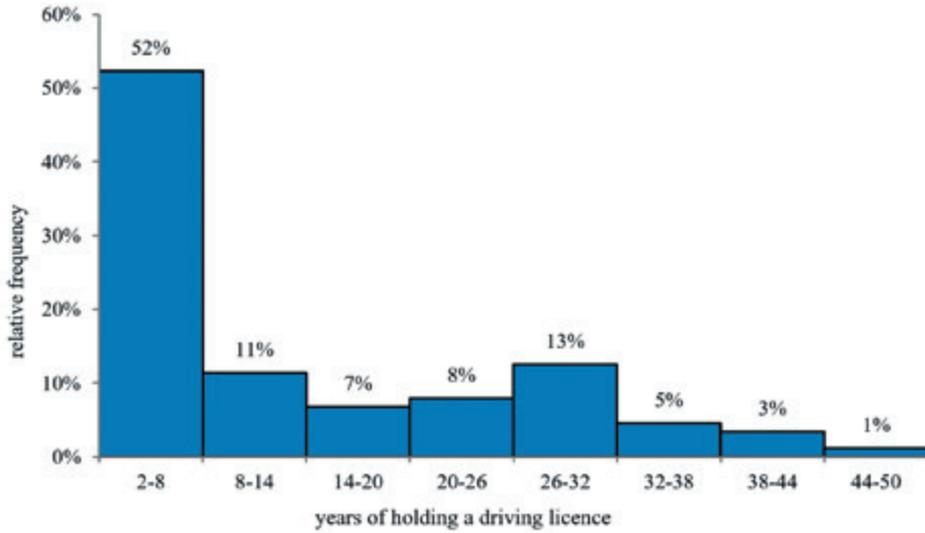


Fig. 1. Time of holding a driving licence by respondents, expressed in years

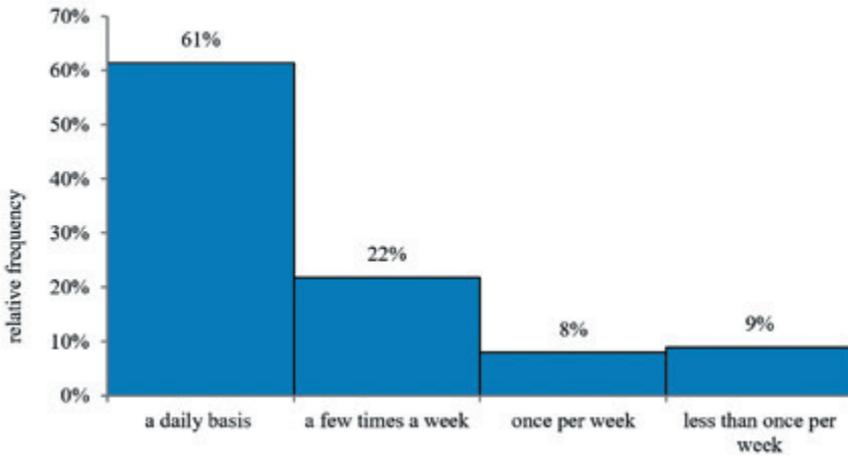


Fig. 2. Driving frequency of respondents (categories B, D or C)

The main part of the questionnaire comprised sixteen questions with three of them related to roadside advertising. The questions were of closed type and included one conjunctive and two disjunctive questions. Alternative questions asked whether the respondents had ever been an offender or a victim of a road accident or collision. If yes, they had to give the number of such cases.

### 3. Impact of roadside digital billboards on driver attention and accident rate

Analysis of one of the questionnaire questions: "Does roadside conspicuous advertising affect your attention?" indicates that digital billboards rarely distracted them (58%). Only 13 subjects (4%) felt their attention was always driven away by the roadside luminous signs/billboards. Figure 3 illustrates this finding.

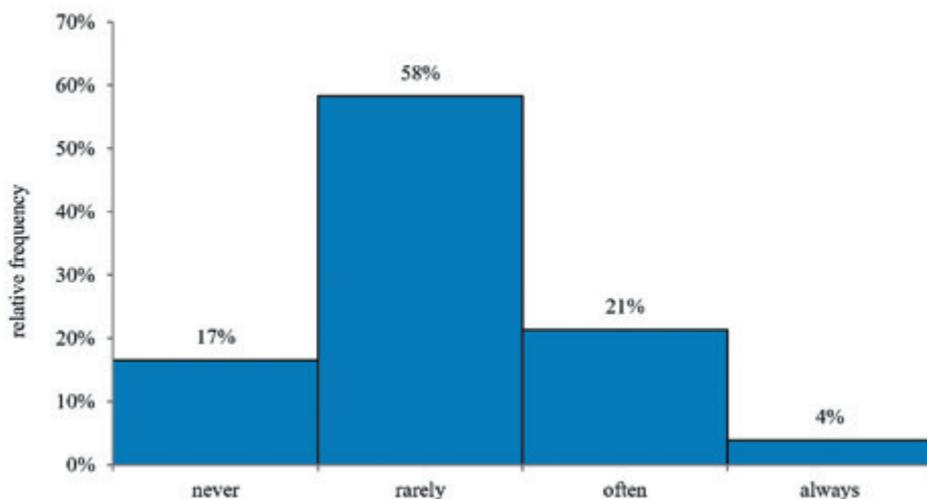


Fig. 3. Impact of luminous advertising boards on respondents' distraction while driving

Regardless of the criterion used in the division of the respondents (sex, place of residence, professional status, frequency of driving), most of them answered "rarely" (Figs 4-7).

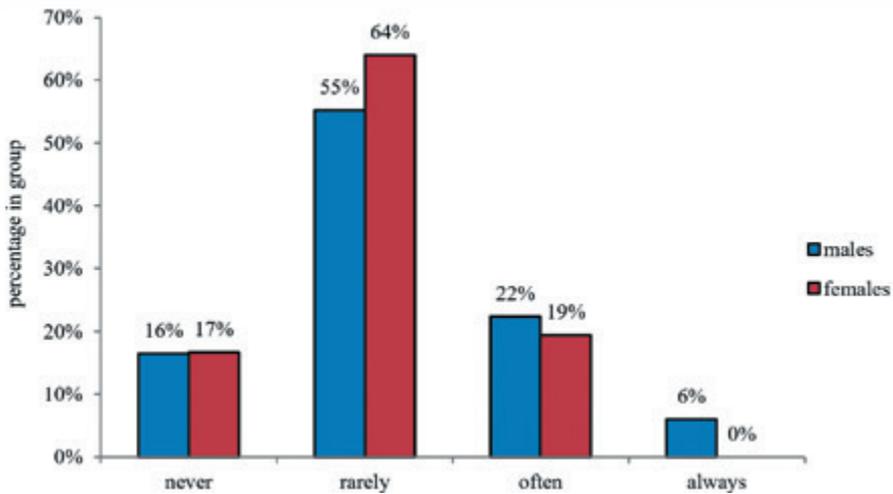


Fig. 4. Impact of luminous advertising boards on respondents' distraction while driving, split by sex

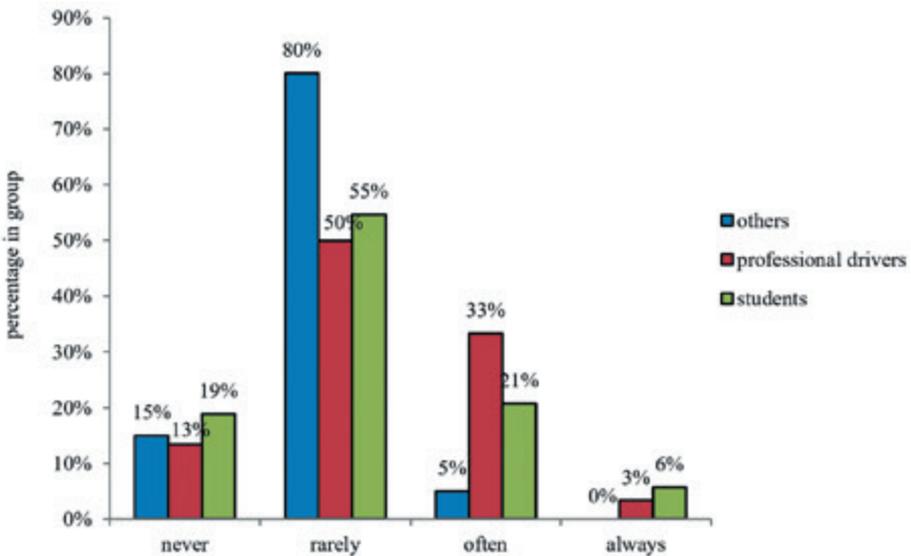


Fig. 5. Impact of luminous advertising boards on respondents' distraction while driving, split by occupational status

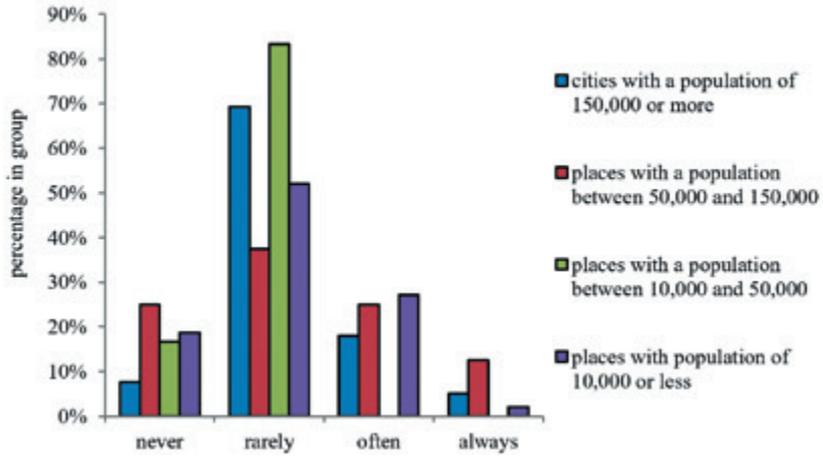


Fig. 6. Impact of luminous advertising boards on respondents' distraction while driving, by place of residence

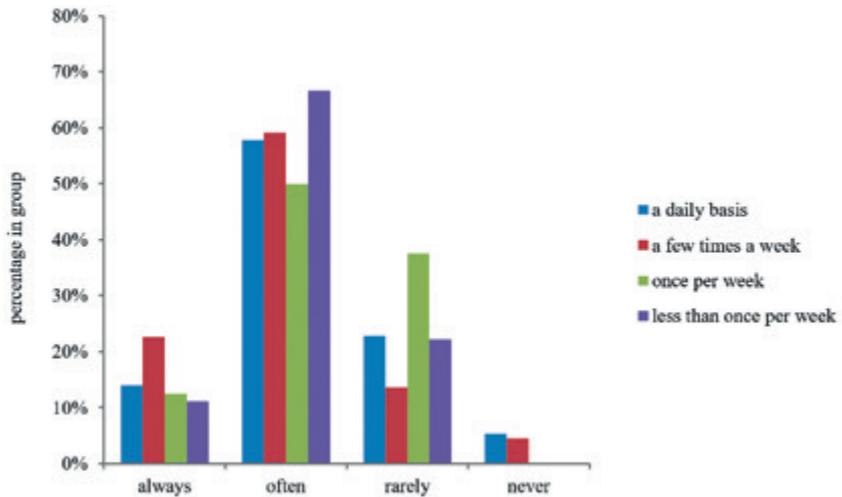


Fig. 7. Impact of luminous advertising boards on respondents' distraction while driving, split by driving frequency

In each group, regardless of the possible safety impact of digital billboards, more than  $\frac{3}{4}$  of respondents had never been an offender or a victim in any accident (Fig. 8).

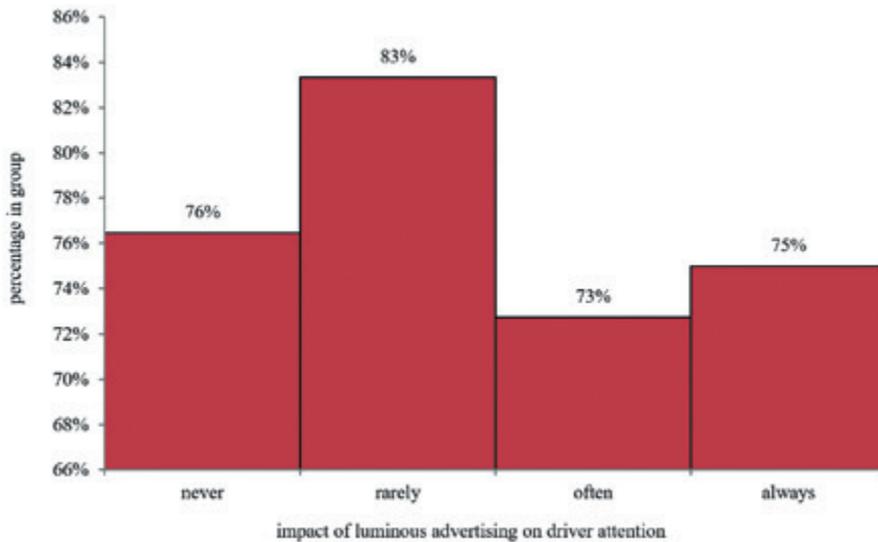


Fig. 8. Number of respondents who have never been involved in a road accident as offender or victim

Of all persons who declared that digital billboards **rarely** influenced their attention, 5% admitted to having caused an accident. Those who declared that their attention was **often** distracted by luminous signs had been involved in an accident (9%). None of the persons who answered **never** or **always** to the question: "Does roadside conspicuous advertising affect your attention?" had ever caused a road accident.

Most numerous group of accident victims (25%) consisted of persons who felt that digital luminous adverts always affected their attention. Another group of accident victims (23%) were often distracted, 12% rarely and 24% never. Figure 9 illustrates these findings.

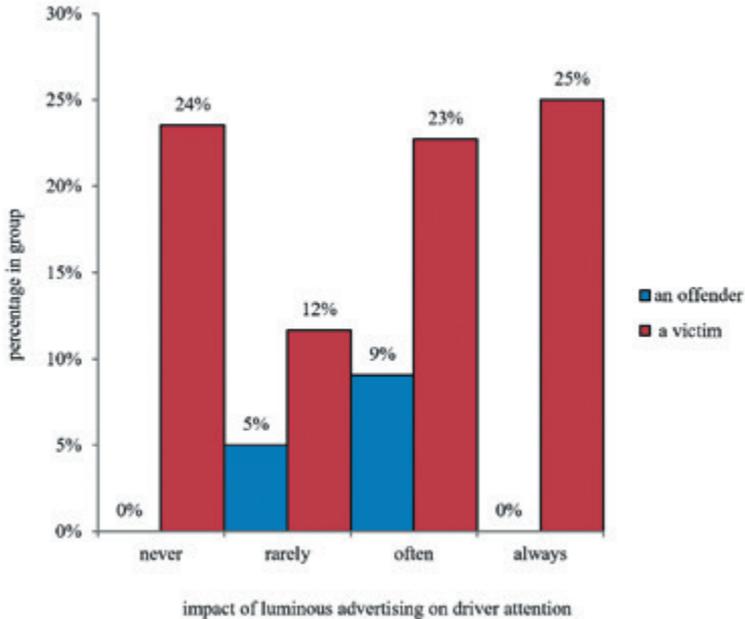


Fig. 9. Number of respondents who have been involved in a road accident

The situation seems to be worse for road collisions. As many as 50% of respondents were involved in a collision as an offender or a victim. The offender group included the respondents who felt that luminous advertising affected them always (25%), often (45%), rarely (18%) and never (35%).

The 50% of respondents who felt that their attention was always affected by the billboards had been a victim in a collision at least once. One of them was three times a victim and once an offender.

Most collision victims were among those persons who often felt distracted (59%).

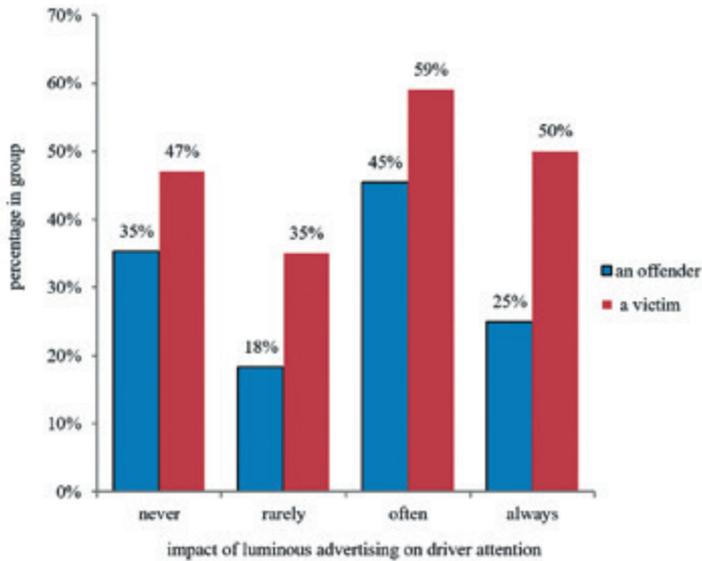


Fig. 10. Number of respondents who have been involved in a collision

Among the respondents, the 56% of persons who answered that roadside advertising had never obstructed the clarity of road signs or signals declared they had not been involved in a road accident. Of the respondents answering "rarely" to this question – 80% did not take part in an accident, "often" – 83%, always – 85%. The cases of accident involvement were recorded more often for professional drivers (Fig. 11).

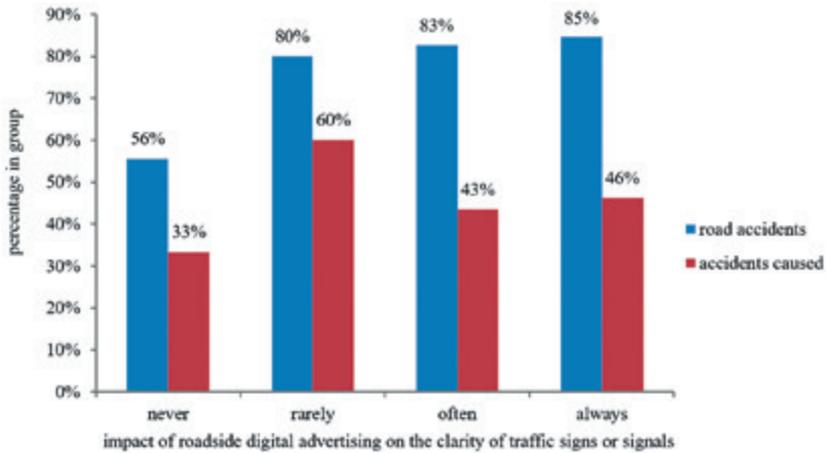


Fig. 11. Number of respondents who have never been involved in an accident or collision

None of the drivers who felt that digital billboards obstructed the clarity of road signage had caused an accident. But 44% of those drivers were accident victims, 22% had a share in a road collision, and 56% of them were collision victims.

None of the drivers who felt that illuminated billboards always reduced the clarity of the signs and signals had ever caused an accident. The 31% of these drivers were offenders and 15% were involved in an accident and 46% in a collision as a victim.

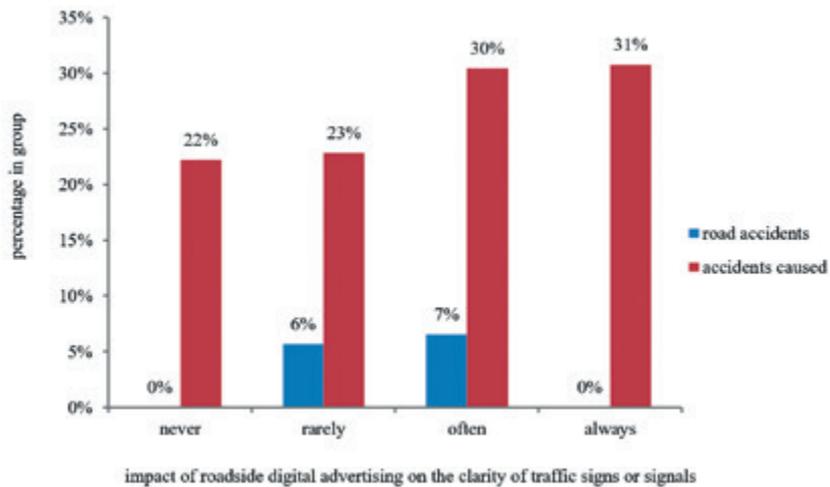


Fig. 12. Number of respondents who have been involved in an accident or collision

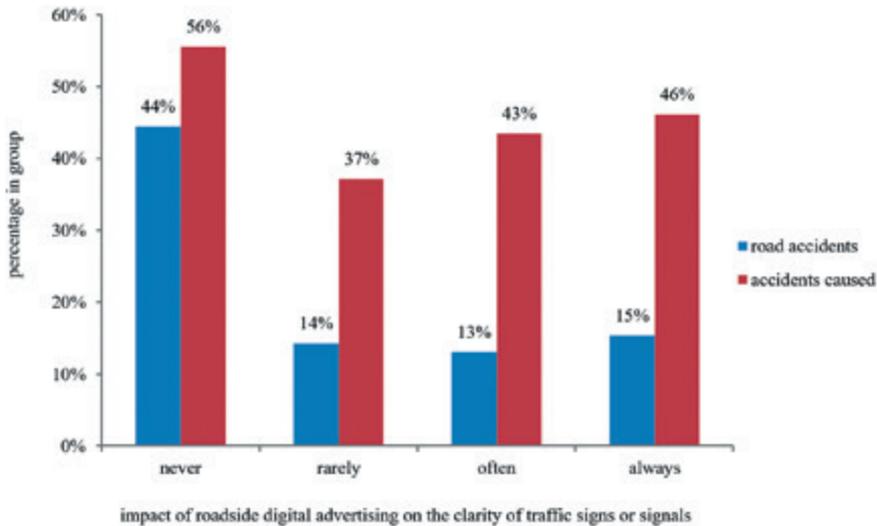


Fig. 13. Number of respondents who have been victims in an accident or collision

## 4. Conclusions

Most drivers who had been involved in accidents or collisions as offenders or victims were in the group of respondents who declared that digital billboards often affected their attention. Offenders in accidents made up 9% of them (the highest number of all respondents involved in road accidents) and in collisions – 45% (the highest number of all respondents involved in road collisions). The 23% of the drivers often distracted by the billboards had been a victim in a road accident and 59% – a victim of a road collision (the highest number of all respondents involved in road collisions as victims).

The smallest number of drivers – offenders or victims of collisions and victims of accidents are among those respondents who stated that conspicuous advertising rarely affects their attention. But those drivers, along with the drivers often distracted by billboards, were offenders in road accidents.

Of the drivers always distracted by illuminated advertising, every fourth was a victim of an accident and every second driver of a collision, with every fourth being an offender in a collision. None of them had caused a road accident.

Interesting results were obtained for the drivers who declared that conspicuous advertising had never had an impact on their attention. Every third (35%) of them had been an offender in a collision, every second (47%) – a victim of a collision, and every fourth (24%) – a victim of an accident. Furthermore, 44% of drivers who felt their view of road signs or traffic signals was never obstructed had been victims of road accidents (the highest

number among the respondents – victims of road accidents). These drivers represented the largest group among those who had been road collision victims.

As in the case with the impact of luminous advertising on driver attention, in the case of the obstruction of the clarity of road signage, the most frequent offenders in accidents and collisions were the persons whose view was often obstructed by illuminated billboards.

In summary, the results of this analysis provide some evidence about a correlation between digital advertising along public roads and the rate of accidents/collisions. The drivers who felt the billboards obstructed their view and distracted them often or always had been most often involved in road accidents/collisions. Even those drivers who declared that the billboards never affected their attention had caused road collision several times (47%) or had been victims of accidents (24%) and collisions (35%). This may result from the fact that the drivers are unaware of the impact on their behaviour. Therefore, it seems that consideration should be given to whether the legislator should strengthen the roadside advertising laws concerning locating the billboards along the roads, the number of billboards along a road segment, the size and brightness of the billboards. Only 10% of the respondents feels that nothing should be changed in this matter. Every second person thinks the laws should be strengthened in terms of the location and brightness of advertising billboards. It can be deduced from the analysis of the responses that the more impact digital billboards have on driver attention (never, rarely, often, always), the higher number of drivers are in favour of strengthening the relevant laws.

To show the explicit relationship between the distraction of drivers caused by roadside illuminated panels and their involvement in road accidents and collisions, the investigations should be repeated and expanded to cover a larger population size over the whole territory of Poland.

The full text of the article is available in Polish online on the website <http://archiwummotoryzacji.pl>.

Tekst artykułu w polskiej wersji językowej dostępny jest na stronie <http://archiwummotoryzacji.pl>.

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