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Summary

Pedestrian compliance with traffic lights: A national roadside survey Belgium

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Summary

Pedestrian compliance with traffic lights: A national roadside survey in Belgium

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Respect des feux de signalisation par les piétons : mesure nationale de comportement menée en Belgique

Study objective

Despite an overall decrease in the number of road casualties, the Belgian figures show that in recent years the proportion of pedestrians in the casualty statistics increased. Among the fatalities there was an increase of almost 3 percent points between 2008 and 2014 (source: FPS Economy - Directorate General Statistics and Economic Information). The analysis of collisions with pedestrians in Belgium (2013) learns that in 62% of the cases, a crossing pedestrian was involved. Eighty-three percent of the collisions with crossing pedestrians occurred in the absence of pedestrian lights. It is nevertheless remarkable that the remaining 17% of the accidents occurred in the presence of operational pedestrian lights. In an analysis of police reports in Brussels, Populer (2014) found that in 39% of these cases, pedestrians crossed the road while the pedestrian light was red. In the same study it appeared that, irrespective of collisions, about 20% of the pedestrians violated traffic lights.

These findings clearly indicate that pedestrians also bear responsibility in improving their safety in traffic. The purpose of the present study is to obtain a better understanding of the behavior of pedestrians at pedestrian lights and, as such, to provide a scientific basis for potential measures to promote safe crossing behavior. For the first time in Belgium an estimate is made of the proportion of pedestrians that violate the lights at crossings that are frequently used by both pedestrians and vehicles. In addition, we study the influence of specific environmental variables on the prevalence of red-light running by pedestrians.

Method

The data of this study were collected during observations in the nine most populated Belgian cities: Antwerp, Mons, Bruges, Brussels, Charleroi, Ghent, Leuven, Liège and Namur. There were in total 1320 observation moments between September 10th and September 20th 2014. Each observation lasted 15 minutes and concerned a single zebra crossing on one of 80 selected intersections. Intersections were primarily selected in urban areas where pedestrian and motorized traffic are represented in large numbers. Each crossing featured a continuous zebra crossing with pedestrian lights at each side. All measurements started at the beginning of a green phase for pedestrians. During exactly 15 minutes the numbers of pedestrians that started crossing on green and red lights were counted. Regarding the colour of the lights we only considered the colour the lights had when pedestrians started crossing. Each time a pedestrian violated the light we recorded whether or not this resulted in an unsafe situation. On every green phase for vehicles the number of vehicles that crossed the observation site was counted. The frequency of these phases was also recorded. This was all done during the same 15 minutes observation interval.

For each observation the following situational characteristics were recorded:

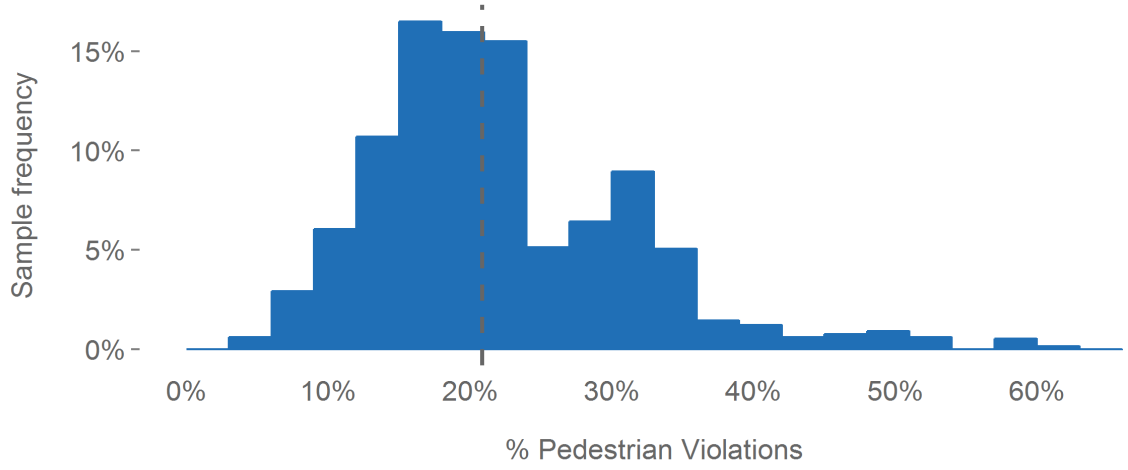
- Starting time of the observation
- Number of driving directions at the pedestrian crossing
- Number of lanes per driving direction
- Presence or absence of a tram or bus lane
- Presence or absence of a train/tram/bus station in the immediate vicinity of the crossing (i.e., visible from the crossing)
- Presence or absence of a push button at the crossing ("Pelican crossing")
- Presence or absence of visual support (e.g., push button with message)
- Presence or absence of auditory support
- Good or bad visibility of the crosswalk
- Weather conditions (sunny, cloudy, rainy, foggy, windy, warm, moderate temperature, cold)

For each 15 minute observation, the study yielded four dependent variables:

- The total number of pedestrians that started crossing on a green light
- The total number of pedestrians that started crossing on a red light
- The total number of passing vehicles during the green phases for vehicles
- The number of green phases for vehicles

Means and correlations of these four dependent variables were analyzed by means of a so-called multivariate generalized linear mixed model with the situational characteristics as predictors.

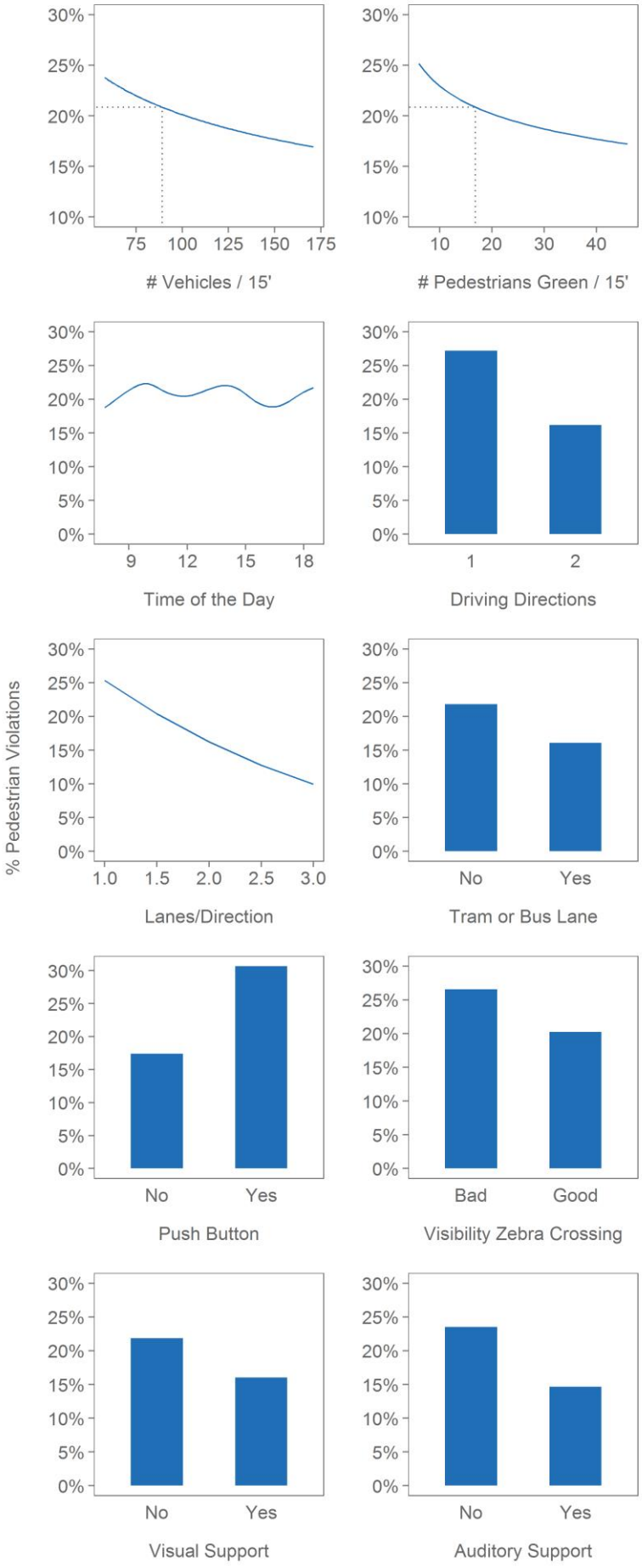
Figure A. Sample distribution of the percentage of pedestrians violating the traffic lights according to the multivariate model.



Results

The results show that on a regular pedestrian crossing controlled by lights in an urban setting in Belgium, approximately 21% (20.85%) of the pedestrians violate the lights. There is, however, large variability in this prevalence depending on the specific context; percentages below 15% and above 30% are no exceptions (see Figure A). Traffic density and situational characteristics associated with traffic density (time of the day, number of driving directions, number of lanes per driving direction and the presence of a tram or bus lane) clearly have a lowering effect: the more vehicles and pedestrians are present, the lower the prevalence of red-light running. Apart from these variables, a number of technical characteristics also exert a significant influence: push buttons and ill visibility of the zebra crossing increase the frequency of violations. On the other hand, auxiliary signals, either visual or auditory, have a positive effect (less frequent violations). Figure B summarizes the most important effects.

Figure B. Overview of the most important effects on the percentage of pedestrians that start crossing on a red light.



Conclusions and recommendations

The observation that at some crossings more than 30% of the pedestrians violate the traffic lights poses an important problem for road safety. At the same time, it further demonstrates that pedestrians carry a considerable responsibility in improving their own safety. The results show that pedestrians do not violate lights arbitrarily: the percentage of violations decreased as the traffic volume increased and the observed violations only rarely resulted in an unsafe situation. Nevertheless, by definition red-light running qualifies as dangerous behaviour. National and international research clearly demonstrates an increased risk of collisions when pedestrians start crossing on a red light. It is also important to stress that the current observations were made at pedestrian crossings with a high density of pedestrian and vehicle traffic.

Even when, in a specific situation, violating pedestrian lights does not result in a collision, this behaviour can induce collisions in another situation through individual and social influences. We can assume that the behaviour of each road user influences the behaviour of other road users. As such, an individual decision to start crossing on a red light can be transferred onto other road users and other unsafe behaviour in traffic. The importance of adult role models towards children should not be underestimated in this regard.

The recommendations that can be put forward on the basis of this study primarily concern infrastructural characteristics. This is because no personal information was gathered about pedestrians that committed violations and pedestrians that respected traffic lights.

- The observed relationship with traffic volume leads to the recommendation to pay special attention to the expected traffic volume and the expected variation therein when designing or evaluating pedestrian lights. At sites with frequent periods of low traffic density, one can wonder whether pedestrian lights indeed improve safety and one could envision installations where traffic lights are not operational during these periods, accompanied by clear signalling for pedestrians and vehicles (e.g., flashing orange lights).
- The negative effect of push buttons leads to the recommendation to thoroughly evaluate the behaviour of pedestrians at pelican crossings. A potential cause for the higher frequency of red-light running is that waiting times are inherently untransparent in the presence of push buttons. In other research it was already found that the anticipation of an extensive waiting time and the absence of information on waiting times have negative effects on safe crossing behaviour by pedestrians. As shown in various international studies, the implementation of count-down signals can provide a solution to this problem.
- The results of our study show that additional signalling, either visual or auditory, can also improve safety at sites without push buttons. Although the results do not provide information about the effectiveness of the different systems in Belgium, the value of count-down displays has been demonstrated repeatedly. Nevertheless, the implementation of this type of system is limited in Belgium. Interestingly, we see the strongest positive effect in the case of auditory support and the variation in this type of systems is much smaller compared to that in visual systems. On the basis of our study we can thus conclude that the functionality of auditory signalling exceeds that of support for blind and visually impaired pedestrians.
- Road authorities can also exert a positive influence on the behaviour of pedestrians by paying sufficient attention to the quality of road markings. The observation that pedestrians commit violations more frequently when the visibility of the zebra crossing is poor is in line with the more general observation that a well ordered public space is beneficial for behaviour that aligns with social norms. Consequently, safe crossing behaviour can also be tied to broader investments in spatial planning.

Awaiting research that deals with the individual characteristics of pedestrians that violate traffic lights, one can reflect on ways to raise awareness among pedestrians about (a) their own responsibility in improving road safety and (b) the example they set towards other road users in respecting traffic regulations.

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