

The Combined Effect of Speed Reduction, Vehicle Frontal Design, Autonomous Emergency Braking and Helmet Use in Reducing Real Life Bicycle Injuries

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ABSTRACT

Vulnerable road users as bicyclists and pedestrians account for a significant share of fatalities and serious injuries in the road transport system [1]. Traditionally, the protection for bicyclists has been addressed by speed management and separating vulnerable road users from motorized traffic [2]. Also, the use of bicycle helmet has been prompted and regulated in some countries. Pedestrian protection by improving the car frontal design has been around since the late 1990th and has proven to be effective in reducing injury risk on pedestrians [3] although the benefits for bicyclists have not yet been evaluated on real world data. Pedestrian detection with Autonomous Emergency Braking (AEB) has also been introduced on the market to prevent and mitigate pedestrian and bicycle injuries. The purpose of this study was to evaluate the combined effect of the different interventions promoting safety for vulnerable road users. Emergency hospital reports from approximately 2 000 bicyclists and 1 200 pedestrians between Jan 1st 2003 and April 31st 2014 were included in the study. Hospital reports including injury diagnosis were combined with police data and the vehicle registry in order to obtain detailed vehicle information. Preliminary results showed effects on reducing risk for bicyclists of higher level of permanent medical impairment (RPMI10+) with approximately 20% for speed reduction (speed limit 40-50 kph vs. 20-30 kph), 45% for improved car frontal design (1-2 star Euro NCAP pedestrian scoring vs. 3-4 star), 60-70% for pedestrian detection with AEB and 30% for helmet-use. The calculated combined effect of speed-reduction and car frontal design, if treated as independent interventions, was 67%. However, when these two interventions was applied to real-life crashes the effect was 79%, indicating a system effect by the combination of these actions. When other preventive actions like helmets and AEB were added, the risk of long term disability decreased with more than 90%.

Keywords: Vulnerable road users, pedestrians, bicyclists, pedestrian protection, system effect.

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