Braking from different speeds: Judgments of collision speed if a car does not stop in time

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Abstract

The purpose of speed limits is to keep driving speed low enough for drivers to be able to pay attention to relevant information and timely execute maneuvers so that the car can be driven in a safe way and stopped in time. If a driver violates a speed limit or drives too fast she or he will not be able to stop as quickly as from a slower speed. We asked participants to imagine that they themselves had driven a car outside a school at a speed of 30 km/h when a child suddenly had rushed into the street. From this speed it was possible to stop the car just in front of the child after braking as quickly and forcefully as possible. We then asked the participants to imagine that they drove the same street at a higher speed of 50 km/h and the child appeared at the same place as before. At what speed would the car hit the child after braking in the same way as before? This kind of problems were presented in three studies and the results showed that the judged speeds of collision were always underestimated in different hypothetical driving context scenarios by judges differing in numerical skills. This indicates an overly optimistic view on the possibilities to reduce speed quickly if the driving speed is too fast, which is an important component of attitudes towards speed limits, their legitimacy and recommended driving speeds. Further implications of the results were discussed last.

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1. Introduction

Imagine that you are driving past a school at 30 km/h and that you start to brake maximally when a child unexpectedly runs into the street in front of you. You are able to stop the car just before the child. You are an alert driver with a short reaction time. The condition of the road surface is good, dry with high friction. Assume that you had driven past the school at 50 km/h and from the same position as before you see the child running out into the street at the same place in front of you as earlier. You react in the same way as before and hit the brakes the moment you see the child. However, this time you will not be able to stop in time from the faster speed 50 km/h and you will hit the child with your car. At what speed do you think that you will hit the child? This is a description of the problems (Svenson, 2009) presented to a group of participants.

Speed is one of the main contributing factors causing car accidents. A higher speed increases the stopping distance and thereby also accident risk as it takes longer to reduce the speed and come to a complete stop than if the speed had been lower (Aarts and van Schagen, 2006; Cameron and Elvik, 2010; Nilsson, 2004). The severity of an accident depends on the energy released at the time of collision; a greater speed at the time of a collision also means greater physical damage and personal injury and subsequently a higher risk of a fatal accident (Nilsson, 2004; Cameron and Elvik, 2010).

One of the aims of the present studies is to replicate the findings of Svenson (2009) which indicate that driver’s judgments about how fast a car can be stopped in a braking episode (from a higher speed compared to braking from a lower speed) are biased. Another aim is to test to what extent the results apply to different driving situations and whether a driver who is more familiar with numbers and numerical calculations will be less susceptible to the judgment bias. All judgments were given in non-driving contexts and the speed judgments are in this sense an important component of the belief foundation of attitudes towards driving speed, preferred driving speed and traffic regulation and planning.

When drivers, the public and politicians form their norms and opinions about driving, speed limits and traffic planning, they typically base their views on attitudes and implicit or explicit judgments of stopping distances, risks at different speeds, etc. At their best, these judgments are based on formal calculations, but often