Why Speeding – Just a Bit – Can Be Dangerous

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As a teenager, my reason for not speeding was simple; I couldn't afford the cost of a ticket or endure my parents' lectures on the topic. Now with the experience of having investigated hundreds of auto collisions, my reasons for not speeding have evolved based on observations of driver behaviour, called human factors, and some simple mathematics.

Unfortunately, not everyone believes that speeding can be dangerous. As a collision reconstructionist, I have seen the outcome from drivers that believe that they have super ninja powers and travel at 160 km/hr on a rural road. It doesn't usually end well. Even travelling 10 km/hr over the speed limit can change the outcome of a collision and the severity of injuries; something I never would have guessed before becoming a reconstructionist. Here's how it all breaks down.

You travel during your perception-response time (PRT)

The faster you travel, the more ground you're going to cover during the time it takes you to perceive a hazard and start to react (brake or steer). If you're travelling at 75 km/h in a 60 km/h zone, you're travelling 4 metres per second faster than the speed limit. Even if you react really quickly, within one second (which is not often the case), you have already lost out on a precious 4 metres of braking distance – about the length of a small car. So you are already at a disadvantage, and you haven't even started to brake yet. The key thing to remember about braking is…

Braking distance goes up exponentially with speed

The formula to calculate the distance required to brake to a stop is this:

$$d = \frac{v^{\,2}}{2a}$$

Where "v" is your initial speed and "a" is your deceleration, or braking rate. Now don't let the math scare you. What matters here is that the distance is proportional to the square of speed. This means that if your speed doubles, your braking distance quadruples. The following graph gives a better visual of this relationship.

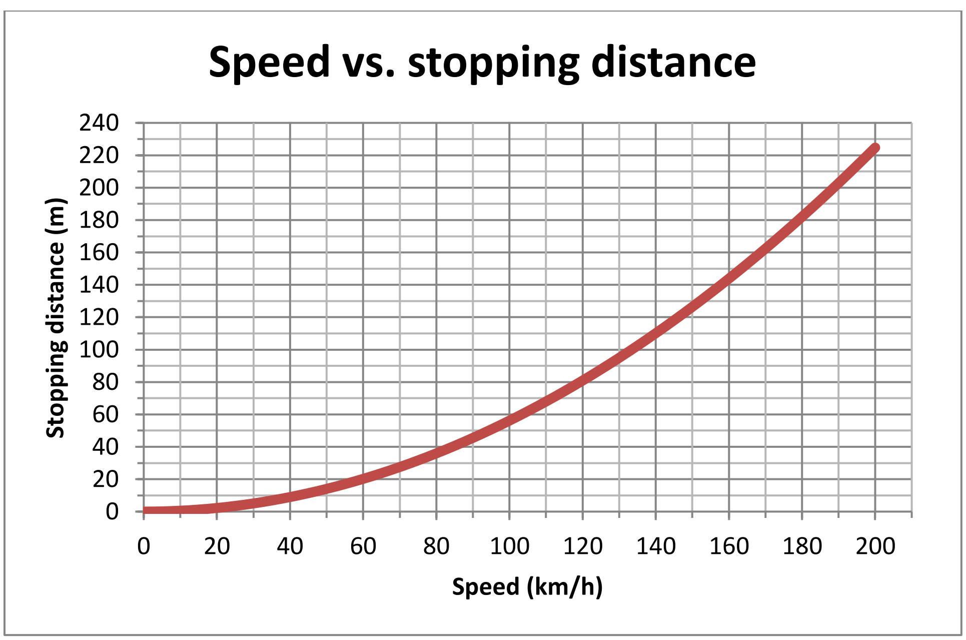

Figure 1: Graph of the exponential relationship between speed and stopping distance. Given the same braking rate, if the speed is doubled, the stopping distance is quadrupled. If the braking rate is changed, the specific distances will change, but the relationship remains the same.

The braking rate used here was 0.7 g (units of gravity), which is on the low end for emergency braking on a dry road. As you can see from the graph, with the same braking rate, the distance to brake to a stop from 75 km/h is about 11 metres longer than from 60 km/h – about two car lengths. So, not only do you have less distance available to brake because you have travelled further during your perception-response time, but your higher speed also necessitates a longer braking distance. Two disadvantages. Which means….

You crash at a higher speed

Let's continue with this example. Let's say you're about 40 metres away when the car begins to turn left in front of you. At the speed limit of 60 km/h, you would cover at least 17 metres during a one second perception-response time before you began to react to the left-turning car, and you would need about 20 metres to brake to a stop to avoid it. All together, you would need 37 metres to perceive, respond and come to a stop. You had 40 metres available, so you can avoid this crash, with 3 metres to spare. At 75 km/h though, you travel 21 metres during your perception-response time, and you would need about 31 metres to brake to a stop. That's 52 metres altogether….and you just T-boned someone.

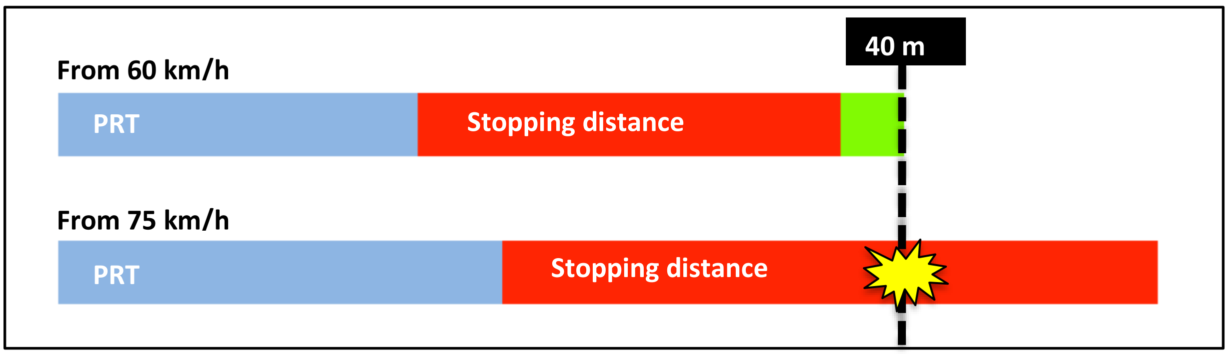

Figure 2: Illustration of the distance a vehicle would travel during a 1 second perception-response time, and the distance required to brake to a stop from 60 km/h and 75 km/h. If both vehicles are initially 40 metres away from a hazard (i.e. left-turning vehicle), the vehicle initially travelling at 60 km/h would brake to a stop 3 metres before reaching the hazard, while the vehicle initially travelling at 75 km/h vehicle would crash into it, with 12 additional metres required to stop.

Now let's look at this another way. Let's say you are only 30 metres away when the car turns left in front of you, so it is an unavoidable crash in either situation. At 60 km/h, you will have 13 metres left to brake after your one-second perception-response time, and your impact speed will be about 36 km/h. It's a bad day, but it's a relatively minor crash. From 75 km/h however, you only have 9 metres left to brake, making your impact speed a much higher 63 km/h. Speeding just 25% over the limit has now caused your impact speed to be 175% higher.

	At 60 km/h	At 75 km/h
Distance from impact	--- 30 metres ---	
Distance travelled in 1s PRT	17 metres	21 metres
Distance left to brake	13 metres	9 metres
Impact Speed	36 km/h	63 km/h

Figure 3: Table comparing the outcome of a crash when the vehicles are initially only 30 metres away when the opposing vehicle begins to turn left.

In this type of situation, the left-turning driver probably made a bad judgement call in deciding to turn. However, if your speed is drastically higher, it can lead to further issues. This is called….

Violation of expectancy

Drivers have a certain expectation of how traffic is moving. Whether we are watching the flow of approaching traffic before making a left turn, or whether we are on the highway checking our rear view mirror and blind spot before making a lane change, we use our experience to judge how quickly traffic will arrive. If your car is far off in the distance, and experience has shown that it will be some time before you arrive, a driver may judge that they have enough time to turn or change lanes. However, if you are speeding excessively, at twice the speed limit for example, you will reach them twice as quickly, violating their expectancy of your arrival time. In these types of situations, what was perceived to be a safe manoeuvre can turn into a violent crash. This type of situation has been a factor in many fatalities involving left turns, U-turns, and lane changes on the highway.

At the end of the day, nobody is a perfect driver. We are all guilty of speeding, myself included. But next time you set the cruise control on a wide-open highway, or start to speed in city streets because you're late for an appointment, please think twice. That little extra speed might make a big difference in someone's life, including your own.

About the Author:

Jillian specializes in collision reconstructions, including investigations of potential fraud relating to staged collisions, and has extensive experience with automobile Event Data Recorder downloads and analysis. Her credentials include an Honours Bachelor of Science degree and Professional Physicist designation, along with a multitude of courses in collision reconstruction. In addition to having managed hundreds of reconstructions, Jillian has participated in automobile crash testing and research projects. She shares her knowledge through articles in industry periodicals and presentations to insurers, lawyers and industry groups.