

VULNERABLE ROAD USERS: PEDESTRIANS AND CYCLISTS

It is a busy Saturday afternoon downtown. You are buying a present for a friend's birthday and have found a parking

spot across the street from the store where you intend to purchase the gift. The nearest crosswalk is a good distance away, so you decide to wait for an opening in traffic and run across the street. Timing your run across two lanes of opposing traffic proves difficult, but you take your chance as soon as you think it is safe. You make it across the first lane of traffic but stop when you realize that traffic in the other lane is moving faster than you had anticipated. Unable to finish crossing or turn back, you are stuck in the middle of the road, with cars speeding by you on both sides.

Vulnerable road users like pedestrians and cyclists are at an increased risk of fatal or severe injury in the event of a collision with a motor vehicle. Modern vehicle safety features can help lower the overall risks facing vulnerable road users, however these benefits can only be realized if drivers and vulnerable road users alike do not become over-reliant on those safety features. For instance, the Traffic Injury Research Foundation's (TIRF) 2011 national survey of Canadian drivers revealed that many drivers would drive less safely if they knew that their vehicles were equipped with modern safety features like electronic stability control and brake assist. Many of these risky driving behaviours including speeding, distracted driving, and tailgating have direct negative consequences for the overall safety of vulnerable road users.

WHO ARE VULNERABLE ROAD USERS?

Pedestrians and cyclists are among the most vulnerable road users. In collisions with other road users they suffer the most severe consequences because their level of personal protection compared to persons in a vehicle is very low. Not only do pedestrians and cyclists lack the protection of an enclosed vehicle, they also do not benefit from any vehicle safety features like seatbelts or airbags, so they are more likely to be injured or killed in a collision. Due to this greater vulnerability, pedestrians and cyclists are often described as vulnerable road users.



HOW DO VULNERABLE ROAD USERS AFFECT TRAFFIC SAFETY?

Vulnerable road users are more likely to be seriously injured in motor vehicle crashes due to the lack of added protection that vehicle occupants receive from their vehicle. This means that when vulnerable road users are involved in a crash with a motor vehicle the amount of overall damage suffered is likely to be extremely disproportionate.

To illustrate, in 2013, there were 300 pedestrian fatalities accounting for 15.6% of all road user fatalities in Canada (Transport Canada 2015). This

number is consistent with data from the United States, which reported 4,735 pedestrian fatalities in 2013, accounting for 14.0% of all traffic crash fatalities (NHTSA 2013a). In Canada, pedestrians also accounted for 14.5% of serious injuries (Transport Canada 2015).

In 2013, 62 cyclists were killed on Canadian roads, accounting for 3.2% of all road user fatalities in that year (Transport Canada 2015). Cyclists also accounted for 4.6% of serious injuries resulting from traffic crashes. As a comparison, the most recent data from the United States show that cyclists accounted for 2.3% of road crash fatalities, with 743 cyclists fatally injured in 2013 (NHTSA 2013b).

WHAT ARE THE RISK FACTORS FOR VULNERABLE ROAD USERS?

There are several factors that are relevant to the risk of vulnerable road users being involved in a collision, such as:

Area (urban vs. rural): The majority of vulnerable road user fatalities happen in urban areas, where there are more complex intersections, more pedestrians and cyclists, and where drivers are likely focused on traffic signals and other vehicles and may not notice these road users. For instance, in Canada between 2004 and 2008, 75% of pedestrian fatalities occurred in urban areas. (Road Safety Canada Consulting 2011). Similarly, in the United States, 73% of pedestrian collisions occurred in urban areas (NHTSA 2015a)

Alcohol: Alcohol is a major contributing factor in crashes involving vulnerable road users. Pedestrians under the influence of alcohol accounted for 40% of alcohol-related deaths in Canada in 2008 (CCMTA 2013). There is little data regarding the magnitude of

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alcohol impairment among seriously or fatally injured cyclists in Canada. However, in the United States, 20% of cyclists killed in 2013 had a BAC of 0.08% or higher (NHTSA 2013b).

Time of day: Between 2004 and 2008, more than half of pedestrian fatalities (60%) in Canada occurred at night or under low light conditions (Road Safety Canada Consulting 2011). Since there are fewer pedestrians at night, these rates of pedestrian fatalities and injuries show that they are truly over-represented. In contrast, for cyclists 34% of fatal crashes occurred in dark conditions (Road Safety Canada Consulting 2011). As a comparison, in the United States 22.0% of collisions in 2013 occurred between 6:00 and 9:00 p.m., while 27% of collisions occurred between 9:00 p.m. and 6:00 a.m. (NHTSA 2015b).

Cell phones and mp3 players: Auditory cues that indicate important safety information to pedestrians and cyclists may be missed if they are having a conversation on a cell phone or listening to music. Overall, pedestrians behave less safely when talking on cell phones while walking, thereby increasing their risk of crash involvement (Hatfield and Murphy 2007). The use of cell phones, mp3 players, and other technological devices also puts cyclists at increased risk of being involved in a collision. A recent study of cyclists in The Netherlands found that teen and young adult cyclists were significantly more likely than older cyclists to use cell phones or other distracting devices while cycling, and that the use of these devices resulted in 1.6 – 1.8 higher odds of being involved in a crash (Goldenfeld et al. 2012).

Driver factors: Speed is one of the most important factors in collisions involving vulnerable road users (Heinonen and Eck 2007). The chance of a pedestrian being hit by a vehicle increases as speed increases, since drivers are less likely to see vulnerable road users, react, and stop in time. In addition, as speed

increases the severity of any injuries sustained by the vulnerable road user also increases, since collision energy is mainly absorbed by the lighter body (ERSO 2006).

WHICH VULNERABLE ROAD USERS ARE MOST LIKELY TO BE INVOLVED IN A COLLISION?

Certain profile characteristics are associated with a vulnerable road user's elevated risk of being involved in a collision with a motor vehicle:

Sex: Males are over-represented in both pedestrian and cyclist collisions. In Canada in 2010, males accounted for 61.7% of all pedestrian deaths (TIRF 2013). This disparity also holds true for cyclists, among whom males accounted for 90.9% of cyclist deaths in 2010. Data for 2013 in the United States reflects similar patterns. Among pedestrians, males represented approximately 68.6% of fatalities (NHTSA 2015a) and among cyclists, males represented approximately 86.9% of fatalities (NHTSA 2015b).

Age: Elderly pedestrians are most at risk of being fatally injured on the road. Of all fatally injured pedestrians in 2011 in Canada, 31.3% were aged 65 or older (TIRF 2013). Among cyclists in 2003, 31.2% of fatally injured road crash victims in Canada were over the age of 55 (TIRF 2013). Elderly people are at an increased risk of being killed on impact when struck by a vehicle due to their increased fragility, slower movement, and declines in perceptual skills. The youngest pedestrians are also at an increased risk of being hurt in a collision. In 2013, American children aged 14 and younger accounted for 26.3% of pedestrian fatalities, and 15.2% of all pedestrians injured in traffic crashes (NHTSA 2015a).

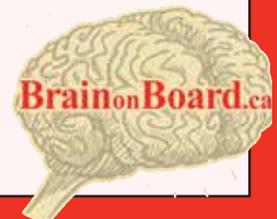
DO VEHICLE SAFETY FEATURES MAKE VULNERABLE ROAD USERS LESS VULNERABLE?

The primary reason why vulnerable road users are vulnerable is that they lack the mass, speed, and the physical compartment of a vehicle that protects drivers and passengers in a collision. When crashes occur, vulnerable road users are likely to suffer significantly more overall harm than drivers of a vehicle. As more and more vehicle safety features become standard on new vehicles, it is increasingly important for vulnerable road users to remember that vehicle safety features cannot reduce their vulnerability on the road. It is still necessary for pedestrians and cyclists to remain vigilant, behave safely, and to be aware of their vulnerability.

CAN VEHICLE SAFETY FEATURES BENEFIT VULNERABLE ROAD USERS?



Vehicle safety features like **anti-lock brakes (ABS)**, **brake assist**, and **traction control** are designed to help drivers stop their vehicle more effectively and to help them retain steering control after an episode of heavy braking. Other vehicle safety features



like **frontal collision warning systems** and **lane departure warning systems** alert drivers if one of these potentially dangerous situations is detected. These safety systems promise to help improve overall road safety when combined with safe driving practices. In some cases, these safety features may help prevent vulnerable road users from being hit by a vehicle, or may help lessen the overall harm sustained by vulnerable road users in the event of a collision. However, these features can only benefit vulnerable road users if they are combined with safe road use practices by everyone who shares the road.

To illustrate, brake assist can provide extra braking support to drivers who need to make an emergency stop. However the benefits of brake assist are limited if drivers are distracted and brake later, thereby giving the advanced safety system less time to work and reducing the odds that a collision can be avoided. The benefits of brake assist are limiting in the same way when pedestrians or cyclists behave erratically or unexpectedly, leaving drivers with less time to react.

Similarly, advanced collision warning systems can alert drivers if they are about to collide with another vehicle, but many of these systems are not designed to detect potential collisions with pedestrians or cyclists, nor can they give sufficient advanced warning if a vulnerable road user appears suddenly in front of the vehicle. This design limitation combined with unsafe driver or vulnerable road user practices can make it impossible for the collision warning system to benefit vulnerable road users.

Every safety feature has functional and/or design limits like the ones just described. Speed, distraction, impairment, and unsafe behaviours on the part of pedestrians and cyclists can seriously undermine the performance of safety features and easily negate the benefits of having safety features.



When it comes to vulnerable road users, over-reliance on vehicle safety features can be a two-way street: drivers can rely too heavily on their safety features to “watch the road” for them, and vulnerable road users can rely too heavily on safety features to help protect them when they engage in risky behaviour like jaywalking or cycling without being clearly visible to drivers. If drivers and vulnerable road users alike falsely believe that safety features alone can help prevent crashes, they may act in ways that they otherwise would find too risky. TIRF's most recent survey revealed a willingness on the part of at least some drivers to engage in dangerous behaviours including speeding, tailgating, and drinking and driving in vehicles with safety features. Under these conditions, vulnerable road users may not be able to benefit from advances in vehicle safety technology since drivers with this technology available to them may be more aggressive, less attentive, and generally more dangerous. It cannot be overstated that the only way that safety features can benefit drivers and vulnerable road users is if both groups combine advances in vehicle safety technology with safe road practices.

HOW CAN VULNERABLE ROAD USERS LOWER THEIR RISK OF COLLISION?

There are several solutions and countermeasures in place to help vulnerable road users lower their risk of being involved in collisions:

Visibility: Increasing the visibility of pedestrians and cyclists through the use of, for example, reflective or fluorescent clothing, reflectors, and light or bright helmets for cyclists could help drivers detect these road users more easily and potentially decrease crash risk.

Bicycle helmets: Opinions are divided on the overall benefit of bicycle helmets. Although they have been linked to reductions in head injuries, this has not been definitely proven. Nevertheless, helmets are the only protective device available for cyclists and their use is mandatory in several Canadian provinces. In addition to protecting against head injuries when used properly, helmets may also increase the visibility of cyclists.

Education: Public awareness campaigns aimed at pedestrians and cyclists to increase knowledge and to motivate changes in behaviour have had some positive effects. Programs include education, pedestrian safety messages, public service announcements, and pedestrian safety workshops for children and older populations.

Technology: Various technological methods are currently in use to minimize the risk of crashes with vulnerable road users. These methods include cross-walk countdowns (IIHS 2008) and adding flashers to yield signs (Van Houten et al. 2008). In addition, some changes are being considered in vehicle design to help reduce the severity of crashes with vulnerable road users, including flexible bumpers that absorb more energy on impact (IIHS 2008).



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WHERE CAN I FIND MORE INFORMATION ABOUT VULNERABLE ROAD USERS?

Vulnerable road users are the subject of growing amount of road safety research. Walking and cycling are often encouraged as good forms of exercise, therefore helping to ensure the safety of vulnerable road users is an issue of increasing importance on the agendas of researchers and policy makers. TIRF's 2008 Road Safety Monitor (RSM) – a national poll designed to gauge public opinion on a variety of road safety issues – was dedicated to exploring road safety trends, risk factors, and the effectiveness of various countermeasures associated with vulnerable road users. This RSM, as well as TIRF's other research, can be accessed at www.tirf.ca.

Transport Canada has both supported TIRF's research on vulnerable road users and released their own information on the safety of pedestrians and cyclists on Canada's roads. This research can be accessed at www.tc.gc.ca.

Finally, the National Highway Transportation Safety Administration (NHTSA) and the Insurance Institute for Highway Safety (IIHS) in the United States have researched and published a variety of reports, statistics, and fact sheets concerning vulnerable road users. These publications can be found at www.nhtsa.gov and www.iihs.org respectively.

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