Nighttime Collisions – The Dilemma of the Invisible Pedestrian

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A man wearing blue jeans and a dark jacket stands at the edge of a dimly lit road at night. He lives in the suburbs and is heading to the corner store on the next street. He spots an approaching car, decides it's safe to cross, and starts walking across the road. The car, travelling at 60km/h in a 50 zone with functioning headlights, strikes the man.

The driver, a middle-aged gentleman with a clean driving record, claims he never saw the man until just before impact. The pedestrian claims there was plenty of light for him to be perfectly visible.

Unfortunately, this scenario is common in nighttime pedestrian collisions. All too often, the driver claims that the pedestrian was invisible, despite reported evidence that seems to indicate the contrary. The focus of the adjuster's investigation then shifts to whether or not the driver was paying attention. However, there is often more to this story of the invisible pedestrian than meets the eye – the almost paradoxical issue that both parties are correct from their own perspective. As we will explore in this article, there are a number of factors that cause pedestrians (adults as well as children) to be lured into the false belief that they are more visible to drivers than they actually are. It is this dilemma that is the source of many nighttime pedestrian collisions.

Nighttime driving is inherently more hazardous than daytime driving due to the reduced visibility available. Having less time to see hazards means less time to consider those hazards and respond to them. Numerous factors affect a driver's visibility of pedestrians at night: roadway lighting, weather,

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visual clutter, pedestrian clothing, pedestrian movement, driver age, driver condition, vehicle headlight condition, and moonlight (in rural areas). However, from the pedestrian's perspective, the pedestrian retains the ability to see him/herself, the headlights of the approaching vehicle, and objects in his/her immediate vicinity at night despite all of those factors. This difference in perception leads to a false sense of visibility at night on behalf of pedestrians, when in fact they may be invisible to drivers. Understanding this dilemma yields obvious recommendations for public awareness campaigns. But first, let's quickly visit some of the limitations of human vision.

The Human Visual System

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Contrast is the difference in brightness, or luminance, between two objects. 'Luminance' is the amount of light being given off by a surface (either by reflection, or due to it being a light source), whereas 'illuminance' is the amount of light reaching a surface. Many common clothing colours, including blue, brown, grey and black, have very low reflective values reflecting only a small fraction of the light that reaches them. During the day, high illumination levels provide good contrast between dark objects of different shades. But at night, when the amount of light reaching a pedestrian from street lighting is often minimal, the luminance of different shades of blue, brown, grey or black are nearly identical and close to the background value of zero.

Driver visibility at night is also limited by adaptation and accommodation. Visual adaptation refers to the process by which our eyes adjust to large changes in lighting levels. Our eyes see using two kinds of light-sensitive receptor cells: cones and rods. The cones function at high levels of illumination and the rods take over in low levels of illumination. Visual accommodation refers to the process by which our eyes change focus from near to far, and vice versa. Both of these require a measurable amount of time, which can delay driver perception of

a hazard. For example, when a driver looks at the bright speedometer within his/her vehicle at night and then looks back at the road, there will be some delay in perception due to both adaptation and accommodation.

Even when pedestrians would otherwise be visible, they may be difficult to detect due to other objects in the vicinity having higher conspicuity (due to higher contrast levels or motion). This is particularly relevant in urban areas, where there is a high degree of visual clutter to scan through. An extreme example of this occurs when a pedestrian is 'masked' from view at night due to being next to the glare of oncoming headlights or a bright sign.

Headlights vastly improve the visibility of objects by providing increased contrast between those objects and the background. Unfortunately, the effective range of standard low-beam headlights is limited to 40 metres or less. Beyond that range, the amount of illumination provided by headlights is only significant for highly reflective surfaces like warning signs and reflective jackets.

The Pedestrian's False Perception of Safety

Pedestrians are not limited by the above factors to the same extent as drivers. A pedestrian's vision is already fully adapted to the dark ambient conditions. Pedestrians can easily discern the objects around them. Pedestrians can see their own body, the person standing next to them, the surface of the sidewalk, the surface of the road next to them, and any other objects in their immediate vicinity. At pedestrian speeds, there is ample time to inspect and view one's surroundings, unlike a driver in a moving vehicle who is exposed to a constantly changing scene. *Most importantly, the pedestrian who is scanning for cars is looking at a light source, whereas the driver who is scanning for pedestrians is not.* The bright headlights of approaching vehicles stand out clearly against the dark background and are easily visible to a pedestrian from far away. The nighttime pedestrian has an excellent view of approaching vehicles and a reasonable view of any other hazards in his or her vicinity.

All of this sensory feedback lulls the pedestrian into a false perception of safety when it comes to crossing the road or standing on the road. Pedestrians are lured into the belief that they are visible to drivers, just like the rest of their surroundings are visible to them. Even adult pedestrians, who are experienced drivers and know the difficulty of driving at night, may forget to see things from the driver perspective when playing the role of pedestrian. The sensory feedback results, perhaps subconsciously, in the pedestrian's incorrect assumption of mutual detection. Even when consciously asked, pedestrians assume that drivers are able to see them from twice as far as drivers actually can. This false perception of safety by pedestrians at night is society's 'dilemma of the invisible pedestrian'.

This false perception explains why pedestrians sometimes walk on the side of the road at night instead of using the sidewalk, or stand in groups on the side of road at night when talking. The pedestrians simply assume that drivers will drive around them. This problem is further exacerbated by the fact that it is difficult to gage the speed of an approaching vehicle at night from the headlights in the distance. This explains why pedestrians often misjudge the safety of road crossings at night, either misjudging the time they had to cross, or assuming that the driver would slow down once they were seen. Unfortunately, by the time the driver perceives and reacts to the presence of the pedestrian in such circumstances, it is often too late to avoid the collision.

Public education and awareness campaigns for both adults and children regarding this dilemma would be of great societal benefit, helping pedestrians remember just how difficult it is for drivers to see them at night.

In closing, while it is true that driver inattention can be the cause of pedestrian collisions at night, it may simply be the case that the pedestrian was invisible to the driver, despite witness evidence to the contrary. A nighttime re-enactment by a qualified expert will answer that critical question.

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