Do motorcyclists have greater exposure to situations in which another driver fails to give way?

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Abstract

This study investigated the possible increased exposure of motorcyclists to situations in which another driver is more likely to fail to give way. Leading and trailing time gaps for passing motorcycles compared to those for other vehicles were measured at 178 urban and rural sites in Victoria, and categorised into 4 distinct time periods. Motorcyclists significantly more frequently had larger time gaps around them compared to other vehicles. This in turn may mean that motorcyclists are more exposed to scenarios where another driver fails to give way to them as the approaching vehicle.

Background

One of the most common scenarios for motorcycle injury crashes involves another driver failing to give way to the motorcyclist (Allen et al., 2013; Brown et al., 2015; Pai, 2011). There is also evidence that motorcyclists are over-represented (as the "through vehicle") in these crash types (de Craen, Doumen, & van Norden, 2014; SWOV, 2010). Previous research has explored a number of explanations, including differences in physical or sensory conspicuity of motorcyclists (Wells et al., 2004), cognitive conspicuity factors (Beanland, Lenne, & Underwood, 2014; Olson, 1989), motorcyclist speed (Clabaux et al., 2012), and crash risk or driver responses such as look-but-fail-to-see (LBFTS) errors. However, one potential contributing factor not yet investigated is a greater exposure of motorcyclists to scenarios where driver error (related to failing to give way) is more likely. This includes circumstances where the approaching traffic is a single vehicle well clear of other vehicles travelling in the same direction. The purpose of this study was therefore to test this hypothesis, by comparing time gaps around passing motorcyclists to that of other vehicles at selected road sites in Victoria, Australia.

Methods

The study population were motorcycles and other vehicles observed on public roads within a 150km radius of the city of Melbourne, Australia. The data was collected as part of a larger case-control study of serious non-fatal motorcycle crashes. A motorcycle was defined as a powered two wheeler (PTW) vehicle registerable for use on Victorian roads, including mopeds and scooters. The study was approved by the Monash University Human Research Ethics Committee.

Measurement of time gap for both motorycles and other vehicles was available from 178 of 204 sites sampled (87%), with a total of 101,224 vehicles (0.5% motorcycles) assessed. Sites were selected based on the location of a recent motorcycle injury crash occurring between the hours of 6am and midnight from May 2012 to August 2014. Traffic observations and measurements were sampled for a mean of 2 hours at each site on the same type-of-day (weekday, Saturday or Sunday), within 1 hour each side of the crash time.

Time gap between vehicles was recorded using a traffic counter radar (Sierzega SR4, Sierzega Elektronik GmbH,Thening, Austria). The device measured time gap between passing vehicles, as well as vehicle speeds and lengths. Vehicle length allowed identification of motorcycles from other

(larger) passing vehicles, which was confirmed using time synchronized digital photographs taken within close proximity to the traffic counter.

Time gap between vehicles was categorised into 4 distinct periods: 0-2 s, 2-4 s, 4-6 s, and >6 s, with 0-2 s assigned as the reference category. Statistical comparisons of time gaps between motorcycles and other vehicles used a generalized Poisson (log-linear) regression model

Results

Motorcycles showed significantly higher rates of large time gaps (> 2 s) both behind and in front when compared to other vehicles (see **Figure 1**). Motorcycles were almost 3 times more likely to have a 4-6 s gap behind, and 2.5 times more likely to have a 4-6 s gap in front, when compared to other vehicles. This effect was present (to a lesser extent) for all other larger gap categories (2-4 s and >6 s), and was significant for all categories except > 6 s in front.

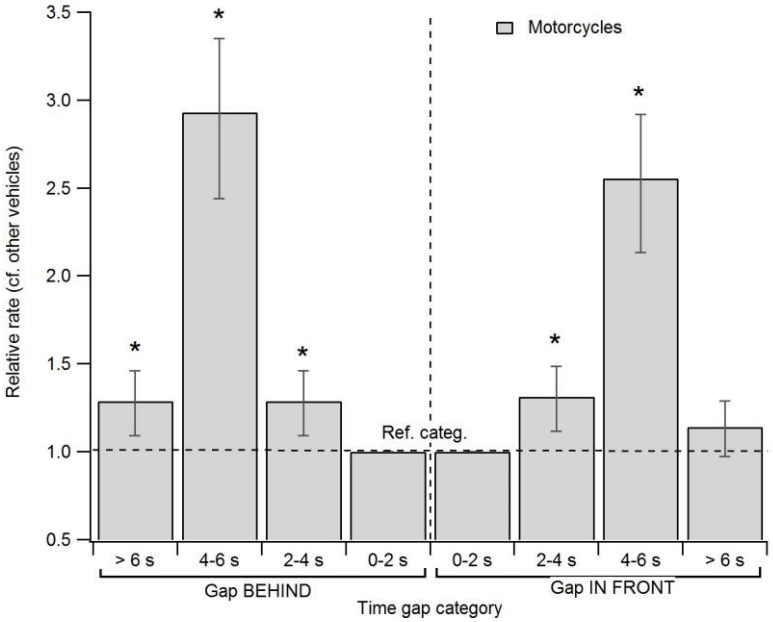

Figure 1. Leading and trailing time gaps of passing motorcycles, expressed relative rate to other vehicles (using 0-2 s as the reference category). * = significantly different to other vehicles (p<0.05).

Conclusions

These findings support the notion that motorcyclists travel with greater distances to other (same-direction) traffic more frequently when compared to other vehicle types. If we assume that the probability of a driver error involving failure to give way to another vehicle (including a look-but-fail-to-see error) is higher when an approaching vehicle is 'alone', our results suggest that motorcyclists have greater exposure to these situations. This, combined with other factors such as conspicuity (Beanland et al., 2014), may provide a more complete understanding of one of the most common motorcycle crash scenarios. The higher rate of longer time gaps around motorcycles may reflect vehicle characteristics unique to motorcycles that increase opportunities to move ahead of a traffic stream (eg. agility, size) and/or active strategies of riders to move clear of vehicles in close proximity. This finding provides a potentially important contribution to our understanding of motorcycle injury crashes involving another vehicle failing to give way, and may be useful for reducing their occurrence. Further research is needed to determine whether particular riding strategies in traffic can reduce risk of a serious crash involving another vehicle.

Acknowledgments

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