Rider, motorcycle and trip-related factors associated with motorcycle injury crash risk in Victoria, Australia

Trevor Allen[a], Karen Stephan[a], Stuart Newstead[a], Mark Symmons[b], Michael Lenné [a], Rod McClure[c], Peter Hillard[a], & Lesley Day[a]

[a]Monash University Accident Research Centre, [b]Australian Catholic University, [c]Faculty of Medicine and Health, University of New England

Abstract

This population based case-control study aimed to investigate risk factors associated with serious injury motorcycle crashes in Victoria, Australia. Cases were adult riders admitted to hospital following a recent motorcycle crash on a public road. Controls were adult riders observed passing a recent case crash site. All participating riders completed a structured questionnaire. Data were analysed using multiple conditional logistic regression. Analysis identified rider, motorcycle and trip-related factors that were: a) significantly associated with crash risk, and b) prevalent in at least 15% of cases. These findings have direct application for evidence-based strategies to improve motorcycle safety.

Background

Motorcyclists are over-represented in road trauma statistics, in part due to their greater vulnerability. Less than 1% of all distance travelled on Victorian roads is by motorcycle or scooter (ABS, 2016; Allen, 2017), yet about 20% of those seriously injured in 2017-18 were motorcyclists or pillions (Source: TAC). Descriptive case studies can help us understand crash trends and possible causative factors. However, population based case-control studies provide a more sophisticated understanding of crash risk by controlling for exposure characteristics of the active rider population (Hurt et al., 1981; Haworth et al., 1997). The most recent Victorian-based study of this type was conducted more than 20 years ago. The aim of this case-control study was to investigate contemporary risk factors associated with serious injury (non-fatal) motorcycle crashes in Victoria. Focus was specifically on rider, motorcycle and trip-related factors associated with injury crash risk that were prevalent in at least 15% of cases.

Method

Eligibility and recruitment

Cases were 204 riders of motorcycles or scooters who had recently been injured in a crash and admitted to one of 14 study hospitals. Study design and recruitment details have been described previously (Day et al., 2013). Case eligibility criteria included: the crash occurred on a public road within 150km of Melbourne CBD between 6am and midnight, the rider was aged 18 years or over, and the motorcycle had current Victorian registration. Controls were 511 riders observed passing the location (or closest possible location) of a case crash site on the same type of day and within 2 hours of the crash time (where possible). Controls were invited by post to the registered vehicle owner. All procedures were approved by the ethics committees of Monash University and study hospitals.

Data collection and analysis

All riders completed a structured questionnaire which included questions about the rider, their motorcycle and the related trip. Data were analysed using multiple conditional logistic regression with multiple imputation for missing data.

Results and Discussion

Table 1. Rider, motorcycle and trip-related factors found to be a) significantly associated with serious injury crash risk, and b) prevalent in >15% of cases.

	Associated with *increased* risk	**Associated with *decreased* risk**
Rider-related factors	• Greater typical weekly riding distance in past 12mths (>200 km/week) • Ever stopped riding for >12mths • Greater typical weekly driving distance in past 12mths (>200km/week) • Increasing risk taking score	• Greater recent riding distance (>100 km in past week) • Off-road motorcycle experience • Familiarity with route by car/other vehicle
Motorcycle-related factors	• Owned motorcycle <=2yrs (compared with >4 years) • Cruiser type motorcycle (compared with all other types) • Increasing bike age	• Anti-lock brakes fitted
Trip-related factors		• Rider wearing tinted visor or lenses • Increasing weight of load/gear

Rider-related risk factors

While there was an expected association between riding exposure and crash risk, recent riding (past week) was associated with decreased risk, suggesting a protective effect of recent familiarity with riding. While having stopped riding (ever) for more than 12 months was associated with increased risk, about half of these riders had returned to riding for more than 5 years. The decreased risk associated with off-road experience should be investigated further.

Motorcycle-related risk factors

Less familiarity with the motorcycle was associated with increased risk, as was increasing age of the bike. The decreased risk associated with motorcycle ABS fitment is promising given this is the first study (to our knowledge) that controlled for rider-related factors. Further research is needed to understand the increased risk associated with cruisers.

Trip-related risk factors

The results for wearing a tinted visor or lenses suggest a possible benefit for perceiving hazards during daylight hours. The decreased risk associated with increasing weight of load/gear may be related to a more conservative approach to riding when carrying a significant load.

Conclusions

A number of rider, motorcycle and trip-related factors were found to be associated with either increased or decreased injury crash risk. It is hoped that findings from such a robust research methodology will be pivotal in shaping discussions on road safety policy by government, the rider community and other stakeholders and highlight areas where more research or evaluation is needed.

Acknowledgements

The case-control study from which this data was sourced was funded by the Australian Research Council (LP110100057), VicRoads, the Transport Accident Commission of Victoria, and the Victorian Government Department of Justice, with in-kind support from Victoria Police, Victorian Automobile Chamber of Commerce. Ambulance Victoria provided daily crash notification and location information. We thank the MICIMS full-time project team (Josie Boyle, Rob Jackel, Geoff Rayner) as well as all project research nurses, research assistants and field-based researchers.

References

ABS. (2016). Survey of Motor Vehicle Use, 30 June 2016. Australian Bureau of Statistics, Canberra(9208.0).

Allen T, McClure R, Newstead S, Lenné M, Hillard P, Symmons M & Day L (2016). Exposure factors of Victoria's active motorcycle fleet related to serious injury crash risk. Traf. Inj. Prev. 17: 870-877.

Day, L., Lenne, M. G., Symmons, M., Hillard, P., Newstead, S., Allen, T., & McClure, R. (2013). Population based case-control study of serious non-fatal motorcycle crashes. BMC Public Health, 13, 72. doi: 10.1186/1471-2458-13-72.

Haworth, N., Smith, R., Brumen, I., & Pronk, N. (1997). Case-control study of motorcycle crashes (CR 174): Federal Office of Road Safety, Canberra

Hurt, H., Ouellet, J. & Thom, D.R. (1981). Motorcycle accident cause factors and identification of countermeasures. U.S. Department of Transportation. National Highway Traffic Safety Administration 1: Technical Report: 1-435.

TAC (2019). Searchable road trauma statistics. http://www.tac.vic.gov.au/road-safety/statistics/online-crash-database (accessed 11/2/19). Transport Accident Commission, Victoria, Australia.