Finding evidence-based strategies to improve motorcycle safety: a case-control study on serious injury crashes in Victoria

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Increased popularity of motorcycles

Motor vehicle registrations in Australia

Motor vehicle use in Australia (million km travelled)

<table>
<thead>
<tr>
<th></th>
<th>2003</th>
<th>2010</th>
</tr>
</thead>
<tbody>
<tr>
<td>Car</td>
<td>151,743</td>
<td>163,360</td>
</tr>
<tr>
<td>Motorcycle</td>
<td>1,376</td>
<td>2,394</td>
</tr>
</tbody>
</table>

Source: Australian Bureau of Statistics
Vulnerability of motorcyclists to injury

Fatality rates

Victoria - past 5 yrs (2008-2012)

- Car: 5
- Motorcycle: 30

Hospital admissions

Victoria - past 5 yrs (2008-2012)

- Car: 100
- Motorcycle: 600

Sources: Australian Bureau of Statistics, Transport Accident Commission (VIC)
Managing Increasing Challenges in Motorcycle Safety (MICIMS) Aims

- To determine risk factors for motorcycle-related crashes involving serious injury

Specific focus on:

1. **Role of speed** - incl. “excessive” vs. “inappropriate”
2. **Role of road infrastructure and environment**
3. **Role of rider factors** – incl. age & rider experience

This presentation:

Data from first 75 recruited cases (recruitment continuing to early 2014)
- Comparison with previous studies in Victoria
  (Haworth et al. 1997, Stephan et al. 2008)
Methods

- **Population:** Motorcycle riders aged 18yrs & older
  - riding on public roads (150km radius of Melbourne, 6am-midnight)

- **Study Design:** Case-control + in-depth investigation

  1. **Rider** is unit of analysis (road environment is controlled)
     - **Group 1: Case riders** - seriously injured riders admitted to hospital
     - **Group 2: Control riders** - riders passing crash sites

  2. **Site** is unit of analysis (rider is controlled)
     - **Case site + Case motorcycle** - Site of crash + Motorcycle inspection
     - **Control site** - 1km upstream of crash site
Measurement Modules: Case-series report

Rider Questionnaire (self reported)

- Crash details & circumstances (eg. number of vehicles involved)
- Contributing factors, trip-related factors, motorcycle factors
- Rider factors (incl. age, experience)

Crash site inspection

- Crash event investigation, contributing factors, travel speed estimation (where possible)
- Features of road environment (eg. road type, intersection type)

Case motorcycle inspection

- Crash investigation (incl. speed estimation where possible)
- Motorcycle type, engine capacity, safety features
Results: Rider factors & involvement of other road users

<table>
<thead>
<tr>
<th></th>
<th>Single-vehicle</th>
<th>Multi-vehicle</th>
<th>All crashes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Intersection</td>
<td>5</td>
<td>30</td>
<td>35</td>
</tr>
<tr>
<td>Mid-block straight</td>
<td>11</td>
<td>12</td>
<td>23</td>
</tr>
<tr>
<td>Mid-block curve</td>
<td>14</td>
<td>3</td>
<td>17</td>
</tr>
<tr>
<td>TOTAL</td>
<td>30</td>
<td>45</td>
<td>75</td>
</tr>
</tbody>
</table>

Multi-vehicle crashes
- 60% of crashes involved another vehicle(s)
- Over two-thirds occurred at an intersection
- Most common scenario was another vehicle turning into path of rider (69%)

Single-vehicle crashes
- 40% of cases were single vehicle crashes
- For 70% of cases a misjudgement/control error on part of the rider was a contributing factor
- Ineffective braking was the most common control error
Results: Features of road environment

<table>
<thead>
<tr>
<th></th>
<th>Urban</th>
<th>Rural</th>
<th>All roads</th>
</tr>
</thead>
<tbody>
<tr>
<td>Intersection</td>
<td>28</td>
<td>7</td>
<td>35</td>
</tr>
<tr>
<td>X-Intersection</td>
<td>13</td>
<td>4</td>
<td>17</td>
</tr>
<tr>
<td>T-Intersection</td>
<td>13</td>
<td>1</td>
<td>14</td>
</tr>
<tr>
<td>Y-Intersection</td>
<td>2</td>
<td>2</td>
<td>4</td>
</tr>
<tr>
<td>Not intersection: straight</td>
<td>19</td>
<td>4</td>
<td>23</td>
</tr>
<tr>
<td>Not intersection: curve</td>
<td>4</td>
<td>13</td>
<td>17</td>
</tr>
<tr>
<td><strong>TOTAL</strong></td>
<td>51</td>
<td>24</td>
<td>75</td>
</tr>
</tbody>
</table>

Urban areas (68% of cases)
- 55% of crashes occurred at an intersection (X-Int. 25%, T-Int. 25%)

Rural areas (32% of cases)
- 54% of crashes occurred on a curve (incl. corner or bend)
Results – Speed related factors

- Excessive speed (=exceeding speed limit)

<table>
<thead>
<tr>
<th></th>
<th>Current Study (MICIMS)</th>
<th>Haworth et al. (1997)</th>
<th>Stephan et al. (2008)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Study period (years)</td>
<td>2012-2013</td>
<td>1995-1996</td>
<td>2000-2005</td>
</tr>
<tr>
<td>Injury type (inclusion criteria)</td>
<td>Serious injury</td>
<td>Serious Injury + Fatal</td>
<td>Fatal</td>
</tr>
<tr>
<td>Region type</td>
<td>Vic Metro + Vic Regional</td>
<td>Vic Metro</td>
<td>Vic Metro + Vic Regional</td>
</tr>
<tr>
<td>Number of cases</td>
<td>75</td>
<td>222</td>
<td>201</td>
</tr>
<tr>
<td>Number (%) of cases where speed could be evaluated</td>
<td>37 (49%)</td>
<td>118 (53%)</td>
<td>109 (54%)</td>
</tr>
<tr>
<td>% of cases where excessive speed judged to be involved</td>
<td>27 %</td>
<td>23 %</td>
<td>47* %</td>
</tr>
</tbody>
</table>
Results: Rider factors

- Rider age

![Bar chart showing rider age distribution with data from Haworth et al. (1996-97, n=222) and the current study (2012-13, n=75).]
- Mean age of on-road motorcyclists admitted to Hospital (1995-2012)

Source: Victorian Admitted Episodes Dataset (VAED)
Results: Rider factors

- Age vs. experience (licence years)
Results: Motorcycle characteristics

- Motorcycle type

- 2 case motorcycles (3%) were fitted with an anti-lock braking system (ABS)
Results: Motorcycle characteristics

- Engine Capacity

![Bar chart showing engine capacity distribution for different studies.]

- Haworth et. al. (1996-97, n=222)
- Current Study (2012-13, n=75)

% of Cases

- 0-260cc
- 261-749cc
- > 750cc

Legend:
- LAMS
- > 1249cc

Haworth et. al. (1996-97, n=222)
Current Study (2012-13, n=75)
Summary & Conclusions

- 60% of PTW crashes investigated involved another vehicle
- The most common scenario was another vehicle turning into the path of the rider (69% of multi-vehicle crashes)
- For single-vehicle crashes, 54% occurred on a curve
- The age of riders seriously injured has increased substantially in recent years
- Very small number (3%) of motorcycles fitted with anti-lock brakes (ABS)
- At study completion, the case-control analysis will provide much more valuable information about the risk factors associated with rider characteristics, the road environment and motorcycle characteristics.
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