Comparison of moped, scooter and motorcycle crashes: Implications for rider training and education

Ross Blackman and Narelle Haworth
Powered Two-Wheelers (PTWs)

- **Motorcycle** → ADR Category LC
- **Scooter** → Over 50cc LC
- **Moped** → Up to 50cc LA

No motorcycle licence required for moped in QLD.
Current knowledge (1)

- PTW riders - vulnerable road users
  - High crash/injury risk
  - Lack of protection from injury

- <5% of registered motor vehicles (AUS) (DTMR 2009)
- 15-20% of road user fatalities (AUS) (DTMR 2010)
- 70% PTW sales increase in 5 years (AUS) (FCAI 2008)
- Mopeds and scooters highest sales growth
- Largest sales growth in State of Queensland (QLD)
Current knowledge (2)

- Key PTW principles apply to mopeds/scooters
- Risk factors may differ by PTW type

<table>
<thead>
<tr>
<th>Risk factor/Hazard</th>
<th>Moped</th>
<th>Scooter</th>
<th>Motorcycle</th>
</tr>
</thead>
<tbody>
<tr>
<td>Inexperience</td>
<td>√√</td>
<td>?</td>
<td>√</td>
</tr>
<tr>
<td>Risk taking</td>
<td>?</td>
<td>?</td>
<td>√</td>
</tr>
<tr>
<td>Driver failure to see PTWs</td>
<td>√</td>
<td>√</td>
<td>√</td>
</tr>
<tr>
<td>Instability &amp; braking difficulties</td>
<td>√?</td>
<td>√?</td>
<td>√</td>
</tr>
<tr>
<td>Road surface &amp; environment</td>
<td>√?</td>
<td>√?</td>
<td>√</td>
</tr>
<tr>
<td>Vulnerability to injury</td>
<td>√?</td>
<td>√</td>
<td>√</td>
</tr>
</tbody>
</table>
Most research on mopeds & scooters from Europe

Differences between Australia & elsewhere – context

Effectiveness of rider training programs unclear

Previous Australian research shows

- Increase in moped crashes in QLD (Haworth 2008)
- More commuting than recreational use (Harrison & Christie 2003)
- Crash severity similar to motorcycles (Haworth 2008)
- Less use of protective clothing among moped/scooter riders (de Rome 2006; Christie 2008)

No specific comparisons of moped and scooter crashes
Methods

- Crash & registration data analysis – Queensland State
- Data supplied by Department of Transport & Main Roads
- PTWs on register, 2001 - 2009
  - Mopeds and motorcycles separated by ADR category (LA or LC)
  - Scooters not separated from motorcycles (both LC)
- Merged crash & registration data
  - Reported PTW crashes, July 2003 – June 2008
  - PTW type identified by make & model details
  - Unknown PTW types excluded
Crash numbers

7,347 crashes July 2003 – June 2008 (excluding unknown types)

<table>
<thead>
<tr>
<th>PTW</th>
<th>N</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Motorcycle</td>
<td>6711</td>
<td>91.3</td>
</tr>
<tr>
<td>Moped</td>
<td>541</td>
<td>7.4</td>
</tr>
<tr>
<td>Scooter</td>
<td>95</td>
<td>1.3</td>
</tr>
</tbody>
</table>
Crash rates

Crash rate per 10,000 registration years – 5 year average

• Motorcycles 125 (includes scooters)
• Mopeds 133

Crash rate per million VKT – 5 year average

• Motorcycles 1.70 (includes scooters)
• Mopeds 6.33
• Based on self-report survey data (n = 2975)
Rider characteristics

- **Age & Gender**

![Bar chart showing the percentage distribution of riders by age group and gender for different modes of transport: Motorcycle, Moped, and Scooter.](chart.png)

*Note: The chart illustrates the distribution of riders across age groups (17-20, 21-24, 25-29, 30-39, 40-49, 50-59, 60-74, 75+) and genders (Male, Female) for each mode of transport.*
Crash characteristics

- Wet road: Motorcycle 8%  Scooter 6%  Moped 13%
- On curve: Motorcycle 29%  Scooter 14%  Moped 17%

Crash configuration
Main contributing circumstances

- **Motorcycles:** Inattention, road conditions, speed, violations
- **Mopeds:** Inattention, violations, road conditions, inexperience
- **Scooters:** Inattention, violations
- **Other road users:** Violations, inattention, inexperience
Crash severity & speed zone

- Statistically significant difference in crash severity
- ~90% of moped & scooter crashes in speed zones up to 60km
Analysis of severity by PTW type

Ordered probit regression model
- As described in Accident Analysis & Prevention 57, 1-9.

Explanatory variables
- PTW type
- Speed zone
- Horizontal alignment (Straight/Curve)
- Weekday/Weekend
- Day/Night
- Single/Multi-vehicle
Analysis of severity by PTW type

- Severity outcomes not a function of PTW type per se

- Mopeds
  - more severe in 90+ zones & at night

- Scooters
  - More severe in 70 zones & on weekends

- Motorcycles
  - More severe in 80+ zones, on curves, weekends, night & in single vehicle crashes
Implications

- Compared to motorcycles
  - Scooter riders safer despite same licensing system
  - Mopeds higher crash risk
  - Moped and scooter crashes less severe
  - Less risk-taking on mopeds and scooters
  - Moped rider skills inferior?

- Severity outcomes related to usage patterns
  - Moped limited performance limits usage

- Crash rates declined for all PTWs
  - Exposure data needed for scooters
Potential measures to improve safety

- Licensing and training
  - Findings support different emphases for different groups
  - Demonstrated competency – all PTW riders?
  - Demonstrated theoretical knowledge?
  - Compulsory or optional training?
  - PTW licence for moped riders?

- Education campaigns
- Infrastructure treatments
- Development of standards for protective clothing
- Regulation on minimal level of clothing while riding
Potential topics for further research

- Reliable exposure data for Queensland moped & scooter use
- Feasibility of increasing homogeneity of travel speeds
- Potential of education & awareness campaigns for other road users
- Potential impact on industry of moped rider PTW license
- Rider training & licensing system evaluation
- Barriers to protective clothing use
Questions?

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