Challenges & Opportunities of Motorcycle Safety: Malaysia experience

Motorcycle Safety Forum
Brasil, 2013

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Director General
Malaysian Institute of Road Safety Research
Presentation Contents

• Motorcycle classifications and regulations
• Motorcycle regulations, traffic
• Motorcycle ridership
• Road environment and motorcycle lane
• Crash statistics & pattern
• Case study 1: Young motorcyclists
• Case study 2: Underage motorcyclists and pillion
• Helmet wearing observations
• Educating road users
• Understanding riders behaviors
• Conspicuity
Contents

• Motorcyclists protection
• Crash test simulation
• Other researches
• Other initiatives
Motorcycle Classification

• Majority, 99% <250 cc engine
• >250 cc engine low representation, primarily for leisure riding
• >95% of <150 cc dominates the category, for commuting to work, college
• No moped category
Motorcycle regulations

• Ownership registration and road-tax fee
• Driver license requirements
• License eligibility starts at 16 years
• Motorcycle occupancy 2
• No age limit for pillion passengers
• Traffic rules apply, same as other modes
Utilization Growth

Registered Motorcycles by Years

[RTD Statistics, 2013]
Motorcycles in traffic

• In common traffic
  • Mix with other modes
  • Multi-positions
  • Splitting moves
• Motorcycle lanes
  • Exclusive
  • Shared (non-exclusive)
Exclusive MC lane
(physical barrier, raised median)

Non-exclusive MC lane
(shared, marking segregation)
Mixed with other modes, in expressways, intercity, interstate roads
Relative Risk to Users of Various Means Transport

- The KSI rate for car occupants were about 7–9 times higher and for pedestrians 3–54 times higher as compared to those of bus and coach occupants (ECBOS, 2001)

- Killed and seriously injured (KSI) rate per 100 million

<table>
<thead>
<tr>
<th>Mode of travel</th>
<th>Passenger</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Kilometres</td>
</tr>
<tr>
<td>Car</td>
<td>3.1</td>
</tr>
<tr>
<td>Foot</td>
<td>21.5</td>
</tr>
<tr>
<td>Bus or coach</td>
<td>0.4</td>
</tr>
<tr>
<td>Motorcycle/moped</td>
<td>19.2</td>
</tr>
</tbody>
</table>
Motorcycle ridership
Ridership and travel pattern
Licensing
Ridership and travel pattern

• Distributed age groups ridership
• Commuting to work, occupational and perform daily chores
• Factors influencing ridership
  • Economy – fuel, parking, low ownership & maintenance
  • Traffic situations
  • Door-to-door service
## Motorcycle Licensing System

<table>
<thead>
<tr>
<th>LDL</th>
<th>PDL</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Minimum age to obtain LDL for motorcycle is 16 years old.</td>
<td>• Probation license</td>
</tr>
<tr>
<td>• Restrict to single rider only, pillion not allowed.</td>
<td>• Subject to KEJARA demerit point system.</td>
</tr>
<tr>
<td>• Renewable every 3 or 6 months to maximum of 2 years.</td>
<td>• PDL will be revoked if demerit points accumulated to 10.</td>
</tr>
<tr>
<td>• Shall display the “L” plate.</td>
<td>• Shall display the “P” plate.</td>
</tr>
</tbody>
</table>
Road environment and motorcycle lane

- Effectiveness of lane
- Existing practice
- Design guidelines
# Types of Motorcycle Lane

<table>
<thead>
<tr>
<th>Type</th>
<th>Example</th>
<th>Location</th>
</tr>
</thead>
</table>
| Exclusive             | ![Image](exclusive.jpg) | • Federal Route No 2 connecting Shah Alam to Klang,  
                          • KESAS highway and  
                          • Persiaran Utara dan Persiaran Timur, Putrajaya |
| Non – Exclusive :     | ![Image](inclusive.jpg) | • Seksyen No 115-125 Federal Route No 5, Batu Pahat Johor  
                          • Sekyen No 0 –5.5, Federal Route No 58, Teluk Intan, Perak |
| Inclusive             |         |                                                                          |
## Type of Motorcycle Lane

<table>
<thead>
<tr>
<th>Type</th>
<th>Example</th>
<th>Location</th>
</tr>
</thead>
<tbody>
<tr>
<td>Non – Exclusive : Paved Shoulder</td>
<td><img src="https://via.placeholder.com/150" alt="Image" /></td>
<td>All roads with existing paved shoulder</td>
</tr>
</tbody>
</table>
Effectiveness of MC Lane

• 1970s, the exclusive MC lanes were built as part of the Federal Route 2 but no study was conducted.

• 1994, the MC Lane was extended and a study showed a reduction of 39% in motorcycle crashes.

• The road accident statistics have consistently indicated that most of the fatal motorcycle accidents involved another motor vehicles (70% in 2011). If the motorcycles are segregated from the other motor vehicles, we would be able to isolate the said risk in an effective way.
Motorcycle Lane Design Guideline

• The design of the earlier Malaysian Motorcycle lanes was based on the design criteria for bicycle, with much lower cruising speed.

• The earlier design was based on “A Guide on Geometric Design of Roads 8/16” and “A Guide to the Design of Cycle Track 10/86”, both published by the Public Works Department, Malaysia (PWD, 1986).

• Recently, in the year 2011, the Road Engineering Association Malaysia (REAM) has published a guideline related to motorcycle lane design called “Guideline for Motorcycle Facilities”.

Guideline for Motorcycle Facilities (REAM, 2011)

- The guideline cover the following:
  - Motorcycle Warrants
  - Exclusive MC Lane
  - Non-Exclusive MC Lane
  - Treatment of Paved Shoulder at Point of Conflict
  - Motorcycle Shelter
  - Street Lighting
  - Traffic Barrier
  - Motorcycle Lane Facilities at Work Site
Motorcycle Safety on Barrier

Full Scale Motorcycle Crash #7
Video Clip
Recorded: 30fps
Playing: 30fps
Copyright © 2004
All Rights Reseved
Road Safety Research Centre
Universiti Putra Malaysia
Injury at MC lane

Crashes with roadside objects along motorcycle lanes in Malaysia

- Exclusive motorcycle lanes were effective to reduce motorcyclist fatalities on roads.
- Nevertheless, frequent motorcycle crashes still occur on exclusive motorcycle lanes.
- Roadside objects are one of the main contributing factors to motorcyclist fatalities.
- As a standard practice, standard guardrails erected along highways and roads.
- Guardrails identified as the most struck object, representing 32.7% of all roadside object-related motorcycle crashes along MC lane, and narrow surface objects contribute to higher fatality rate than guardrails.
- Guardrails contributed 23.5% of all fatal roadside object-related crashes.
- 1.7 times more likely to cause serious injury to motorcyclists than non-object-related motorcycle crashes.
- These findings support that guardrails are suitable to be used as a protection agent for the motorcyclists using the exclusive motorcycle lanes. However, further research and enhancements on the guardrail design system and material type are needed to have safer exclusive motorcycle lanes.

[S.H. Tung et al., 2007]
Prediction Models for Motorcycle Crashes at Signalized Intersections

• Addressed intersection crashes involving motorcycles.
• Provided models for predicting motorcycle crashes at signalized intersections
• Traffic entering the intersection, approach speed, lane width, number of lanes, shoulder width, and land use at the approach of the intersection were found to be significant in describing motorcycle crashes.
• Findings allowed road engineers to draw up appropriate intersection treatment criteria specifically designed for motorcycle lane facilities

[S. Harnen et al, 2004]
Crash statistics & pattern
## South East Asia – Road Safety Status

<table>
<thead>
<tr>
<th>Country</th>
<th>Population</th>
<th>Total registered vehicles</th>
<th>% Car</th>
<th>% Motorcycle</th>
<th>% Heavy Truck</th>
<th>% Buses</th>
<th>% Other Veh</th>
<th>Total fatalities</th>
<th>% Motorcyclist death</th>
</tr>
</thead>
<tbody>
<tr>
<td>Brunei</td>
<td>398920</td>
<td>349279</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cambodia</td>
<td>14138255</td>
<td>1652534</td>
<td>15%</td>
<td>83%</td>
<td>2%</td>
<td>0%</td>
<td>0%</td>
<td>1816</td>
<td>67%</td>
</tr>
<tr>
<td>Indonesia</td>
<td>23987094</td>
<td>7269295</td>
<td>11%</td>
<td>83%</td>
<td>5%</td>
<td>2%</td>
<td>0%</td>
<td>31324</td>
<td>36%</td>
</tr>
<tr>
<td>Laos</td>
<td>6200894</td>
<td>1008788</td>
<td>17%</td>
<td>81%</td>
<td>0%</td>
<td>3%</td>
<td>0%</td>
<td>790</td>
<td>74%</td>
</tr>
<tr>
<td>Malaysia</td>
<td>28401017</td>
<td>2018856</td>
<td>45%</td>
<td>47%</td>
<td>5%</td>
<td>0%</td>
<td>3%</td>
<td>6872</td>
<td>59%</td>
</tr>
<tr>
<td>Myanmar</td>
<td>47963010</td>
<td>2326639</td>
<td>12%</td>
<td>82%</td>
<td>3%</td>
<td>1%</td>
<td>3%</td>
<td>2464</td>
<td>23%</td>
</tr>
<tr>
<td>Philippines</td>
<td>93260800</td>
<td>6634855</td>
<td>42%</td>
<td>52%</td>
<td>5%</td>
<td>1%</td>
<td>0%</td>
<td>6941</td>
<td></td>
</tr>
<tr>
<td>Singapore</td>
<td>5086418</td>
<td>945829</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>193</td>
</tr>
<tr>
<td>Thailand</td>
<td>69122232</td>
<td>2848482</td>
<td>35%</td>
<td>61%</td>
<td>3%</td>
<td>0%</td>
<td>1%</td>
<td>13766</td>
<td>74%</td>
</tr>
<tr>
<td>Vietnam</td>
<td>87848460</td>
<td>3316641</td>
<td>2%</td>
<td>95%</td>
<td>2%</td>
<td>0%</td>
<td>0%</td>
<td>11029</td>
<td></td>
</tr>
</tbody>
</table>
Malaysia Road Fatalities Record

[Graph showing road fatalities from 1972 to 2010 with turning points highlighted]

[Rohayu S., et al., 2012]
Fatalities by Transport Mode

[Abdul Manan and Várhelyi, 2012]

Fig. 1. Fatality distribution by mode of transport [1].
Road Fatalities Prediction

If business remains as usual !!!

[ Rohayu S., et al., 2012]
Case study 1: Young motorcyclists

[Ilhamah O., et al., 2013]
Young motorcyclist fatality in Malaysia

- 54% of the 6877 deaths from traffic injuries were motorcycle riders in 2011 and of these motorcyclist deaths, 37% were young riders aged between 16 to 25 years old.

- The trend of fatalities among motorcycle riders aged between 16 to 25 years as a proportion of all rider fatalities remain the highest in comparison with other age distribution throughout the year.
Crash locations

[Ilhamah O., et al., 2013]
Case study: License Type (age group 16-21)

[Ilhamah O., et al., 2013]
Helmet Wearing Compliancy (age 16-21)

[Ilhamah O., et al., 2013]
Case Study 2: Underage Motorcyclists & Pillion

[Noorfaradila P. et al., 2011]
Overloading Issues

• Study focused on child pillion only.
  • 29% riders carried more than one child pillion riders
  • Female riders were 1.6 times more likely to carry more than one pillion rider (95%CI 1.1-2.2)
  • 19% child pillion rider sat in between the riders and the most rear pillion.

• Multiple pillion riders could affect the centre of gravity (CG) and handling of motorcycle. Sudden changes on CG might affect the maneuvering process.
Children Pillion

• Riders tend to allocate youngest child in front while riding.
  • increases the risk of the child being squeezed during emergency braking or road crash

• 7.2% child pillion riders occupying the front “seat”.

• 35% child pillion did not occupy footpeg
  • Out-of-reach OR
  • In multi-pillion cases, footpeg occupied by other pillion
## Mode of Commuting to School

<table>
<thead>
<tr>
<th>MODE OF TRAVELLING</th>
<th>PENINSULAR</th>
<th>SABAH &amp; SARAWAK</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>13 years (%)</td>
<td>14 years (%)</td>
</tr>
<tr>
<td>Car/4wd</td>
<td>26.9</td>
<td>22.7</td>
</tr>
<tr>
<td>Walk</td>
<td>17.8</td>
<td>14.9</td>
</tr>
<tr>
<td>School Bus/Van (yellow)</td>
<td>10.0</td>
<td>10.6</td>
</tr>
<tr>
<td>Bicycle</td>
<td>7.3</td>
<td>8.7</td>
</tr>
<tr>
<td>Army Truck/Van/MPV</td>
<td>6.8</td>
<td>7.1</td>
</tr>
<tr>
<td>Public Bus</td>
<td>6.2</td>
<td>8.4</td>
</tr>
<tr>
<td>LRT/Monorel</td>
<td>4.1</td>
<td>3.9</td>
</tr>
</tbody>
</table>

[Noorfaradila P. et al., 2011]
More than 40% students have ridden motorcycles on the road for any purpose.

[Noorfaradila P. et al., 2011]
Helmet wearing – observational study
# Helmet-wearing, Festive Season (Hari Raya 2012)

<table>
<thead>
<tr>
<th></th>
<th>Semenyih (Urban)</th>
<th></th>
<th>Sekinchan (Rural)</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Before OPS</td>
<td>During OPS</td>
<td>OR (95% CI)</td>
<td>Before OPS</td>
</tr>
<tr>
<td>Wear helmet</td>
<td>4074 (96.0)</td>
<td>5063 (96.6)</td>
<td>0.842 (0.680, 1.043)</td>
<td>2519 (85.8)</td>
</tr>
<tr>
<td>Not wear helmet</td>
<td>171 (4.0)</td>
<td>179 (3.4)</td>
<td>417 (14.2)</td>
<td>366 (13.1)</td>
</tr>
<tr>
<td>Standard helmet</td>
<td>3665 (90.0)</td>
<td>4388 (86.7)</td>
<td>1.378* (1.210, 1.571)</td>
<td>1078 (42.8)</td>
</tr>
<tr>
<td>Non-standard helmet</td>
<td>409 (10.0)</td>
<td>675 (13.3)</td>
<td>1441 (57.2)</td>
<td>1510 (62.1)</td>
</tr>
</tbody>
</table>

*Significant at p < 0.05.
# Helmet Wearing Festive Season (CNY 2013)

<table>
<thead>
<tr>
<th></th>
<th>Rawang (Urban)</th>
<th></th>
<th>Sekinchan (Rural)</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Before OPS</td>
<td>During OPS</td>
<td>OR (95% CI)</td>
<td>Before OPS</td>
</tr>
<tr>
<td><strong>Wear helmet</strong></td>
<td>2841 (98.6)</td>
<td>2587 (98.7)</td>
<td>0.9335 (0.5891, 1.4791)</td>
<td>1466 (86.5)</td>
</tr>
<tr>
<td><strong>Not wear helmet</strong></td>
<td>40 (1.4)</td>
<td>34 (1.3)</td>
<td></td>
<td>229 (13.5)</td>
</tr>
<tr>
<td><strong>Standard helmet</strong></td>
<td>2516 (88.6)</td>
<td><strong>2365 (91.4)</strong></td>
<td>0.7267* (0.672, 0.8697)</td>
<td>604 (41.2)</td>
</tr>
<tr>
<td><strong>Non-standard helmet</strong></td>
<td>325 (11.4)</td>
<td>222 (8.6)</td>
<td></td>
<td>863 (58.8)</td>
</tr>
</tbody>
</table>
Educating road users

• RSE in schools
  • Awareness program
  • Community-based program
Demographics relationship between rider and pillion and child pillion for safety helmet use compliance

<table>
<thead>
<tr>
<th>Variables</th>
<th>Safety helmet use compliance</th>
<th>Total no.</th>
<th>Statistical significant</th>
<th>Odd Ratio</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Yes (%)</td>
<td>No (%)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Position of occupant</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Rider</td>
<td>468 (66.8)</td>
<td>233 (33.2)</td>
<td></td>
<td>11.7 (9.2-14.9)</td>
</tr>
<tr>
<td>Child pillion rider</td>
<td>134 (14.7)</td>
<td>779 (85.3)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Rider</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Male</td>
<td>328 (75.1)</td>
<td>109 (24.9)</td>
<td></td>
<td>2.7 (1.9-3.7)</td>
</tr>
<tr>
<td>Female</td>
<td>140 (53.0)</td>
<td>124 (47.0)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Child pillion rider</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Male</td>
<td>72 (16.3)</td>
<td>371 (83.7)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Female</td>
<td>62 (13.2)</td>
<td>408 (86.8)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Child pillion sitting position</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Front (PF)</td>
<td>6 (9.1)</td>
<td>60 (90.9)</td>
<td></td>
<td>5.7 (1.4-23.6)</td>
</tr>
<tr>
<td>Back (PB)</td>
<td>125 (18.6)</td>
<td>547 (81.4)</td>
<td></td>
<td>0.76 (0.02-0.24)</td>
</tr>
<tr>
<td>Middle (PM)</td>
<td>3 (1.7)</td>
<td>172 (98.3)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Location</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Urban</td>
<td>241 (63.1)</td>
<td>141 (36.9)</td>
<td></td>
<td>0.69 (0.50-0.95)</td>
</tr>
<tr>
<td>Rural</td>
<td>227 (71.2)</td>
<td>92 (28.8)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*Safety Helmet Use Rate and Child Pillion Rider’s Characteristic in Selangor, 2013*
RSE in Secondary School

• 2012, RSE module which aims to provide knowledge and subsequent behavior modification, began to be taught among secondary school students (13 years old and beyond).

• By 2014, RSE reached 15 years-old (Form 3)

• Only modules for Form 2 and 3 have specific topics related to motorcycle safety.
FORM 2 (14 years old)

Unit 3:
Safety Equipment: Seat Belts & Helmets

Unit 4:
Consequences of driving or riding without a license
## Unit 3

### ALATAN KESELAMATAN:
TALI PINGGANG KELEDAR DAN TOPI KELEDAR

<table>
<thead>
<tr>
<th>Tajuk 2:</th>
<th>Kenali Topi Keledar Lebih Mendalam</th>
</tr>
</thead>
</table>

### Hasil Pembelajaran

<table>
<thead>
<tr>
<th>Fokus Utama:</th>
<th>Aras 2 (ii) Menyatakan persetujuan dan menolak beberapa pernyataan yang diberikan oleh pihak lain dalam perundingan.</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>3.2 Berbincang untuk menerima dan menolak pandangan orang lain secara terbuka untuk mencapai kata sepakat.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Fokus Sampingan:</th>
<th>Aras 1 (i) Memilih kata, frasa, rangkai kata, peribahasa dan pelbagai jenis ayat yang sesuai untuk menyampaikan maklumat.</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>9.1 Menggunakan kata, istilah, frasa, rangkai kata, peribahasa dan ayat yang tepat serta indah untuk menyampaikan maklumat secara tersusun dan kohesif.</td>
</tr>
</tbody>
</table>

### Kemahiran PKJR:

<table>
<thead>
<tr>
<th>Kemahiran PKJR:</th>
<th>3.2</th>
</tr>
</thead>
</table>
Helmet & wearing
<table>
<thead>
<tr>
<th>Tajuk 1</th>
<th>Elakkan Menunggang Motosikal Tanpa lesen</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Hasil Pembelajaran</strong></td>
<td></td>
</tr>
<tr>
<td><strong>Fokus Utama</strong></td>
<td>7.1 Mengenal pasti dan menyatakan gambaran keseluruhan, idea utama, isi penting, dan isi relevan tentang bahan yang didengar, dibaca, dan ditonton.</td>
</tr>
<tr>
<td><strong>Aras 1 (i)</strong></td>
<td>Mengenal pasti dan mengutarakam gambaran umum dan isi-isi penting daripada pelbagai bahan.</td>
</tr>
<tr>
<td><strong>Fokus Sampingan</strong></td>
<td>12.1 Menghasilkan prosa dan puisi secara terancang, tertib dan kemas dengan menggunakan bahasa yang tepat, indah, dan menarik.</td>
</tr>
<tr>
<td><strong>Aras 3 (ii)</strong></td>
<td>Menghasilkan cerita berdasarkan lakaran plot dengan menggunakan gaya penulisan yang menarik.</td>
</tr>
<tr>
<td><strong>Kemahiran PKJR</strong></td>
<td>6.1.1, 6.1.2</td>
</tr>
</tbody>
</table>

**Objektif**
Pada akhir pembelajaran murid dapat:
## Tingkatan 2

### KESAN MENGENDALIKAN KENDERANA TANPA LESEN

<table>
<thead>
<tr>
<th>Langkah</th>
<th>Aktiviti Pengajaran dan Pembelajaran</th>
<th>Nota/Media</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Kesalahan kerana tidak mematuhi undang-undang</td>
<td>Denda dikenakan</td>
</tr>
<tr>
<td></td>
<td>- Tidak memiliki lesen secara sah:</td>
<td></td>
</tr>
<tr>
<td></td>
<td>- Mereka yang di bawah umur 16 tidak</td>
<td></td>
</tr>
<tr>
<td></td>
<td>dikenakan menunggang motosikal.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>- Mereka yang di bawah umur 17 tidak</td>
<td></td>
</tr>
<tr>
<td></td>
<td>dikenakan memandu.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>- Memandu atau menunggang melebihi</td>
<td></td>
</tr>
<tr>
<td></td>
<td>had laju yang ditetapkan.</td>
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<tr>
<td></td>
<td>- Menyebabkan kematan kesana memandu</td>
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<td></td>
<td>atau menunggang secara melulu dan</td>
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<td></td>
<td>berbahaya.</td>
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<td></td>
<td>- Memandu atau menunggang secara</td>
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<td></td>
<td>melulu dan barbahaya.</td>
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</tr>
<tr>
<td></td>
<td>- Memandu atau menunggang secara</td>
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</tr>
<tr>
<td></td>
<td>tidak cermat dan tidak bertimbang</td>
<td></td>
</tr>
<tr>
<td></td>
<td>rasa.</td>
<td></td>
</tr>
</tbody>
</table>

- Denda RM1000 atau 3 bulan penjara (atau kedua-duanya).
- Denda RM1000 atau kurang.
- Lesen disahkan (endor) polis sebagai melakukan kesalahan.
- Penjara 2 - 10 tahun.
- Denda minimum RM5,000 dan maksimum RM20,000.
- Lesen ditarik balik atau tidak layak memiliki lesen.
- Penjara sebanyak 5 tahun.
- Denda minimum RM5,000 dan maksimum RM15,000.
- Denda minimum RM4,000 dan maksimum RM10,000.
- Penjara sebanyak 1 tahun.
- Lesen ditarik balik atau tidak layak memiliki lesen.
FORM 3 (15 years old)

Unit 1: Risky Behavior

Unit 3: Owning a license is a privilege
**Poster Kajian Kes**


"Bolehkah kita makan malam ni?" tanya Azam kepada Sabri.


Azam dan Sabri tertawa sendiri di tempat duduk mereka. Lalu Azam memulakan "Kajian, apa kita kata kita berbincang sedikit malam ni?"


"Kajian, bercerita," buat Sabri.


"Oh, fikir apa lagi tu...? Takkanlah berasa takut?" pujuk Azam.

---

**Cerita contoh:**

Anda ke rumah rakan pada suatu petang. Apabila hendak pulang, rakan anda meminta anda untuk menghantarnya ke kedai berhampiran, menggunakan motosikal anda. Malangnya, pada ketika itu anda hanya ada sebuah topi keledar sahaja.
### Hasil Pembelajaran

<table>
<thead>
<tr>
<th>Fokus Utama :</th>
<th>2.4 Mengemukakan cadangan yang membina untuk membantu dalam membuat penyelesaian.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Aras 2 (i)</td>
<td>Memantapkan hujah dengan mengemukakan bukti.</td>
</tr>
<tr>
<td>Fokus Sampingan :</td>
<td>8.2 Menyusun maklumat mengikut keutamaan.</td>
</tr>
<tr>
<td>Aras 1 (ii)</td>
<td>Menyusun maklumat mengikut urutan yang sesuai.</td>
</tr>
<tr>
<td>Kemahiran PKJR :</td>
<td>5.1.3</td>
</tr>
</tbody>
</table>

### Objektif

Pada akhir pembelajaran murid dapat:

i. memantapkan hujah dengan mengemukakan lima bukti keistimewaan memiliki lesen secara sah.
Unit 3

MEMILIKI LESEN IALAH SATU KEISTIMEWAAN

Poster Langkah-Langkah Mendapatkan Lesen

Langkah-Langkah Mendapatkan Lesen

1. Hubungi dan berbincang dengan pengacara di instil membimbing
   a. Hubungi instil membimbing terdekat dan pastikan
   b. Instil membimbing yang ditunjuk di instil membimbing yang
   c. HUB. instil membimbing terdekat

2. Ujian
   a. Ujian diberikan di tempat komputer

3. Ujian
   a. Ujian diinstil membimbing

Aktiviti 2

Tulis surat kepada Guru Penasihat Kelab Keselamatan Jalan Raya tentang
   a. Surat untuk memberi tahu keadaan
   b. Surat untuk memberi tahu keadaan

Aktiviti 3

Kotak Lesen Ialah Satu Keistimewaan

MEMILIKI LESEN IALAH SATU KEISTIMEWAAN
Community-based Program, CBP

- Interventions explored by MIROS to educate the community and eventually improve the state of road safety in Malaysia.
- Provides an opportunity for the community to tailor and execute the social marketing, education, and enforcement programmes that benefits their own members.
- MIROS roles - consultation and evaluation activities (essential supports from other stakeholders such as the local governments, police, non-governmental organisations and relevant government agencies).
- First CBP - district of Kuang in 2007, rural community involved in educating their members on proper helmet wearing.
- CBP programme was carried out in Precinct 8, Putrajaya in 2011, involving urban population in the Malaysia’s administrative capital.
- Result proved that Precinct 8 recorded a significant improvement in the % of proper helmet and seat belt wearings when compared to a control site Precinct 16.
- Manual on CBP implementation developed to enable other communities to replicate the programme.
Understanding riders behaviors – MIROS study

• Hazard perception and behaviors
• Instrumented motorcycle
• Lighting and conspicuity
### STUDY 1: Hazard Perception & Response Study (old curriculum)

<table>
<thead>
<tr>
<th></th>
<th>Oncoming vehicle</th>
<th>Crossing vehicle</th>
<th>Both oncoming and crossing</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Manuevering speed (km/h)</strong></td>
<td>Participants reduced speed significantly ($p&lt;0.05$)</td>
<td>No significant differences</td>
<td>Participants reduced speed significantly ($p&lt;0.05$)</td>
</tr>
<tr>
<td><strong>Turn signal activation (s)</strong></td>
<td>Participants gave the signal significantly sooner ($p&lt;0.05$)</td>
<td>No significant differences</td>
<td>No significant differences</td>
</tr>
</tbody>
</table>

**Samples**: 65 males and 39 females novice motorcyclists who just completed the motorcycle licensing and training program

[Ibrahim, M. K. A., et al., 2012]
Hazard Perception & Response Study

Summary of findings

• Age and gender are significant factors in predicting accident risk of novice motorcyclists at junctions.

• Female and older motorcyclists were more at-risk on both performances measured.

• No significant effects of the crossing vehicles were observed on riding performances.

• Hazard perception skills of novice motorcyclists in our sample were not entirely improved during the training.

• Stricter exit test and more riding restrictions are needed to address the risk factor of motorcyclists.

[Ibrahim, M. K. A., et al., 2012]
STUDY 2: Gap Acceptance & Riding Behaviours of Motorcyclists at Unsignalised Junctions

Table 2 Analysis of variance table

<table>
<thead>
<tr>
<th>Variables</th>
<th>d.f.</th>
<th>$F$-ratio</th>
<th>GAP</th>
<th>GAP-reject</th>
<th>Speed</th>
<th>SIG</th>
</tr>
</thead>
<tbody>
<tr>
<td>Experience ($E$)</td>
<td>1</td>
<td>4.050</td>
<td>5.886*</td>
<td>0.503</td>
<td>0.043</td>
<td></td>
</tr>
<tr>
<td>Crash Involvement</td>
<td>1</td>
<td>2.002</td>
<td>2.811</td>
<td>0.002</td>
<td>1.147</td>
<td></td>
</tr>
<tr>
<td>Presence of right turn lane ($PL$)</td>
<td>1</td>
<td>1.008</td>
<td>0.319</td>
<td>4.899*</td>
<td>5.798*</td>
<td></td>
</tr>
<tr>
<td>$E \times PL$</td>
<td>1</td>
<td>0.165</td>
<td>2.267</td>
<td>0.214</td>
<td>2.425</td>
<td></td>
</tr>
</tbody>
</table>

* Significant at the 0.05 level

Samples: Twenty (20) experienced motorcyclists with a mean age of 27 years and average riding experience of 10 years

[Ibrahim, M. K. A., et al., 2011]
STUDY 2: Gap Acceptance & Riding Behaviours of Motorcyclists at Unsignalised Junctions

Summary of findings

- Possibility of collecting gap acceptance data of motorcyclists in the field with the use of instrumented motorcycle.
- Results indicated the differences in the size of gaps accepted and rejected by motorcyclists at junctions with a right turn lane (compared to junctions without a turning lane).
- Changes in riding performances were also observed in terms of turn signal use and choice of speed when the availability of the right turn lane was considered.
- Study identified the effects of experience on the riding performances of motorcyclists at junctions.
- The results are beneficial in developing a better understanding of the motorcyclists and road design factors that can contribute to reduction in risk of accidents - paving the way to more effective design solutions.

[Ibrahim, M. K. A., et al., 2011]
Instrumented Motorcycle v.1

Figure 1: Diagram of the instrumented motorcycle with sensors and cameras location

- Data Acquisition and DVR system
- Steering Angle Sensor
- Camera – Rider’s Face
- Camera – Rear View
- Camera – Forward View
- Inputs from Sensors
- Brake Pressure Sensor
- Speed Sensor
- Data Acquisition and DVR system
Instrumented Motorcycle v.2
Conspicuity
Recent MIROS work
Prevalence study of motorcycle lightings and conspicuity

- Prevalence study on motorcycle lights functionality which include day running light (DRL), rear position light (PL) and brake light (BL)
- Prevalence study on availability and possibility of adding LED type secondary brake light including its BCR
- Prevalence study of motorcycle and motorcyclists clothing dominant colour
- Study of availability of retro-reflective strip on motorcycle helmets

[Mohd Syazwan S., et al., 2013]
Results

- DRL malfunction 16.99%
- PL malfunction low, 26.2%
- Brake light malfunction low, 16%
- 3\textsuperscript{rd} light brake availability, 4%

[Mohd Syazwan S., et al., 2013]
Motorcyclists Clothing

- Dominant clothing is dark color with 44%

[Mohd Syazwan S., et al., 2013]
Helmet Reflector & Motorcycle Colour

- Reflective sticker availability very low, 3.75%
- Dark-colour motorcycle, 41%

[Mohd Syazwan S., et al., 2013]
Motorcyclists Protection in MVA
Riders protection

- Accident and injury characteristics
- PPE and clothing
- Helmet effectiveness
- Helmet regulations and standards
- Compliance and wear rate
Accident characteristics of injured motorcyclists

• To identify motorcyclists characteristics who are higher fatality risk, 412 cases
• Predominantly young, novice riders, 3-year licensure, male
• Fatal outcome associated with
  • larger engine size
  • crash opponent (heavy vehicle)
  • head-on configuration
  • non-junction road section
• Non-fatal outcome associated with
  • small engine capacity
  • crash opponent another motorcycle or passenger car
  • at road junction
  • side or rear collisions

[TY Pang et al., 2000]
Cervical Injuries

• To correlate the motorcycle crash mode to the cervical injury sustained by motorcyclists in real-world scenes.
• High count was noted for injuries to the lower cervical vertebrae, especially at vertebrae C5, intervertebral C5-C6, and vertebrae C6.
• Upper cervical spine was observed to have a high frequency of injury at C2, especially the odontoid process.
• Crash mode is significant in determining the cervical injury mechanism
• Neck flexion and extension movements are the most frequent neck injury mechanisms, especially in frontal and rear end impacted motorcycles.
• Burst fractures were commonly observed in frontal impacts.
• Uncinate process fractures, a result of neck lateral flexion in side impact and skidding motorcyclists crashes.

[S S Ooi et al., 2005]
Clothing

• Hospital-based study, 300 cases
• Common clothing worn at time of crashes
  • short sleeve shirts, 63%
  • sandals/slippers, 40.8%.
• helmet wearing rate among motorcyclists involved in road crashes, 92.7%,
• frequency of motorcyclists involved in crashes
  o 1st timers, 48.5%
  o more than once, 42.5%

[Azhar H., et al., 2011]
Helmet Effectiveness

• Non-helmeted motorcyclists
  • >4 times as likely to have head injuries, 10 times as likely to have brain injuries

• Comparing with full-face, wearing half helmets were >2 times as likely to have head injuries.

• Compared with firmly fastened helmets, those with loosely fastened helmets increased their risk of head injury and were more than twice as likely to have brain injuries.

[Wu YY et al., 2011]
Helmet Effectiveness

• Helmeted trauma patients had lower odds of death when compared with nonhelmeted: adjusted odds ratio of 0.84 (95% CI: 0.76–0.93). N 75,644 helmeted patients had better Glasgow Coma Scale scores [2009,Croce et al.]

• Retrospective review of motorcycle crashes in the trauma registry at a Level I trauma center from 1996 to 2000. The risk of death was 16% lower in helmeted riders as compared with nonhelmeted riders [2002,Brandt et al]
Helmet Effectiveness

• Head injuries occurred in 4.7% of injured riders without a helmet compared with 1.9% of helmeted riders [Lin et al, 2001]

• Nonhelmeted riders were 2.5 times more likely to be killed and 3.5 times more likely to sustain a serious brain injury [Ouellet and Kasantikul, 2006]

• 32.8% increase in head injured-related mortality and a 42.2% increase in head injury-related hospitalizations per 10,000 motorcycle registrations after repeal of helmet law [Mertz and Weiss, 2008]
Helmet regulations

• Gazetted and enforced since 1970’s
• Incorporated in Motorcycle Safety section, Road Transport Act, ACT 333
• Latest amendment 2012
  • Inclusion of UN Regulation, R22
• Make reference to Helmet Standard, MS1
ROAD TRANSPORT ACT 1987

MOTORCYCLES (SAFETY HELMETS) (AMENDMENT) RULES 2012

IN exercise of the powers conferred by paragraph 88(1)(s) of the Road Transport Act 1987 [Act 333], the Minister makes the following rules:

Citation and commencement
1. (1) These rules may be cited as the Motorcycles (Safety Helmets) (Amendment) Rules 2012.

(2) These Rules come into operation on 1 September 2012.

Amendment of rule 3
2. The Motorcycles (Safety Helmets) Rules 1973 [P.U. (A) 43/1973] are amended by substituting for subrule 3(1) the following subrule:

“(1) Every safety helmet shall conform with the specification of MS 1 Specification for Protective Helmets for Vehicle Users or United Nations Economic Commission for Europe Regulation No. 22 Uniform Provisions Concerning the Approval of Protective Helmets and their Visors for Driver and Passengers of Motorcycles and Mopeds.”.

Made 4 April 2012
[KP/PUU/0.440/W/BD/9; PN(PU2)460/LXVI]

DATO’ SERI KONG CHO HA
Minister of Transport
Helmet Standards

• **Helmet standards**
  • Malaysia Standard, **MS1:2011** Helmet & visor specifications
  • UN Regulations, **R22**
    • Both covers design and performance tests, e.g. Impact performance, penetration resistance (excluded in R22), retention system integrity

• **Standard-compliant helmets**
  • Proper certification by independent body
  • Helmet and visor performance tests
  • Traceable approval ID

• **Non-standard helmets**
  • Not traceable to any standards, performance in doubt
  • Not meeting head protection minimum coverage profile
  • Intended for recreational use, however available in motorcycle shops
Helmet Impact Test
Penetration Test
Standard-compliant helmets

Approval sticker

Approval sticker, behind comfort liner
Standard-compliant children helmets

Approval sticker

Approval sticker, behind comfort liner
Non-standard helmets

Warning label, not for motorcycle use

Unknown label
Non-standard helmet

Leather outer shell
Non-standard helmet

Warning label, not for motorcycle use
Non-standard children helmet

Games or toy helmet
Observation - Cracked helmet in use

Impact foam exposed
Awareness Posters

Tiada gunanya kalau tidak diikat ketat.

Be wise and protect yourself with a SIRIM certified helmet. How?

Mencelah-celah di jalan raya tidak menjimatkan masa la membazirkan nyawa.
Crash test simulation

• Full scale test
  • Lab-based test
  • Virtual testing
Motorcycle crash test 1

• 30 km/h, motorcycle side impacted car
• Rider’s head hit side windows
• Body (abdomen & hip) trapped on handlebar
• Helmet ejected (was not buckled)
• Severe damaged to front suspension and front wheel of motorcycle
Motorcycle crash test with and without on-board airbag

Test details
• Exploratory test
• 100 cc motorcycle
• Side collisions into car
• 45km/h impact
• Instrumented dummy (MATD)
• With and without airbag
Without experimental airbag
With experimental airbag
Findings

• Without experimental airbag
  • Low HIC, but high chest deflection values (contact with side window lower frame)
  • Increase injury risk to car occupants

• With airbag
  • High HIC, >1000 and severe neck/cervical loading
  • Airbag limit rider pivotal movement but caused head+helmet to hit stiff roofrail

• Airbag position, trigger time needs further research
• Other injuries such as abdomen and lower extremities
Other researches and works in Malaysia
Side underrun device for Heavy Vehicle (Trucks)

- Motorcycle side collision with heavy vehicle contributed approximately >200 fatalities annually.
- Lack of side under-run protection is one of the factors contributed to injury severity.
- Currently, Malaysia adopted front and rear underrun protection device from UN Regulation 58 and 93.
Consequences
Comprehensive Parametric Studies on Impact Behaviour of Front Wheel

Various empirical models for predicting the impact response of the wheel
Front Wheel Full Deformable Impact Simulation Model
Front Fork Static and Impact Tests – characterize energy absorption
Front Fork Full Deformable Simulation Model
Laboratory-based Full Crash Test

Guardrail Crash Test
Laboratory-based Full Crash Test

Moving Rigid Barrier Crash
Motorcycle Full Crash Simulation (on-going project)
Motorcycle Full Crash Simulation (on-going project)
Other initiatives
Regulatory control
Aftersales Market

• Under National Automotive Policy review which was announced on 28 October 2009, government has set the banning of substandard and used automotive component importation, in stages beginning from June 2011.
  • Minister of International Trade and Industry, Malaysia has decided that it will be done based on component impact on safety.

• Safety standards for automotive components in the market, has also been enforced in stages, to protect safety of consumers.
  • Trade Description Act 2011, provide legal authority to the Ministry of Domestic Trade, Cooperative and Consumerism to issue an order for an item required to be certified or marked, as a guarantee of the manufacturing description.
# Automotive Components

## Trade Description Order (2012)

<table>
<thead>
<tr>
<th>Trade Description Order</th>
<th>Gazetted</th>
<th>Enforced</th>
<th>Prudent enforcement</th>
<th>Full enforcement</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pneumatic tyre marking 2012</td>
<td>1 Mac 2012</td>
<td>1 Sep 2012</td>
<td>By 31 Dec 2012</td>
<td>1 Jan 2013</td>
</tr>
<tr>
<td>Motorcycle helmet marking 2012</td>
<td></td>
<td></td>
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</tr>
</tbody>
</table>

1. **“MS 1394”**
   - MS 1394 _New Pneumatic Tyres for Commercial Vehicle_

2. **“MS 149”**
   - MS 149 _New Pneumatic Passenger Cars Tyre_

3. **“MS 224”**
   - MS 224 _Retreaded Pneumatic Rubber Tyre for Passenger Cars and Commercial Vehicles_

4. **UNECE R 54**
   - Pneumatic Tyres for Commercial Vehicles

5. **UNECE R 30**
   - Pneumatic Tyres for Motor Vehicles and Their Trailers

6. **UNECE R 108**
   - Retreaded Pneumatic Tyres for Motor Vehicles
   - Retreaded Pneumatic Tyres for Commercial Vehicles

7. **FMVSS 119**
   - New Pneumatic Tyres for Commercial Vehicles

8. **FMVSS 109**
   - New Pneumatic Tyres for Passenger Cars

9. **UNECE R 22**
   - Protective Helmets and their visors for drivers and passengers of motor cycles and mopeds
Automotive Components
Trade Description Order (2013)

<table>
<thead>
<tr>
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<th>Prudent enforcement</th>
<th>Full enforcement</th>
</tr>
</thead>
<tbody>
<tr>
<td>Brake Marking 2013</td>
<td>1 June 2013</td>
<td>1 June 2014</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

• Regulations:
  • UN R13, R13-H, R90
  • MS1164
2014 Implementation Plan

• Trade Description Order to be enforced in 2014 including:
  • Vehicle lamps
  • Windscreen

<table>
<thead>
<tr>
<th>Lamps Regulation</th>
<th>Windscreen Regulations</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. UN R112, R113, R37, R99</td>
<td>1. UN R43 – Safety Glazing Material</td>
</tr>
</tbody>
</table>
Conclusions

• The country is going through rapid development, and so does the mobility needs.

• Motorcycles have become a very important element in the traffic system. Innovative & creative ways to address their presence vitally needed.

• Numerous researches, initiatives and interventions were, have been and will be planned and implemented to ensure sustainable safety and growth are achieved.
New challenges

• Entry of electric motorcycle in the traffic, volume around 400 units [2012 registration record], potential risk due to low noise/sound emission, need further study

• Regulatory compliance to MS 2413:2011 Electric Motorcycles Specifications
Thank You