Deceleration Differences Between Novice and Experienced Riders

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Research Question

Do Motorcyclists brake differently based on their experience?
Background

- Braking is the primary evasive maneuver used in crash avoidance.
- Experienced riders brake harder than Novice riders in controlled tests.


The MSF 100 Motorcyclist Study

- 100 participants
- Participation from 2 months to 2 years
- 100 calendar years of participation
- 568,700 minutes of riding
- 363,000+ miles
- 38,581 “trips” i.e., key-on to key-off
The MSF 100 Motorcyclist Study

Breakdown of Experience by Bike Type

<table>
<thead>
<tr>
<th></th>
<th>Experienced</th>
<th>Novice</th>
</tr>
</thead>
<tbody>
<tr>
<td>CRUISER</td>
<td>25</td>
<td>16</td>
</tr>
<tr>
<td>SPORT</td>
<td>19</td>
<td>2</td>
</tr>
<tr>
<td>TOURING</td>
<td>37</td>
<td>1</td>
</tr>
</tbody>
</table>
Defining Experience

• Two Categories
  – Novice
  – Experienced

• Determined from Questionnaire data
6. (a) For how long have you been riding MOTORCYCLES on public roads?

(DO NOT include long periods when you never rode; Please write in the number of years and months)


8.2 How long was your most recent break of more than a year from riding motorcycles on public roads? (Please write in the total number of years and months)


(b) Approximately how many miles have you ridden a MOTORCYCLE on public roads in the past 12 months?

(Please include the amount you have ridden in total on all motorcycles)


(g) On average, how many miles per year do you ride a street motorcycle? INTEGER miles (round to nearest whole number, make sure to convert to yearly number if necessary)


Virginia Tech
Defining Experience

• How is experience defined?
  – Novice
    • Less than 50000 lifetime miles
    • AND less than 2000 miles in the previous year.
  – Experienced
    • Less than 50000 lifetime miles
    • AND less than 2000 miles in the previous year.
Importance of Braking Behavior

• Cars and Motorcycles are different
  – Modern cars equipped with more advanced safety features than average motorcycle
  – Brakes are controlled independently
  – Motorcycles are inherently unstable in their riding position.
Decelerations

20 Strongest Decelerations P03 (green) and P04 (red)
Deceleration Distribution
Positive Longitudinal Acceleration

Negative Longitudinal Acceleration ("Deceleration")
Different aspects of braking analyzed

- 95\textsuperscript{th} Percentile braking levels
- Normal braking
- Crash and Near Crash Braking
Finding 95\textsuperscript{th} Percentile

Decelerations of participant are ordered and the 95\textsuperscript{th} percentile is located.
95th percentile mean decelerations

- Experience not
- Overall Average: -0.18g
95th percentile decelerations

- Experience was significant.
- Overall Average: -0.37g

Distribution of 95th percentile Max decelerations

NOT SIGNIFICANT!
95th percentile decelerations

- Experience not
- Overall Average: -0.18g

![Distribution of 95th percentile mean decelerations](image-url)
Deceleration to Stop

• Looking at top 30 decelerations going from 25-40 mph to 0 per participant.
• Analyses uses Motorcycle Type and Experience as Independent Variables
Max Decelerations

- Experience was significant.
- Experienced riders have higher Max decelerations

Experience Level

- Experienced
- Novice

Mean Deceleration (g)

-0.6
-0.4
-0.2
0.0

-0.413 g
-0.347 g
Mean Decelerations

- Experience was significant
- Experienced riders have higher mean decelerations
Braking during Crash and Near Crash

- 152 Crash and near crash events
- 133 Were moving
- 110 braking was an evasive maneuver
Crash Near Crash Events

• Max Decelerations not significant between Experienced and Novice riders.

• Mean Decelerations are significant between Experienced and Novice riders.

<table>
<thead>
<tr>
<th></th>
<th>Avg. Max Deceleration</th>
<th>Avg. Mean Deceleration</th>
</tr>
</thead>
<tbody>
<tr>
<td>Novice</td>
<td>-0.44 g</td>
<td>0.14 g</td>
</tr>
<tr>
<td>Experienced</td>
<td>-0.46 g</td>
<td>-0.07 g</td>
</tr>
</tbody>
</table>
Summary

• Mean 95\textsuperscript{th} Percentile Decelerations Significant.
• Experienced motorcyclists can brake harder than novice motorcyclists going from surface street driving speed to 0.
• There is no difference between experience levels when braking in Crash and Near Crash situations.
Questions?