Curves as a risk factor for motorcyclists

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Are curves risky for motorcyclists?

• Yes.
Background

• In 2013 motorcycles accounted for 3% of registered vehicles[1].
• That same year motorcycles accounted for 0.7% of vehicle miles traveled[1].
• Yet they comprised 14% of all traffic fatalities[1].
• Even when alcohol is eliminated as a contributing factor, single vehicle conflicts represent 25% of all motorcycle fatalities in the U.S. [2]

Identifying Events: Overview

- Motorcycle sensor data
- Digital maps

1. Motorcycle sensor data
2. Curves isolated and identified
3. Curve entry speed
4. Braking while leaning
5. 2% Strongest decels
6. Video Reduction on potential events
7. 130+ video variables recorded
8. Results written to database
9. Researchers review reduction results
10. Analysis
11. Non Event
Curve Exposure

Curves were isolated in the digitally mapped data and assigned a radius.

- Radius calculated from digital map data
- Summary measures derived for each curve including min, max, and mean radius

![Exposure to curves under 500m Radius](image-url)
Results Curve Exposure

• Between subjects ANOVAs revealed no significant differences between bike types, experience levels, or age groups in terms of the percentage of miles ridden in curves.
Event Types

• Single vehicle conflict - A crash\near-crash type involving only the participant rider.

• Near Crash – taking a curve wide
  – Rider taking a right curve too wide and crossing the traffic divider.

• Crash – Run off the Road

• A rider leaving paved surface of the road or shoulder while negotiating a curve.

• A rider choosing to flatten their trajectory in a curve by cutting inside across the yellow line was neither recorded as a crash or a near-crash
Situations of Interest

A. 
B. 
C. 
D. 
E. 
F. 

Crash  Near Crash  Nothing
Detection Algorithms

• A three-pronged approach was used to identify potential crash and near-crash events in the dataset.
  – 2% strongest deceleration events
  – Curve entry speeds
  – Lean angle and braking
The Event Set

- 27 crashes and near-crashes (15 participants) were identified as being both single vehicle conflicts and occurring on a curved roadway geometry.

- 85% of the detected events happened on a right-hand curve (23\27).

- All 27 events occurred on roads with two lanes and opposing traffic.
  - In the majority of cases (85%), the rider took a curve too fast for the situation (geometry, ability, etc.) leading them to cross over the left hand lane marker into opposing lanes.

- Roadway debris was not listed as a contributing factor in any of the events.
- No events took place in construction zones, and
- all events occurred under sunny or partly cloudy skies with no moisture on the roadway.
• Riders are 2.7 times more likely to be involved in a CNC in a curve than while on straight road segments. 
  – [OR = 2.72 CI (1.92, 3.87)]

• Motorcyclists are 1.6 times more likely to be involved in a single vehicle conflict while curving than any other type of crash while on straight segments. 
  – [OR = 1.56 CI(1.02, 2.37)]

• Novice riders are 3x more likely to have a single vehicle conflict in a curve than non-returning experienced riders. 
  – [OR = 3.39, CI (1.13, 10.17)]

• All riders are nearly 10 times more likely to have a single vehicle conflict in curves than straight sections. 
  – [OR = 9.3, CI(4.9, 17.4)]
Results Curve Crashes and Near Crashes 2 of 2

- Riders are 15 times more likely to experience a single vehicle conflict in a curve when riding with one or more other motorcyclist(s) than they are while riding solo
  - [OR = 14.86, CI(5.95, 37.08)]
Are curves risky for motorcyclists?

• Yes.

• No differences between motorcycle types on exposure.

• Riders are more likely to have a crash or near-crash in a curve than any other road geometry.

• Right hand curves are of particular risk.

• Novice riders are at an increased risk compared to experienced riders.

• Riding with one or more other riders increases your risk of a crash or near-crash in a curve 15-fold.
Questions?
Contact Information

If you have any questions about motorcycle related research at VTTI or would like further information, please contact:

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