Curves as a risk factor for motorcyclists

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Are curves risky for motorcyclists?

- Yes.

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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 comprised14% 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]

[1] National Center for Statistics and Analysis. (2015, May). Motorcycles: 2013 data. (Traffic Safety Facts. Report No. DOT HS 812 148). Washington, DC: National Highway Traffic Safety Administration.
[2] National Center for Statistics and Analysis. (2014, June). Motorcycles: 2012 data. (Traffic Safety Facts. Report No. DOT HS 812 035). Washington, DC: National Highway Traffic Safety Administration.

The MSF100 Dataset

- 30,844 Trips
- 366,667 miles
- 9,354 hours

- 152 Crash and Near Crash Events

Arizona – 6 California – 47 Florida – 17 Virginia - 30

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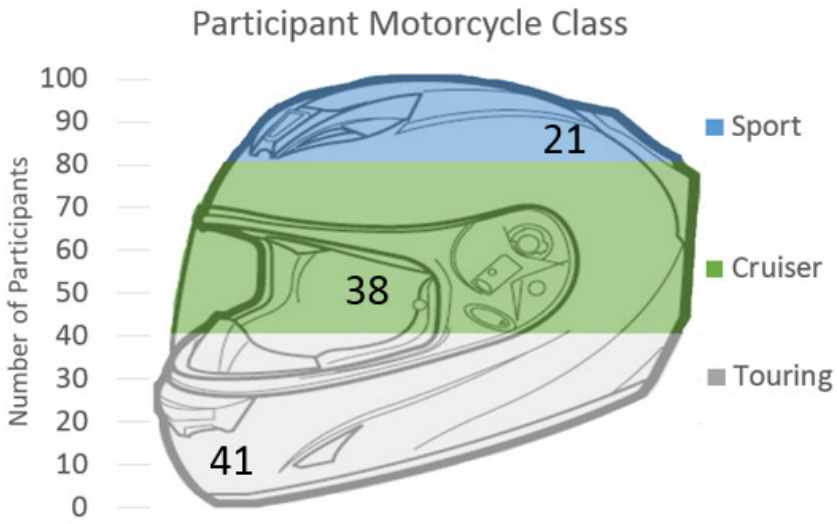
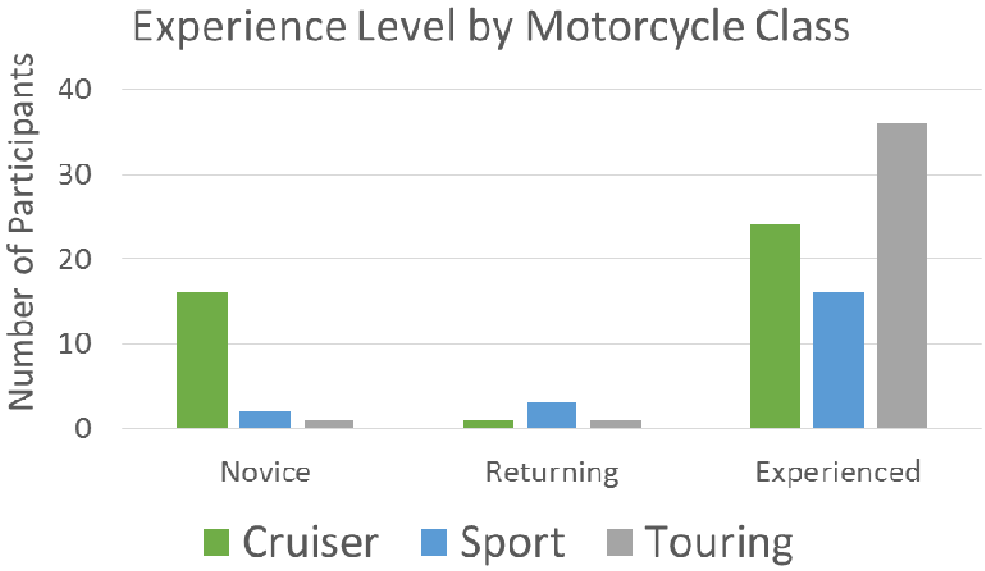
MSF 100 Participants



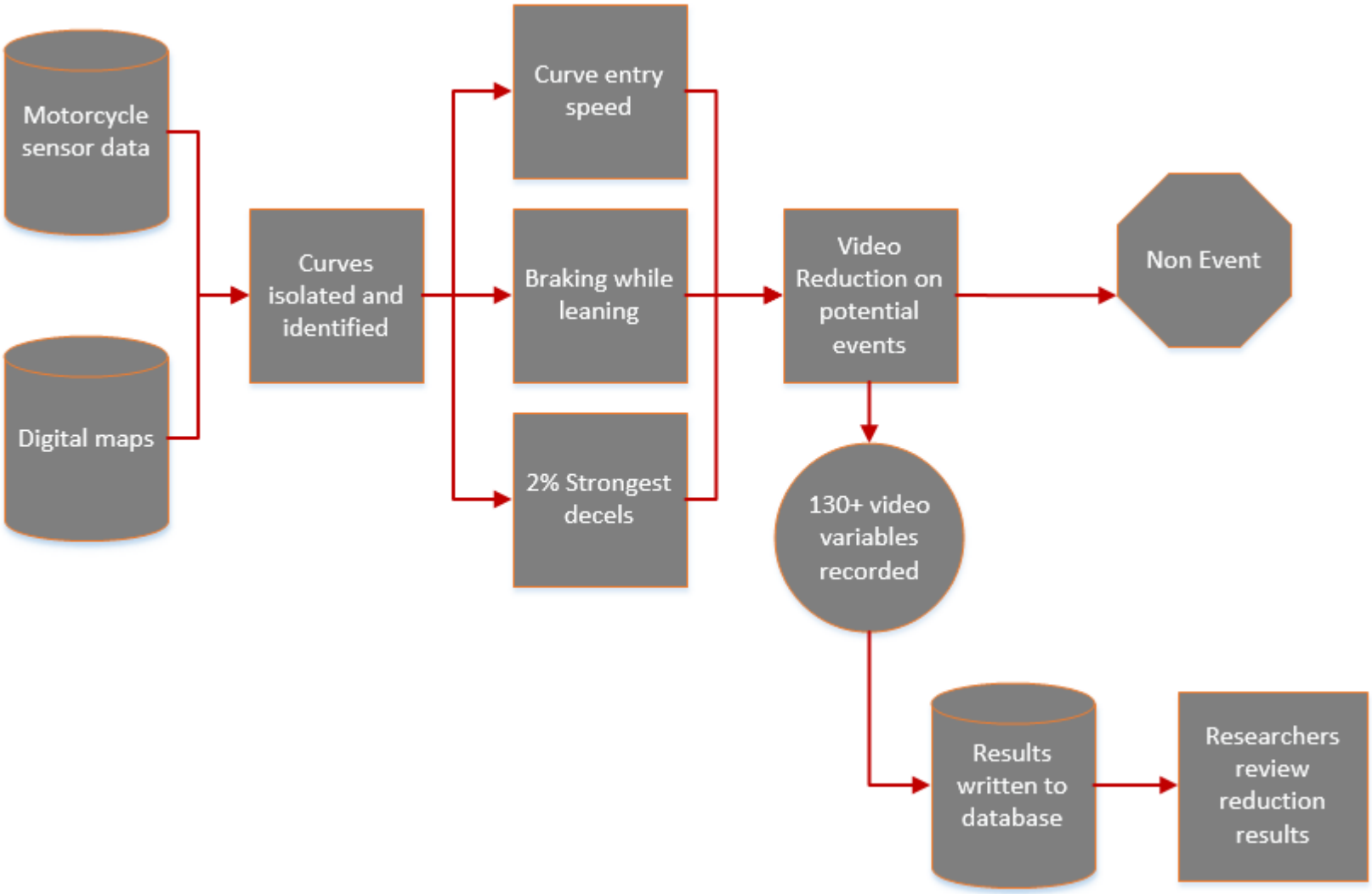
- Participant age: 21-79
- 78 Males, 22 Females
- Installed from 2 months to 2 years

3 Experience Levels

- Experienced (76)
- Returning (5)
- Novice (19)



Identifying Events: Overview



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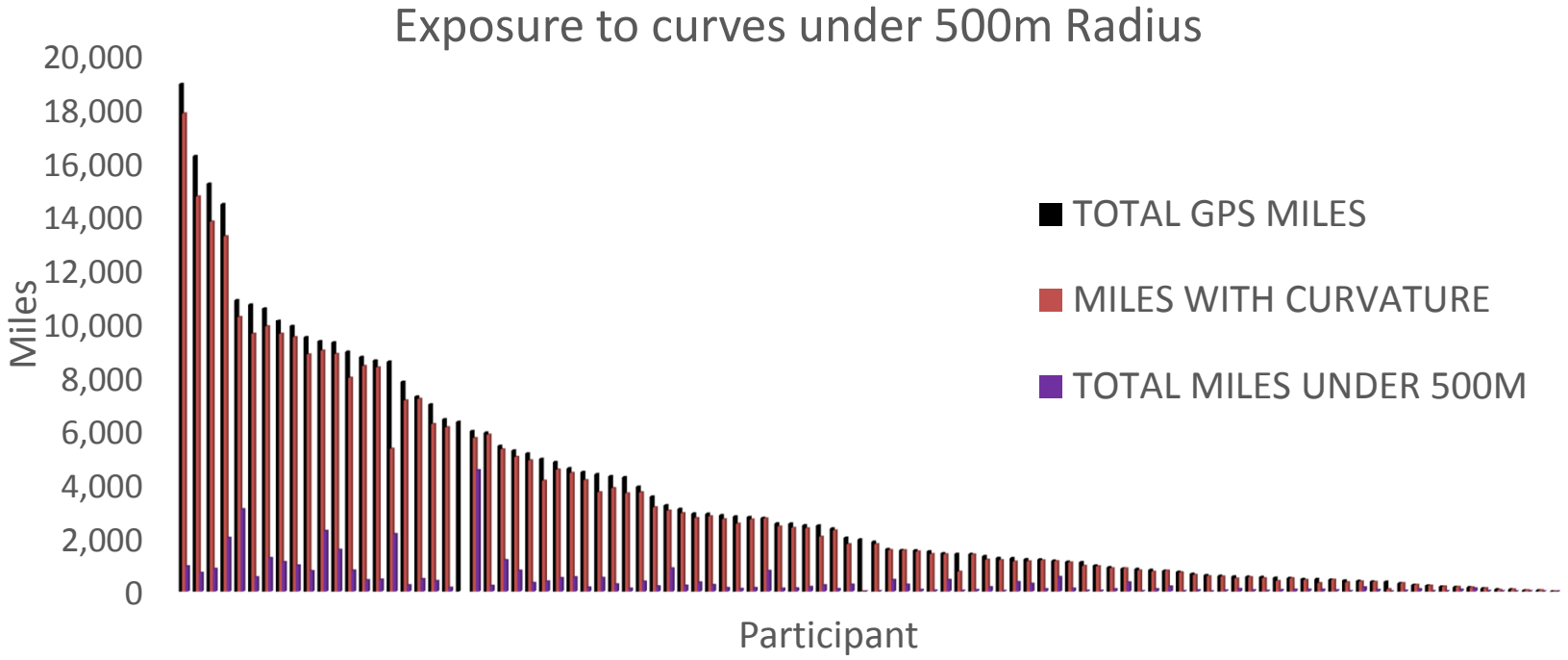
Curve Exposure

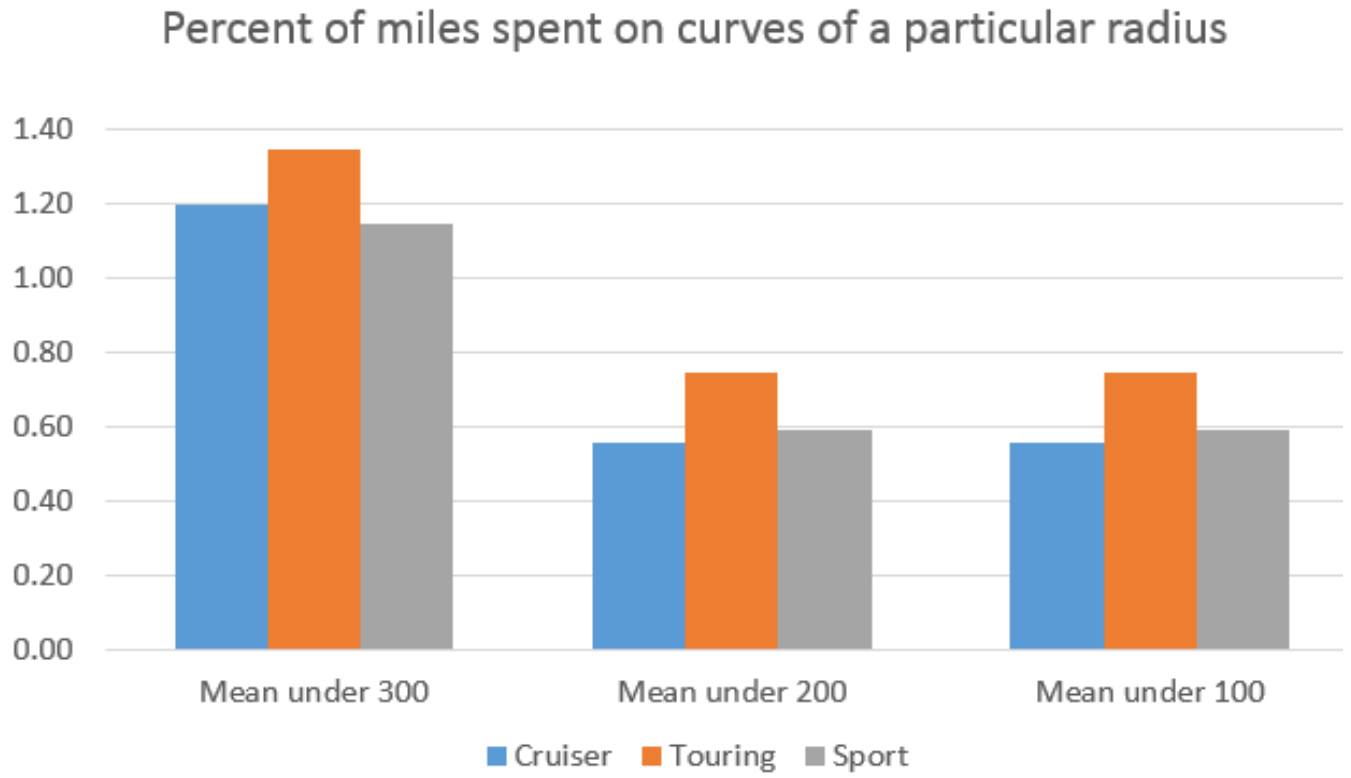
Curves were isolated in the digitally mapped data and assigned a radius.

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



Differences in Exposure by Bike Type

- 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.



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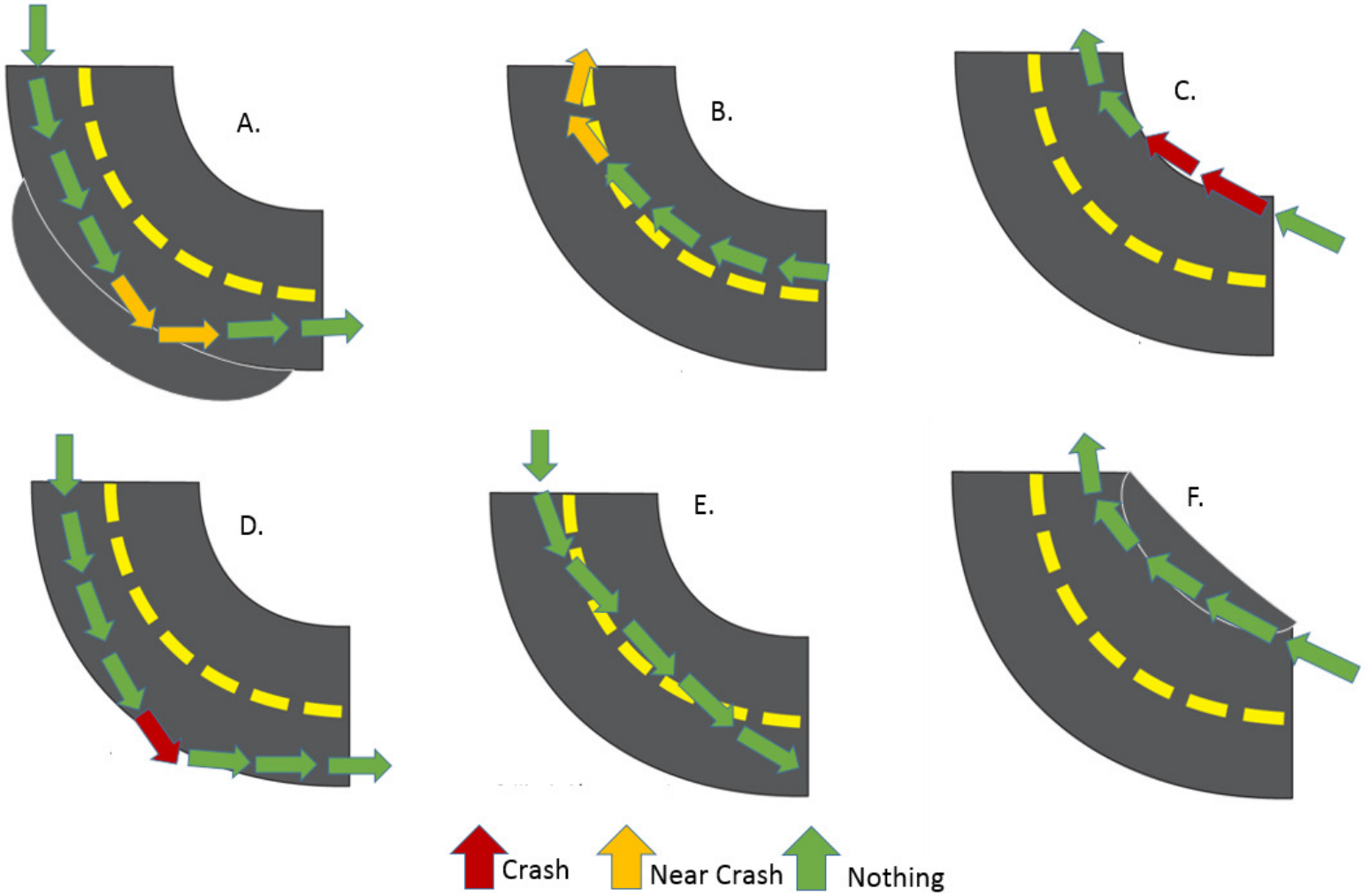
Event Types

- 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.
  - Link
- Crash – Run off the Road
- A rider leaving paved surface of the road or shoulder while negotiating a curve.
  - Link
- 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



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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.

Results

- 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)]

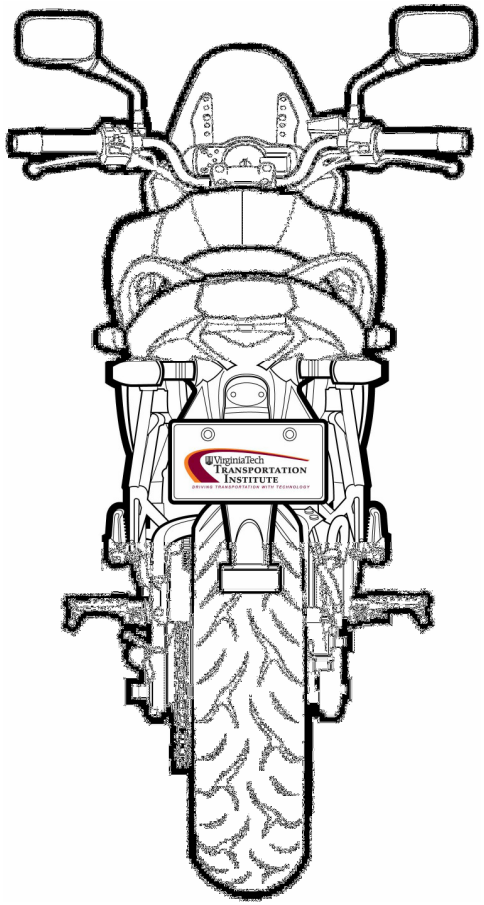
Results 2 of 2

- 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.
- 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?



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Contact Information

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

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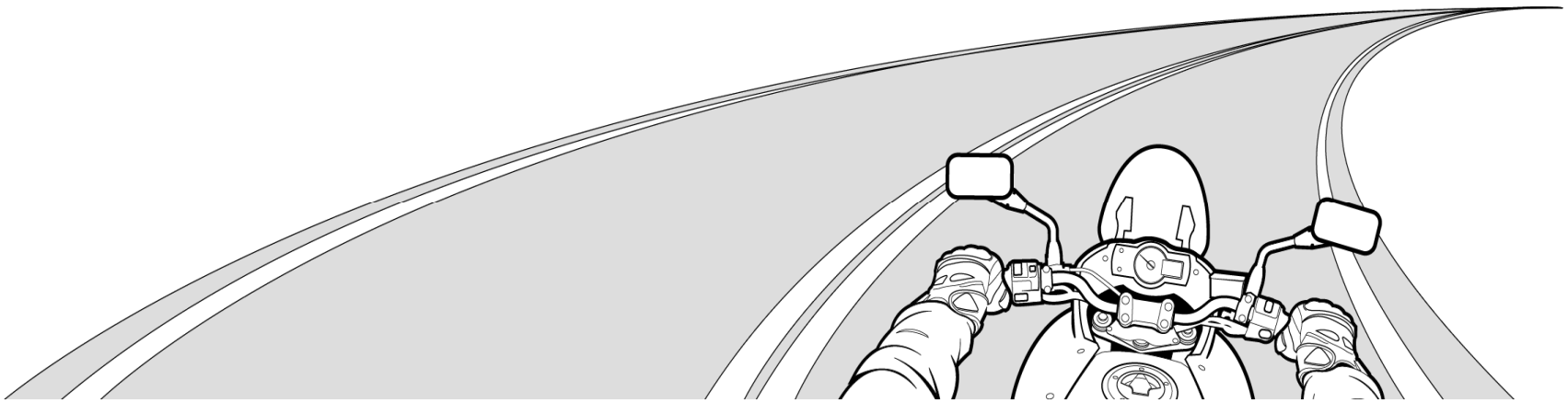

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