Analysis of Mean Trip Speed of Motorcycles

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Introduction

- Motorcyclist fatalities are disproportionately higher than those of automobile passengers (24.8 vs 0.8 fatalities per 100 million miles driven). [1]
- Passenger vehicle and large truck fatality rates have been decreasing since the 1970's, but motorcycle fatality rates have not experienced steady decline. [1]
- Deviation from average traffic speeds has been shown to increase the likelihood of a crash. [2,3]
- Previous studies of motorcyclist speed have been primarily from accident reports or fixed observation areas.
- Continuous observation is needed to report on true rider speed behavior.
- Naturalistic studies have become useful in providing this constant observation. [4]
- The MSF 100 Motorcyclists Naturalistic Study is the first large scale naturalistic motorcycle to be conducted.

Instrumented Motorcycle

Close up of Data Acquisition System

Methods

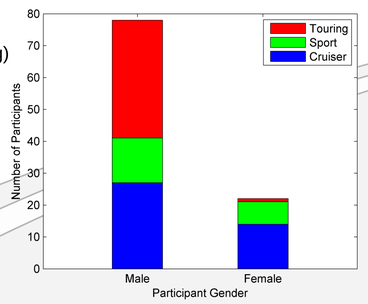
Dataset:

- 100 Participants on their personal motorcycles
- Observed between 2 months and 24 months
- Located in Irvine California, Orlando Florida, Blacksburg Virginia and Phoenix Arizona
- 2 non-functioning GPS Units
- Age range from 21 to 79 years old
- 29,267 trips analyzed

Analysis:

- A 3X2 between subjects experimental
  - Motorcycle Type (Cruiser, Sport, and Touring)
  - Gender (Male and Female)

Type	Male	Female	Total
Cruiser	27	14	41
Sport	13	7	20
Touring	36	1	37
Total	76	22	98



Left: Table showing distribution of Participants by gender and motorcycle type
Right: Distribution of motorcycle type by gender

Materials

- Designed by Hardware Engineering Lab at VTTI
- Mounted in inconspicuous housing to preserve naturalistic nature of research
- Capable of recording video from 5 separate cameras:
  - Forward
  - Rear
  - Left hand
  - Right hand
  - Face
- Records sensor data such as:
  - Brake light activation
  - Brake lever inputs
  - Engine RPMs
  - Accelerations about 3 axes
  - Rotation about 3 axes
  - GPS location
  - Speed
  - Heading
  - Turn signal activation

Small camera installed to monitor rider's face

Example of views from 5 DAS mounted Cameras

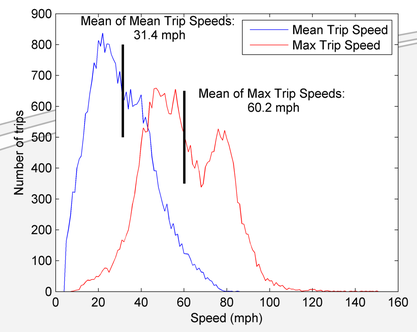
Results

Mean Trip Speed:

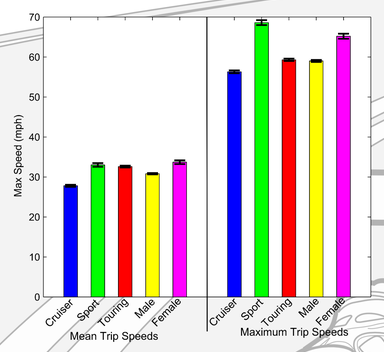
- The General Linear Model was used.
- No significant difference between mean trip speeds by Motorcycle Type, Gender or Gender X Motorcycle Type.

Maximum Trip Speed:

- The General Linear Model was used.
- No significant difference between mean trip speeds by Motorcycle Type, Gender or Gender X Motorcycle Type
- Four participants were recorded riding at speeds in excess of 140 mph, some of them multiple times.



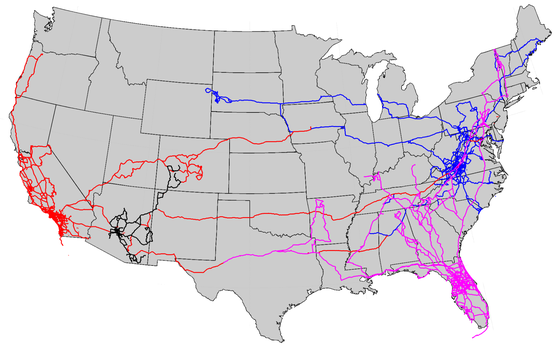
Distributions of mean trip speeds and maximum trip speeds



Means of mean trip speed and maximum trip speed by motorcycle type and gender

Conclusions

- Speed range was collected across different types of roads in many different conditions.
- Data were collected in urban and non-urban environments.
- Mean trip speed of motorcycles mean speeds seem to be slightly higher than those of normal light passenger cars (29 mph). [4]
- Consistent with average pre-crash speed from both the MAIDS study and the Hurt Report
- Extreme cases of maximum trip speed are higher than expected from passenger vehicles.
- Basic descriptive statistics were found that offer a view into the speed behavior of motorcyclists.
- Data set contains speeds from a wide array of riders belonging to various demographic groups and riding different kinds of motorcycles.
- A wide array of speeds were present, ranging from slow trips to speeds well above any posted speed limit in North America.



Map of participant trips, color coded by installed location

Acknowledgements

We would like to thank the Motorcycle Safety Foundation for making this research, and other research associated with the MSF Naturalistic Motorcyclist Study, possible.

References

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[4] Dingus, T. A., Klauer, S. G., Neale, V. L., Petersen, A., Lee, S. E., Sudweeks, J. D., . . . Knipling, R. R. (2006). *The 100-Car Naturalistic Driving Study, Phase II - Results of the 100-Car Field Experiment*. (DOT HS 810 593).

[5] Hurt, H. H., Ouellet, J. V., & Thom, D. R. (1981). Motorcycle Accident Cause Factors and Identification of Countermeasures Volume I: Technical Report. Los Angeles, CA: University of Southern California.

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