
MSF
MOTORCYCLE
SAFETY FOUNDATION®

MSF 100 Naturalistic Research Study: Half Million Miles to Rider Safety

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Goal of Eliminating Crashes, Injuries, Fatalities

Our Purpose:

Create and support motorcyclists of good riding character, who make wise choices in risk management and become advocates of safe riding and lifelong learning and to create an increasingly safe riding environment.

- Not-for-profit
- Funded by 11 OEM industry members and Rider fees/tuition
- MSF certified 9,500 RiderCoaches and 250 RiderCoach Trainers
- 4 Doctoral SMEs – Quality assurance, research, education, licensing, risk management
- 25% of national training volume managed directly through 5 state contracts

Creating Better Motorcyclists

- 6.5 million riders trained since 1974
- Last year, MSF curricula were used to train over 500,000 riders with 23 unique courses
- More than 50,000 decided not to continue their pursuit of riding, a benefit of training.
- Less than 50% of on-highway motorcyclists in the U.S. have taken a formal rider training course

Rider Education Training System

- Research & Experience
- Safety & Risk Management Principles
- Adult Learning & Development
- Motor Skills Development

Contemporary Theory & Research

Human Factor Based

Constant Improvement

Foundational Learning Theories

Stakeholder Focus

Service Leadership

- Why a naturalistic research study?
  - Our curriculum is the global standard in motorcycle training
  - We expect to train 10 million new or returning motorcyclists by 2020
  - We aim to eliminate crashes, injuries and fatalities by using the data to educate riders and drivers and create a safer riding environment

- MSF 100 Motorcyclists Naturalistic Study
  - Currently underway in 3 states
  - Targeting 500,000 miles
  - In partnership with VTTI
  - Flexibility of budget / Industry connections showing practical value in the area of recruiting

The MSF
Naturalistic Study of Motorcyclists:
Preliminary Findings

General Research Method and Need

- Naturalistic method powerful
- Method feasibility had been demonstrated on motorcycles
- There is a research gap – compared to existing motorcycle research - that must be addressed

General Research Method and Need

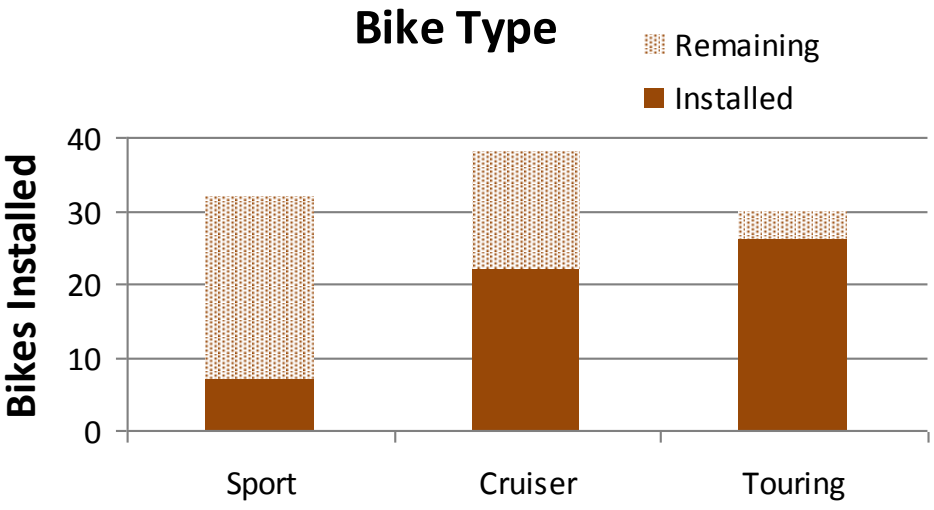
- Nature of motorcycle research – self report – travel studies
- What's Missing?
  - Safer riders – less crash involved
  - Exposure data based on facts
  - Behavior of OV drivers
- Nature of motorcycle crash causation research – police reports
- What's Missing?
  - Interaction of factors
  - Sequence of events
  - Crash avoidance maneuvers
  - Near Misses

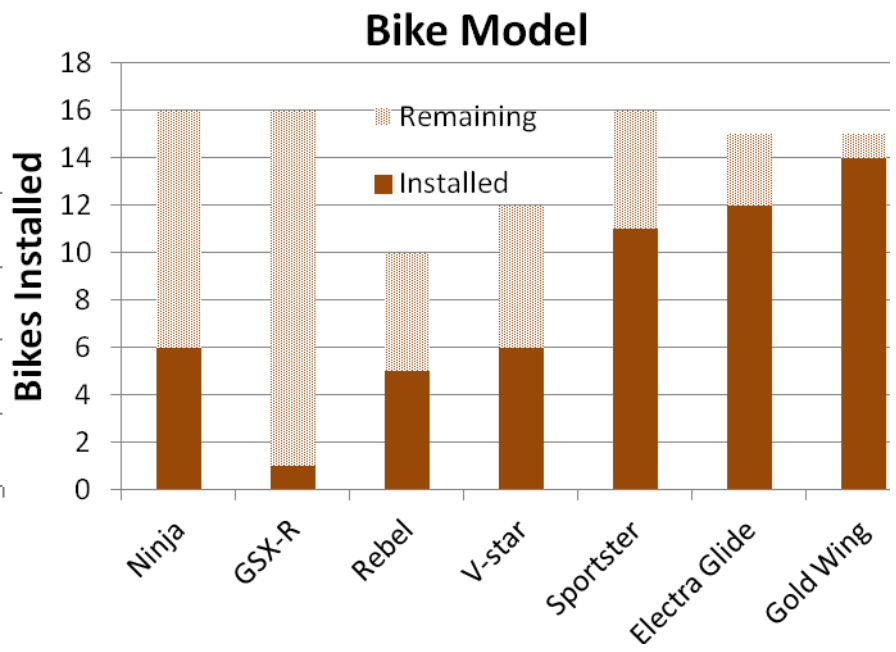
High Level Study Status: The Good News!

MSF, its members, and VTTI are proud sponsors of the first ever and largest, Naturalistic Motorcyclist Study.

- Goal:100+ motorcyclists
- Status:
  - 58 currently recruited, instrumented, 54 on road
  - Over 11,000 trips recorded
  - ~ 2700 hours, 67,000 miles
- Instrumentation performing well
- Analyses being done concurrent with data collection

Participant Bikes





- Some of each Bike Type instrumented
- More Touring than Cruiser or Sport
- Letting age vary within model

Three Installation Sites

- Blacksburg Virginia
  - Fall and Winter
  - Two-lane with hills and curves
  - Geographic overlap with automotive studies

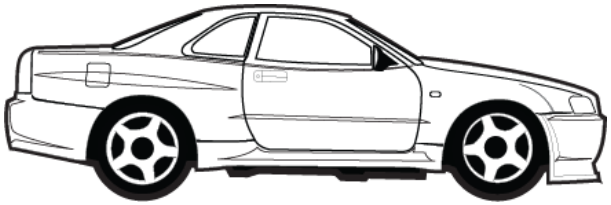
- Irvine, California
  - Year-round riding
  - Mixed traffic densities
  - Geographic overlap with past studies

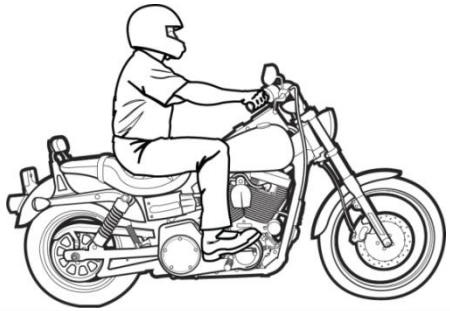
- Orlando Florida
  - Conditioned helmet law
  - Mandatory training
  - Flat and straight roads

High Level Study Status: The Challenges

Some challenges were adequately anticipated, others were not.

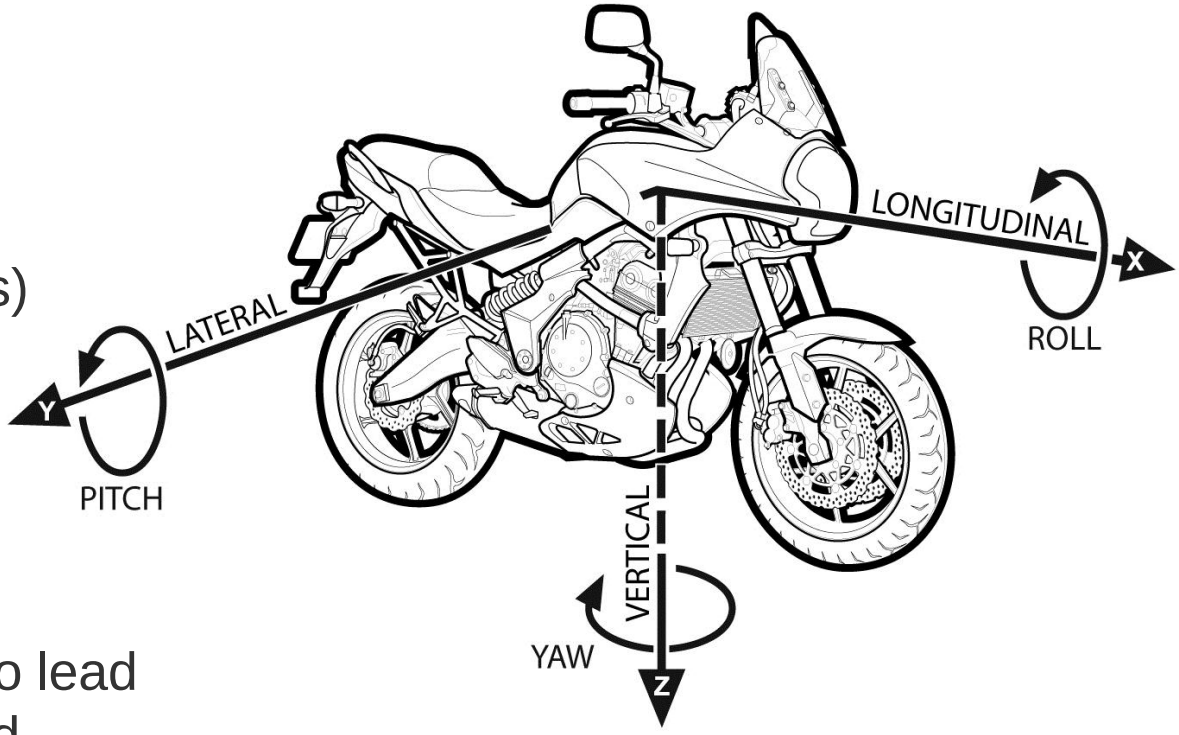
- Uniquely capable instrumentation
- Unobtrusive Design
- Customization
- Recruiting





Instrumentation model

- Video cameras
- Lane tracking
- Helmet / Gaze tracking
- Front and rear brake
- Accelerometers (3 axes)
- Gyro (3 axes)
- Speed
- Turn signals
- GPS
- Forward radar (speed to lead vehicle; distance to lead vehicle)
- Continuous collection
- 8-12 month capacity



Instrumentation: Challenges met!

- Greater number primary of controls
- More complex vehicle dynamics
- Components and cabling fit unobtrusively on a motorcycle
- Functions with low power draw
- Light weight
- Performs with infrequent riding
- Handles various environmental factors – rain, wind, cold, hot, vibration, electromagnetic
- Cameras function in direct sun
- Does not interfere with rider or vehicle maneuvering
- Adaptable to different bike geometries

Instrumentation: Motorcycle-Specific Designs

Instrumentation: Unobtrusive Integration

This is a Sportster…

Owner modification is a hallmark of motorcycle ownership. So – these are also Sportsters…

Even Common Modifications are Challenging

Sportster with bags and windshield

Registrations & Confidentiality

- 3% of registered vehicles are motorcycles, so the recruiting approaches are different
  - Sources of information
  - New vs. Used Sales (regional pockets)
  - Unregistered vehicles
  - Gathering places

Bike night attendance allows for personal approach

Participant Objections - Confidentiality

- Confidentiality – higher salience
  - Who's watching?
  - Who has access to the data?
- Equipment is visible - concerns about bike appearance with equipment
  - –Motorcycle as fashion accessory

Analysis Progression – Phase I

Rider sample characteristics

- Participant demographics
- Training
- Experience
- Other survey responses

Quantifying exposure

- Miles and time
- Trip behavior – time-of-day, day-of-week, durations
- Road classes
- Intersections
- Curves
- Levels of traffic
- Weather

Quantifying maneuvers

- Curve negotiation
- Turning from a stop
- Lane position
- Speed selection
- Acceleration / deceleration
- Stopping
- Scanning

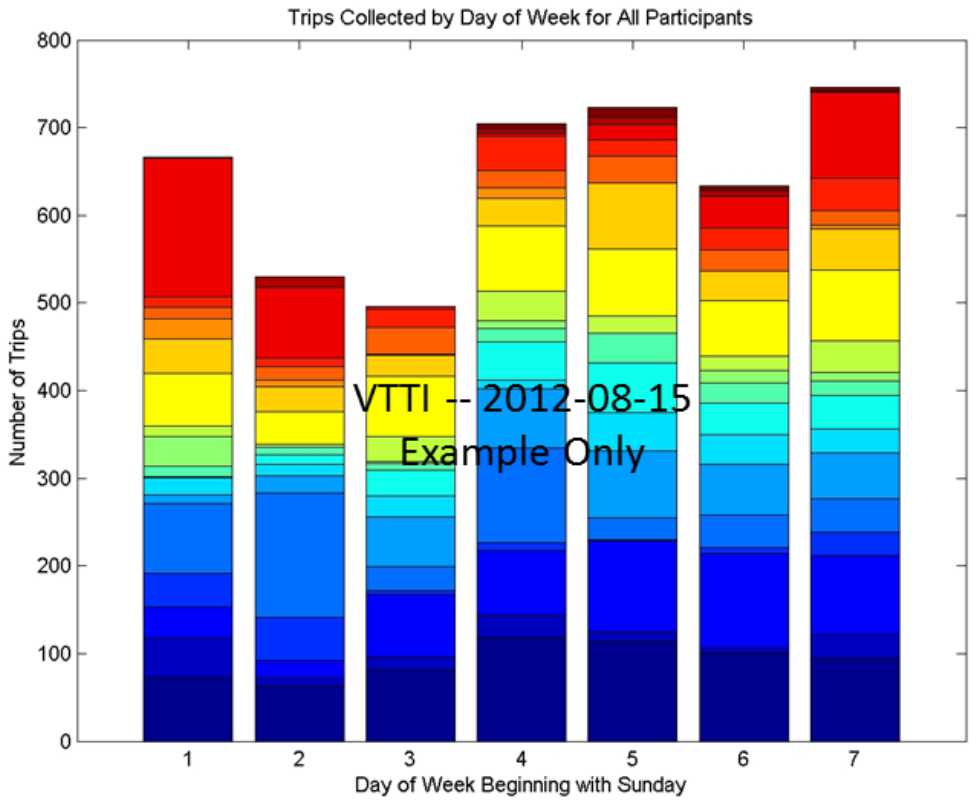
Initial Event identification

Descriptive statistics to support event data mining

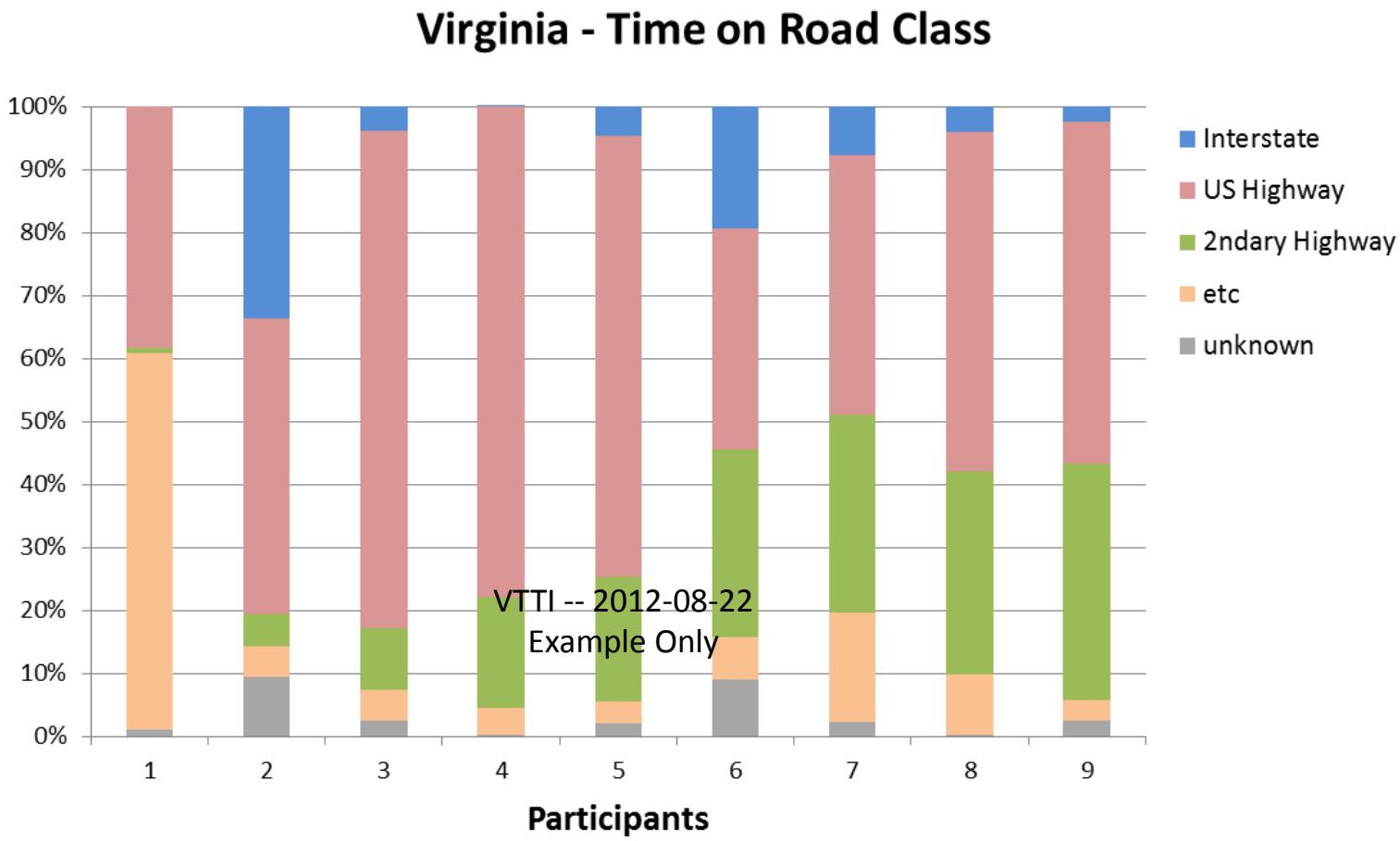
Phase I Sample Analysis

Travel Behavior

- Time of day, day of week weekend vs weekday
- Trip time
- Trip distance



Phase I Sample Analysis

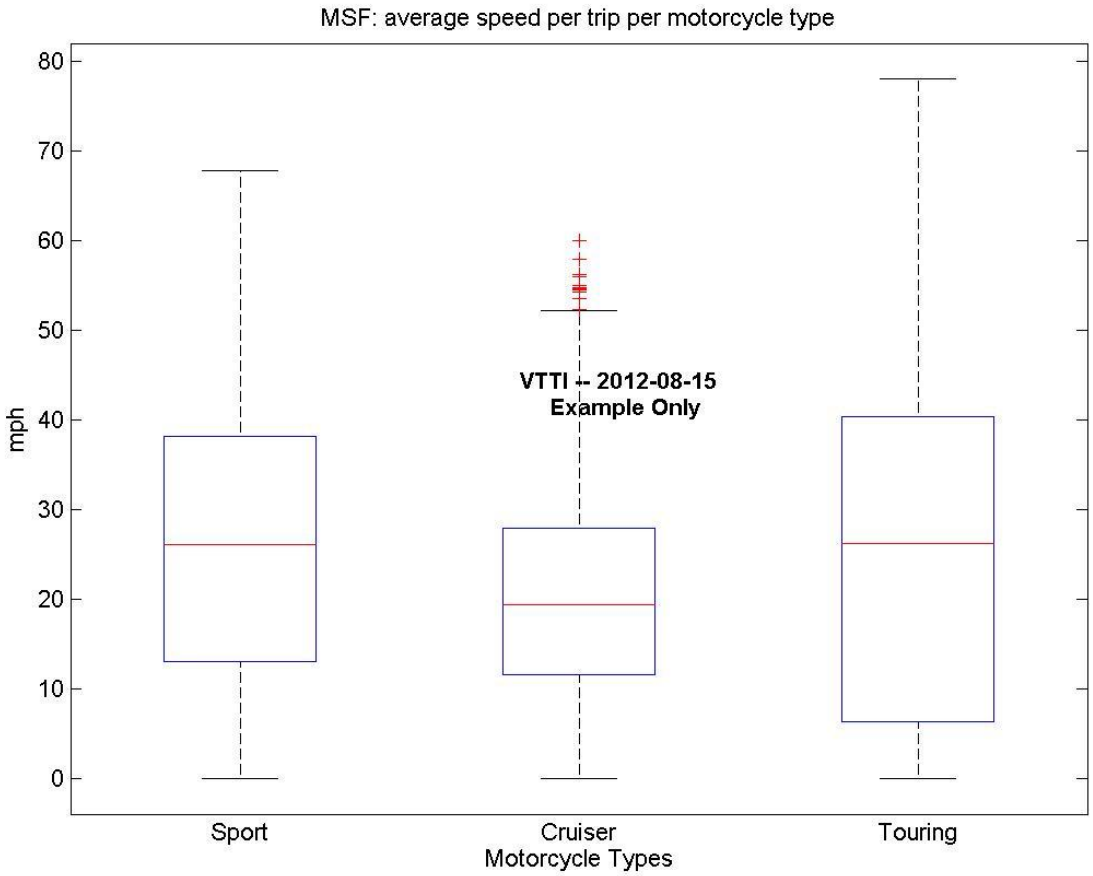


Analysis Progression – Phase II

- **Associating factors**
  - Bike type X curve negotiation
  - Bike type X braking style
  - Age X curve negotiation
  - Experience X scanning behavior
  - Etc
- **Event Data mining**
  - Datamining
  - Video validation
  - Normalizing event frequencies with exposure data
- **Associating event frequency with other factors**
  - Event rate X training
  - Event rate X experience
  - Event rate X scanning behavior
  - Event rate X lane position
  - Etc

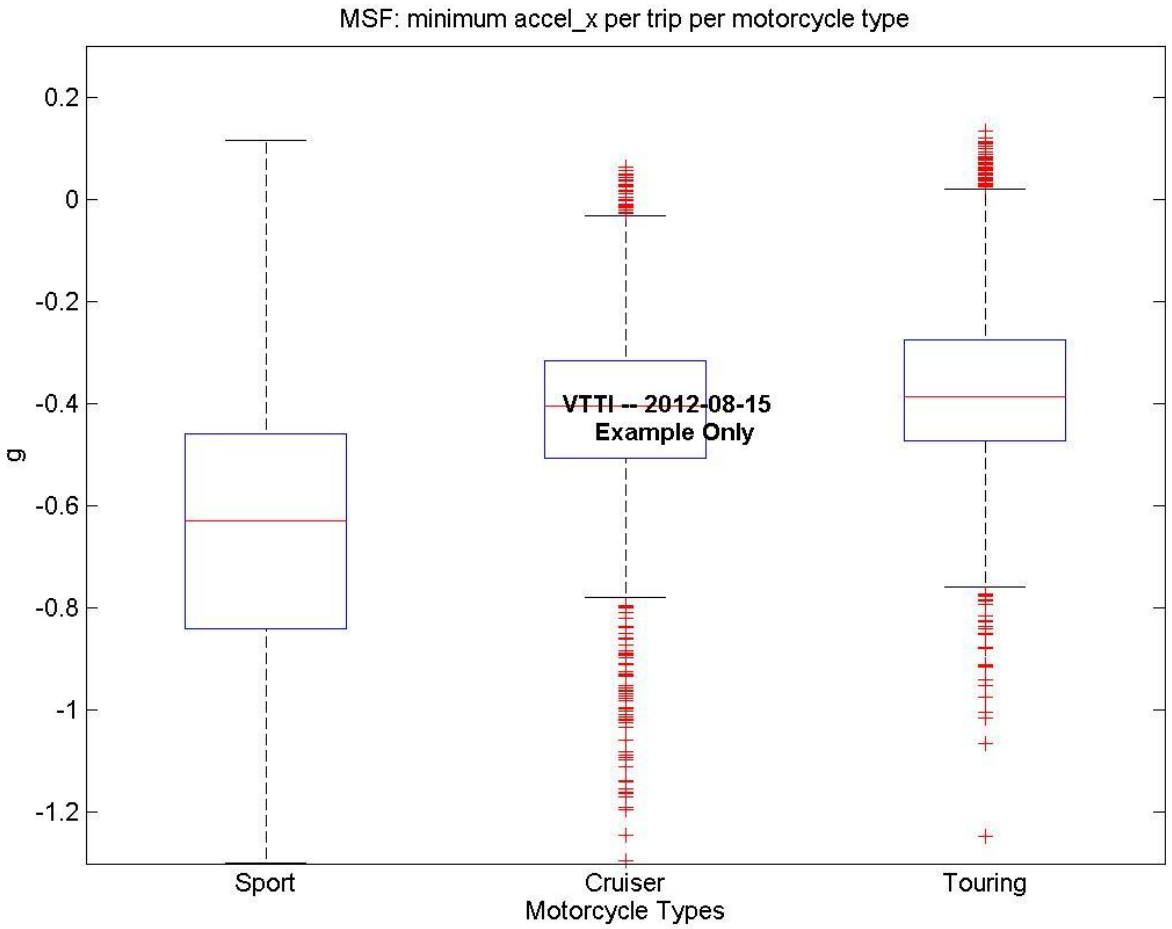
Phase II Sample Analysis

Average Speed: Differences by bike type



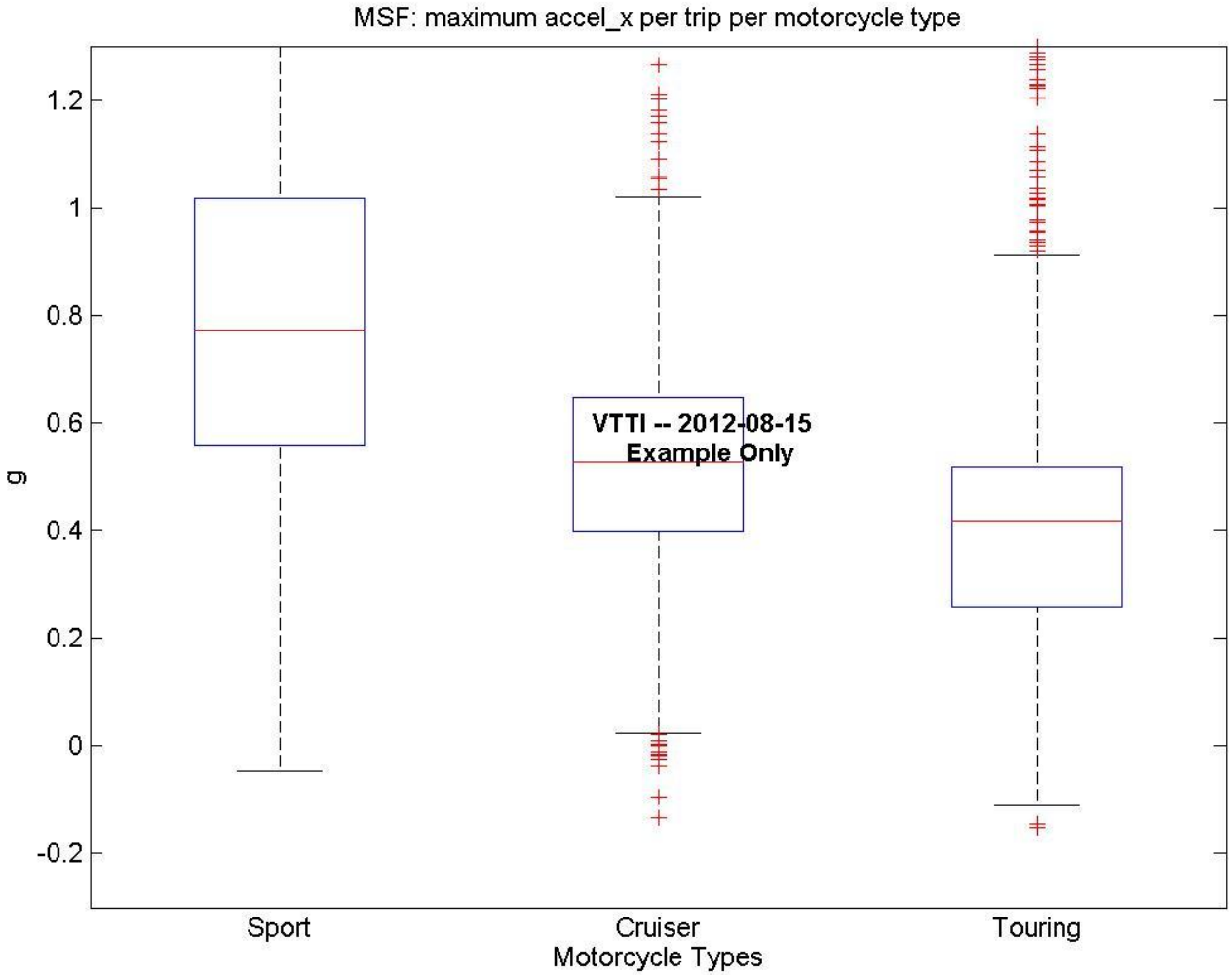
Phase II Sample Analysis

Minimum Accelerations X Bike Type



Phase II Sample Analysis

Maximum Accelerations X Bike Type



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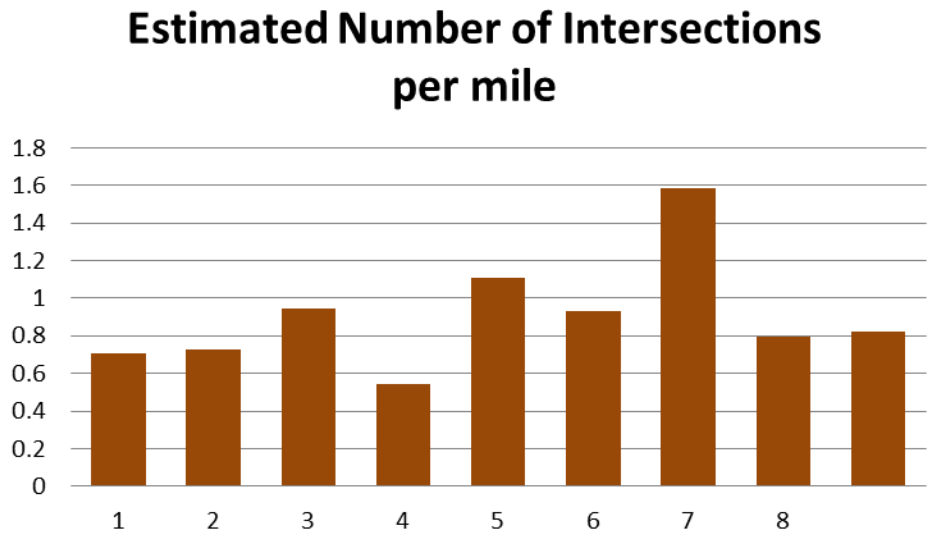
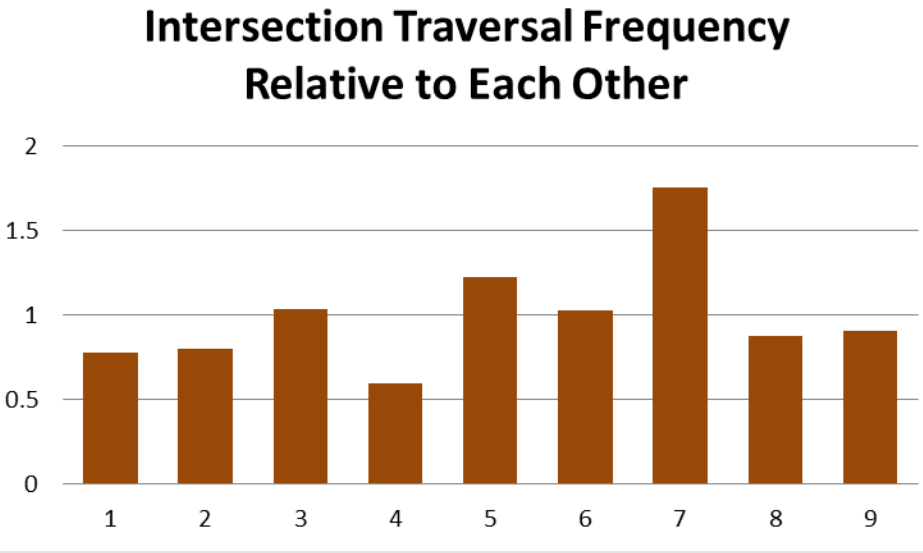


VTTI -- 2012-08-22
Example Only



VTTI -- 2012-08-22
Example Only

Analysis Progression – Phase III

- Identify differences between low and high event rate riders
  - Using machine vision to identify patterns in
    - Lane position
    - Scanning
  - Following distances
  - Training
  - Experience
  - Following

Analysis Progression – Phase III

- Detailed analysis of events
  - Sight distances
  - Roadway factors
  - Environmental conditions
  - Rider behavior
  - Rider performance

Conclusions

- MSF will collaborate worldwide to allow use

The MSF
Naturalistic Study of Motorcyclists

Questions?

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