



Florida
Department of
Transportation

SHRP2 Successes: Lessons Learned from the Field

Improving Pedestrian Safety through SHRP2's Naturalistic Driving Study



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Improving Safety Through SHRP2



U.S. Department of Transportation
Federal Highway Administration

AMERICAN ASSOCIATION
OF STATE HIGHWAY AND
TRANSPORTATION OFFICIALS

AASHTO

TRANSPORTATION RESEARCH BOARD
OF THE NATIONAL ACADEMIES

SHRP2 Safety Program



Consists of Two Large Databases:

- Naturalistic driving study (NDS) database; and
- Roadway Information Database (RID)

Naturalistic Driving Study (NDS):

- Crash, pre-crash, near-crash, and “normal” driving data
- 3,500+ drivers, 6 sites, all ages

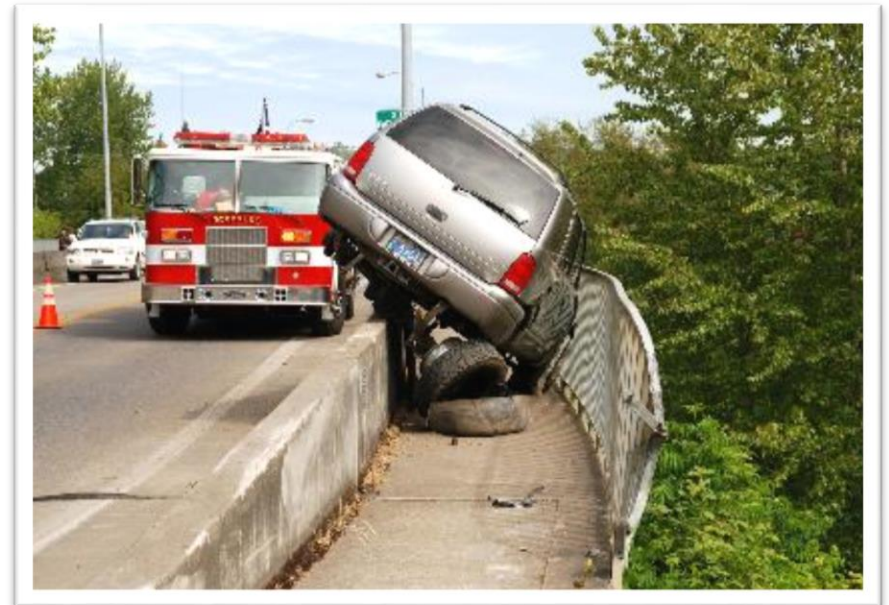
Roadway Information Database (RID):

- NDS trip data can be linked to roadway data from the RID, such as the roadway location, curvature, grade, lane widths, and intersection characteristics.
- These two databases will support innovative research leading to new insights into crash causation.

SHRP2 Implementation Assistance Program (IAP)

Main Objectives

- Utilize IAP to demonstrate the use of the NDS Safety Data
- Increase states' understanding of the potential uses of the data
- Identify safety countermeasures based on research projects
- **Reduce crashes and save lives !**



IAP Safety Process

Phase 1 – Proof of concept with a sample reduced data set



Phase 2 – full data set and in-depth research analysis with countermeasure identification



Phase 3 – deployment to adopt, champion or implement countermeasure nationally

Ongoing Safety Projects

Phase 2 In-Depth Research and Analysis Projects

Pedestrian Safety	Florida DOT
Roadway Departures	Iowa DOT
Speeding	Michigan DOT Washington State DOT
Work Zones	Minnesota DOT
Horizontal and Vertical Curves	North Carolina DOT
Interchange Ramps	Utah DOT
Adverse Conditions	Wyoming DOT
Roadway Lighting	Washington State DOT

FHWA/AASHTO Resources

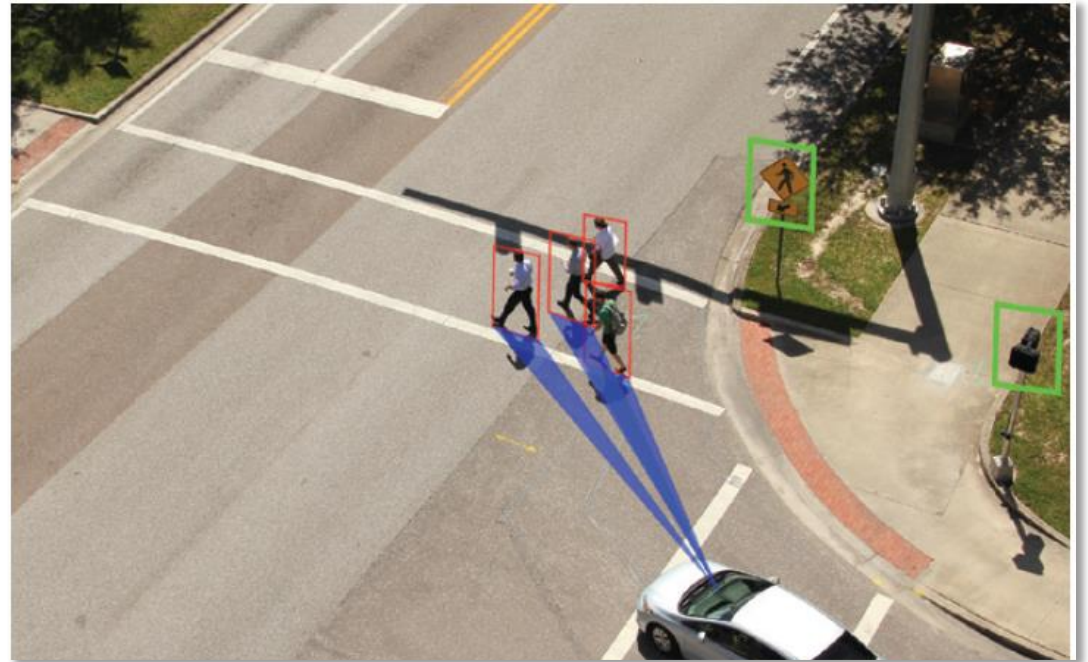
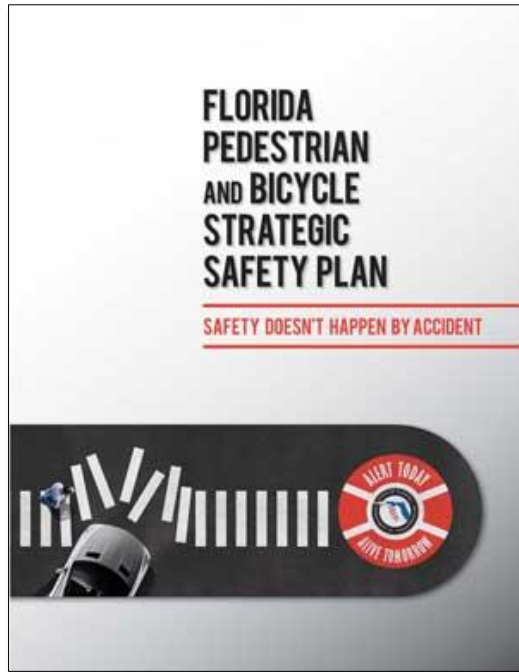
- **FHWA SHRP2 website:** [fhwa.dot.gov/goSHRP2](https://www.fhwa.dot.gov/goSHRP2)
- **AASHTO SHRP2 website:** [SHRP2.transportation.org](https://shrp2.transportation.org)
 - Implementation information for AASHTO members
 - Information about SHRP2 safety implementation
- **Safety Implementation Managers:**
 - Aladdin Barkawi, FHWA: aladdin.barkawi@dot.gov
 - Kelly Hardy, AASHTO: khardy@aaashto.org

Pedestrian Safety Problem in Florida

- ❑ Florida experienced serious pedestrian safety problems.
- ❑ Florida continues to be in the **top five** states with the highest pedestrian fatality rates.
- ❑ Florida has the **top four** metro areas with the highest Pedestrian Danger Index. (Dangerous by Design 2014)

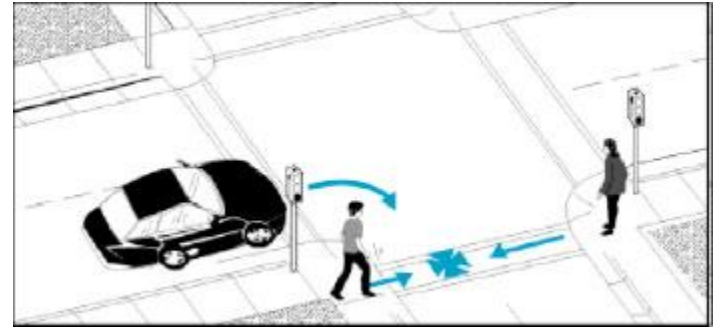
Florida's Pedestrian Strategic Safety Plan

One of Florida's highest priorities is **to investigate major contributing causes for pedestrian crashes and develop effective countermeasures.**

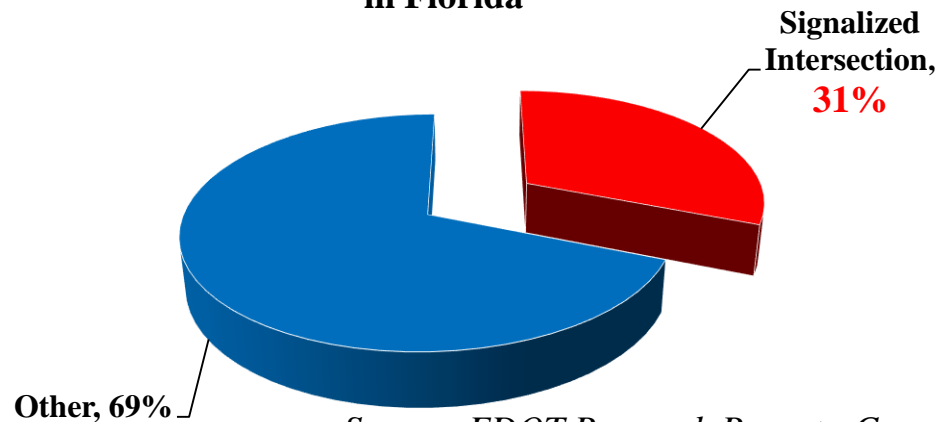


Pedestrian Safety Facts at Signalized Intersections

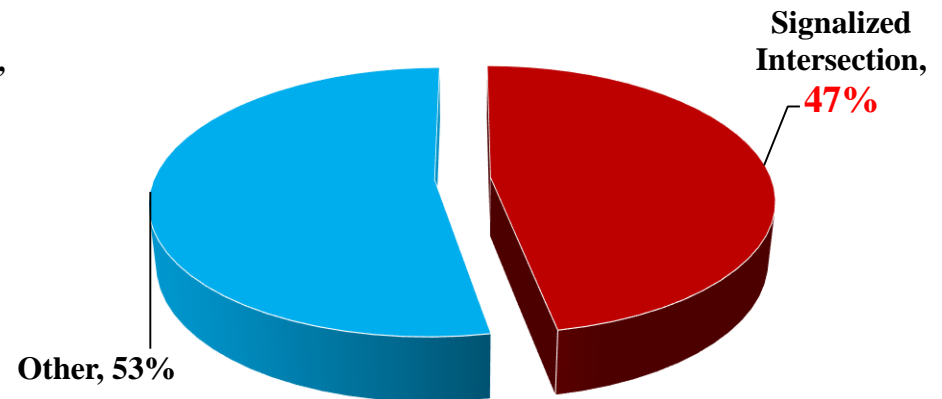
- ❑ High traffic and pedestrian volumes
- ❑ Frequent pedestrian-vehicle conflicts



Pedestrian **Fatal Crashes** by Location
in Florida



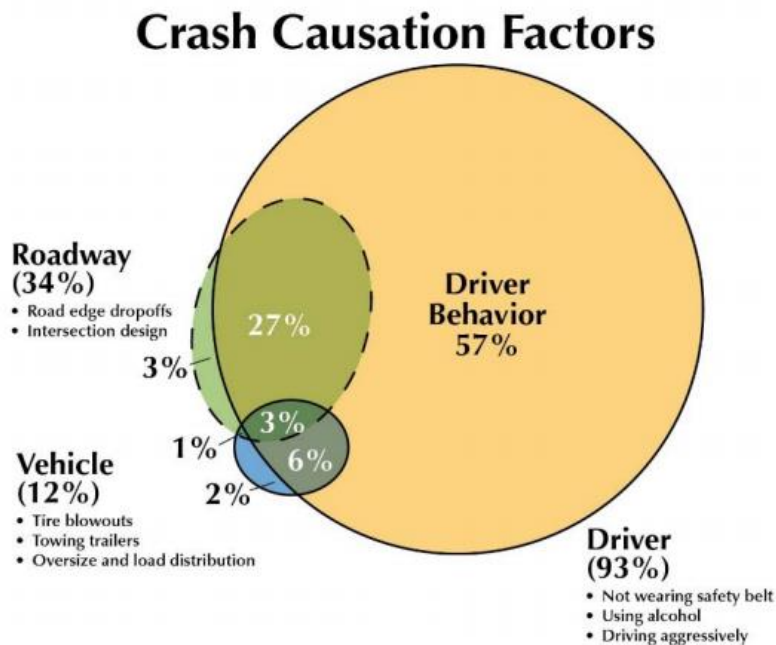
Pedestrian Crashes by Location in Florida



Source: FDOT Research Report - Comprehensive study to reduce pedestrian crashes in Florida

Driver Behavior and Safety

Driver behavior is the primary factor contributing to a crash.







Index of unsafe driving (risk index):

- **Rule violation**
- **Speeding (or unsafe speed)**
- Impaired driving (alcohol-involved)
- Distraction
- Not wearing seat-belt
-

Source: *Human Factors & Highway Safety*, Elizabeth Alicandri, FHWA Office of Safety Programs

Main Pedestrian Features of Study

<p>Stop Here on Red</p>	 <p>R10-6 R10-6a</p>	<p>Stop before stop line on red</p>
<p>No Turn on Red</p>	 <p>R10-11 R10-11a R10-11b</p>	<p>Stop on red, wait for green signal</p>
<p>Turning Vehicles Yield to Pedestrians</p>	 <p>R10-15</p>	<p>Yield to pedestrians on red or green</p>
<p>Right on Red Arrow after Stop</p>	 <p>R10-17a</p>	<p>Stop, observe, and turn on red</p>

Research Question and Goals

□ Major Research Question:

How do drivers interact with pedestrian features at signalized intersections?

□ Research Goals:

- To investigate the interactions between drivers and pedestrian features using the SHRP2 NDS and RID data
- To demonstrate success in accomplishing initial data analysis
- To demonstrate that the research team effectively used the SHRP2 NDS and RID databases

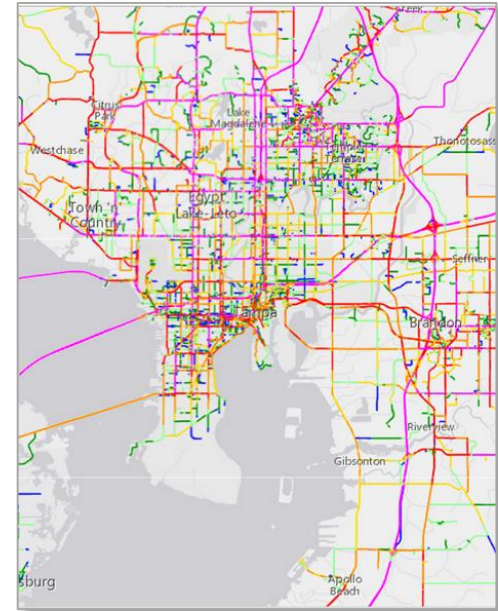
Data Sources

❑ SHRP2-RID Dataset

- Lanes: number, width, and type
- Signs: *MUTCD*
- Intersections: location, control, etc.
- Median type and presence
- AADT(Annual Average Daily Traffic)

❑ SHRP2-NDS Dataset (2700 trips)

- Front Video Data
- Sensor Data: Speed, acceleration
- Supplementary Data:
 - Driver characteristics
 - Driver questionnaires



Data Acquired

❑ Study Sites

- 12 Signalized intersections in Tampa Bay (**4 Features**)
- 2 Feature sites + 1 Control sites for each pedestrian feature

❑ Short Trips

- 270 trips for each feature group
- 270 trips for each control group
- Total 2,160 trips
- 439 participants

❑ Long Trips

- 54 participants
- Total 270 trips

Tool Development

❑ NDS Automatic Video Processing Tool

- To automatically detect and track pedestrians
- To automatically detect traffic signal indications



NDS Data Reduction and Analysis Tool

A screenshot of the NDS Data Reduction and Analysis Tool interface. The interface is divided into several sections:

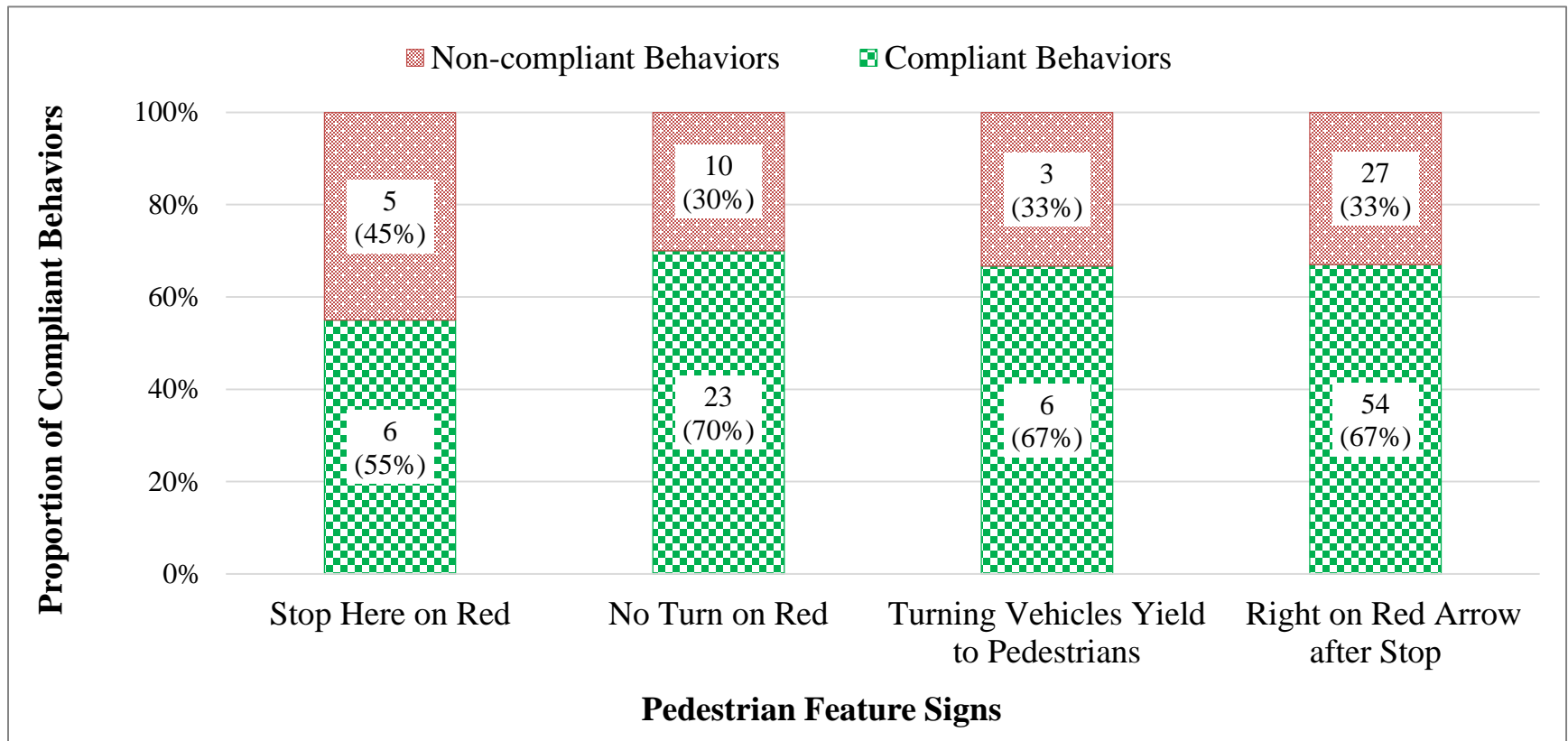
- Site Events:** Includes buttons for "Site Conditions", "Evaluation", "Events Approaching Feature Sign", "Events Approaching Stop Line", and "Events Approaching 2nd Crosswalk".
- Information:** Displays video ID (151791005), road (96th St), road ID (Frontier Ave), movement (RIGHT), final direction (EAST), feature (Right on red after stop), start time (362259), and duration (21).
- Settings:** Includes checkboxes for "Manual Input Video Time" and "Pause When Click Events", and a "Second Review is Needed" checkbox.
- Time Series Data:** Includes a "Speed Profile" button.
- AI_Events Table:** A table with columns: EVENT_CODE, CAL_TIME, MAN_TIME, and DESCRIPTION. The table contains 13 rows of event data, with the 11th row highlighted.
- Speed Graph:** A line graph showing speed over time. The x-axis represents time (from 362200 to 380200) and the y-axis represents speed (from 0 to 60). A green line shows the speed profile, which starts at approximately 45, drops to a minimum of about 10, and then rises to about 60.

EVENT_CODE	CAL_TIME	MAN_TIME	DESCRIPTION	
Save Comment	210	362717	0	Red
Save Comment	300	365322	0	Time passing feature sign
Save Comment	400	365322	368325	Time passing stop line
Save Comment	500	370223	0	Time getting at 2nd crosswalk
Save Comment	301	370223	0	Close to feature sign
Save Comment	456	370223	0	RT1
Save Comment	412	370223	0	Stop
Save Comment	411	370223	0	Stop at 2nd crosswalk
Save Comment	430	370223	0	Front car
Save Comment	482	370223	0	Front Car - Stop
Save Comment	479	370223	0	Front Car Causes - Conflicting traffic
Save Comment	111	370223	0	West
Save Comment	122	370223	0	Rain
Save Comment	130	370223	0	Daylight
Save Comment	611	370223	0	Unsafe
Save Comment	620	370223	0	Concise
Save Comment	630	370223	0	Additional comments

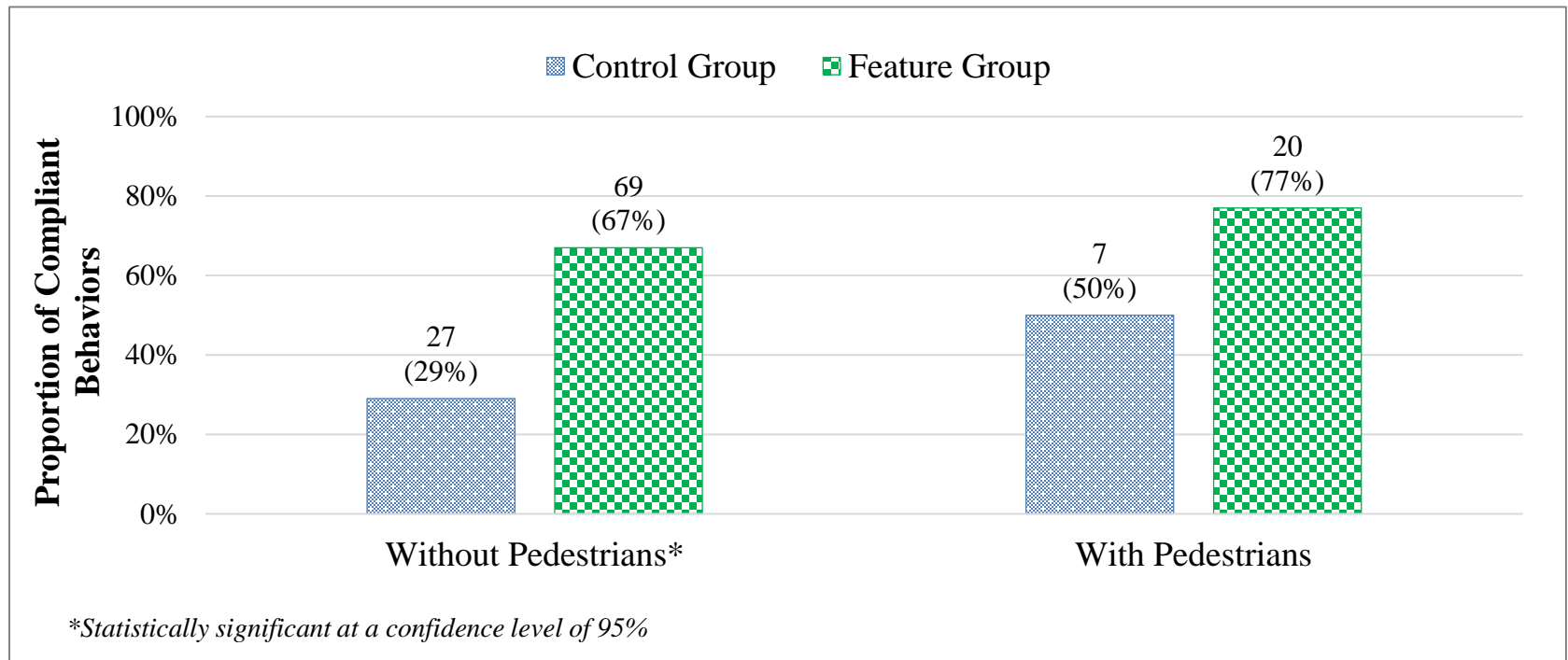
Analysis Results



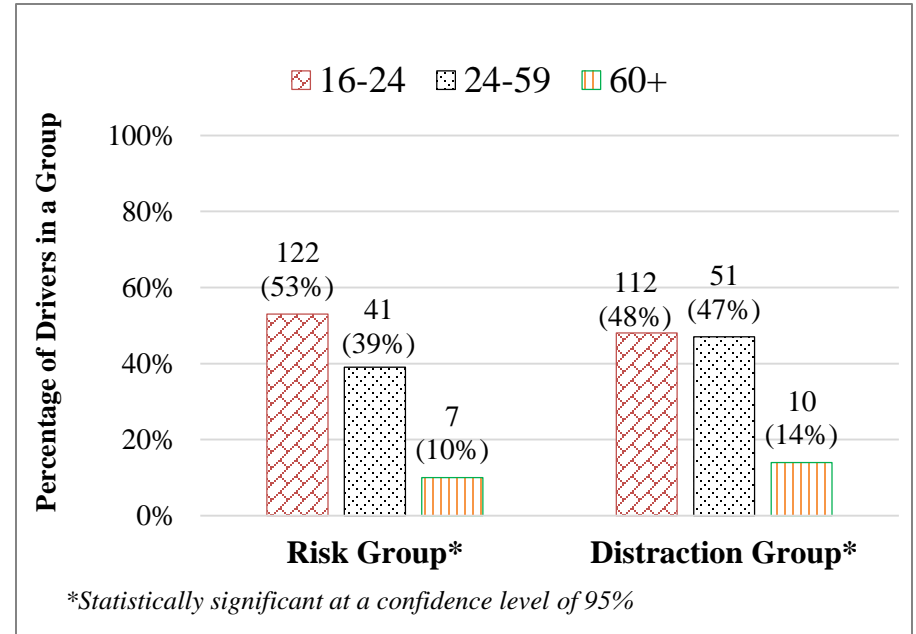
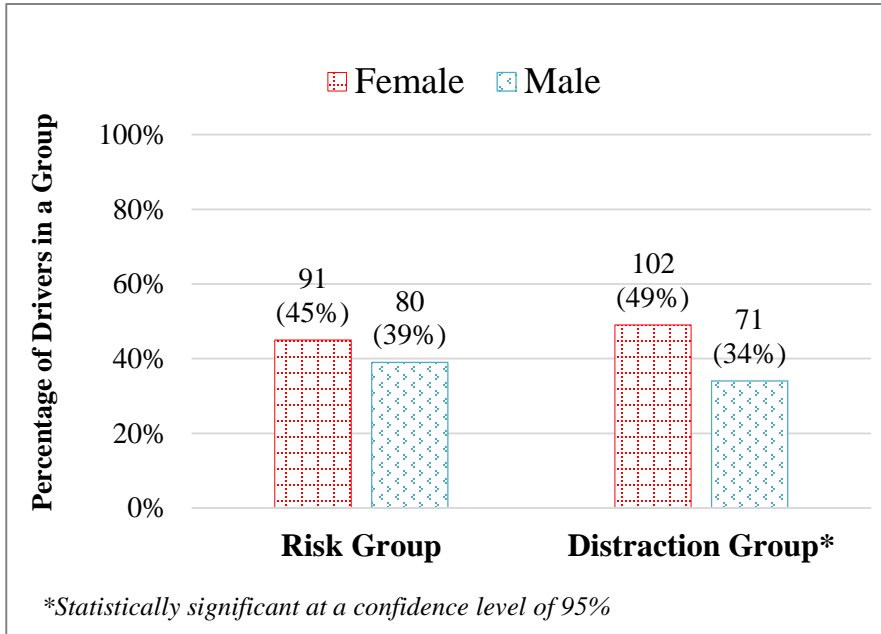
Interactions between drivers and different pedestrian features



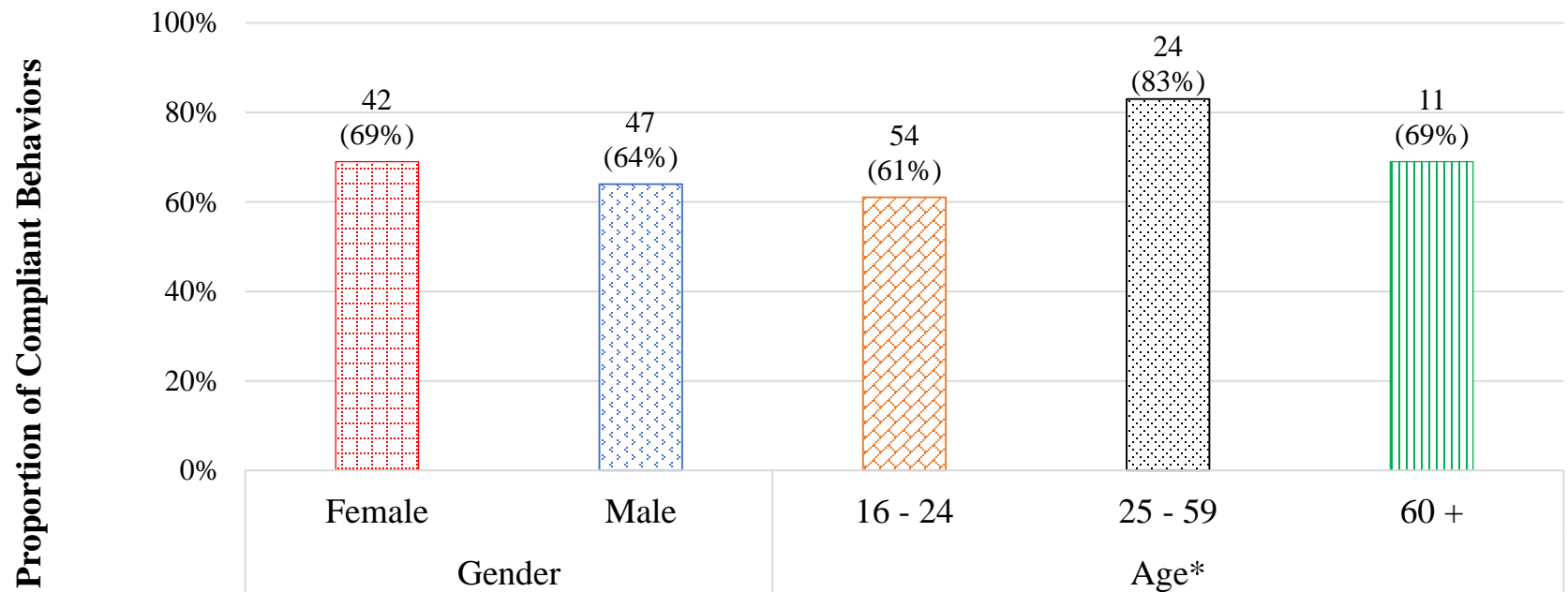
Comparison of compliant behaviors with/without pedestrian presence



Comparison of risk and distraction levels by gender and age groups










Comparison of compliant behaviors by gender and age groups



**Statistically significant at a confidence level of 90%*

Findings of Pilot Study

Traffic Sign (Pedestrian Feature)	Compliance Rate	Increased Likelihood of Compliance Compared to a Control Group
No turn on red 	70%	
Turning vehicles yield to pedestrians 	67%	
Right on red arrow after stop 	67%	
Stop here on red 	55%	

Conclusions of Pilot Study

- ❑ As proof of concept, the pilot project was successful.
- ❑ Data availability, sample size, and complexity were identified.
- ❑ Specific parameters for data extraction and analysis tools were developed.
- ❑ Study methodology was proven.
- ❑ Initial results are encouraging.

Future Work and Countermeasure Development

- ❑ Phase II is currently underway.
- ❑ CUTR and FDOT will develop implementable countermeasures.
 - **E**ngineering: policy/practice for implementation
 - **E**ducation: outreach/campaigns to focus on specific demographics of drivers
 - **E**nforcement: pedestrian and bicycle laws
 - **Combined engineering, education, and enforcement approaches**

Questions



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