

Driver Workload and Visual Studies

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TxDOT Research Project 0-5911



Literature

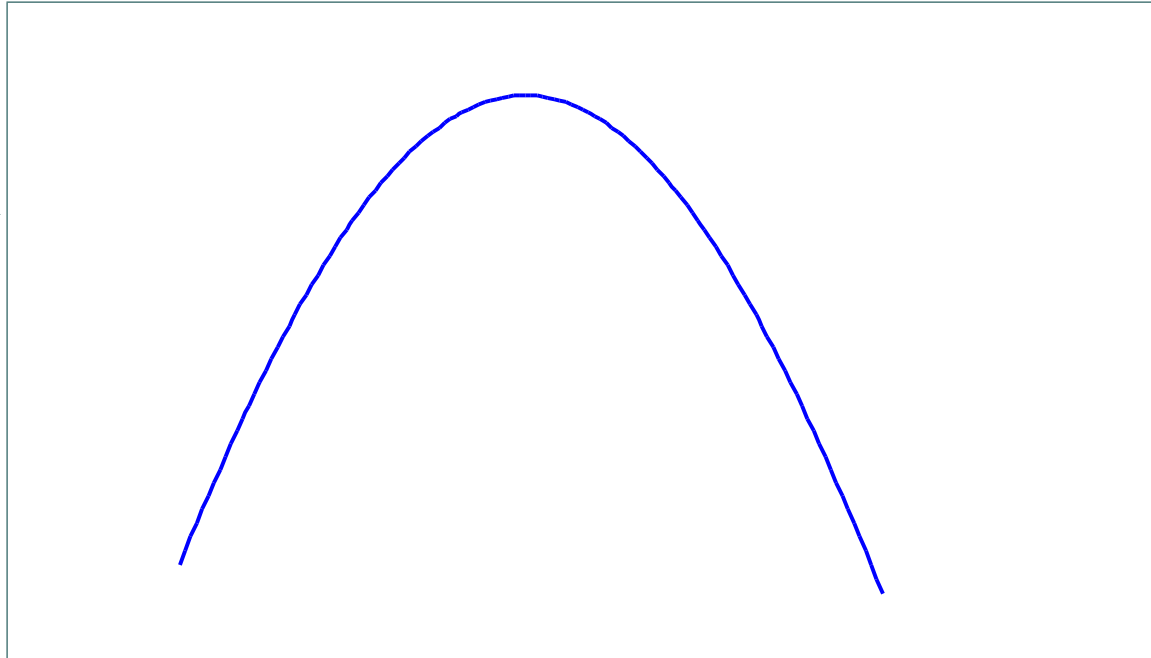
Research-High Speed Driving

- Limited to race car drivers
- Focus has been on basic perception and reaction time findings that could be applied to high speed situations

Literature

Performance is a Function of Stimulation

Driving
Performance
Capability



Low Stimulation

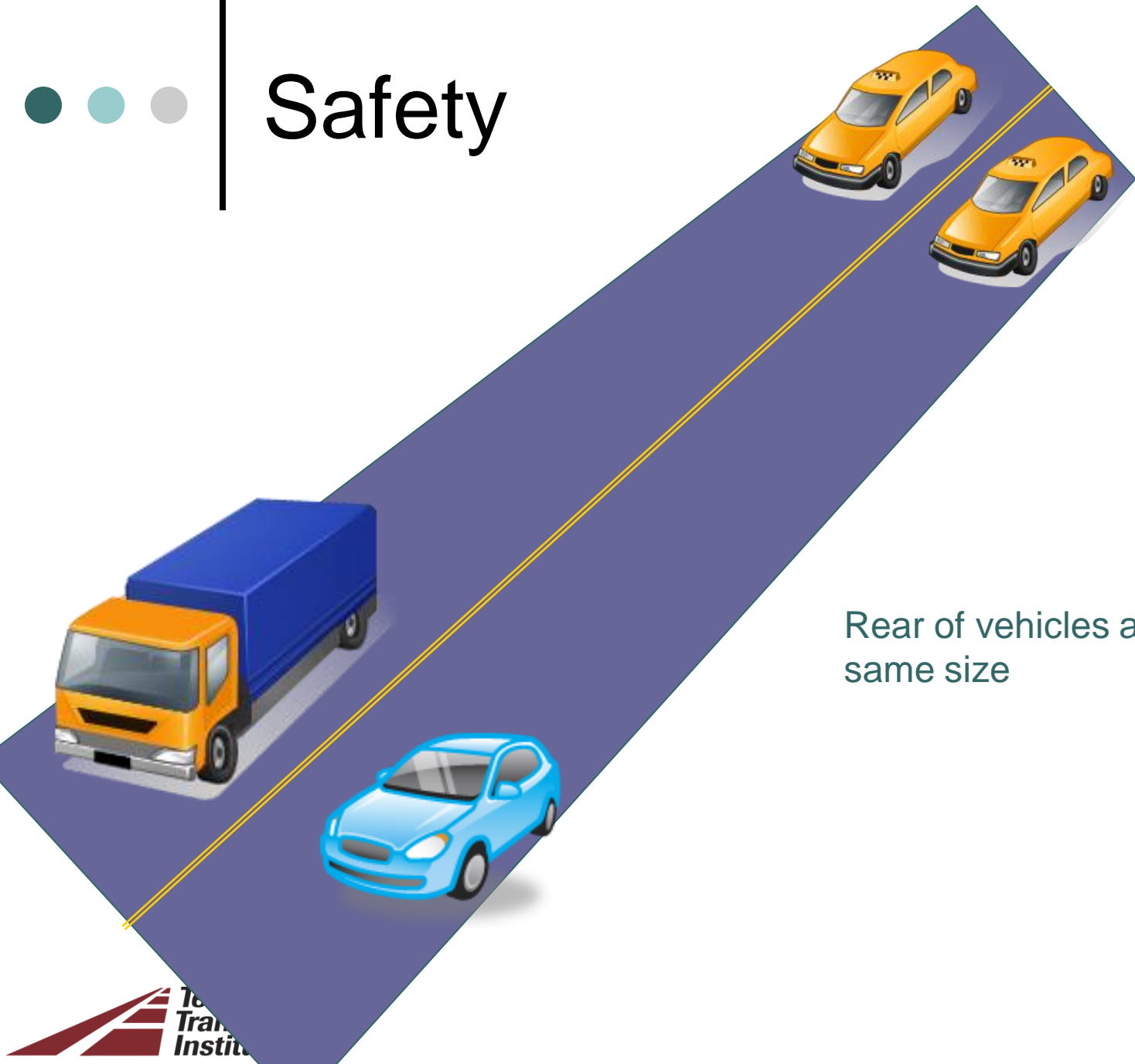
Flat Road, Good Weather

High Stimulation

Curving Road, Bad Weather



Safety



Rear of vehicles appear the same size



Looming





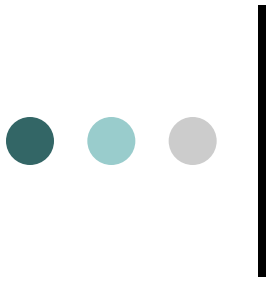
Looming: Which one is moving faster ?



A larger square moving very slow



A smaller square moving slow

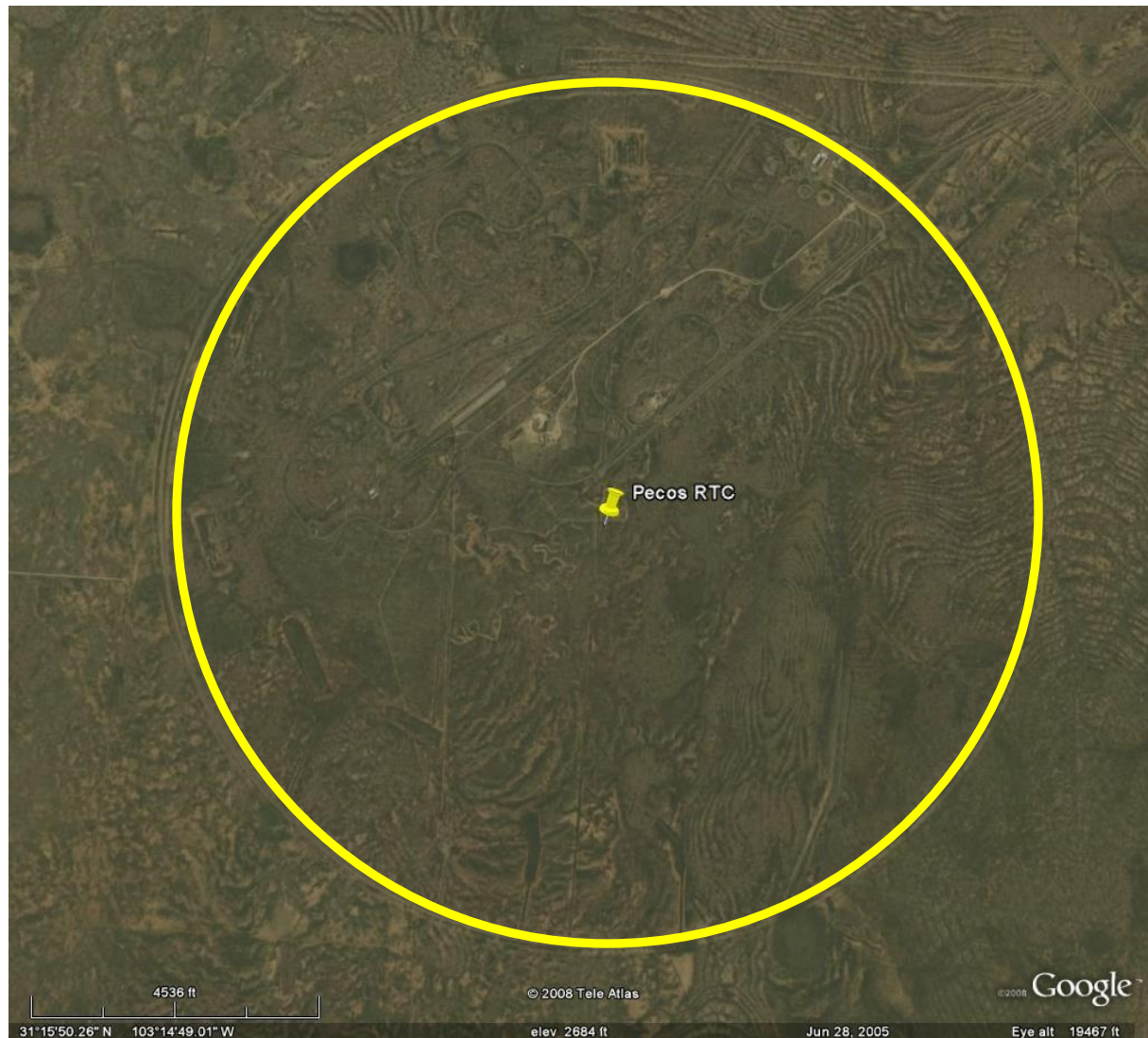


Pilot Studies

- Closed Course
- Open Road (on Way to Closed Course)

Closed Course Pilot Study Route

- Pecos RTC
9-mile
circle
- Total of 6
laps
- 3 laps at
60 mph
- 3 laps at
85 mph



Closed Course Pilot Study Route

- Subject drove Instrumented Vehicle
- Researcher drove Lead Vehicle
- Subjects given series of tasks to perform while driving



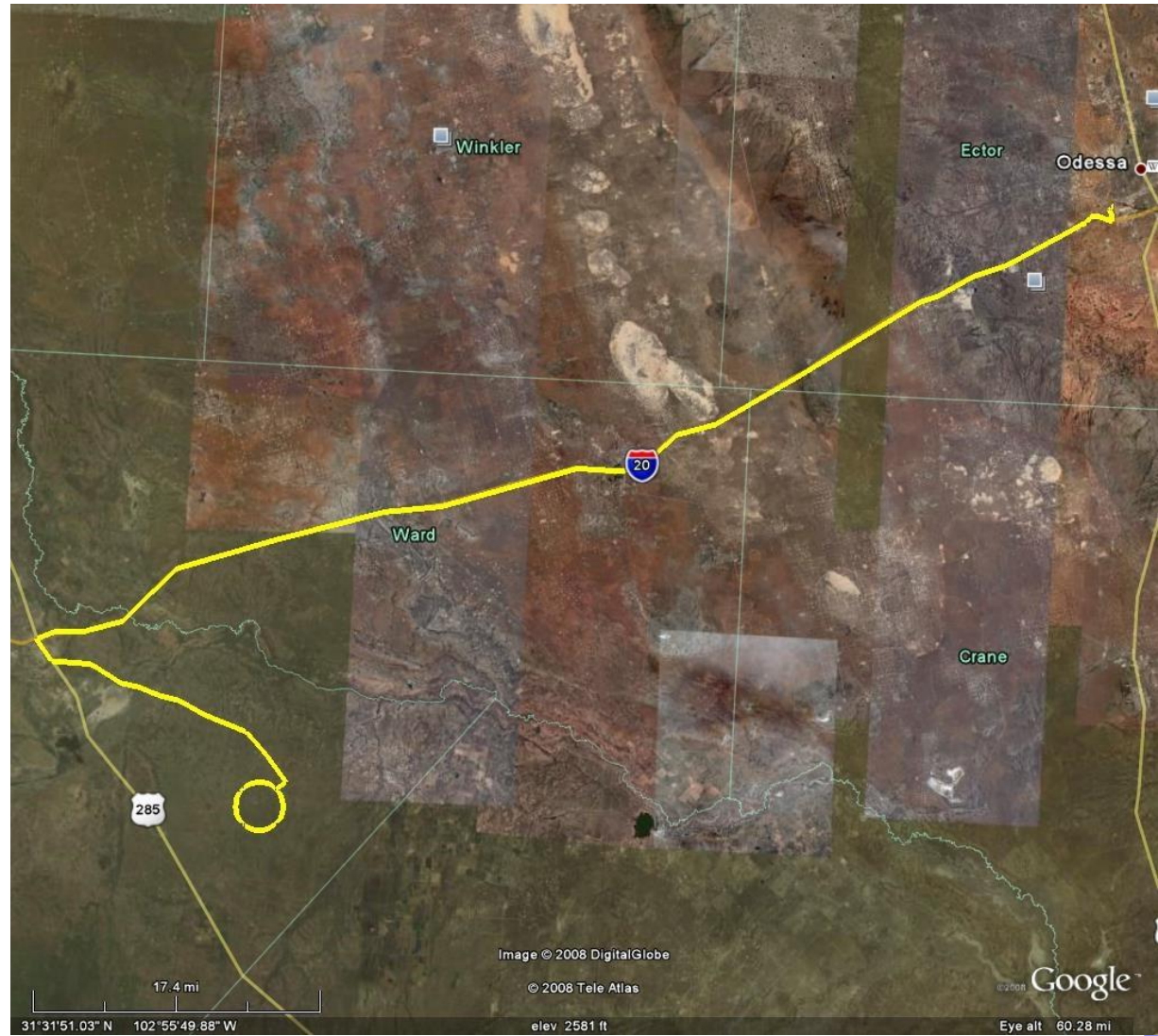


Open Road Pilot Study Basics

- Subjects = 14
 - Female = 4, male = 10
 - Age range = 20 to 71
 - Mean age = 49
- Vehicle = 2006 Toyota Highlander

Open Road Pilot Study Route

- Drove Odessa to Pecos OR Pecos to Odessa
- 70 mph segment = 32 miles
- 80 mph segment = 47 miles

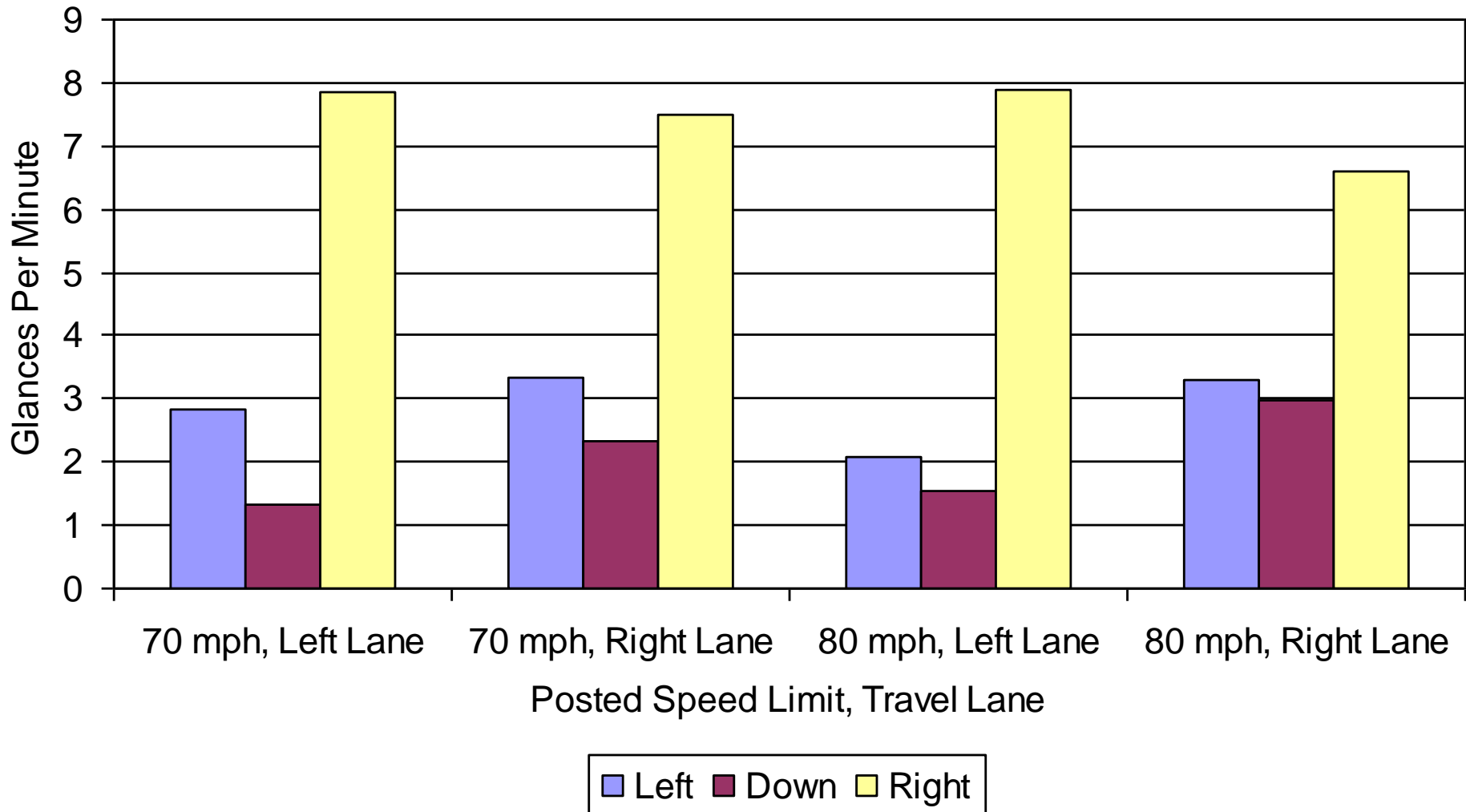




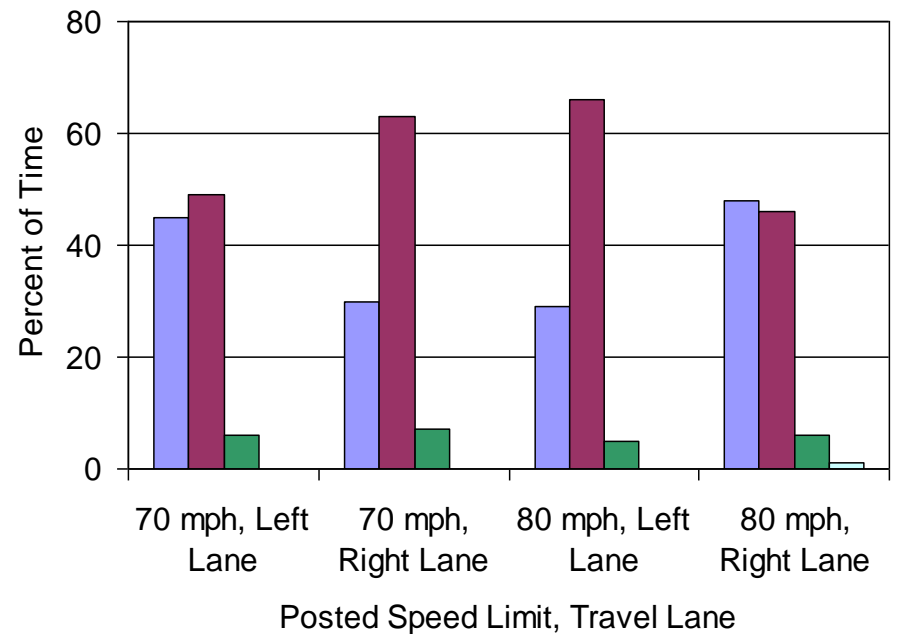
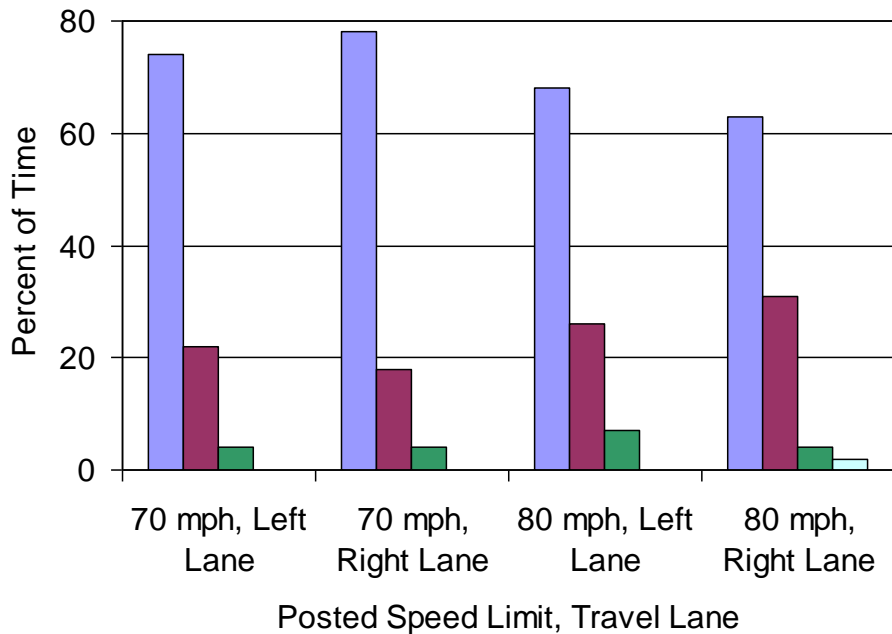
Open Road Pilot Study Data Collected

- Lateral offset
- Driver
 - Glance rate
 - Hand placement
 - Number of hands
- Gap at passing

Open Road Pilot Study Driver Glance Rate



Open Road Pilot Study Driver Hand Placement

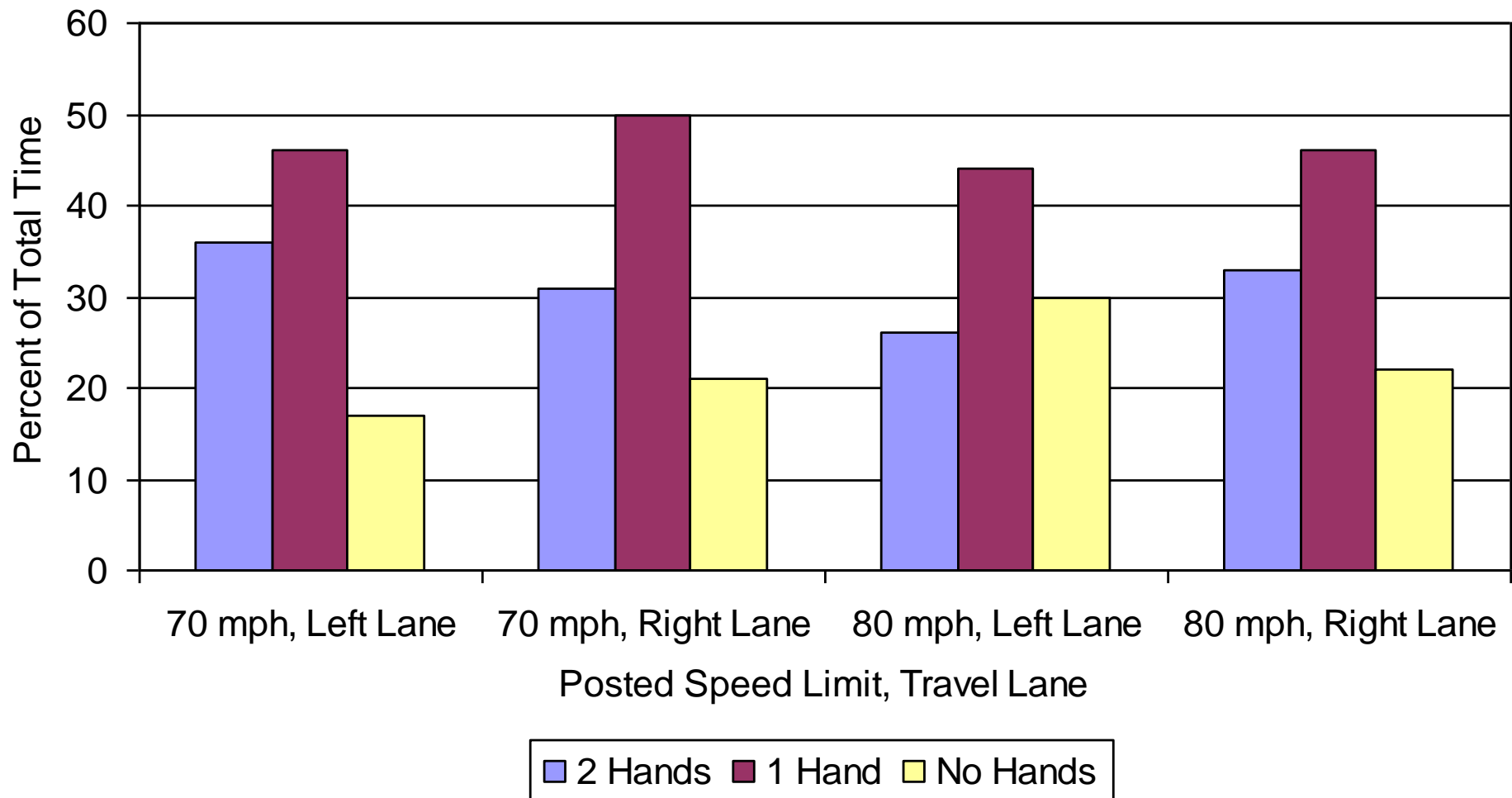


■ On Top
 ■ Not Visible
 ■ Off Steering Wheel
 ■ Holding Something

■ On Top
 ■ Not Visible
 ■ Off Steering Wheel
 ■ Holding Something

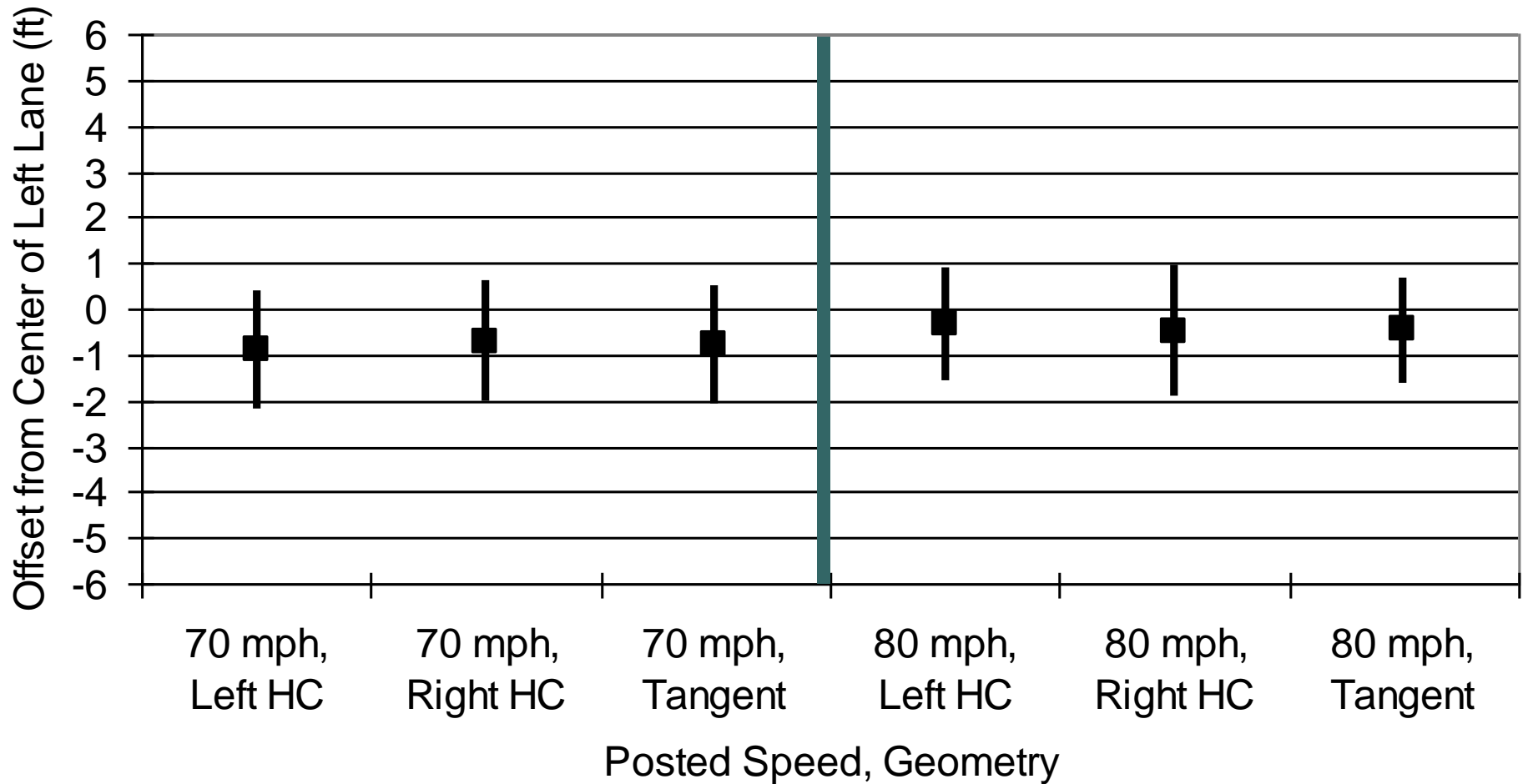
Open Road Pilot Study

Number of Hands



Open Road Pilot Study

Lateral Offset

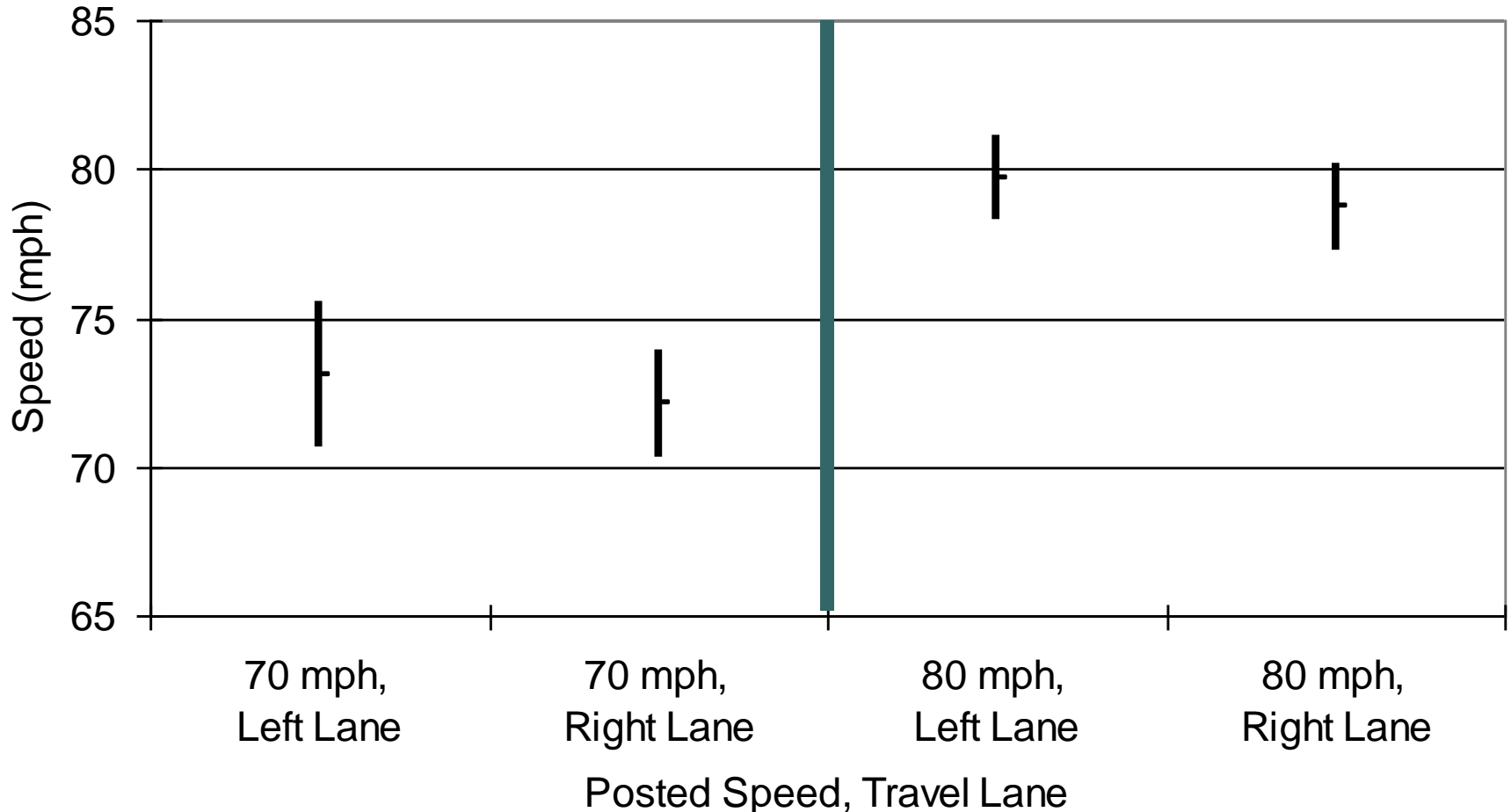


Bottom of Bar = Mean-SD

Top of Bar = Mean+SD

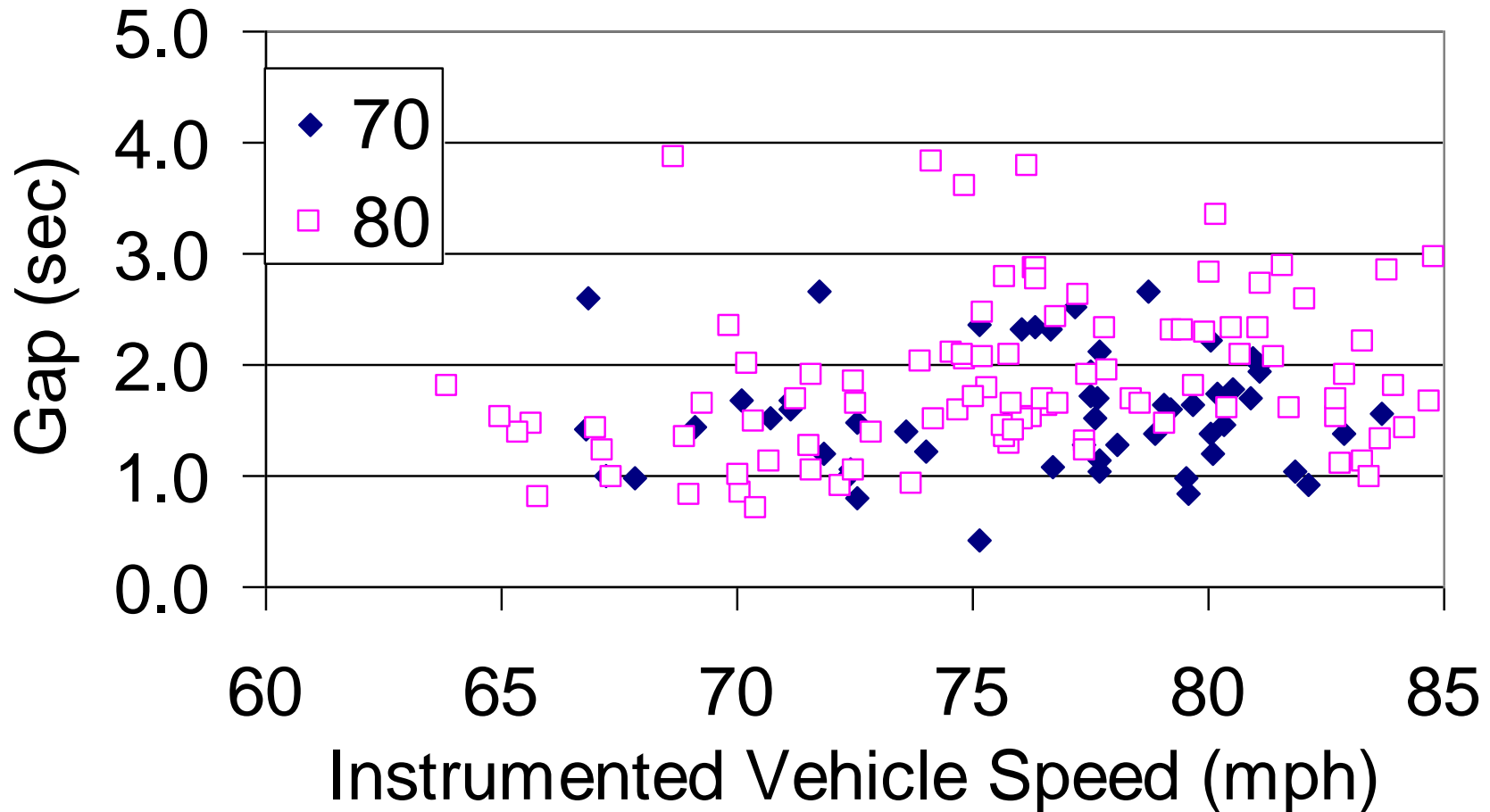
■ Square = Mean

Open Road Pilot Study Speed by Lane



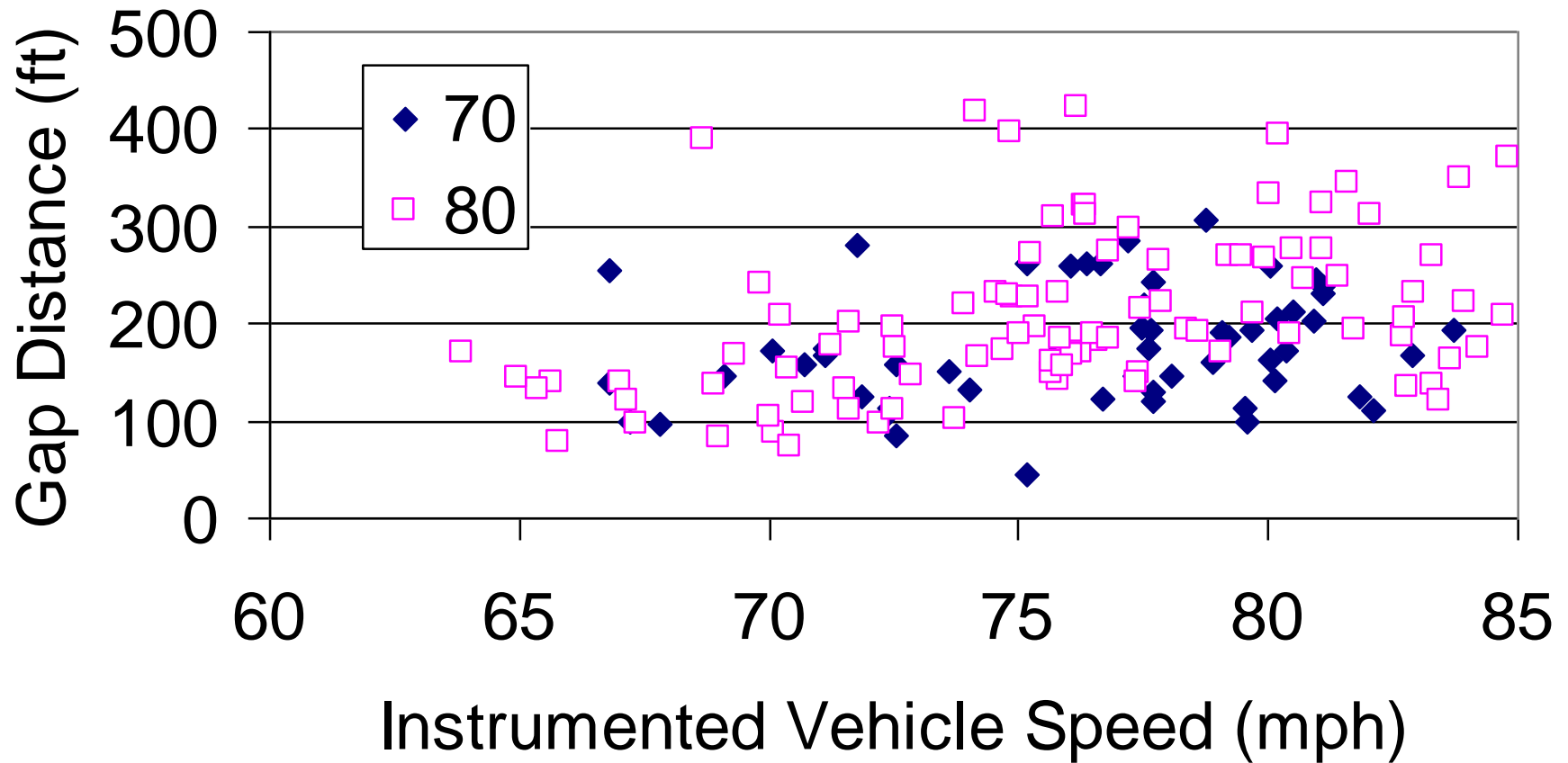
Bottom of Bar = Mean-SD Top of Bar = Mean+SD - Square = Mean

Open Road Pilot Study Gap Time



Open Road Pilot Study

Gap Distance





Open Road Pilot Study Findings (part 1)

- Driver glance rate
 - Higher glance rate to right
 - both posted speed
 - Both travel lanes
- Hand Placement
 - Preference to have left hand on top
 - Two hands on top
 - 70 mph – 33%
 - 80 mph - 30%



Open Road Pilot Study Findings (part 2)

- May have difference in lateral offset by:
 - Posted speed (for left lane on horizontal curve)
- May have difference in operating speed performance
 - Left lane vs. right lane
 - More drivers over 70 mph than 80 mph – but 14 subjects, unfamiliar vehicle, effect of other vehicles present unknown, etc.



Open Road Pilot Study Findings (part 3)

- Gap distance at passing
 - Expect larger gaps at higher speed
 - No pattern for either speed
 - Equipment measuring limit: 50 to 450 ft
- Recommend additional study on this topic