

Teen Driving and Distraction



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Virginia Tech Transportation Institute (VTTI) Facts

VTTI has the largest group of driving safety researchers in the world

- Almost 200 faculty, staff and students
- Over 50 active projects
- Over \$100M in research expenditures since 2000
- VTTI researchers are pioneers in the development of large-scale instrumented vehicle studies

VTTI Research

Research Centers

- Center for Automotive Safety Research
 - Jon Hankey, Director
- Center for Vehicle-Infrastructure Integration
 - Vicki Neale, Director
- Center for Truck and Bus Safety
 - Rich Hanowski, Director
- Center for Sustainable Mobility
 - Hesham Rakha, Director
- Center for Product Development
 - Mike Mollenhauer, Director
- Center for Technology Development
 - Andy Petersen, Director
- Center for Sustainable Roadway Infrastructure
 - Gerardo Flintsch, Leader

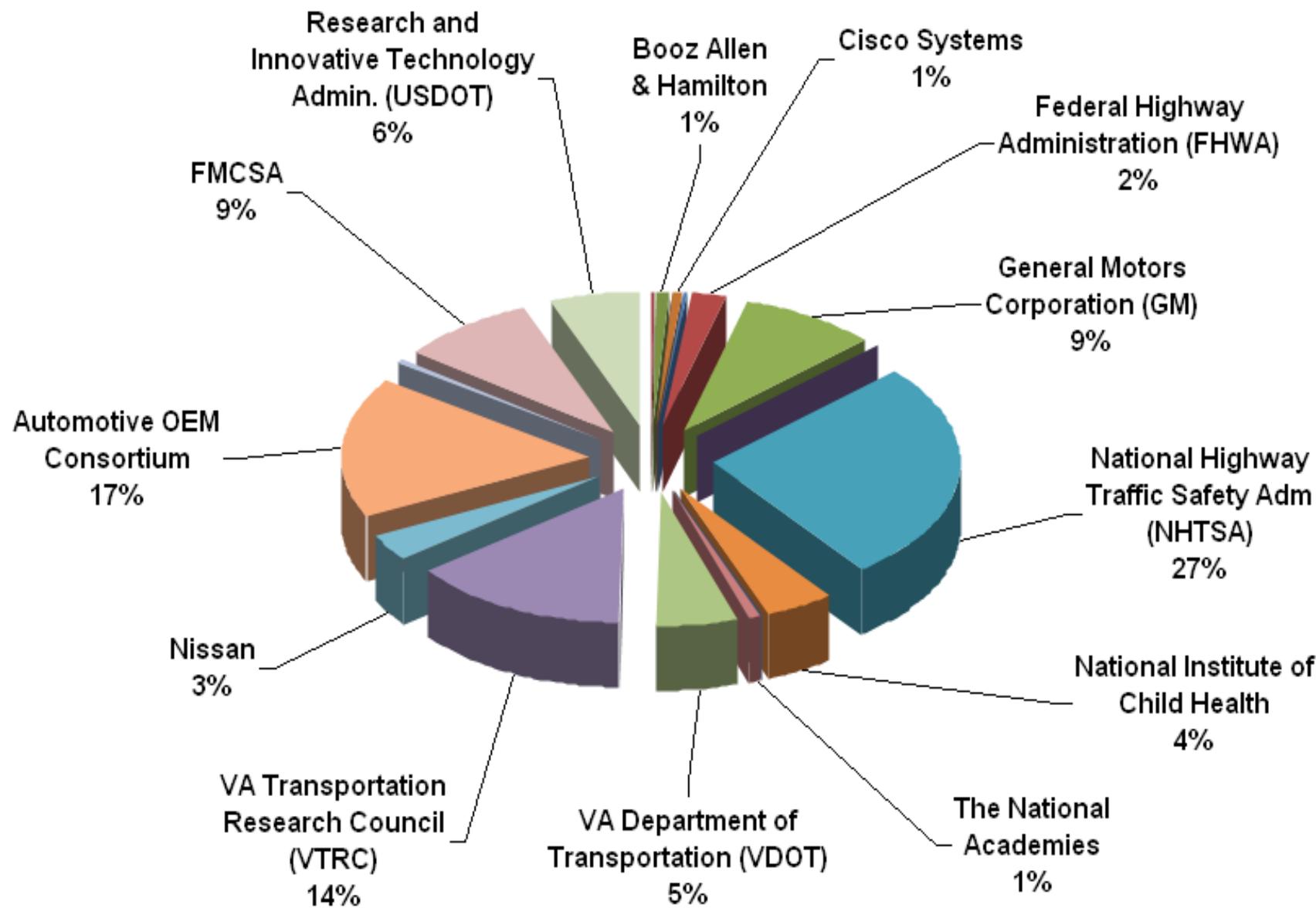
* “Safety Centers”

Research Collaborations

- Transportation Policy Group
 - Ray Pethel, Leader (Outreach)
- Center for Injury Biomechanics
 - Stephan Duma, Director (ME)



FY07 Research Sponsors



**Research of Potential Interest to
JCOTS: Understanding teen
driving behavior through
naturalistic driving studies**

Why is driving safety research important?

- Motor vehicle crashes are:
 - By far the leading cause of injury in the U.S.
 - The third leading cause of death overall behind cancer and heart disease, BUT:
 - The leading cause of death for ages 3 to 33
 - The worst killer in terms of years of life lost
- The US had the lowest fatality rate in 1993; we have since slipped to 9th in fatality rate/mile traveled and will be 15th in the next decade.

The issue at hand

- Human performance and behavior contribute to over 90% of vehicular crashes.
- Roughly 10% of drivers account for almost 50% of the crash risk. Why?
 - impairment (due primarily to alcohol)
 - **inattention and distraction**
 - drowsiness
 - judgment-related error.
- **Newly licensed teen drivers have 3X the fatality rate of adults.**

A New Method of Study: Large-Scale Naturalistic Driving



- 20 to 2500 drivers
- No instructions
- 6 mos. to 3 yrs.
- 10,000's of hours
- Many MVMT

Naturalistic Data Collection Approach

Highly capable instrumentation

- Multiple channels of digital, compressed video
- Multiple radar sensors front, rear and/or side
- Machine vision-based lane tracker and driver monitor
- Many other sensors: GPS, glare, RF, acceleration, yaw rate, controls, etc.
- Ties into vehicle networks to obtain other information (ABS, ESC, Speed, etc)
- Cell phone or wireless internet status checks
- On-board data storage capacity = 26,000 miles
- Can be installed in any vehicle in less than 3 hours

VTTI "100 Car" Data Collection System

Light vehicle install in trunk;
Truck install under passenger's seat



Front Radar



Rearward Camera



Face & Forward Cameras



Why are naturalistic data important?

Data based upon Police Accident Reports is our primary source of data:

Well meaning, nominally trained police officers coming upon a scene is the source of much of our data

- Vehicles have often been moved
- Drivers/Passengers may be deceased or injured
- Drivers/Passenger are almost always dazed
- Pre-crash events happen so fast key elements are forgotten by driver/passenger and left out by witnesses
- Drivers sometimes purposely deceive police officers to avoid prosecution or embarrassment
- Driver/Passengers may not be looking in the correct location to see critical information

Driver inattention is a key contributing factor in crashes for both truck and light vehicles

- The largest single contributing factor is **looking away from the roadway** just prior to an unexpected event or condition. This **accounts for somewhere between 70% and 90% of unsafe events.**
- Engaging in activities that are unrelated to driving (i.e., “secondary tasks”) and external distractions account for most of the inattention-related risk.
 - **High Risk: Looking away many times and/or long periods**
 - **Includes: Cell phone dialing, text messaging, Ipod/MP3 manipulation, and internet interaction.**
 - Much less risk: Eating/drinking, talking to passengers, simple radio functions, and even talking on a cell phone.
- **Teens are four times more likely to be involved in a near crash or crash while performing a secondary task than their adult counterparts.**

Relative Crash Risks for Types of Inattention: A First

Type of Inattention	OR	Lower Confidence Level	Upper Confidence Level
Complex Secondary Task	3.1	1.7	5.5
Moderate Secondary Task	2.1	1.6	2.7
Simple Secondary Task	1.2	0.9	1.6
Fatigue	6.2	4.6	8.5
Driving-Related Inattention to the Forward Road > 2 s	0.5	0.2	0.8
Driving-Related Inattention to the Forward Road < 2 s	0.2	0.2	0.3
Reaching for moving object	8.8	2.5	31.2
Reading	3.4	1.7	6.5
Dialing Hand-held Device	2.8	1.6	4.9
Applying Make-up	3.1	1.3	7.9
Handling CD	2.3	0.3	17.0
Eating	1.6	0.9	2.7
Talking/Listening to Hand Held	1.3	0.9	1.8
Drinking	1.0	0.3	3.2
Adjusting Radio	0.6	0.1	2.2
Passenger in Adjacent Seat	0.5	0.4	0.7

Cell Phone Use Among Teen Drivers Before And After Enactment Of A Cell Phone Ban

Suzie Lee, Tom Dingus,
Marie Claude Ouimet,
Charlie Klauer,
and Bruce Simons-Morton

With support from:
NICHD, NHTSA, and VTTI

Background

- As part of graduated driver's licensing programs, many states have banned cell phone use by teen drivers with a provisional driver's license
- Foss et al. (2008) found that the cell phone ban in North Carolina had no effect on cell phone use by teenage drivers at an entrance to a high school
- Virginia passed a cell phone ban for those under 18 effective July 1, 2007, halfway through an ongoing naturalistic study

Cell Phone Ban

- Prohibits wireless communication device use for those under 18:
 - Unless the vehicle is lawfully stopped
 - Except in case of emergency
- Is a secondary offense (can only be charged in conjunction with another, primary offense)
 - In other words, they cannot be pulled over if seen talking on a cell phone, unless they are also breaking the law in another way

Research Questions

- Did the ban:
 - Affect the number of times cell phones were used in the month after the ban?
 - Affect the types of cell phone functions used?
 - Affect the task time for cell phone tasks?
 - Differentially affect “newer” novice drivers, compared to those who had been licensed for a while?

Method

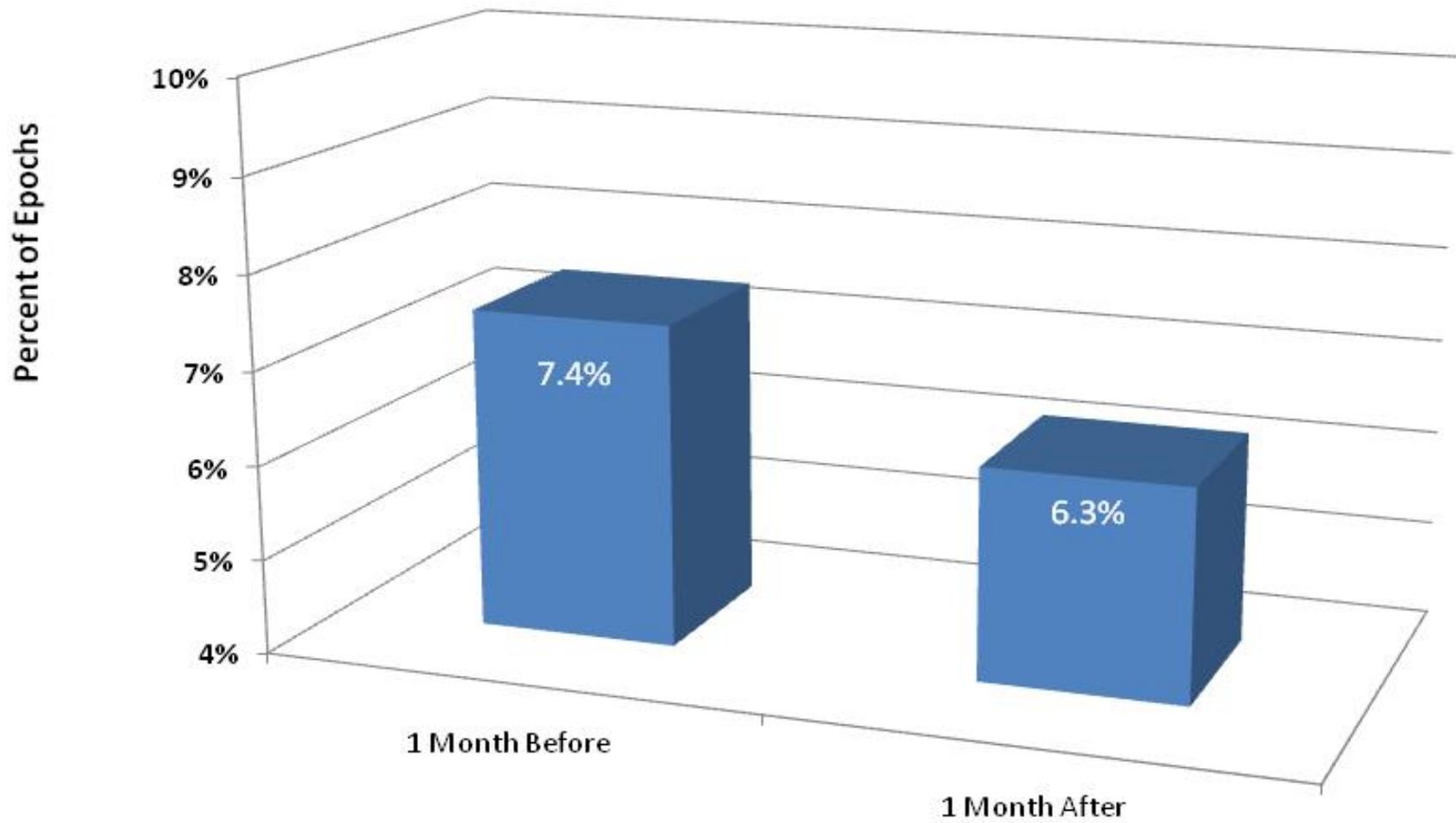
- Instrument 42 private vehicles with highly capable data collection systems
 - Collect *continuous* data beginning within 2 weeks of licensure and continuing for 18 months
 - 22 teens are primary driver of vehicle
 - 20 teens share vehicle with parents
 - 50% male/50% female participants
 - Video, video snapshots, driving performance data, and questionnaire data
 - Data collection will be complete later this month

Did the ban:

Affect the number of times
cell phones were used in
the month after the ban?

Not significant

Cell Phone Use Before and After the Ban

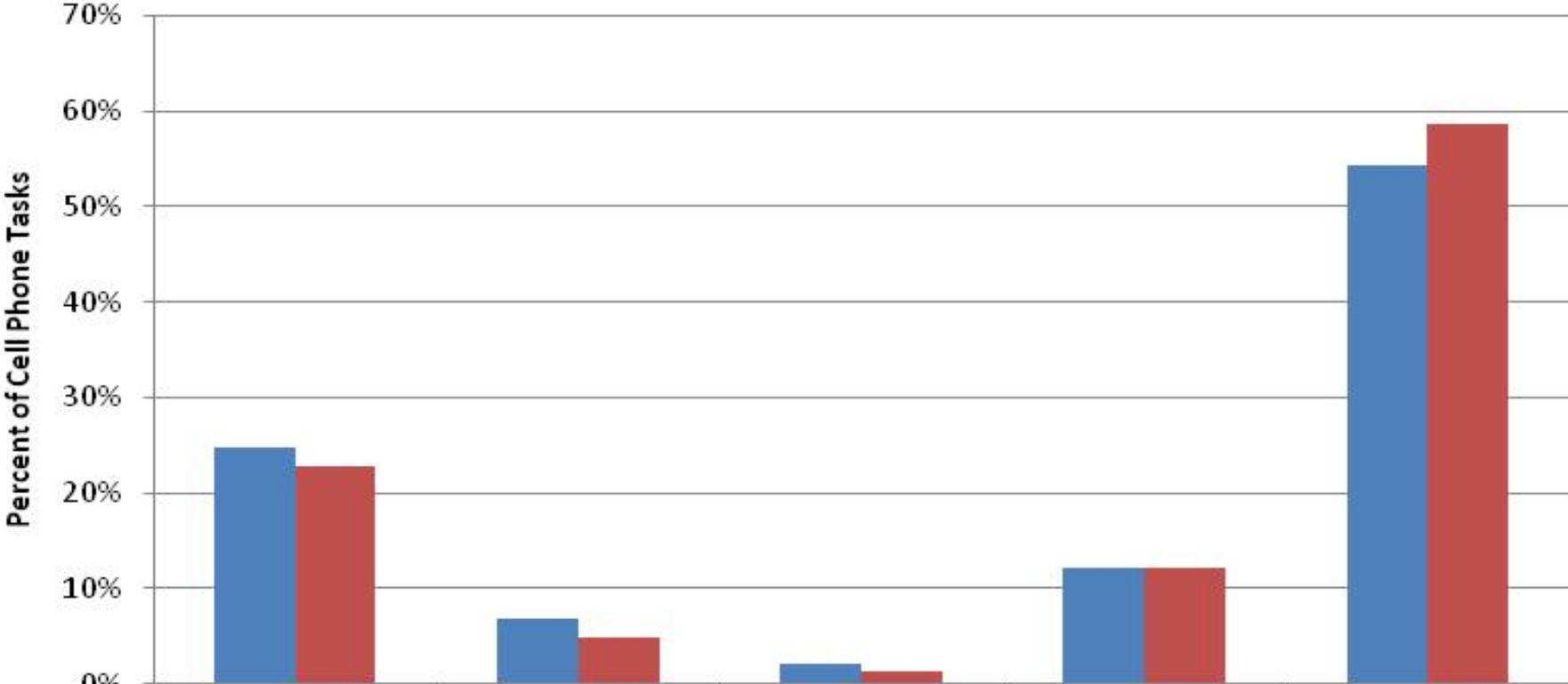


Did the ban:

Affect the types of cell phone functions used?

Not significant

Cell Phone Function By Month

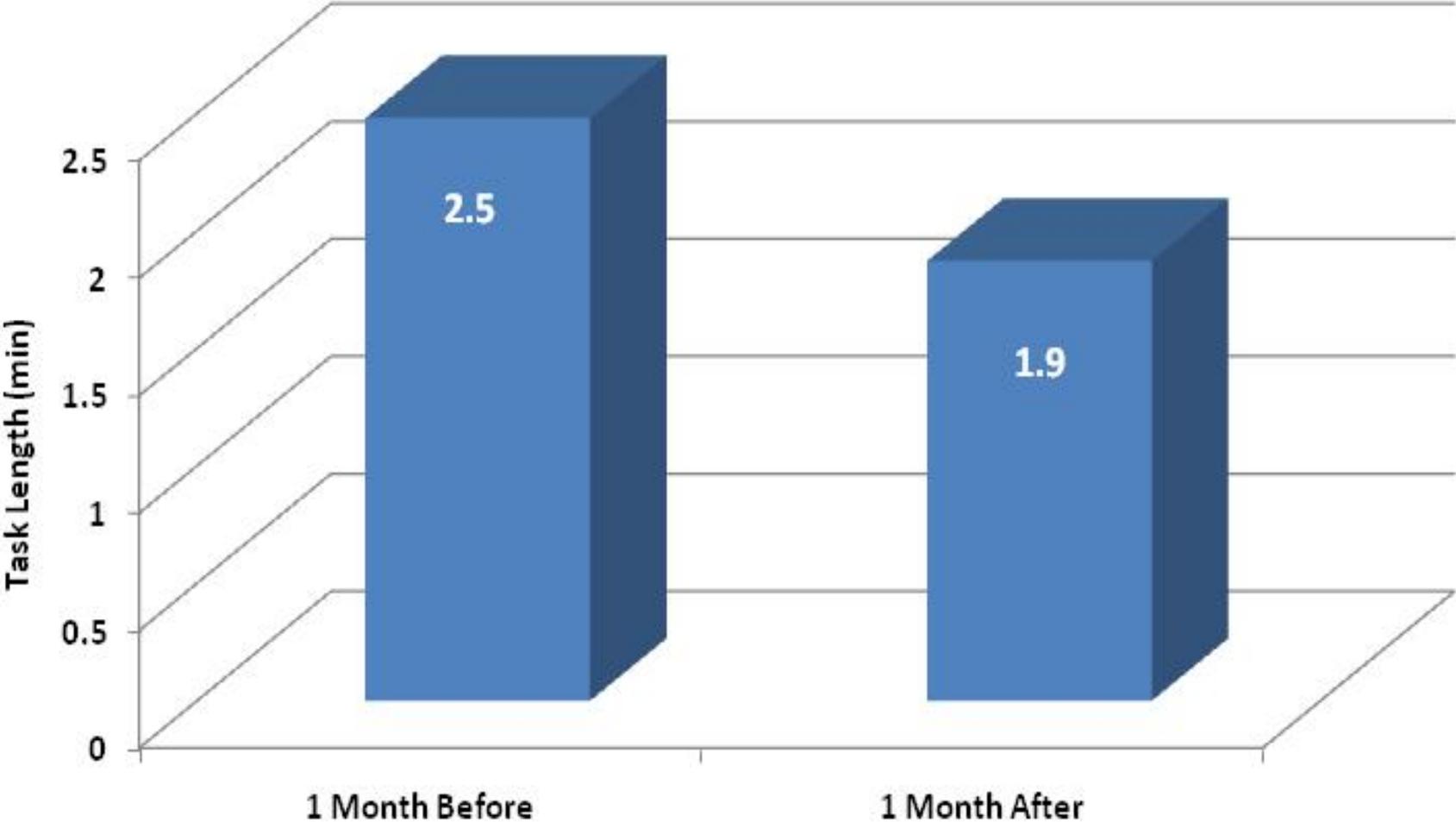


	Text messaging	Dialing	Locating/answering	Looking at display	Talking/listening
1 Month Before	25%	7%	2%	12%	54%
1 Month After	23%	5%	1%	12%	59%

Did the ban:

**Affect the task time for cell
phone tasks?**

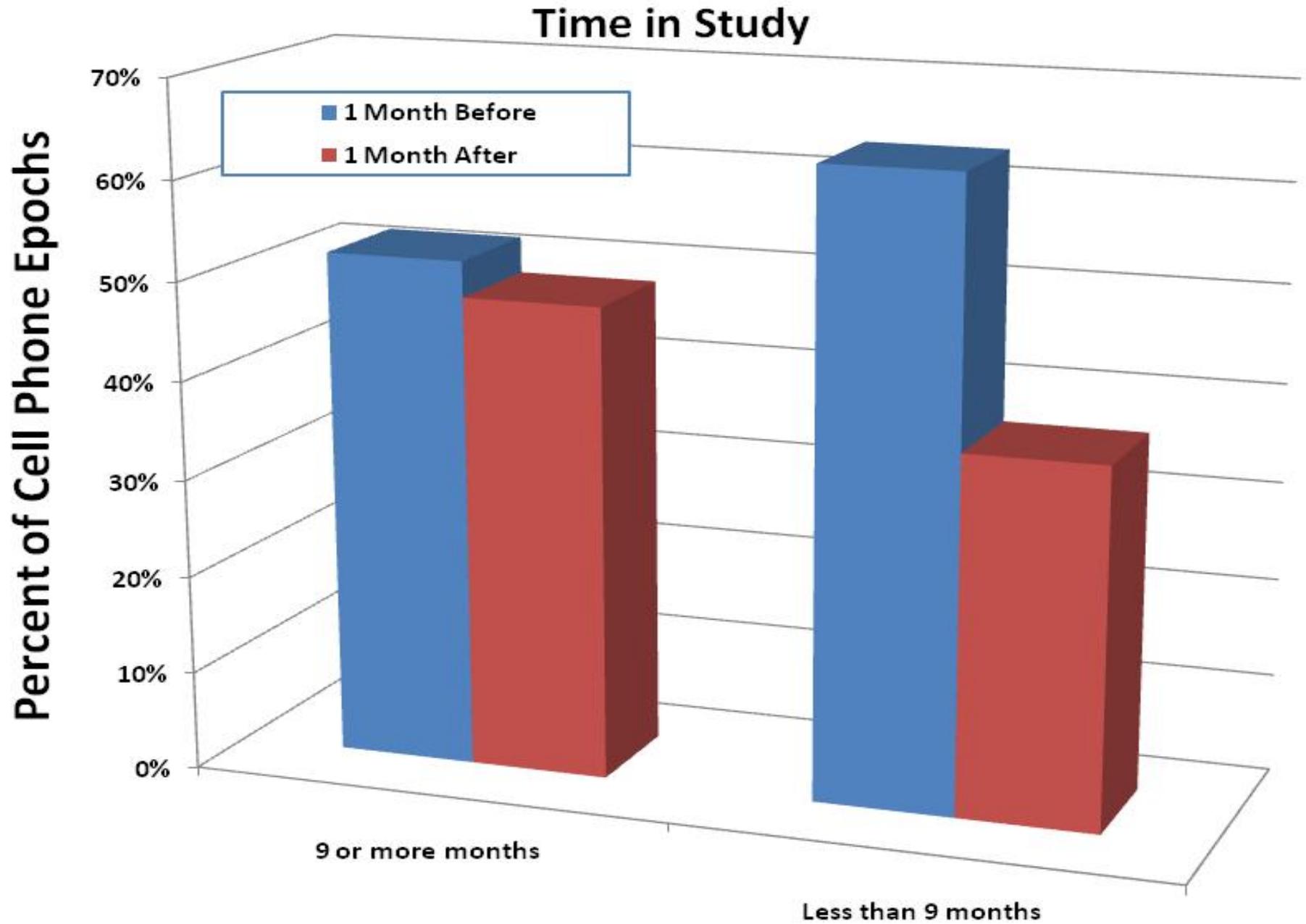
Cell Phone Task Length



Did the ban:

Differentially affect “newer” novice drivers, compared to those who had been licensed for a while?

Yes, Fisher's Exact Test, two-tailed $p = 0.0350$



Conclusions

- Law had a nominal, positive effect within the first month
- Strong evidence of reduced use for drivers with less experience

Conclusions

If legislators intend for teens not to use wireless devices while driving, the law should be a primary offense

- Until teens are charged themselves or know someone who is charged, they are unlikely to change their use patterns to a large degree
- Consequences are also important; consider higher fines and a zero tolerance rule for distracted driving in conjunction with a moving violation

Concluding remarks

We have a teen distracted driving epidemic

- New devices that are extremely dangerous to use while driving
 - More distracting than “traditional” automotive tasks by a factor of 10 or more
- New generation of users with:
 1. A high degree of confidence,
 2. An insatiable motivation to use the technology,
 3. An underdeveloped sense of risk perception, and
 4. A propensity to exercise poor judgment

Concluding remarks

The passage of primary laws with serious consequences is one of the few ways that we have to stem the tide of teen driving distraction and save lives

A general law would also save the lives of adult drivers; particularly younger adults