Driven to Distraction:
Brain Injury and Driving

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May 19, 2021

2021 Webinar Series

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Welcome!

Maria Crowley

Director, Professional Development

Moderator

Haleigh Cushen

Coordinator, Member Services & Communications

Organizer

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About NASHIA

Nonprofit organization created to assist
State government in promoting partnerships and building
systems to meet the needs
of individuals with brain injury
and their families.

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- Continuing Education Credits Available: SW and CRCC
- Certificates of Attendance
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  - NASHIA.org > Professional Development > Trainings On Demand

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Today’s Presenter

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THE UNIVERSITY OF ALABAMA AT BIRMINGHAM

Driven to Distraction

Despina Stavrinos, PhD

Associate Professor, Department of Psychology

Director, Translational Research for Injury Prevention Laboratory

TRIP Translational Research for Injury Prevention LABORATORY

Road Injuries & Fatalities

- In top 10 causes of world-wide deaths for low-income through upper-middle income countries *(WHO, 2020)*
- Leading cause of death for people ages 5-24 in the U.S. *(WISQARS, 2021)*
- 2nd leading cause of death for people ages 25-44 in the U.S *(WISQUARS, 2021)*
- Average of 100 die each day in U.S. *(NHTSA 2020)*
- Costs U.S. over $154 billion dollars per year in just medical bills and work lost *(WISQARS, 2021)*

National Center for Statistics and Analysis. (2020, December). *Overview of motor vehicle crashes in 2019*. National Highway Traffic Safety Administration.

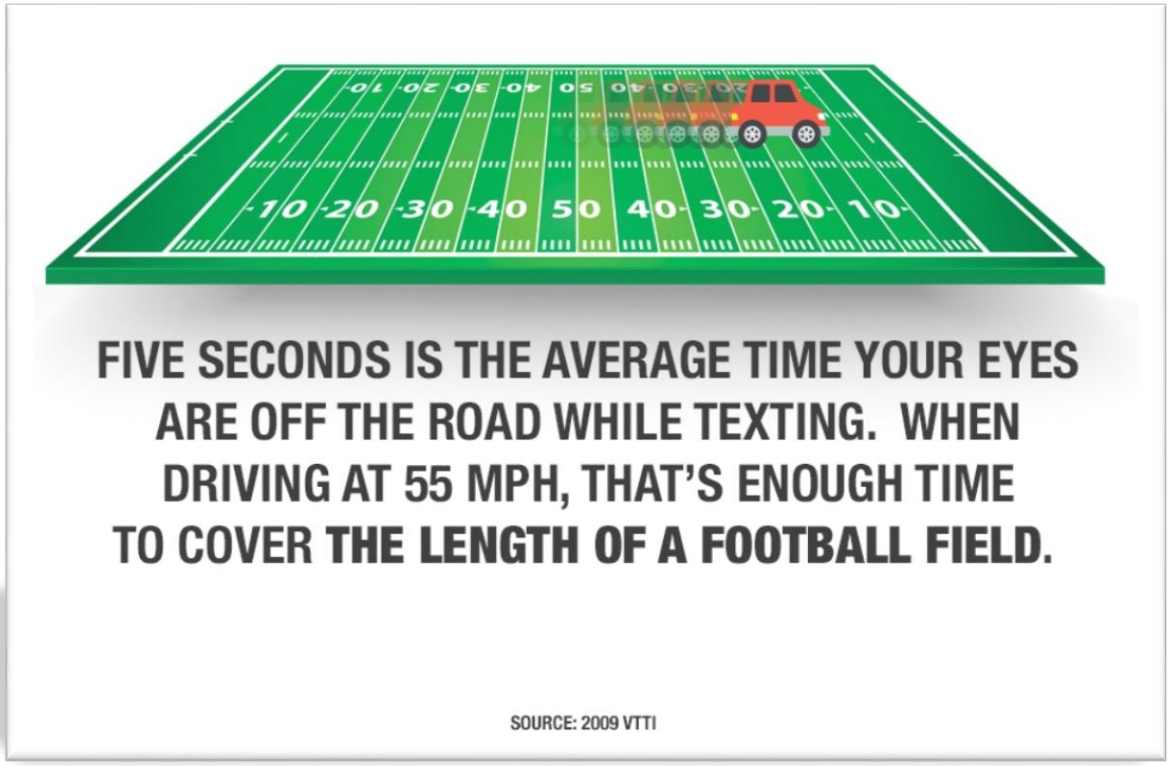
"…the diversion of attention from activities critical for safe navigation to a competing activity"

Defining Distracted Driving

Hanowski et al, 2011, National Surface Transportation Safety Center for Excellence Meeting

Distracted Driving: An Epidemic

- MVCs involving driver distraction (2019 data)
  - 3,142 killed
  - 424,000 injured

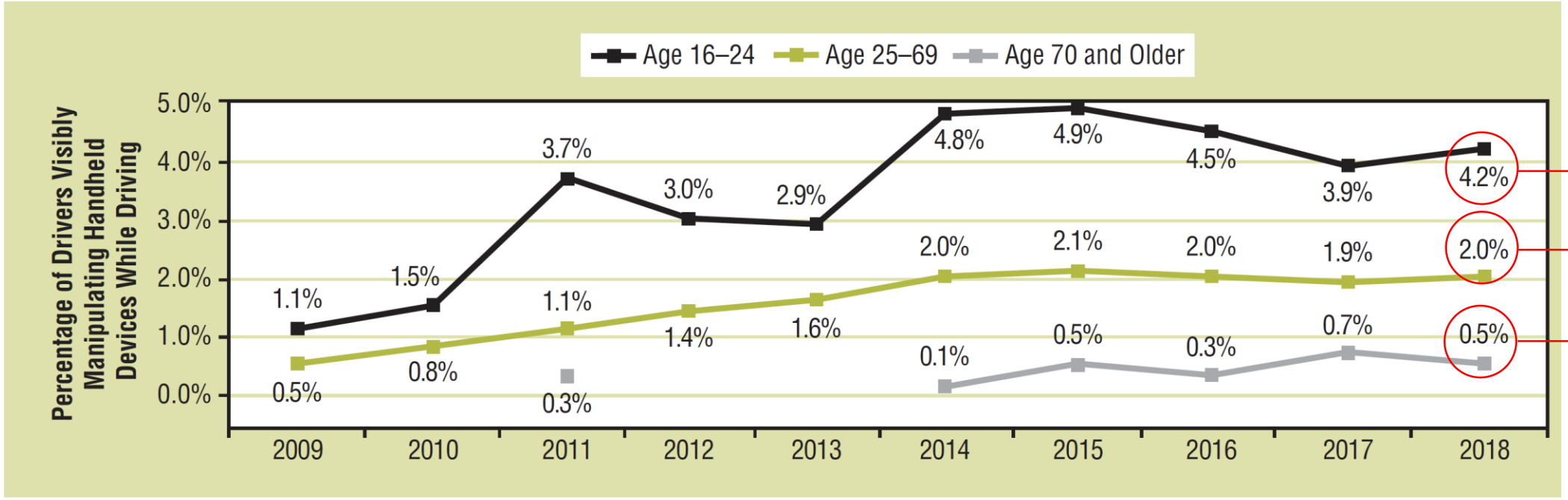


National Center for Statistics and Analysis. (2021, April). *Distracted driving 2019*. National Highway Traffic Safety Administration.

Distracted Driving: An Epidemic

Observation of 51,414 vehicles at 1,612 sites

Drivers Visibly Manipulating Handheld Devices by Age, 2009–2018

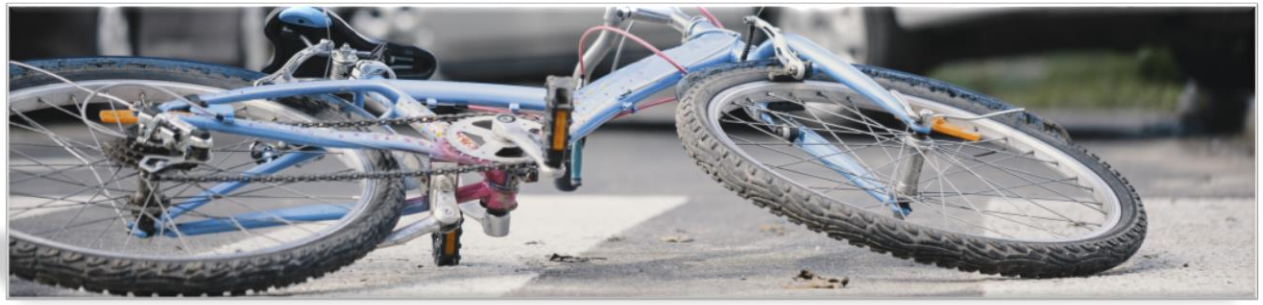


Note: Missing data points signify insufficient data to produce reliable estimates.

National Center for Statistics and Analysis. (2019, October). *Driver electronic device use in 2018* . Washington, DC: National Highway Traffic Safety Administration.

Distracted Driving Fact Check

- About 20% of fatalities involving a distracted driver *were not* in vehicle passengers
  - Pedestrians
  - Bicyclists
  - Otherwise outside a vehicle
- 25% of distracted drivers involved in fatal crashes were young adults aged 20–29
- Drivers aged 15-19 were more likely to be distracted than drivers aged 20 and older in MVCs involving a fatality
- 9% of all teens who died in MVCs were killed in crashes involving distracted driving



www.cdc.gov/transportationsafety/distracted_driving/index.html

Distracted Driving Fact Check

- In 2019, 39% of high school students who drove in the past 30 days texted or emailed while driving on at least one of those days
- Texting or emailing while driving was more common among
- Older students than younger students
- White students (44%) than black (30%) or Hispanic students (35%).
- Texting or emailing while driving was equally as common among students with mostly As or Bs as among students with mostly Cs, Ds, or Fs
- Students who texted or emailed while driving were also more likely to report other transportation risk behaviors
  - More likely to not always wear a seat belt
  - More likely to ride with a driver who had been drinking alcohol
  - More likely to drive after drinking alcohol

www.cdc.gov/transportationsafety/distracted_driving/index.html

UAB's Distracted Driving Initiative

Dr. Despina Stavrinos, Transportation Secretary Ray LaHood, and Dr. Russ Fine at the 1st National Distracted Driving Summit

Translational Research for Injury Prevention (TRIP)

- Established in 2009
  - Research: $9+ million in funding
  - Education: 130+ students
  - Outreach: ~ 10,000 students statewide

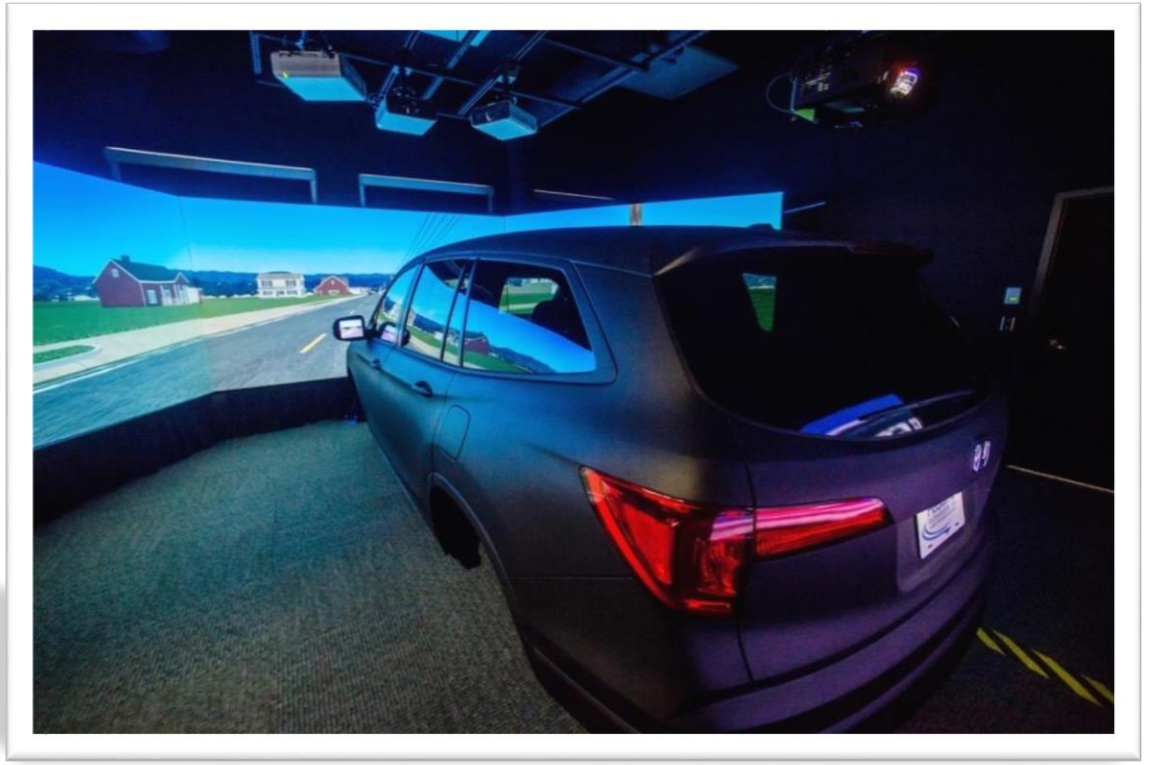
TRIP LAB

State-of-the-Art Driving Simulator

UAB TRIP Lab Driving Simulator

2016 Honda Pilot

- Honda Manufacturing Lincoln, Alabama
- Realtime Technologies, Inc.
- High fidelity
- Fully immersive



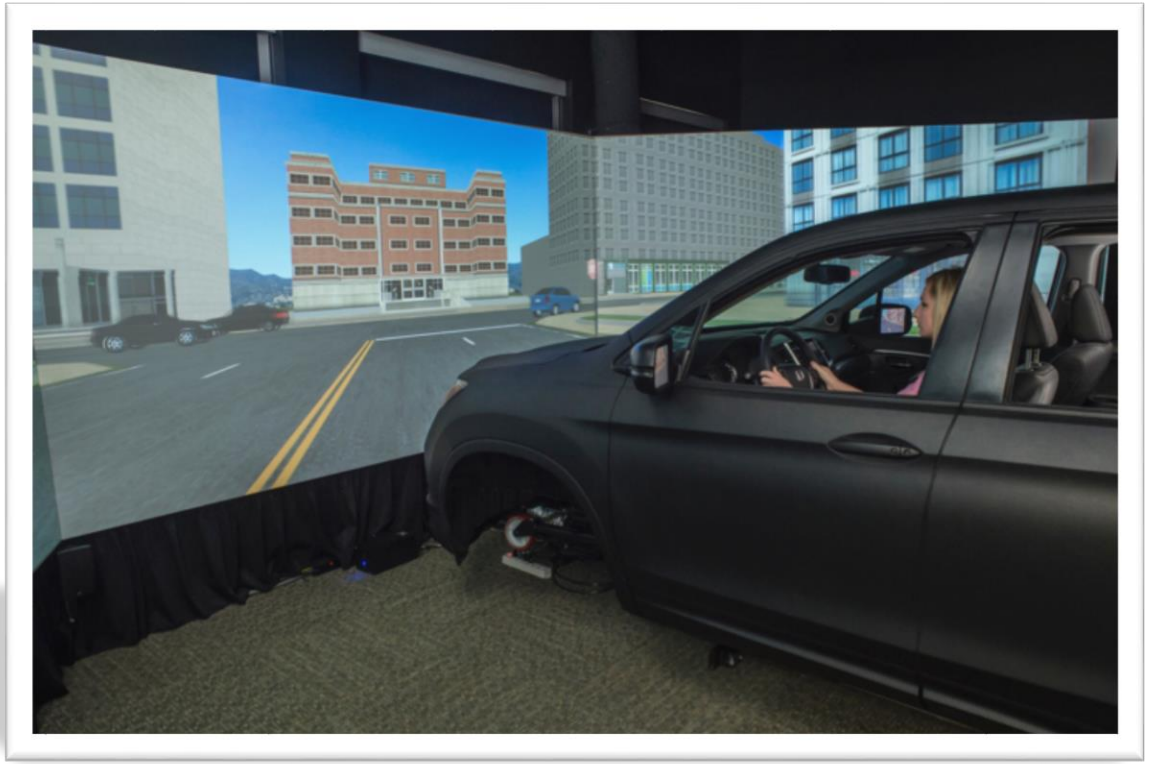
UAB TRIP Lab Driving Simulator

Fully functional

- Throttle
- Brake
- Gear selector
- Steering wheel
- Turn signals
- Dashboard

UAB TRIP Lab Driving Simulator

- Normal ride height
- Motion Base System
- Pitch cues
  - Acceleration
  - Braking
- Sensitive haptic feedback



View of Simulated Environment

- Front
  - Three 80” LCD projection screens
  - 180° field of view
- Rear
  - Side mirrors have LCD displays
  - Large screen behind cab

UAB TRIP Lab Driving Simulator

Additional systems work in conjunction with the TRIP Lab Driving Simulator to supply many additional outcomes associated with driving

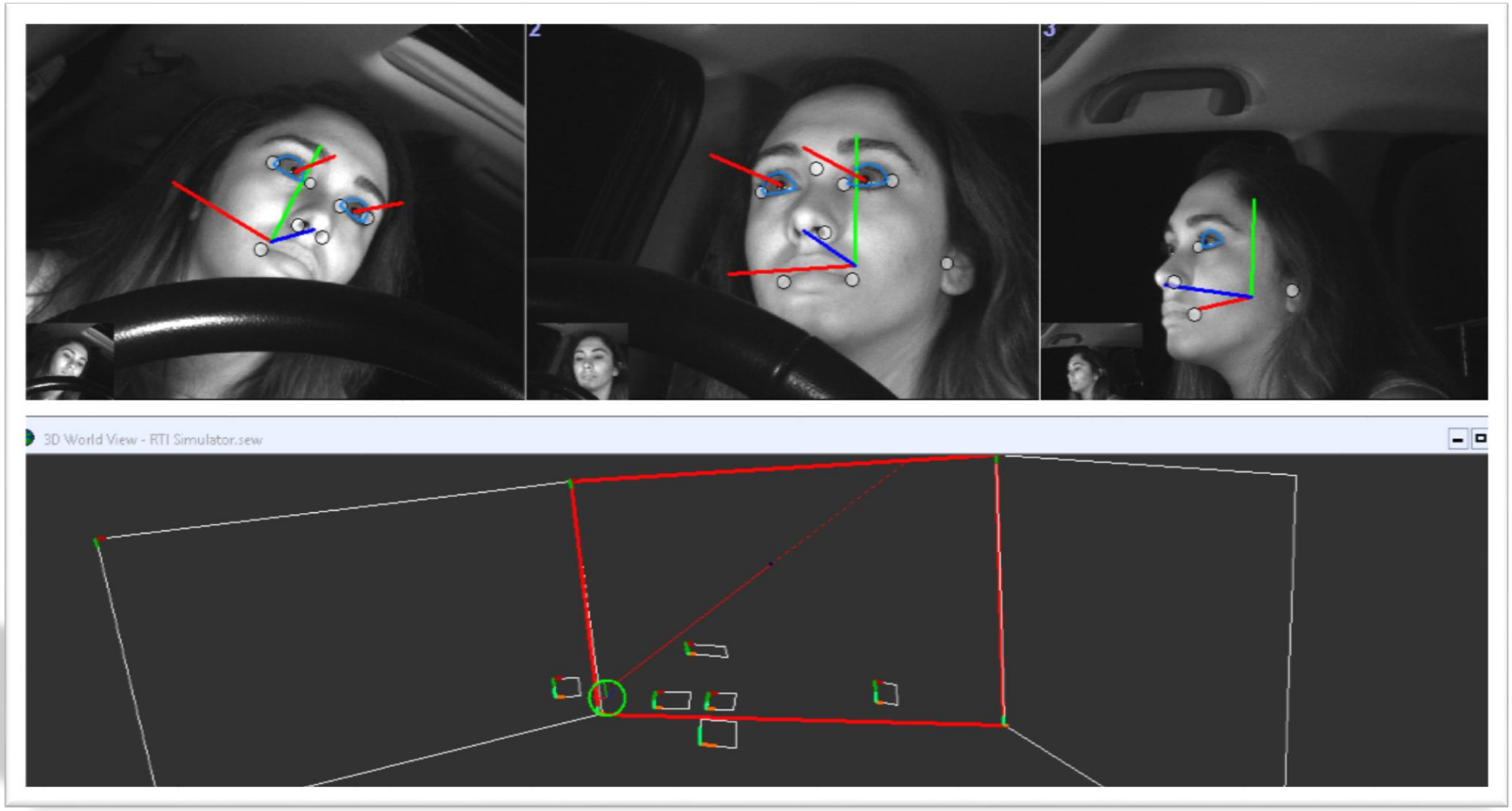
UAB TRIP Lab Driving Simulator

Smart Eye eye tracking system

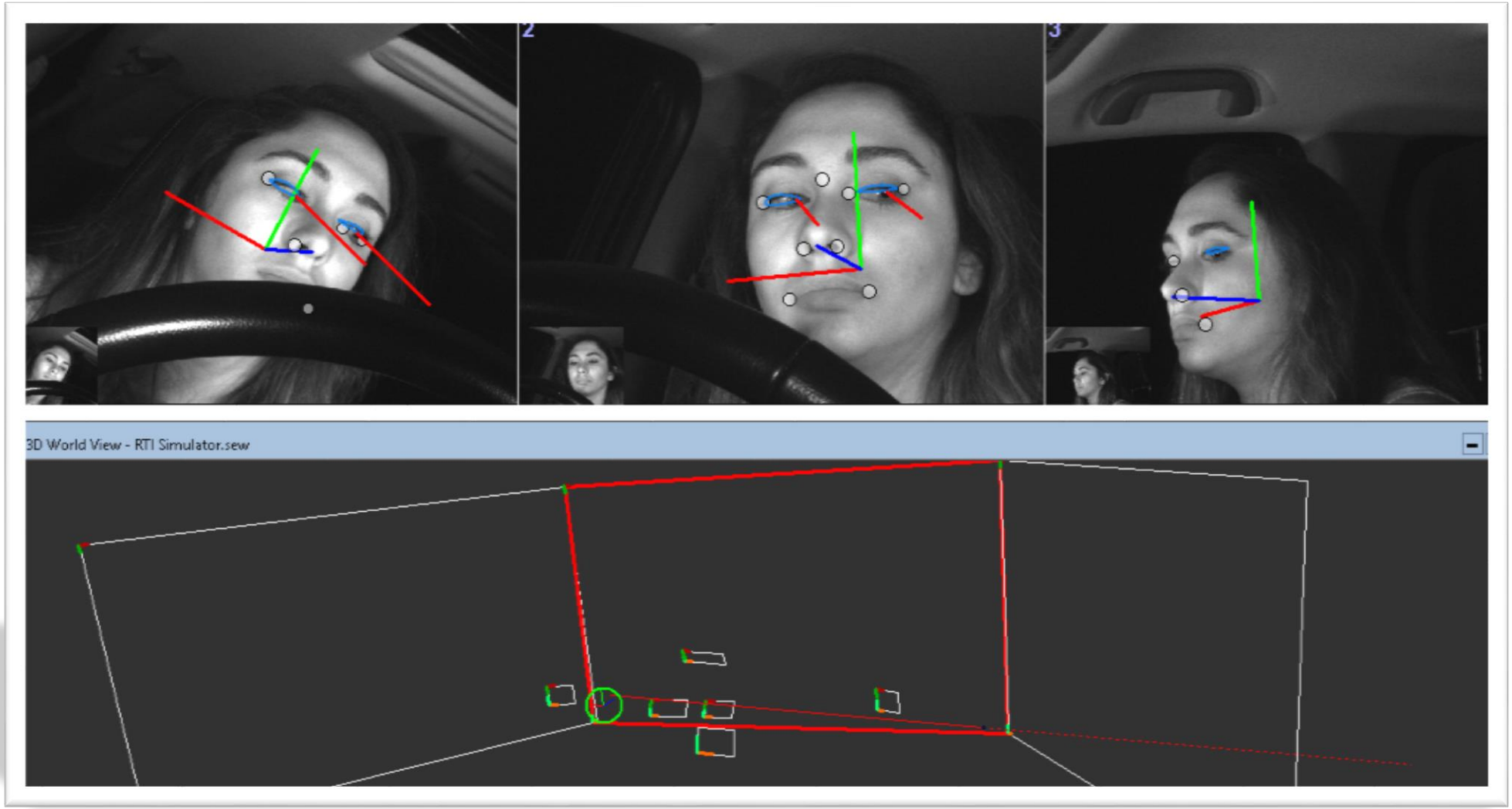
- 3 Smart Eye Pro 3D Eye Tracking cameras
- Tracks gaze direction, head position, eyelid openings
- 3D virtual model of UAB TRIP Lab Driving Simulator environment

smart eye

Eye Tracking System

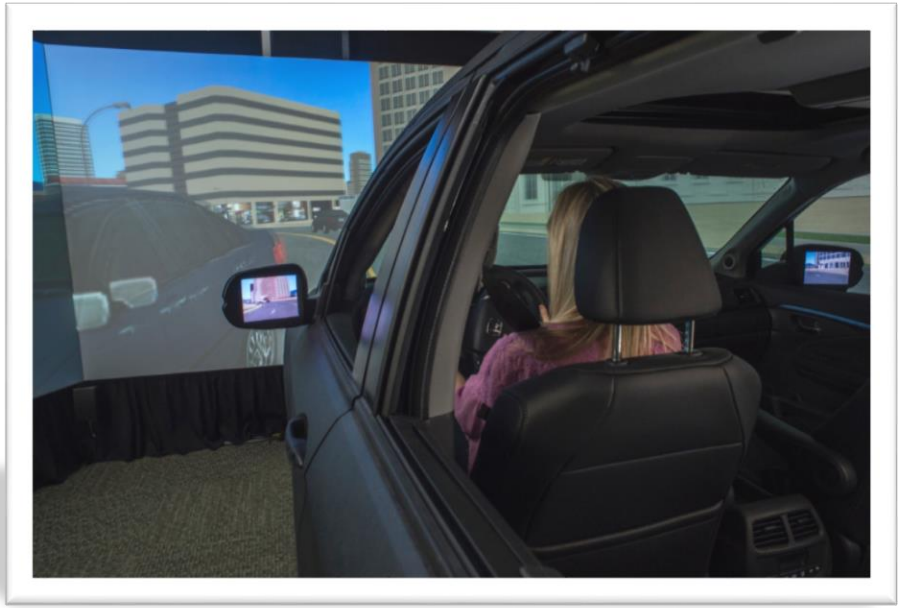


Eye Tracking System



Distracted Driving Performance Metrics

- Distraction Tasks
  - Electronics
  - Working memory tasks
  - Coin-sorting



- Performance Measures
  - Lane deviations (swerving)
  - Reaction time
  - Speed
  - % time eyes of road
  - Crashes

Measuring Distracted Driving

- Crash reports
  - Underestimate?
- Naturalistic Studies
  - High cost
- Instrumented Vehicles & Simulator
  - Real world behavior?
- Self-report
  - Biased?

Overarching Goal of Research Program

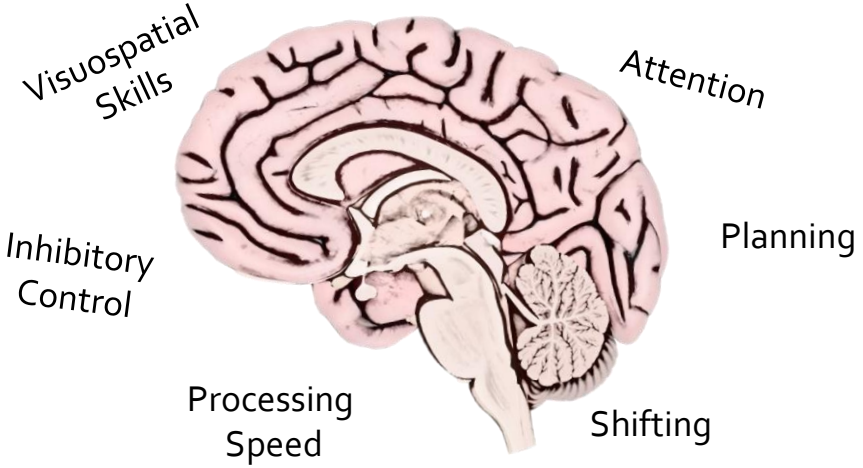
Reduce the morbidity and mortality resulting from transportation related injury *through:*

1. Investigation of *risk and protective factors for MVCs*
2. Translation of findings into *evidence-based interventions* that may improve outcomes for at-risk, vulnerable populations

TRIP LAB

Driving as a Cognitively Challenging Task

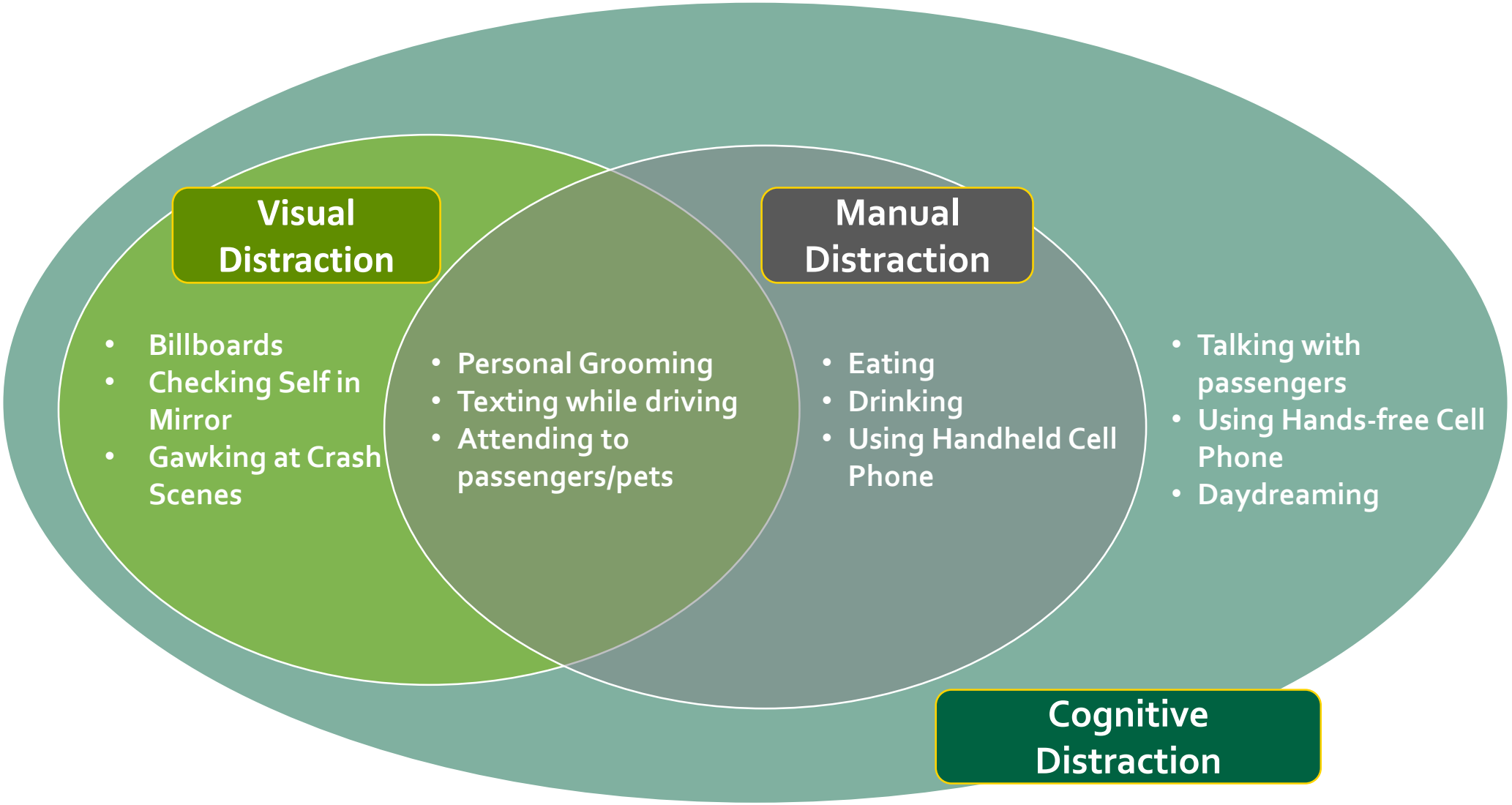
Neuropsychological Functions



Distraction Impacts All Drivers

- Teens and young adults (Stavrinos et al., 2015; Parr et al., 2016)
- Drivers with ADHD (Stavrinos et al., 2015)
- Drivers with ASD (Bishop et al., 2017)
- Older drivers (Stavrinos et al., 2015; Parr et al., 2016)
- Truck drivers (McManus et al., 2017; Stavrinos et al., 2016; Stavrinos et al., 2012)
- But not all tasks are equally detrimental…

Domains of Distraction

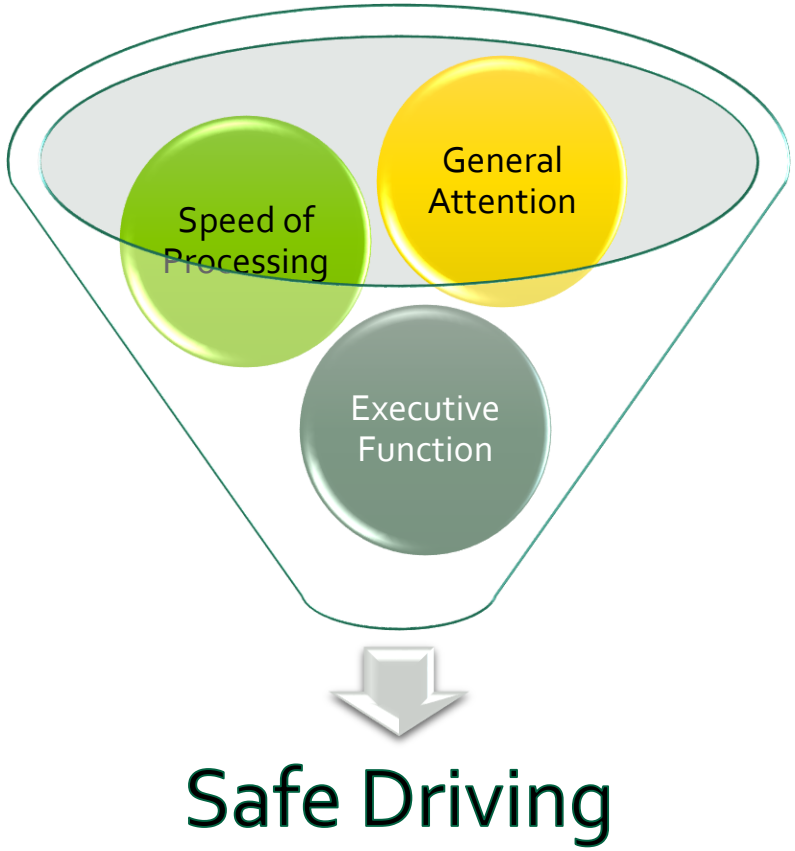


National Traffic Law Center. (2017, May). *Investigation and prosecution of distracted driving cases*. Washington, DC: National Highway Traffic Safety Administration.

Risk Factors for MVCs Faced by Survivors of TBI

Risk Factors for MVCs Faced by Survivors of TBI

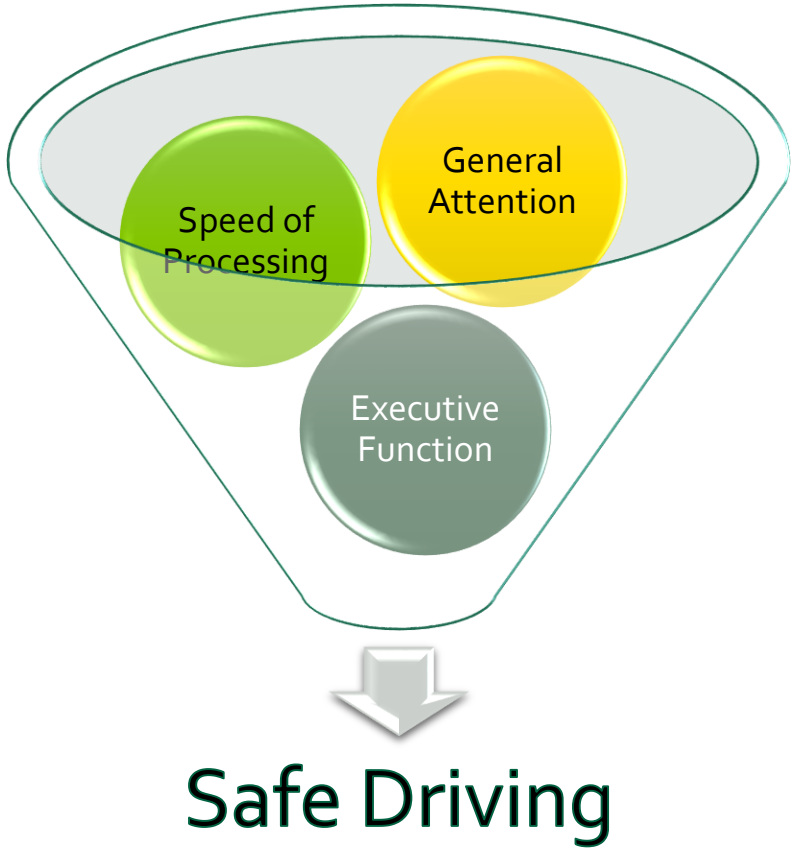
- Examine how TBI-related deficits could impact factors needed to drive safely
  - Shortened attention span
  - Memory problems
  - Problem-solving deficits
  - Problems with judgement
  - Loss of sense of time/space
  - Decreased awareness of self/others
  - Changes in hearing, vision, touch



www.hopkinsmedicine.org/health/conditions-and-diseases/traumatic-brain-injury

Risk Factors for MVCs Faced by Survivors of TBI

- Examine how TBI-related deficits could impact factors needed to drive safely
  - Changes in hearing, vision, touch
  - Loss or heightened sensation of body parts
  - Left- or right- neglect
  - Body-limb spatial relation
  - Difficulty reading
  - Difficulty remembering how to drive
  - Dizziness
  - Disinhibition



www.hopkinsmedicine.org/health/conditions-and-diseases/traumatic-brain-injury

TBI Sequalae May Increase Risk of Distracted Driving

- Talk with your rehabilitation specialist or physician
- Examine the TBI-related deficits experienced by the individual
- Make the survivor of TBI part of the discussion
- Monitor level(s) of deficit(s)
- Driving may be possible very soon after injury, after sequalae have passed, or not at all

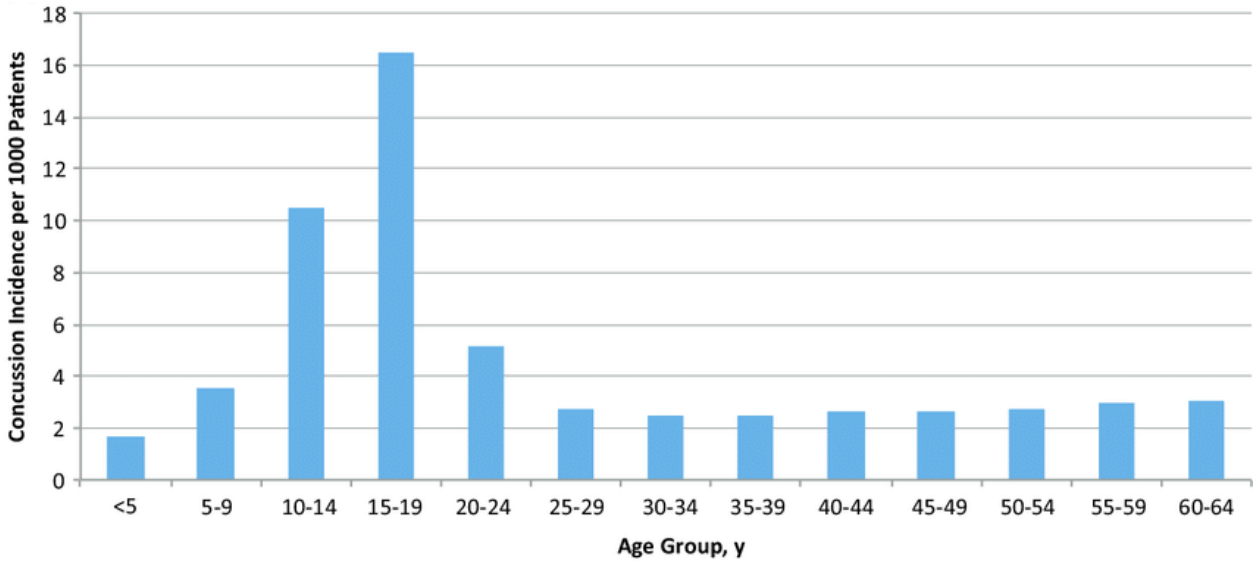
Risk Factors: Neurotypical vs. TBI Populations

- Risk factors are the same
  - MVCs
  - Distracted driving
- Sequelae of TBI are key
  - Can introduce previously unobserved risk factors
- Time may mitigate sequelae
- How much time is critical factor
  - Communication
  - Research
    - R2DRV

R2DRV: Return to Drive After mTBI

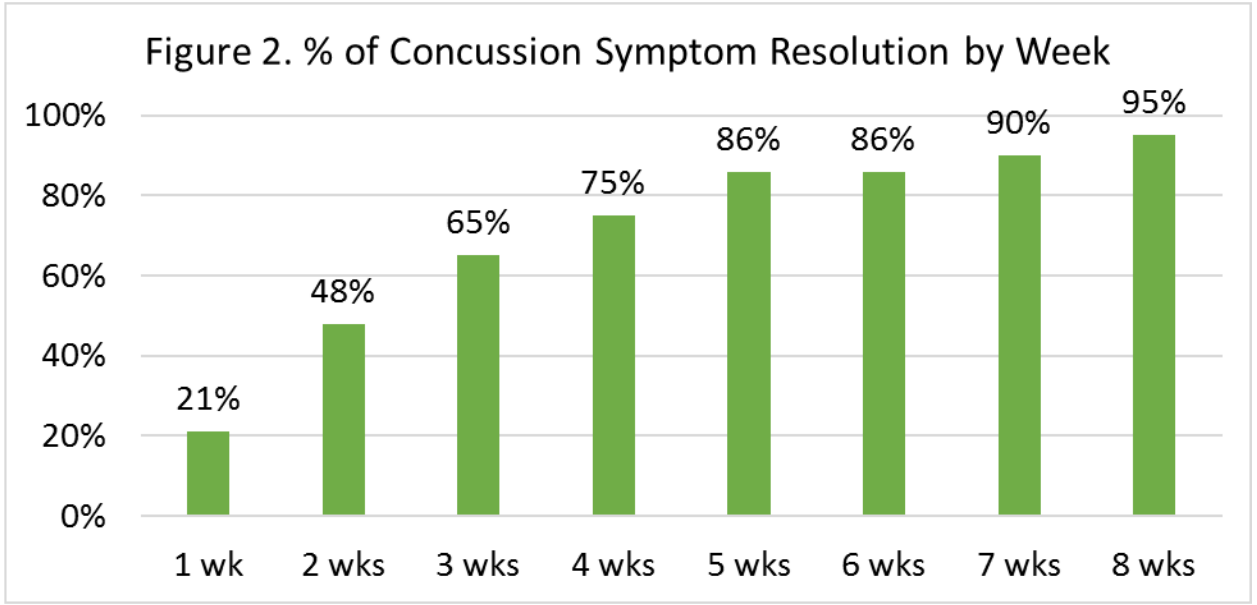
Funded by
Eunice Kennedy Shriver National Institute of Child Health and Human Development

- Clinical practice guidelines in Canada and Australia recommend "no driving within 24 hours of a mTBI," but these guidelines are not evidence based.
- In the US, no guidance, although physicians commonly prescribe physical and cognitive rest.
- Evidence-based guideline is urgently needed to inform clinical care.

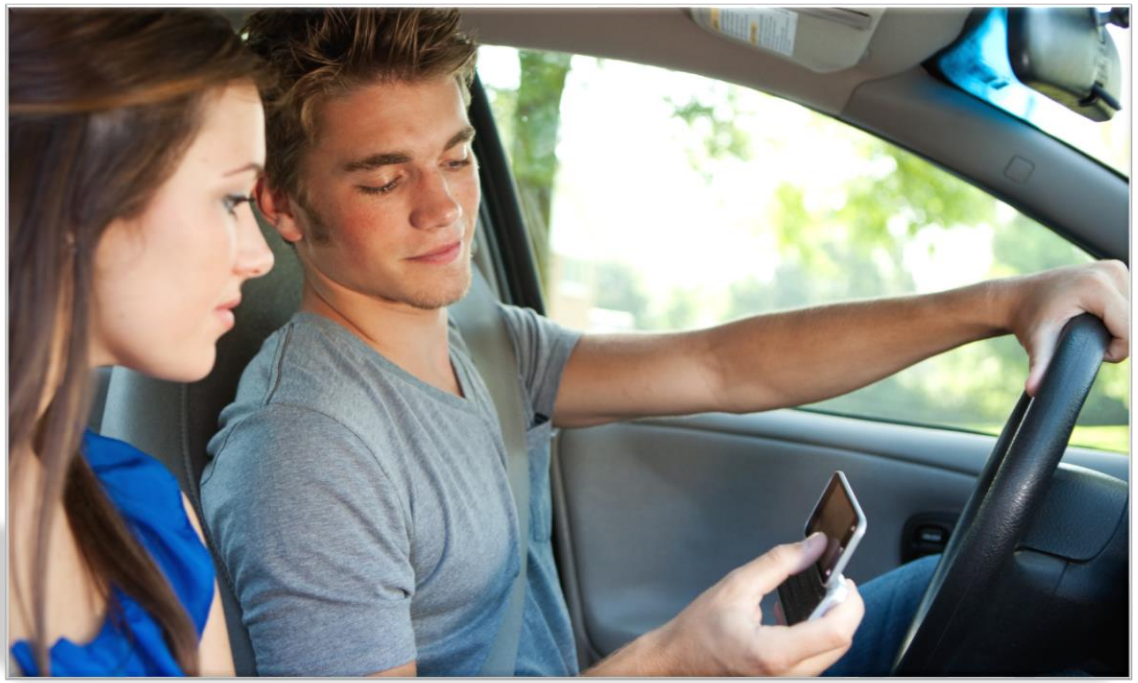


R2DRV

- Cognitive function is often impaired following mTBI, but typically resolves within 4 weeks post-injury
- Median time to self-reported return to drive: 2 weeks
- Each reported PCS reduced likelihood to drive by 14%



R2DRV



- Teens show decrements in driving performance (especially during periods of high cognitive load) acutely post-injury that improve over time
- Increased cognitive load → higher standard deviation of lane position, slower braking reaction time

Overarching Aims

How does driving change from acutely post-injury to symptom resolution?

Neuropsychological
Visual & verbal mem,
rxn time, processing speed

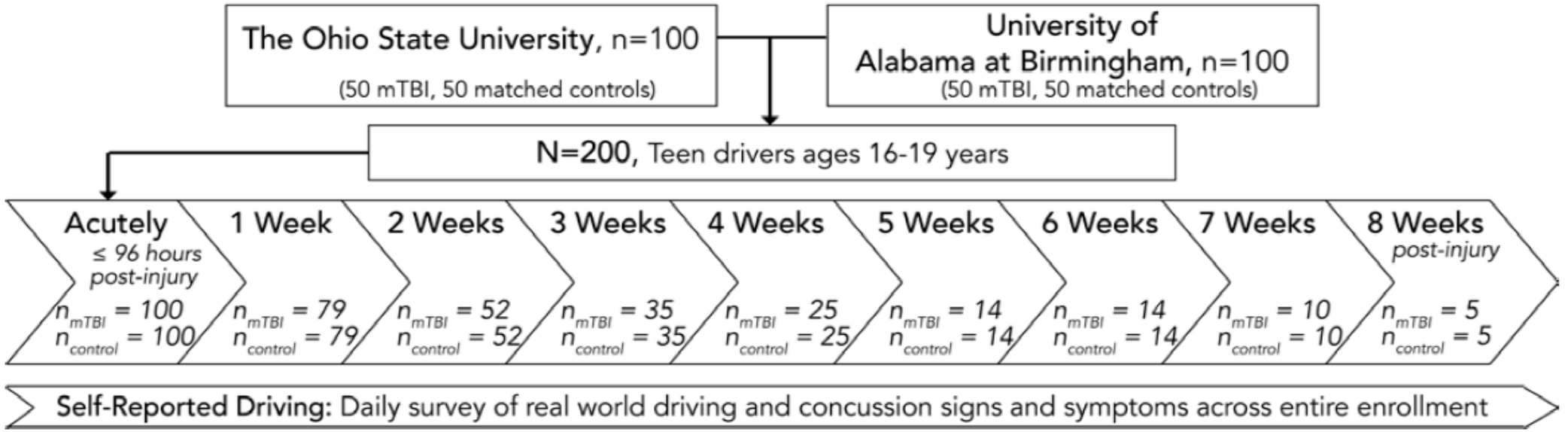
Driving behavior
Driving Simulator

Cognitive Load
Distraction

How are differences in driving performance explained by cognitive mediators?

How does cognitive load affect driving?

R2DRV: Study Design and Participant Flow



We need your help.

*COVID-19 safety protocols are in place.

- Share information about R2DRV with athletes.
- Coordinate time for research staff to attend team meetings to obtain pre-season consent.
- Refer athletes with a concussion or mild TBI to R2DRV within 48 hours of the injury.

STEP 1
Screen athletes with a concussion for R2DRV, using the Inclusion/Exclusion criteria.

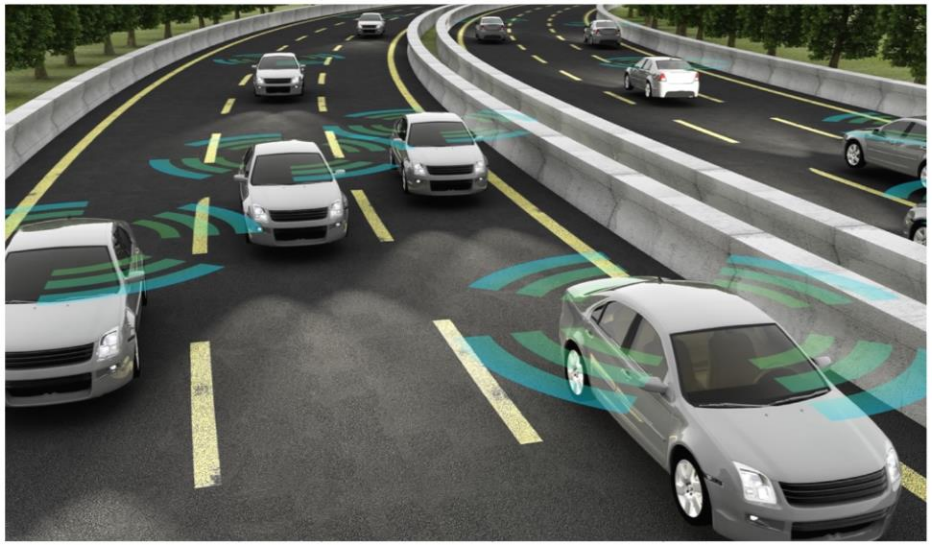
STEP 2
Call the R2DRV hotline at (205) 975-9440 ASAP but no later than 48 hours after injury.

TRIP LAB
(205) 975-9440 | TRIPLAB@UAB.EDU

Potential Impact

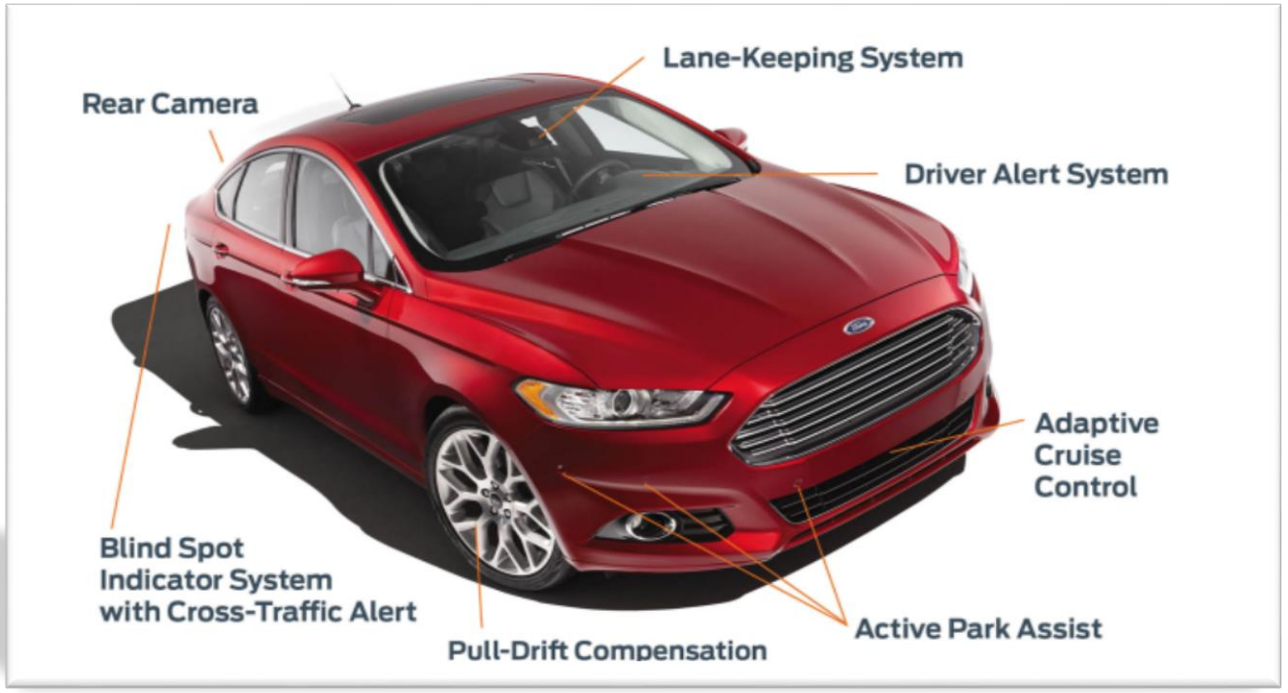
- Evidence on *when* teens can safely return to drive after a mTBI
- Will inform the development of clinical practice
- Online tool for clinicians to determine return based on key patient characteristics

Future Challenges and Opportunities



Technology & Automation

- Adaptive cruise control
- Electronic stability control
- Adaptive headlights
- Forward collision warnings
- Lane departure warnings
- Heads-up displays
- Verbal control systems



Top 10 Tips to Avoid Distracted Driving

1. Fully focus on driving.
2. Store loose gear, possessions and other distractions that could roll around in the car, so you do not feel tempted to reach for them on the floor or the seat.
3. Make adjustments before your get underway.
4. Finish dressing and personal grooming at home – before you get on the road.
5. Snack smart.

https://exchange.aaa.com/safety/distracted-driving/tips-for-preventing-distracted-driving/

Top 10 Tips to Avoid Distracted Driving

6. Secure children and pets before getting underway.
7. Put aside your electronic distractions.
8. If you have passengers, enlist their help so you can focus safely on driving.
9. If another activity demands your attention, instead of trying to attempt it while driving, pull off the road and stop your vehicle in a safe place.
10. If you cannot devote your full attention to driving because of some other activity, it's a distraction. Take care of it before or after your trip, not while behind the wheel.

https://exchange.aaa.com/safety/distracted-driving/tips-for-preventing-distracted-driving/

Other Tips to Avoid Distracted Driving

- What drivers can do
  - Use an app to reduce distractions while driving
    - Cell phone blocking technology
    - Available from wireless services and other companies
    - Basic technologies prohibit calls/texts while a vehicle is in motion.
    - Advanced systems block audio features, track speed and sudden stops
    - Many send text or email notifications to parents of teen drivers.
- What passengers can do
  - Speak up! Ask the driver to focus on driving
  - Reduce distractions for the driver by assisting with navigation or other tasks

www.cdc.gov/transportationsafety/distracted_driving/index.html

Traffic Safety Culture

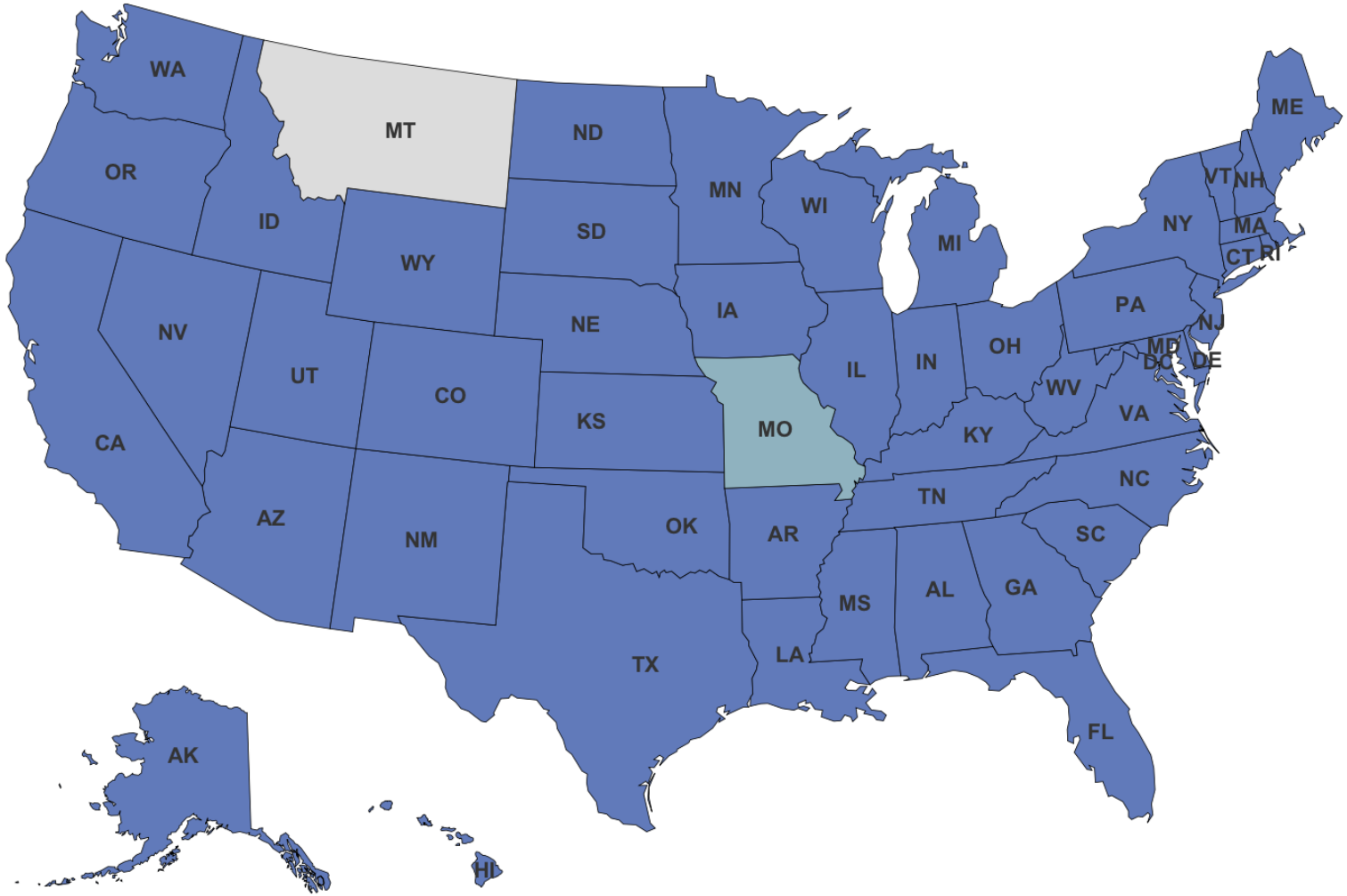
- More than 1 in 5 drivers report having been involved in a MVC in which someone had to go to the hospital
- Nearly 1 in 3 drivers report having had a relative who was seriously injured or killed in a MVC
- Most drivers perceive that distracted drivers are a bigger problem today than in past years.
- Distracted driving outpaced all other issues as a growing concern.

Traffic Safety Culture

- The 2017 Traffic Safety Culture Index reveals motorists' discordance between traffic safety culture beliefs and actual driving behavior.
- The results continue to show an attitude of "do as I say and not as I do" among motorists.

aaafoundation.org

Opportunities: Policy



Texting Bans by State

- All Drivers
- Partial
- No ban

www.ihs.org, 2021

Distracted Driving: Progress?

- Georgia introduces hands-free law
  - Drivers cannot have phone in hand or touching any part of body while talking on their phone and driving

↓ Talking on the phone

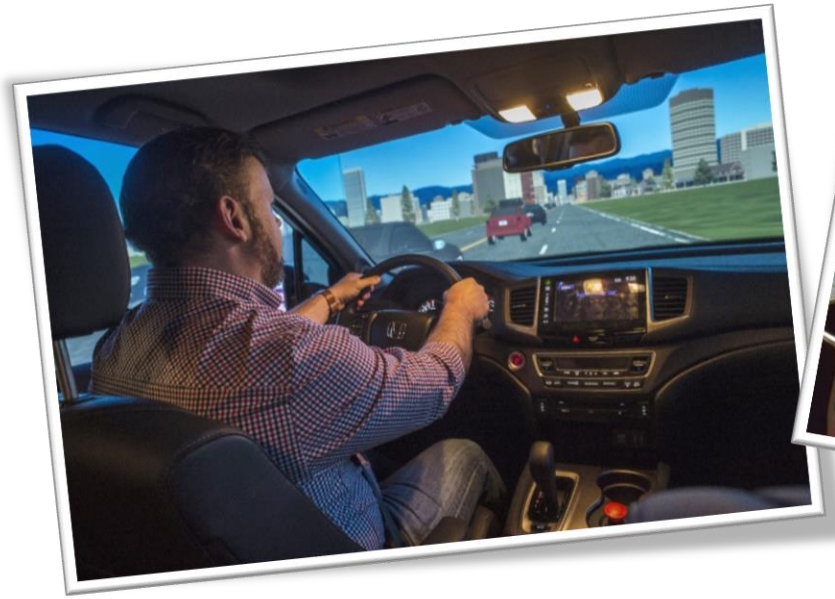
But…

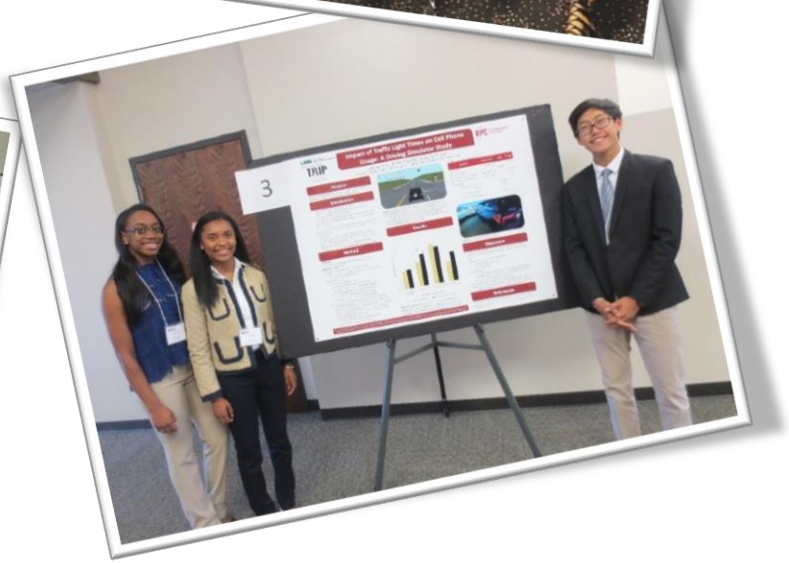
↑ Manipulating the phone (IIHS, 2019)

- Texting
- Browsing
- Navigation
- Music & podcasts

Opportunities: Community Outreach

- Summer workshop for high school students
- Summer internships for undergraduate students
- High school assemblies in the Greater Birmingham area
- URKEYS2DRV events with Children's of Alabama
- In-house TRIP Lab/simulator tours





Impact on Our Community

Mother of teen killed in distracted driving wreck accepts diploma in her memory

Camryn Callaway (Source: WBRC)

By Catherine Patterson | May 23, 2018 at 12:45 AM CDT - Updated August 15 at 11:47 AM

ALABASTER, AL (WBRC) - The mother of a teen killed in a texting and driving wreck accepted the diploma she would've received Tuesday night.

We were there for the emotional graduation ceremony.

This is a day most teens and their parents look forward to.

But after Camryn Callaway, 17, was killed in a distracted driving wreck earlier this year, her mother knew she wouldn't get to see her daughter in her cap and gown walking across the stage.

So on Tuesday, her mother Michelle Lunsford accepted her daughter's diploma in her memory.

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Translational Research for Injury Prevention Laboratory

Distracted Driving Resource: Statistics, prevention programs, research, and much, much more!

DISTRACTION.GOV

Official US Government Website for Distracted Driving

Acknowledgements

- EUNICE KENNEDY SHRIVER NATIONAL INSTITUTE OF CHILD HEALTH & HUMAN DEVELOPMENT
  - R01HD089998 (REACT)
  - R01HD098175 (R2DRV)
- REGIONAL PLANNING COMMISSSION OF GREATER BIRMINGHAM
- COLLABORATORS
  - NATIONWIDE CHILDREN'S HOSPITAL (DR. GINGER YANG)
  - OHIO STATE UNIVERSITY (DR. THOMAS KERWIN)

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THE UNIVERSITY OF ALABAMA AT BIRMINGHAM

Questions?

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Thank you!

Other Training Events

NASHIA 2021 Webinar & Podcast Series

NASHIA Training U:

Leading Practices Academies

NASHIA Training U Workshops

NASHIA

Annual Event:

State of the States Conference: 2021

Membership:

NASHIA is a membership organization.

Please join today!

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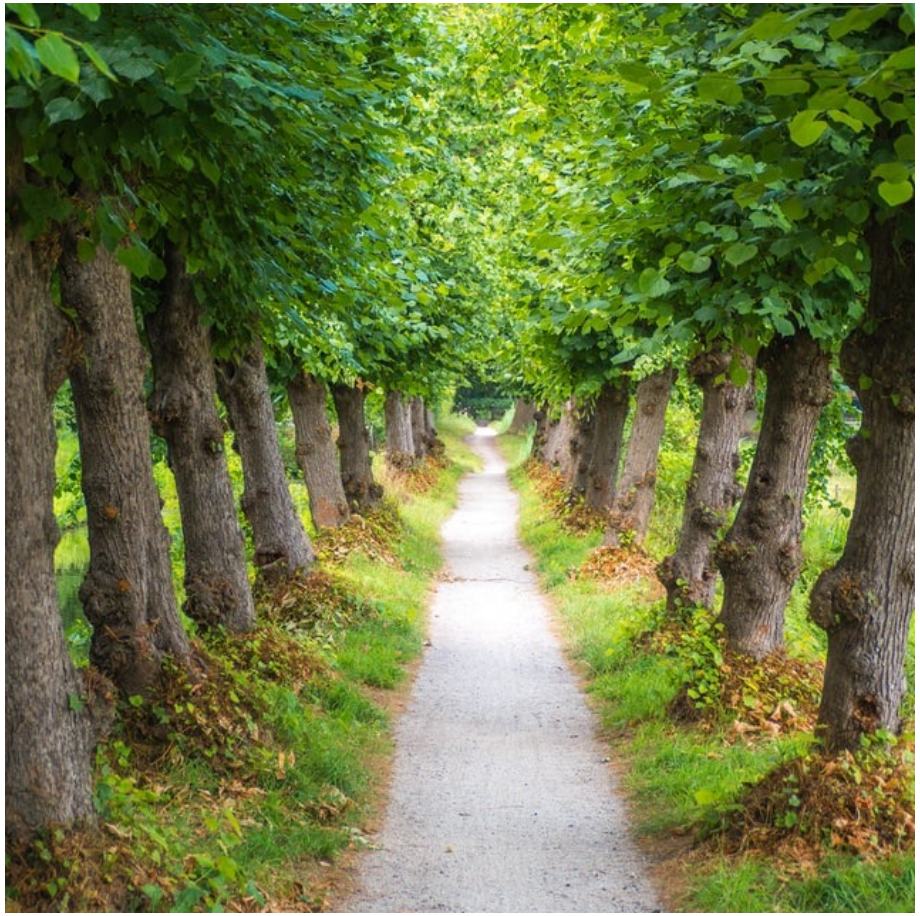

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Thank you!

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