



Understanding the distracted brain

*Why driving while using hands-free
cell phones is risky behavior*

*National Safety Council
White Paper*

making our world safer®



Motor Vehicle Crashes

- No. 1 cause of death
- An estimated 39,000 to 46,000 people killed in crashes every year
- More than 2.2 million injuries from crashes in 2008

*Distractions
now join
alcohol and
speeding as
leading factors
in fatal and
serious injury
crashes.*



Distracted Driving

- Driver distractions leading factor in fatal and serious injury crashes
- In 2008, 28% of all crashes attributable to cell phones
 - 1.6 million crashes
 - 645,000 injuries
- Cell phone users 4x as likely to crash



Millions of People are Talking While Driving

- 11% of drivers at any point during the day are on cell phones
- 81% of drivers admit to talking on cell phone while driving:
 - 74% of Boomers
 - 88% of Gen X
 - 89% of Gen Y
 - 62% of Teen Drivers





Millions of People are Texting While Driving

- 18% of drivers admit to texting while driving:
 - 4% of Boomers
 - 15% of Gen X
 - 39% of Gen Y
 - 36% of Teen Drivers





Driving Culture Change

“A century ago, Model T’s brought motoring to an emerging middle class.

A half century ago, teenagers cuddled in convertibles at drive-in movies.

A new generation of drivers see cars as an extension of their plugged-in lives, with iPods, DVD players and other gadgets.”

USA Today, 2-17-2009



Driving Culture Change

- Webster's Dictionary named "distracted driving" its 2009 Word of the Year
- In 2009:
 - More than 200 state bills introduced
 - U.S. DOT Distracted Driving Summit held
 - President Obama signed Executive Order
 - NSC membership survey
 - Favorable public opinion polls



How Cell Phones Distract

- Visual – Eyes off road
- Mechanical – Hands off wheel
- Cognitive – Mind off driving

CHALLENGE: Drivers don't understand or realize that talking on a cell phone distracts the brain and takes focus away from the primary task of driving.





The Problem

- Hands-free seen as solution and mistakenly believed to be safer than handheld
- People recognize the risk of talking on handheld and texting more than the risk of hands-free
- Most legislation focuses on only handheld devices or texting
- All state laws and some employer policies allow hands-free devices

Hands-free devices offer no safety benefit when driving.



What is a Hands-Free Device?

- Headset that communicates via wire or wireless connection to cell phone
- Factory-installed or aftermarket feature built into vehicle (voice recognition)



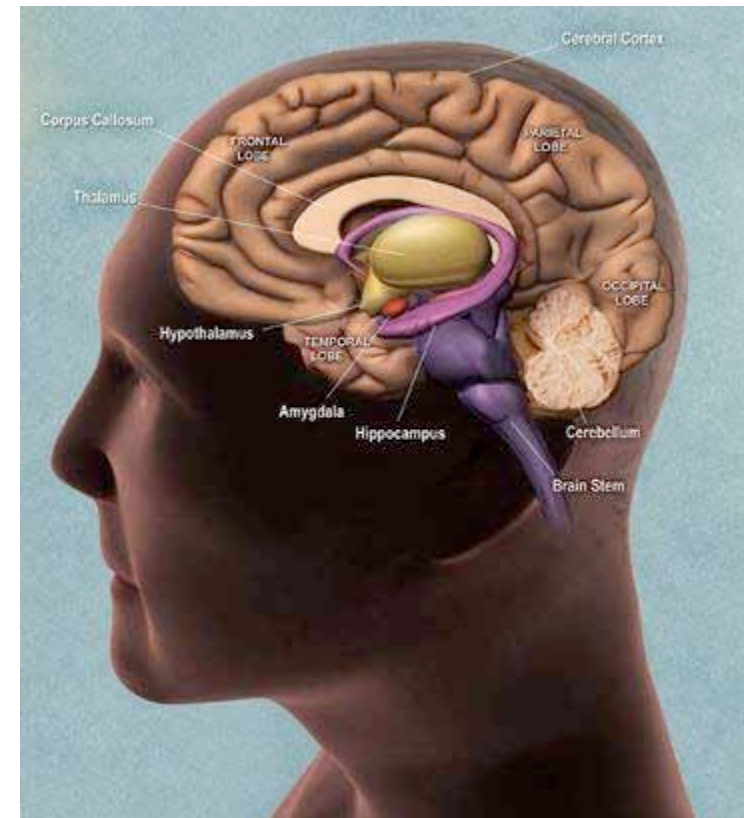
Cognitive Distraction

- Cognitive distraction still exists with hands-free
 - Talking occurs on both handheld and hands-free cell phones
 - Mind focuses on conversation
 - Listen and respond to disembodied voice

Hands-free devices do not eliminate cognitive distraction.

Multitasking: A Brain Drain

- Multitasking for the brain is a myth
- Human brains do not perform two tasks at same time
 - Brain handles tasks sequentially
 - Brain switches between one task and another



**The four lobes of the brain.
Source: National Institutes of Health**



Multitasking: A Brain Drain

Brain engages in a constant process to:

1. **Select** information brain will attend to
2. **Process** information
3. **Encode** to create memory
4. **Store** information

It must also:

5. **Retrieve**
6. **Execute** or act on information

When brain is overloaded these steps are affected



Multitasking: A Brain Drain

Encoding Stage

- Brain filters information due to overload
- Drivers not aware of information filtered out
- Information does not get into memory
- Drivers miss critical information on potential hazards



**Inattention blindness and encoding.
Source: National Safety Council**



Multitasking: A Brain Drain

- Brain juggles tasks, focus and attention
- Brain switches between primary and secondary tasks
- Inattention blindness
 - When people do 2 **cognitively complex** tasks (driving and using a cell phone), causing brain to shift focus
- Bottleneck
 - Different regions of brain must pull from a shared and limited resource for unrelated tasks



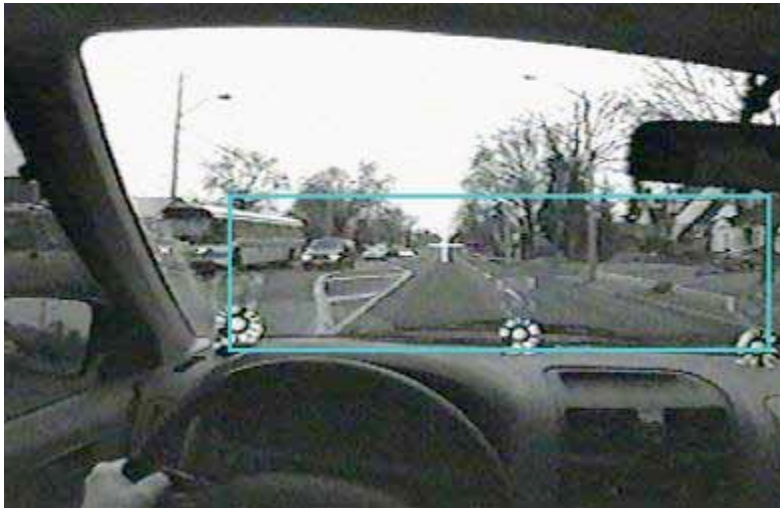
Inattention Blindness

- A type of cognitive distraction
 - “looking” but not “seeing”
- Hands-free drivers **less** likely to see:
 - High and low relevant objects
 - Visual cues
 - Exits, red lights and stop signs
 - Navigational signage
 - Content of objects

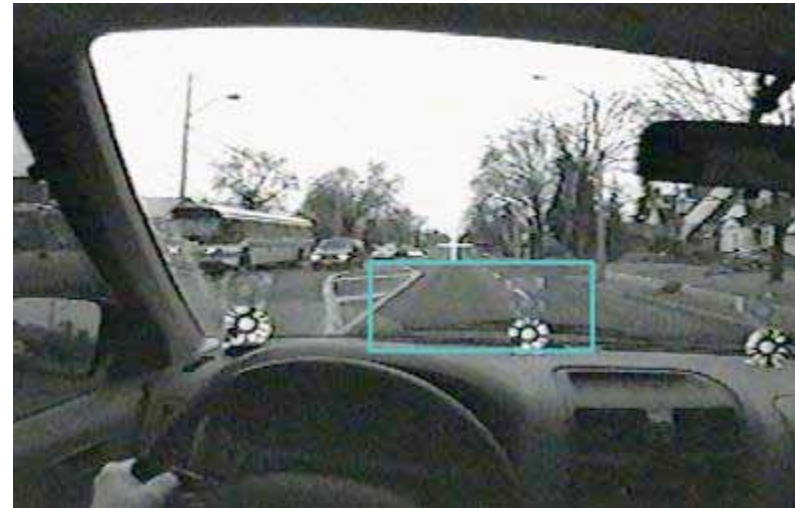


Inattention Blindness

A narrowed scope



Where drivers not using a hands-free cell phone looked.



Where drivers using a hands-free cell phone looked.

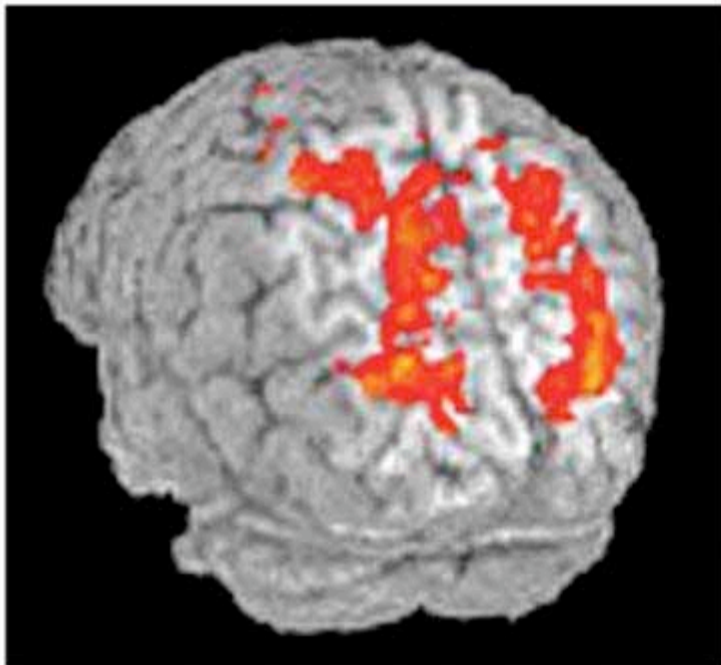
Source: Transport Canada



Multitasking: Impairs Performance

- Carnegie Mellon University Study (2008)
- Took fMRI pictures of brain while drivers listened to sentences and drove simulator
- Literally see the results...

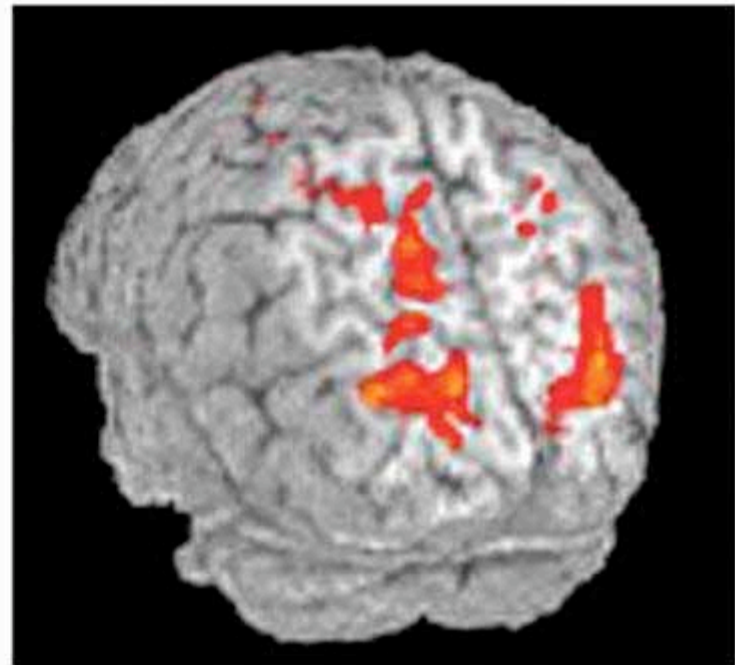
Driving alone



L

R

Driving with sentence listening



L

R

**Functional magnetic resonance imaging images.
Source: Carnegie Mellon University**



Multitasking: Impairs Performance

- Just listening to sentences on cell phones decreased activity by 37% in the brain's parietal lobe which perceives movement, integrates sensory information and also has importance for language processing
- Listening and language comprehension drew cognitive resources away from driving
- Also decreased activity in brain's occipital lobe which processes visual information



Multitasking: Impairs Performance

- We can walk and chew gum safely because it is not a cognitively-demanding task
- But even cell phone-using pedestrians act unsafely. They are less likely to:
 - Look for traffic before stepping into street
 - Look at traffic while crossing street
 - Notice unusual objects placed along path



Multitasking: Impairs Performance

- Driving involves a more complex set of tasks than walking:
 - Visual
 - Manual
 - Cognitive
 - Auditory
- A driver's job is to watch for hazards, but this cannot be done when brain is overloaded



Cell Phone: Driver Risks

- Inattention blindness
- Slower reaction/response times
- Problems staying in lane



Passenger Conversations

- Adult passengers share awareness of driving situation, a safety benefit
- Front seat passengers reduce risk of crashing by 38% compared to cell phone conversations
- Adults with passengers have lower crash rates than adults without passengers
 - Not true for novice teen drivers

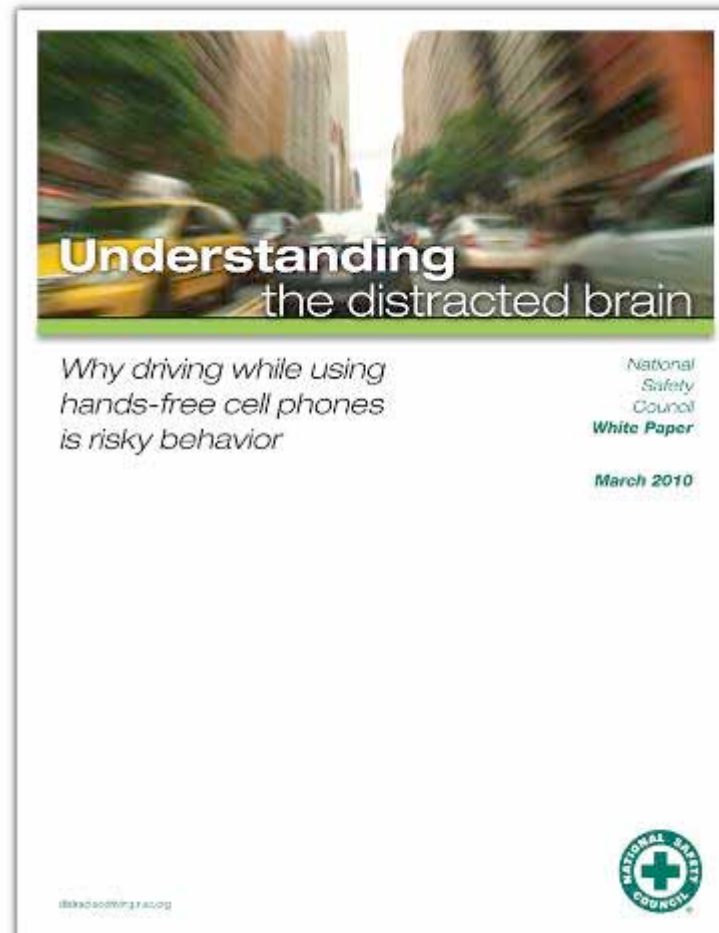


Prevention Steps

- Widespread education
- Corporate cell phone bans
- Legislation
- Law enforcement
- Technology



Download the NSC White Paper



nsc.org

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More than 1.6 million crashes are caused by cell phone use and texting while driving each year.



Joe, 12



Bailey, Merideth,
Hannah, Sara and Katie



Cady, 16



Erica, 9



Jean and Jay, 58

Countless lives
have been lost as a result.



Linda, 61



Jason, 38



Lauren, 17



Matt, 25



Frances, 13



Jordan, 18



Help us save lives.
Tell everyone you know.

On the Road, Off the Phone