Distraction Dodger
Lessons for High School Students

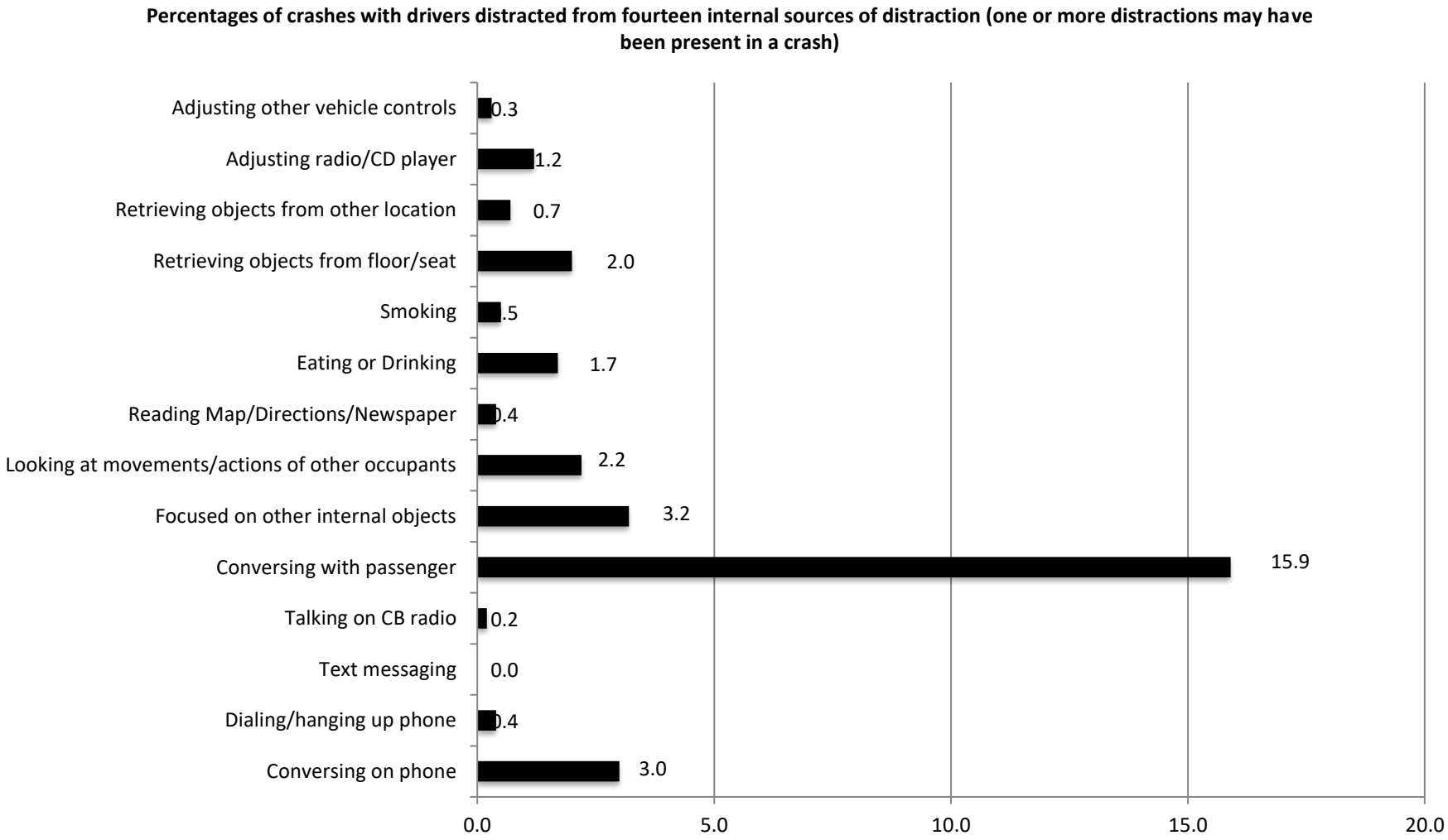
The Intelligent Transportation Systems Institute
and the
HumanFirst Lab
of the
University of Minnesota

Lesson 1, Activity 1

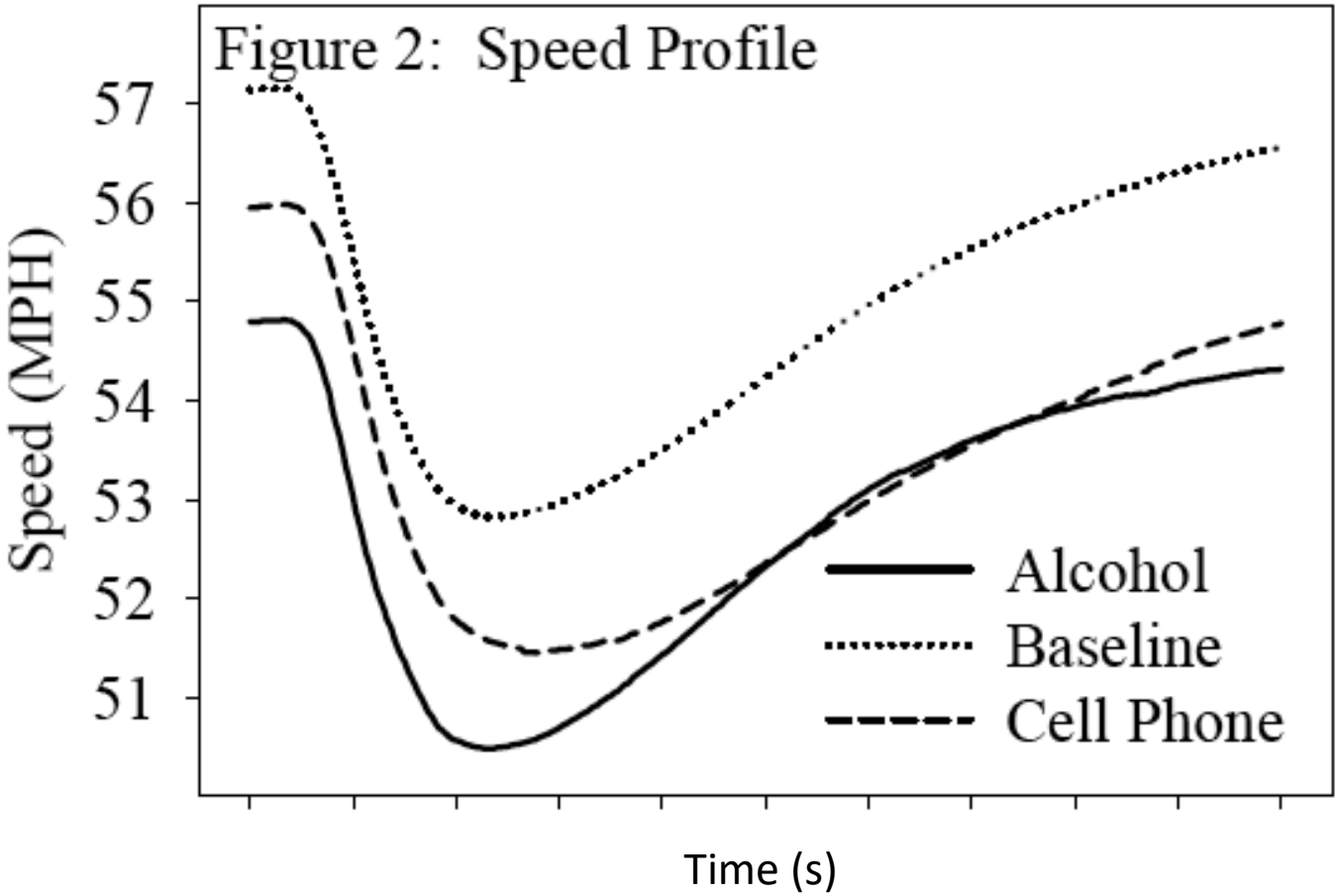
- With a partner, reflect on the game and answer the following questions:
  - What distractions are included in the game?
  - Which distractions did you use most often?
  - Which distractions had the biggest negative impact on performance, and why?
  - Did the use of any distractions have a *positive* impact on performance, for either the short-term or long-term? Explain.
  - What consequences of distracted driving did you discover in the game?

Lesson 1, Activity 2

- In groups of 2 or 3:
  - Examine the graph
  - As a group, discuss the information presented.
    - What does the graph describe?
      - In what units are the numbers reported?
      - What drivers or crashes are included in the graph?
      - What is the minimum and maximum percentages of crashes that could be attributed to one or more of these distractions?
    - Does anything surprise you? If so, what, and why does it surprise you?
    - Does the graph reflect your observations on the road?
    - Why might text messaging show so little incidence?



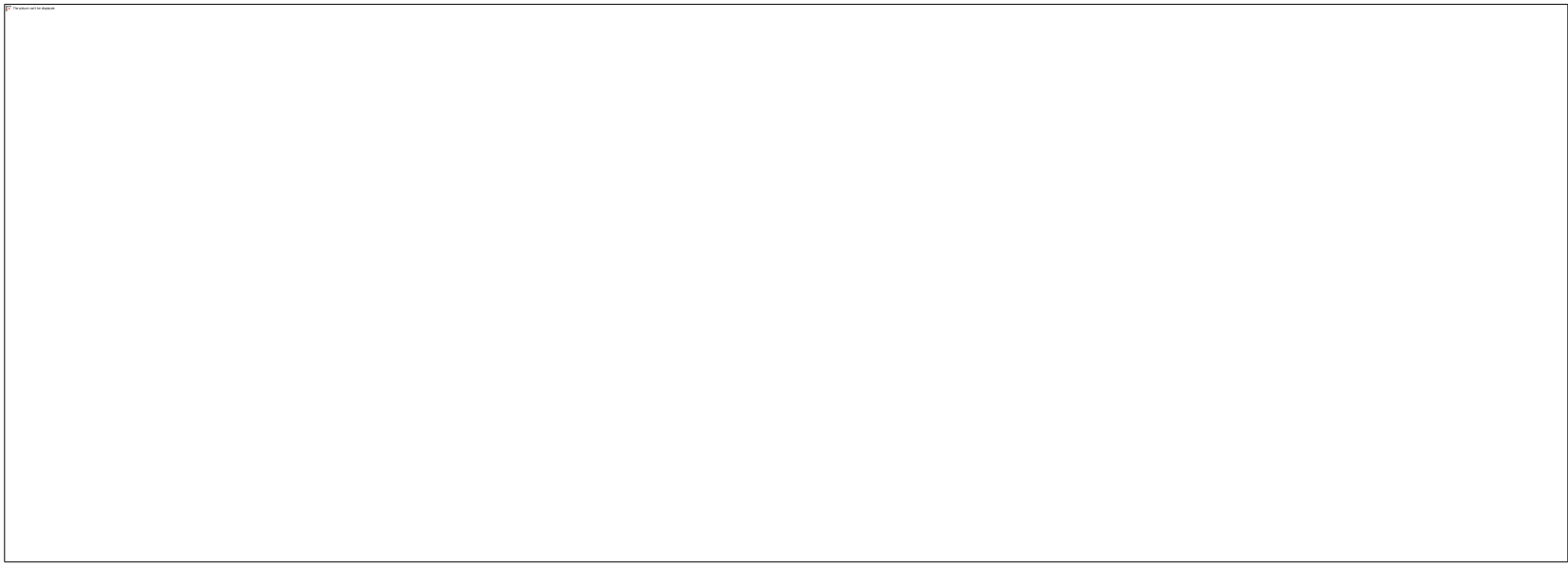
NHTSA, September 2010



Strayer (2003

Activity 3: Other perspectives

- A study from the Virginia Tech Transportation Institute (VTTI) shows the following multiplying factors for the risk of crash during distracted driving vs. non-distracted driving:



Lesson 1, Activity 3

- How do the results of this study compare to the NHTSA study in activity 1?
- Do the studies measure the same factors in the same way? What is the same and what is different about the two methods?
- Do the studies contradict each other, reinforce each other, or both? Explain.

Lesson 2

In 2008, nationwide:

- Total crashes reported: 6,024,000
- Crashes resulting in injuries: 1.711 million
- Crashes resulting in deaths: 37,435
- Fatality rate by miles: 1.27 deaths for every 100 million vehicle miles traveled
- Fatality rate by population: 13 deaths per 100,000 people.
- At least one form of driver distraction contributed to crashes resulting in 5,870 fatalities and 515,000 injuries.
- About 18 percent of the drivers were involved in at least one non-driving activity, with the majority (about 12%) engaged in conversing either with other passengers or on a cell phone."

For your year/location:

- How many crashes were reported?
- How many fatalities were recorded?
- How many crashes involved injuries?
- What is the fatality rate by per million miles driven?
- What is the fatality rate per 100,000 people?
- Based on specific data available, answer the following questions. If specific data is not available, assume that the proportion of crashes that were preceded by the driver engaging in non-driving activities was the same as the national sample (18%) described above.
  - In how many crashes was the driver engaged in some non-driving activity?
  - For how many injuries was the driver engaged in some non-driving activity?
  - For how many fatalities was the driver engaged in some non-driving activity?

Lesson 2, Activity 1

- If there are noticeable differences across years or regions, what do you think contributes to those differences?
- Are there significant differences between your location and the national statistics? If so, what might contribute to those differences?

Lesson 2, Activity 2

"All cell phone use should be banned for newly licensed teen drivers."

(Virginia Tech Traffic Institute, 2009)

“All cell phone use should be banned for newly licensed teen drivers. Our research has shown that teens tend to engage in cell phone tasks much more frequently -- and in much more risky situations -- than adults. Thus, our studies indicate that teens are four times more likely to get into a related crash or near-crash event than their adult counterparts.”

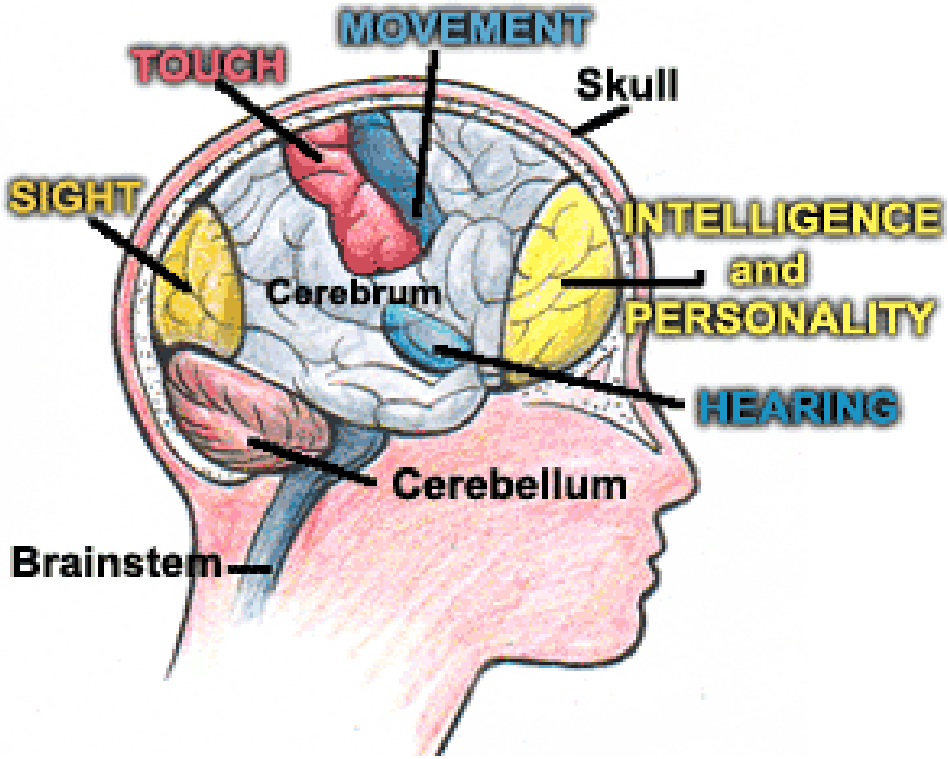
(VTTI 2009)

Teens and Texting

- One in three (34%) texting teens ages 16-17 say they have texted while driving. That translates into 26% of all American teens ages 16-17.
- Half (52%) of cell-owning teens ages 16-17 say they have talked on a cell phone while driving. That translates into 43% of all American teens ages 16-17.
- 48% of all teens ages 12-17 say they have been in a car when the driver was texting.
- 40% say they have been in a car when the driver used a cell phone in a way that put themselves or others in danger.

(Pew Research: Teens and Distracted Driving, November 2009)

Got Brains?



www.cyh.com

Lesson 3 Vocabulary

- **Attention allocation:** Conscious or subconscious choices about where a person directs their attention. Choosing to text while driving is an example of consciously choosing to allocate attention to the device rather than to driving. Responding to an animal running across the road can result in an automatic, subconscious choice to allocate attention to braking.

- **Auditory tasks:** Tasks that require listening. Examples from driving include listening to the radio, listening to conversation (including phone), and listening to audio signals such as sirens from emergency vehicles.

- **Cognitive psychology:** A branch of the field of psychology that focuses on how people learn, perceive, think, reason and remember.

- **Cognitive task:** A task that requires primarily thinking, such as solving a math problem in one's head or thinking about the contents of a text message.

- **Information processing:** The thought process of turning perceptions (input from the senses) into useful information. An example would be seeing a red octagon with white letters, ultimately recognizing that object as a stop sign, determining what would be an appropriate action or response, and then acting accordingly.

- **Kinesthetic tasks:** Tasks that require primarily movement or manual dexterity. Examples from driving include shifting gears, using the brake/accelerator, waving to friends, managing the radio and texting.

- **Performance decrement:** The amount by which a person's performance on a task decreases due to an excessive **task load** or other factors.

- **Resource management:** Closely related to **attention allocation**, resource management refers to how a person chooses to distribute their limited resources of attention among the tasks in their **task load**.

- **Task load:** A person's task load is the combination of all tasks the person is performing at one time. Task loading is the act of requiring a person to engage in an increasing number of tasks.

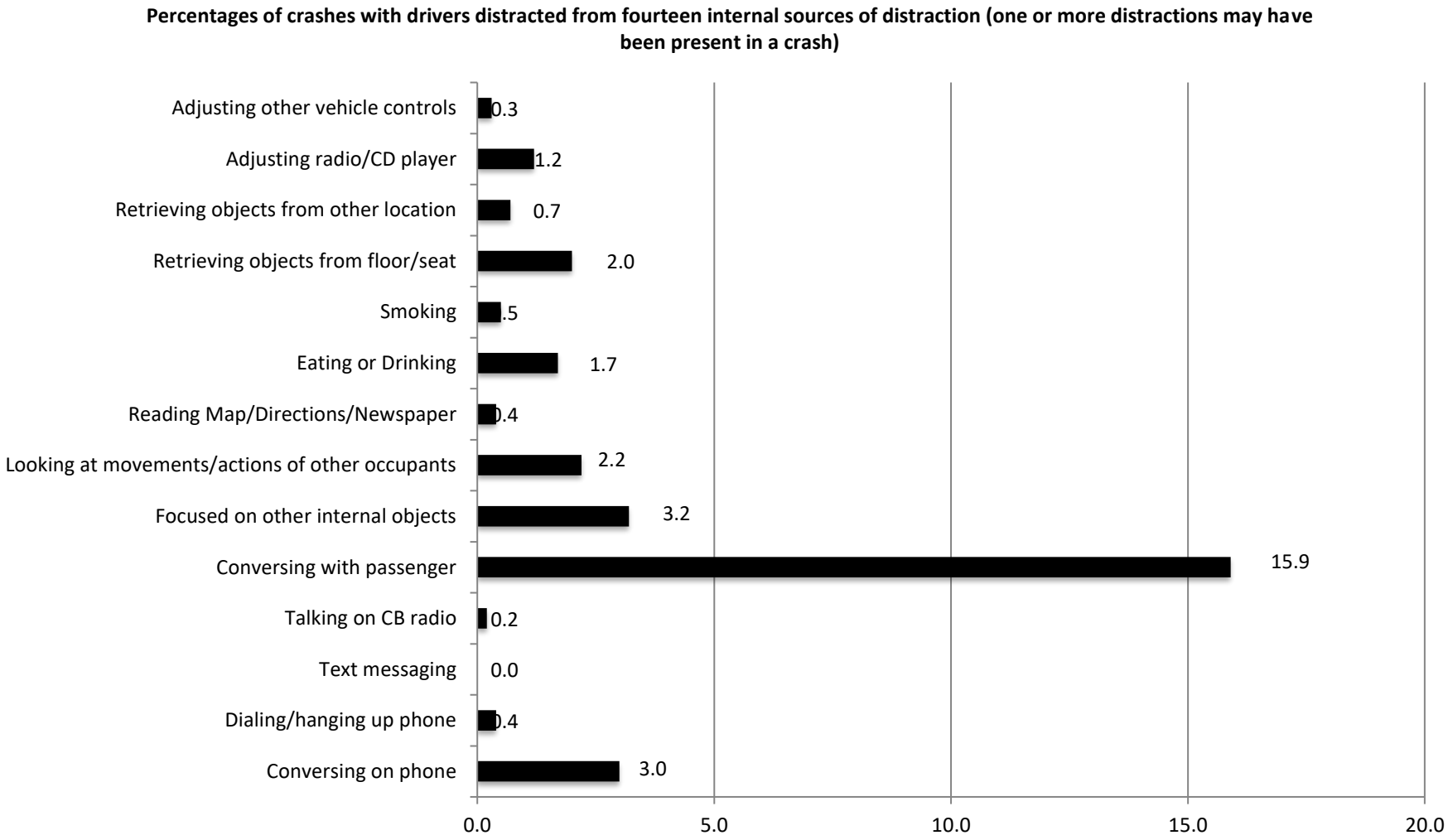
- **Visual tasks:** Tasks that require primarily visual attention. Examples from driving include watching the road, reading road signs, and viewing dashboard gauges, including GPS.

Driving skills

	Auditory/Vocal	Kinesthetic/manual	Visual	Cognitive
Reading road signs			X	X
Using turn signals		X		X
Accelerating		X		X

Distraction categories

Rank		Auditory/Vocal	Kinesthetic/ manual	Visual	Cognitive
	Conversing on the phone				
	Dialing/hanging up phone				
	Text messaging				
	Conversing with passenger				



NHTSA, September 2010

Distraction from the game	Relative performance decrement on hypothetical 100-point scale
Eating food	
Waving to friend	
Listening and managing phone	
Managing the car radio	
Looking at GPS – Visual only	
A fly outside of car	
GPS – Audio and visual	
A fly in car	
Texting	
Car radio – listening to music	
Car radio – listening to sports	
Voice mail - listening	
GPS – Audio only	
Phone conversation	

Distraction from the game	Choice A	Choice B	Choice C	Choice D
Food – easy (e.g. sips of drink w/straw)	20	10	15	25
Waving to friend	10	20	40	10
Food – hard (e.g. tacos, fries & ketchup)	30	20	45	35
Voice mail listening with phone management	50	35	45	60
Car radio – management	70	50	60	50
GPS – Visual only	40	50	45	70
Fly outside of car	10	60	35	65
GPS – Audio and visual	80	70	90	75
Fly in car	20	80	70	60
Smartphone for text – reading	10	80	40	20
Smartphone for text – written exchange – easy	20	85	60	40
Smartphone for text – written exchange – hard	40	90	80	65
Car radio – listening to music	10	5	20	5
Car radio – listening to sports	20	15	25	20
Voice mail - listening	30	15	25	25
GPS – Audio only	40	40	60	70
Phone conversation	60	50	70	70

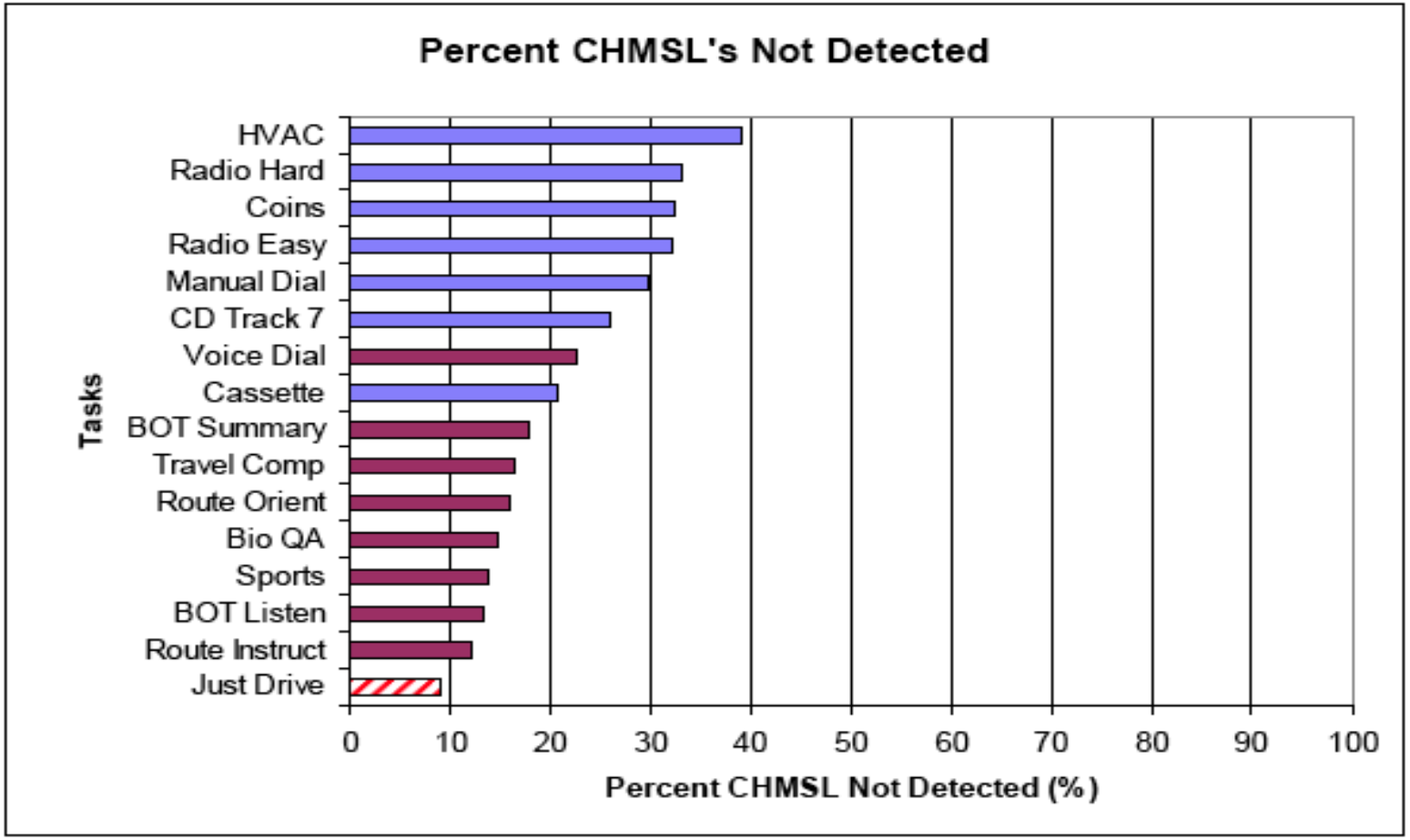
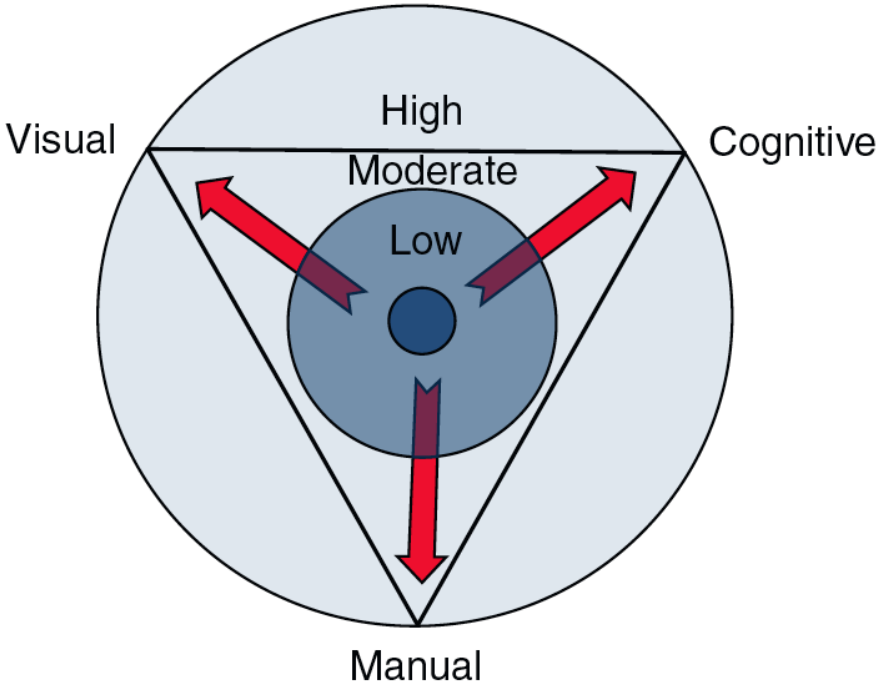


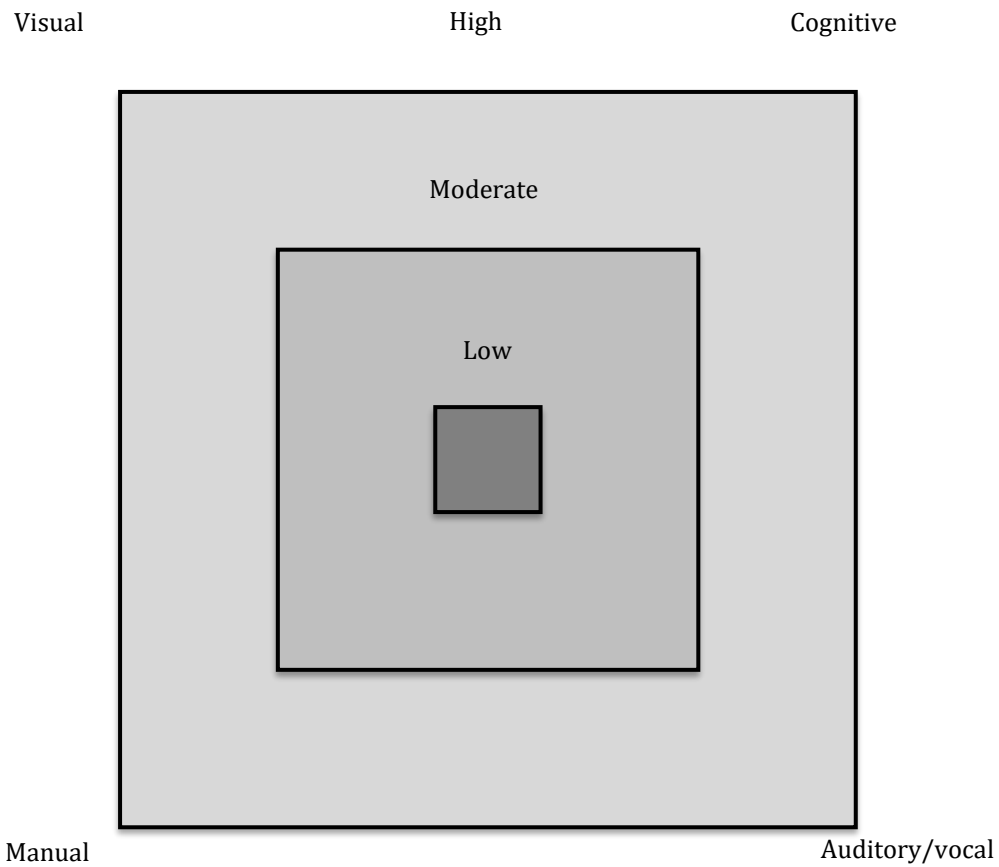
Figure 4-1. On-Road Percent of CHMSLs Not Detected by Task

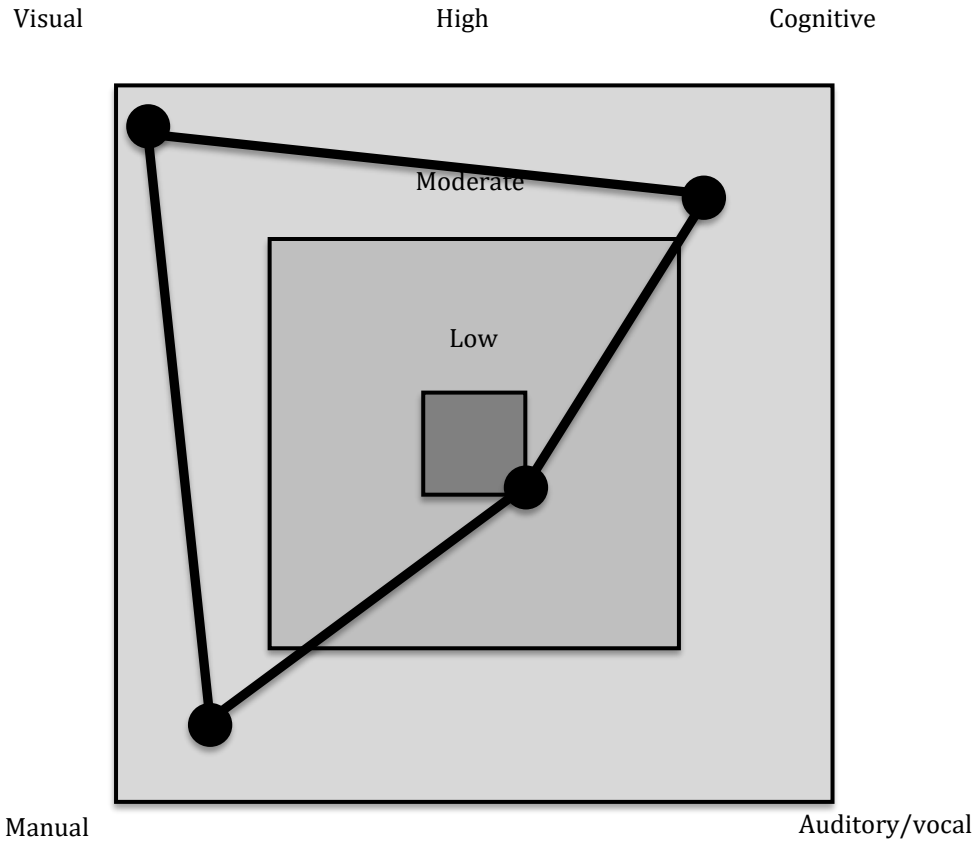
NHTSA (2006)

Model for understanding distractions



Modified Model




Visual
High
Cognitive
Moderate
Low
Manual
Auditory/vocal

Lesson 4 – Reaction Time

$$d = 1/2\ a\ t^2$$

The distance something falls, starting from rest, is equal to half of the acceleration due to gravity multiplied by the square of the time it falls.

We want to know how much time it took for the ruler to fall before the person reacted. A simple rearrangement of the equation results in:

$$t = \sqrt{2d/a}$$

Remember the acceleration due to gravity is $a = 9.8\ m/s^2$

The Gettysburg Address

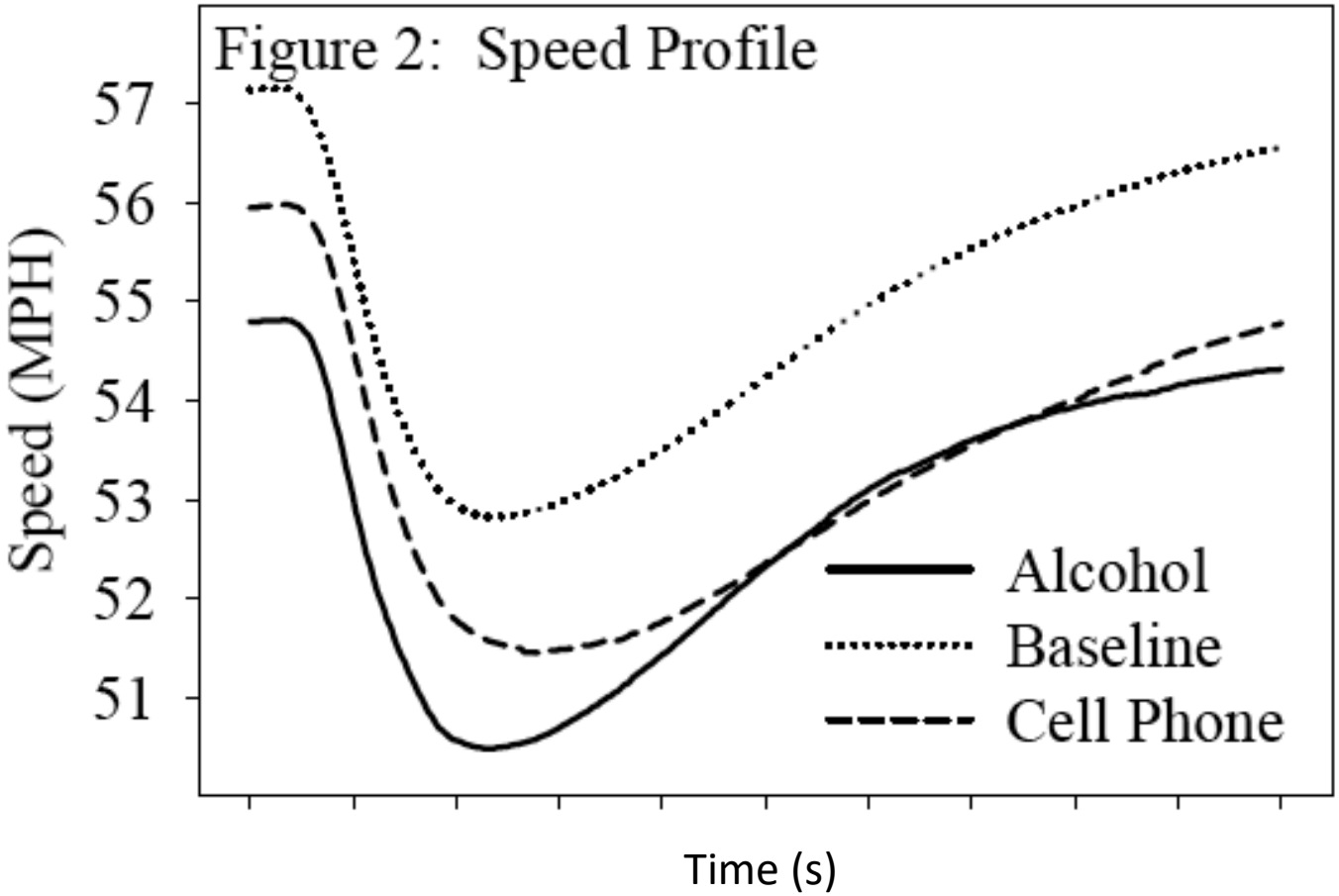
Four score and seven years ago our fathers brought forth on this continent, a new nation, conceived in Liberty, and dedicated to the proposition that all men are created equal.

Now we are engaged in a great civil war, testing whether that nation, or any nation so conceived and so dedicated, can long endure. We are met on a great battle-field of that war. We have come to dedicate a portion of that field, as a final resting place for those who here gave their lives that that nation might live. It is altogether fitting and proper that we should do this.

But, in a larger sense, we can not dedicate -- we can not consecrate -- we can not hallow -- this ground. The brave men, living and dead, who struggled here, have consecrated it, far above our poor power to add or detract. The world will little note, nor long remember what we say here, but it can never forget what they did here. It is for us the living, rather, to be dedicated here to the unfinished work which they who fought here have thus far so nobly advanced. It is rather for us to be here dedicated to the great task remaining before us -- that from these honored dead we take increased devotion to that cause for which they gave the last full measure of devotion -- that we here highly resolve that these dead shall not have died in vain -- that this nation, under God, shall have a new birth of freedom -- and that government of the people, by the people, for the people, shall not perish from the earth.

Reaction Time Questions

1. Create a column graph of your reaction time without the reading and with the reading.
2. Was there a difference between your two reaction time calculations? If not, to what do you attribute that? If so, to what do you attribute that?
3. In most cases, there will be a difference. Do you think this difference appeared because of cognitive or visual attention allocation to the distraction, or a combination of both?
4. Look back at Lesson 1, Activity 3. Where on the graph do you see reaction time included? Explain.



Strayer (2003

Experiment Possibilities

- Vary the distance between the Gettysburg Address and the ruler, requiring different degrees of visual distraction.
- Vary the reading activity to require different degrees of cognitive engagement. For example, students could use a nursery rhyme, the Gettysburg Address, and a random, unfamiliar paragraph from Shakespeare.
- Vary the type of distraction. Instead of reading, a student could be required to do mental math problems, toss & catch a ball, or even engage in a more realistic driver distraction such as talking on the cell phone, talking with a friend, or eating a snack.

Experimental Design

- Hypothesis
- Procedure
- Results
- Conclusion

Reaction Time & Distraction Dodger

- What kinds of distractions had the biggest impact for each person?
- Did everyone have similar experiences regarding which distractions had the most impact?
- Were the tasks that combined various modes (e.g. visual, kinesthetic) more problematic than others?
- How did the results of the game experience compare to your earlier experiments?

Lesson 5

- Education, including educational games such as Distraction Dodger, are one partial solution to the problem of distracted driving. Additionally, many groups are working on technological solutions.
- The effectiveness of technological solutions can be assessed by analyzing crash data both in simulators and naturalistic studies.
- Technological solutions to driver distraction serve one or both of two main purposes: crash avoidance and injury/fatality reduction.

Possible Technological Solutions

- Adaptive cruise control
  - http://www.jdpower.com/autos/articles/Adaptive-Cruise-Control/
- Automatic emergency braking (AEB) systems
  - http://www.trw.com/sub_system/automatic_emergency_braking (includes video)
- Seat belt pretensioners and active control retractors (ACR)
  - http://auto.howstuffworks.com/car-driving-safety/safety-regulatory-devices/seatbelt4.htm
- Heads-up Display (HUD) projected gauges
  - http://www.gizmag.com/wego-hud-navigator/15347/
  - http://www.wired.com/autopia/2010/03/gm-next-gen-heads-up-display/
- Car-to-car communication systems
  - http://www.technologyreview.com/communications/38525/?p1=A3&a=f

Technology solution questions

- Which of the following types of distractions, if any is the technology designed to reduce or eliminate? There may be more than one answer, or the technology may not address any of these.
  - Auditory/vocal
  - Kinesthetic/manual
  - Visual
  - Cognitive
- Is the technology designed to reduce the number of crashes, reduce the injuries/fatalities from crashes, or both? How is it designed to accomplish its goals?
- Is the technology designed to reduce the “need” or attractiveness of engaging with a distraction, to reduce the duration a driver engages with a distraction, or to reduce the frequency with which a driver engages with a distraction? If so, how?