Cognitive Distraction: Why Your Brain Can’t Handle Driving

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Distracted driving is the act of driving while engaged in other activities--such as looking after children, texting, talking on the phone or to a passenger, watching videos, eating, rubbernecking or reading. These activities take the driver's attention away from the road. All distractions compromise the safety of the driver, passengers, bystanders and those in other vehicles.

According to the United States Department of Transportation, "text messaging while driving creates a crash risk 23 times higher than driving while not distracted." Despite these statistics, more than 37% of drivers have admitted to sending or receiving text messages while driving, and 18% admit doing so regularly.

Types

Distractions while driving can be separated into three distinct groups: visual, manual, and cognitive. Visual distraction involves taking one's eyes off the road, while manual distraction involves taking one's hands off the wheel. Cognitive distraction occurs when an individual's focus is not directly on the act of driving and his/her mind "wanders".

Distractions influenced by the advancement of technology, especially text messaging or talking on the phone, can require a combination of visual, manual, and cognitive attention from the driver, thus making these types of distractions particularly dangerous.

Texting while driving is the most widely reported form of "distracted driving", but it is not the only one. Having passengers on the vehicle, changing radio stations, searching for the cell phone charger, or putting make-up on are all distractions that can easily lead to an accident. According to a study made by AAA Foundation for traffic safety, 15 percent of reported crashes were due to a teen driver distracted by talking with a passenger, while another 12 percent of the crashes were because the teen was on a cell phone talking, texting or searching for information while driving. The National Highway Traffic Safety Administration has determined that distracted driving accounts for 25 percent of all crashes involving teenage drivers.

Exposure Assessment

According to the US National Highway Traffic Safety Administration (NHTSA), in 2008, nearly 11% of drivers--approximately one million individuals--used a mobile device at some time. Additionally, 35-50% of drivers admit to cell phone use while driving, while 90% of drivers fear those who do.

Some foods and drinks can lead to dangerous distractions. McKeel Hagerty, president of Hagerty Classic Insurance Company, did a study to find out which foods were the worst to try to consume while driving. Coffee was the top offender because of its tendency to spill even if in a cup with a travel lid. Hot soup was second followed by tacos and chili. Hamburgers and barbecued food came

in fifth and sixth. Eating while driving is not only dangerous, it's messy and it means you're not watching the road.

According to a HealthDay poll from November 2011, most adults who drive admit to engaging in distracted driving behaviors. This poll, which included 2,800 American adults, found that:

Approximately 86% of drivers have admitted to eating or drinking while driving.
Approximately 37% of drivers have texted while driving at least once, while 18% of drivers have said they have formed the habit of doing it often.
Approximately 41% of adult drivers have set or changed a GPS system while driving, and 21% do it "more frequently."
Approximately 36% of adult drivers have used a map as road guidance while driving.
At least 20% drivers have admitted to combing or styling their hair while driving.
Approximately 14% of drivers have applied makeup while driving.
Approximately 24% of adult drivers have browsed the Internet while driving.

Data from this poll also revealed that younger drivers have a greater tendency to be involved in distracted driving than older individuals. Additionally, males have a greater tendency to engage in distracted driving activities, including driving while drowsy, after drinking alcohol, while reading a map, using a GPS system, or using the Internet.

Studies

The Centers for Disease Control and Prevention conducted a study about distracted driving in 2011. This study presented the following data: In the United States, 69% of the people surveyed between ages 18-64 revealed talking on their cellphone in a period of 30 days prior to the survey. It also disclosed that 31% of drivers in the United States between the ages 18-64, sent or read an email or text message while driving not less than once 30 days prior to the survey. Another survey performed in February 2015 by Harris Poll in the interest of Erie Insurance, shows that in addition to cell phone usage, there are many other causes for distracted driving. This survey also disclosed important information regarding drivers who text and drive by region, gender and age groups. By region, the incidence of people texting and driving in the Northeast was 24%. In the Midwest was 28%, followed by the West and South regions with 30% and 35% respectively. By gender, the survey reveals that men are more inclined to text and drive at 32% over women at 28%. In regard to age groups, the survey found that age groups 18-34, shows a high incidence of texting and driving with 51% followed by age group 35-44 with 39%. The next three age groups are classified as 45-54, 55-64 and 65 and older, with 33%, 14% and 7% respectively.

Hazard Assessment

A study in 2013 estimated the following risks of a crash or near-crash among novice drivers:

Activity --- Odds ratio

Dialing a cell phone --- 8.3
Reaching for a cell phone --- 7.1
Sending or receiving text messages --- 3.9
Reaching for an object other than a cell phone --- 8.0
Looking at a roadside object (Rubbernecking) --- 3.9
Eating --- 3.0
Interaction with radio (or head unit) --- 1.0

Among experienced drivers, dialing a cell phone is estimated to increase the risk of a crash or near-crash by odds ratio 2.5.

In September 2017, the NHTSA released a report on distracted driving fatalities for 2015. The NHTSA considers distracted driving to include the following distractions: other occupants in the car, eating, drinking, smoking, adjusting radio, adjusting environmental control, reaching for objects in car, and cell phone use. The report stated that 3,477 people were killed and 391,000 individuals were injured in motor vehicle crashes involving distracted drivers in 2015. Of those individuals killed, 995 were believed to be killed by drivers distracted by cell phones. The report does not state whether this is an under or over representation of the level of cell phone use amongst drivers, or whether there is a causal relationship.

The NHTSA states that 80% of accidents and 16% of highway deaths are the result of distracted drivers. The National Safety Council (NSC) estimates that 1.6 million (25%) of crashes annually are due to cell phone use, and another 1 million (18%) traffic accidents are due to text messaging while driving. These numbers equate to one accident every 24 seconds attributed to distracted driving by cell phone use. The NSC also reported that speaking on a cell phone while driving reduces focus on the road and the act of driving by 37%, irrespective of hands-free cell phone operation.

The US Department of Transportation estimates that reaching for a cell phone distracts a driver for 4.6 seconds, or the equivalent of the length of a football field, if the vehicle is traveling 55 miles per hour. It has been shown that reaching for something inside the vehicle increases the accident risk by 9 times. Texting while driving increases the risk of an auto accident by 23 times.

Driving with a dog or any pet can be very dangerous. An uncaged or unharnessed animal can be a constant distraction.

Driving with a dog can be very dangerous. According to a national study by AAA (American Automobile Association), 31 percent of the people that responded admitted to being distracted by

their dogs. Fifty-nine percent of people that were surveyed had participated in at least one distracting behavior while driving with their dog. Eighty percent of respondents said they'd driven with their pets, and only 17 percent said they used any form of pet restraint. The AAA Foundation for Traffic Safety found that looking away from the road for only two seconds doubles a driver's risk of being in a crash.

A 2003 study of U.S. crash data states that driver inattention is estimated to be a factor in 20-50 percent of all police-reported crashes. Driver distraction has been determined to be a contributing factor in estimated 8-13 percent of all vehicle crashes. Of distraction-related accidents, cell phone use may range from 1.5 to 5 percent of contributing factors, according to a 2003 study.

"Outside person, object, or event" (commonly known as rubbernecking) is the most reported cause of distraction related accidents, followed by "adjusting radio/cassette player/CD". "Using/dialing cell phone" is the eighth most reported cause of distraction-related accidents, according to the study.

According to the article "NHTSA distracted driving guidelines" in the August 2013 Motor Age magazine issue, the NHTSA released voluntary guidelines covering the use of in-car infotainment and communication devices, that have some bearing on connected car technologies and telematics. "Proposed items include disabling manual text entry and video-based systems prohibiting the display of text messages, social media or Web pages while the car is in motion or in gear. The goal: Don't take the driver's eyes off the road for more than two seconds at a time, or 12 seconds in total by limiting drivers to six inputs or touches to the screen in 12 seconds". In 2011, according to the NHTSA, 1/3 of the accidents were caused by distracted driving.

Driving and eating is very distracting. A correspondent for the Boston Globe, Lucia Huntington, stated "Distracted driving is the cause of many of today's traffic accidents. In a world of ever-extending commutes and busy schedules, eating while operating a vehicle has become the norm, but eating while behind the wheel proves costly for many drivers. Soups, unwieldy burgers, and hot drinks can make steering a car impossible. Although the danger of eating while driving are apparent and well known, drivers ignore them repeatedly, accounting for many crashes and near-misses." During a study done by NHTSA, the NHTSA blames "inattentive driving" for 80% of all car accidents. 2.1 percent of the total were daydreaming, personal hygiene, and eating. The location of where people live also causes people to eat and drive. Now that people are now living in the suburbs, this has caused a longer commute to work for some. A study done by Toyota found that truck drivers manage their lives out of their trucks. With this fast-paced life style everyone is always on the move, finding time for food can be difficult, but saving time is not worth risking your life or someone else's.

A study by Monash University found that having one or more children in the car was 12 times more distracting than talking on a mobile phone while driving.

According to David Petrie of the Huntington Post, Children in the back seat are the worst distraction for drivers. While the focus on texting while driving is laudable, it has failed to address long-standing issues. In both cases an incoming call and a crying child create a situation where the driver should pull over and not attempt to multitask.

A study by AAA found that talking to a passenger was as distracting as talking on a hands-free mobile phone.

Today's youth is being blamed for most of the distracted driving, but really adults are at fault too. More than 600 parents and caregivers were surveyed in two Michigan emergency rooms while their children, ages 1-12 years, were being treated for any reason. During this survey, almost 90% of drivers reported engaging in at least one technology-related distraction while driving their children in the past month. The parents who disclosed using the phone--hand held or hands free--while driving were 2.6 times likely to have reportedly been involved in a motor vehicle crash.

Risk Characterization

The rising annual rate of fatalities from distracted driving corresponds to both the number of cell phone subscriptions per capita, as well as the average number of text messages per month. From 2009 to 2011, the amount of text messages sent increased by nearly 50%.

Distracted driving offenders are more likely to report driving while drowsy, going 20 miles per hour over the speed limit, driving aggressively, not stopping at a red light or stop sign, and driving while under the influence of alcohol.

The American Automobile Association (AAA) reports that younger drivers are overwhelmingly more likely than older drivers to text message and talk on cell phones while driving. However, the proportion of drivers aged 35-44 who reported talking on cell phones while driving is not significantly lower than those drivers aged 18-24 who report doing so.

Cultural change is needed to stop teens from texting while driving. It took ten years to get people to buckle up. Now eighty-five percent of the people buckle up. The National Highway Traffic Safety Administrator David Strickland says the standards need to be consistent from state to state. The only way to do that is national legislation. Federal seat belt and drunk driving initiatives have already made a difference. In the end, battling distracted driving is going to have to be a cultural change.

Accident Risk Assessment

In 2011, Shutko and Tijerina reviewed a large naturalistic study of in field operational tests on cars, heavy product vehicles, and commercial vehicles and buses and concluded that:

Most of the collisions and near misses that occur involve inattention as a contributing factor.

Visual inattention (looking away from the road ahead) is the single most significant factor contributing to crash and near crash involvement.

Cognitive distraction associated with listening to, or talking on, a handheld or hands-free device is associated with crashes and near miss events to a lesser extent than is commonly believed, and such distractions may even enhance safety in some instances.

Effects on the Brain

Brain Activity without Distractions

The somatosensory association, parietal and visual cortices are not significantly activated during simple driving tasks, like driving straight or making a right hand turn. A left turn with no oncoming traffic present a little more activation in the premotor cortex, somatosensory area, visual and parietal cortices, as well as the cerebellum. When oncoming traffic is introduced while trying to makea hand turn, there is a significant activation multiple bilateral regions in the mid-posterior braid, which includes motor and premotor areas, visual, parietal, and somatosensory regions, and the cerebellum.

Brain Activity with Distractions

When something as simple as answering general knowledge true or false questions are introduced as a distraction to the driver, the brain activity is increased during both straight driving and when turning left with the presence of oncoming traffic. When just driving straight, which showed very little brain activation without distraction, is paired with answering simple questions, there is a significant increase in brain activity in the ventrolateral prefrontal cortex bilaterally, along with the auditory cortex and parietal lobes. There was also decreased activation in occipital-visual regions of the brain. When a left turn plus traffic, which already yielded the most activation of the undistracted driving tasks, had audio tasks added to the tasking, auditory, motor, somatosensory, visual, parietal, and cerebellar regions were activated. There was also significant additional activation bilaterally in the anterior brain areas, mainly in the dorsolateral prefrontal cortex and frontal polar region.

Driving Ability

The areas of the brain that have decreased activation during a moment of multitasking are areas of spatial processing and spatial attention. Because of this, it is important for drivers to focus on only

the task at hand, driving. Even though driving becomes a primary cognitive function, when drivers are distracted (e.g.on their cell phones, talking to passengers, or fiddling with the radio), the areas of the brain that need to be activated to safely operate the vehicle are not.

Consequences

Distracted driving is a growing problem in the United States. It is responsible for many deaths that could otherwise be prevented, especially in the younger generation of drivers. In 2008, there were 23,059 accidents involving 16- to 19-year-olds, which led to 194 deaths. Of these deaths, 10% were reported to be caused by distracted driving. Throughout the United States, over 3,000 deaths and 416,000 injuries annually can be attributed to distracted driving. To further illustrate the seriousness of this "epidemic," driving while texting is about 4 times more likely to result in an accident than drinking while driving. Not only is distracted driving more likely to result in an accident, but the risk of injury requiring hospital visitation is 3-5 times greater than the rate for other accidents.

Some distracted driving accidents include:-

In 2017, Thames Valley Police in England issued a video of a truck driver who killed a family by driving whilst using his mobile phone.
In 2013, numerous people were also killed in the Santiago de Compostela derailment where the driver had been using the telephone.

Solutions

Thirty-nine states and the District of Columbia (D.C.) have passed laws related to distracted driving. Additionally, 41 states, DC and Guam have banned text messaging for all drivers, and 10 states, DC and Guam prohibit drivers from holding cell phones while driving, however no state currently completely bans all electronic use device, including hands-free. Each state varies in the restrictions placed upon drivers.

Current US laws are not strictly enforced. Punishments are so mild that people pay little attention. Drivers are not categorically prohibited from using phones while driving. For example, using earphones to talk and texting with a hands-free device remain legal.

Laws have not led to consistent driver compliance. Hand-held mobile phone usage fell in New York in the five months after the hands-free law took effect. However, it returned to near the prior level by the 16-month mark.

Another approach is through education. The U.S. Department of Transportation (DOT) and NHTSA conducted a series of initiatives and campaigns, such as "One Text or Call Could Wreck It all",

"Stop the Texts, Stop the Wrecks" advertisement, and "Faces of Distracted Driving". The "Stop the Texts, Stop the Wrecks" commercials advocate safe driving habits via vivid scenarios, attempting to make the consequences of distraction more tangible. The "Faces of Distracted Driving" is a DOT online video series that focuses on individuals who have been personally affected.

The cell phone providers AT&T, Verizon, Sprint, T-Mobile and several hundred other organizations have teamed up to create the "It Can Wait" campaign, that started on May 20, 2013 (Wireless Leaders Unite for "It Can Wait" Campaign to Curb Texting While Driving, 2013). The campaign is an attempt to inform young drivers that no phone call or text message is worth a life.

Washington State has also created a video PSA to educate people about the dangers of distracting driving.

Avoiding Distracted Driving

Adjust mirrors and heat/AC before traveling or ask a passenger to assist.
Pre-program favorite radio stations for easy access and arrange music (MP3 player/CDs/tapes) in an easy-to-access spot.
Turn off your cell phone(s) and place them out of reach to avoid the urge to dial or answer; if a passenger is present, they should handle any calls or texts.
Designate a passenger to serve as a co-pilot to help with directions or, if driving alone, map out destinations in advance, and the driver should pull out to study a map, if needed.
Try to avoid food/beverage (at least, hot and or messy foods), and be sure food and drinks are secured.
Teach children the importance of good behavior in a vehicle; do not underestimate how distracting it can be to tend to children while driving.
Speak up to stop drivers from distracted driving behavior.
Don't make calls nor text to people who are driving; call them back at a safer time.

There are some places where it is illegal for drivers to read, compose and send text messages and emails. For example, there's a "No Texting while Driving" law in Minnesota, that besides covering what was mentioned before, it also states as illegal to access the Internet using a wireless device while the vehicle is in motion or a part of traffic (including stopped in traffic or at a traffic light).

Cell phone use is totally banned for school bus drivers and for teen drivers during their permit and provisional license stages.

Dr. Paul Atchley, professor of psychology at the University of Kansas, says parents not technology are the key to educating teens about safer driving. "The area of the brain that's used in good decision making (the prefrontal cortex) doesn't mature until age 25," according to Dr. Atchley. "Until then, parents need to help children make good decisions." Dr. Atchley suggests two steps for

parents to help teach good habits

Have teens place phone in the trunk of the car (or another inaccessible spot) before driving. Parents review cell phone records and texting histories. If parents uncover usage while the teen is driving suspend use of both phone and car. "Parents are the technology to solve this problem."

Insurance providers offer tools such as Telematics2.0 and education.

The Research and Innovative Technology Administration is considering technologies to enhance transportation safety and reduce distracted driving via a program called the Connected Vehicle Technology Challenge."

Some employers have taken steps to reduce distracted driving beyond current legislation. The military requires only hands-free use of phones. Freight companies ban cell phone use while driving.

In October 2009, President Obama signed an executive order banning federal employees from sending texts in government cars.

U.S. Transportation Secretary Ray LaHood introduced his "Blueprint for Ending Distracted Driving," a plan for reducing distracted driving accidents and related deaths. This blueprint encourages the eleven states without distracted driving laws to enact such legislation. It challenges the auto industry to adopt guidelines to reduce the potential for distraction. It recommended that states partner with driving educators on new curriculum materials.

Technology

Automakers are providing dashboard and heads-up displays to allow driving information to be available without the driver looking away from the road. Gesture- and voice-based interfaces simplify controlling the vehicle and its services. Mobile applications such as LifeSaver, DriveScribe and TextLimit disable communication when the phone is moving. A similar approach is under investigation by telecom providers.

On January 7, 2014, an article in CNNMoney announced a partnership between AT&T and car manufacturers Audi and Tesla. AT&T head of emerging devices, Glenn Lurie told CNNMoney that these advancements reflect a major step forward in converting cars form mindless machines to intelligent gadgets. AT&T says everything is going to be connected. The car will be easier to use, safer, reduce distracted driving, and deliver infotainment. Mr. Laurie was asked, Will these innovations increase distracted driving? Mr. Laurie replied, "Visual distractions will be limited to passengers as drivers can keep their hands on the wheel." One will need only their voice to send messages and communicate with their car.

Toyota is working on perfecting technology that will monitor driver's eyelids to make sure they are looking at the road. Other carmakers are also working on similar technology. For example, General Motors has a pilot program using it to monitor distraction, and Jaguar Land Rover monitors the driver's eyes to create the 3D image for its "Virtual Windscreen".

Cellebrite has reportedly developed a textalyzer device that can be used to scan a vehicle driver's mobile phone after an accident or incident to determine whether the phone was used to make calls or send text messages or e-mails during operation of the vehicle.