



Distracted Drivers in School Zones

A National Report



Distracted Drivers in School Zones: A National Report



Jurek G. Grabowski, PhD, MPH

Stephanie Goodman, MPH

Department of Evaluation and Research

Safe Kids USA

1301 Pennsylvania Ave., N.W.

Suite 1000

Washington D.C. 20004

jgrabowski@safekids.org

Office: 202-662-0623

Cell: 202-510-7953

Fax: 202-393-2072

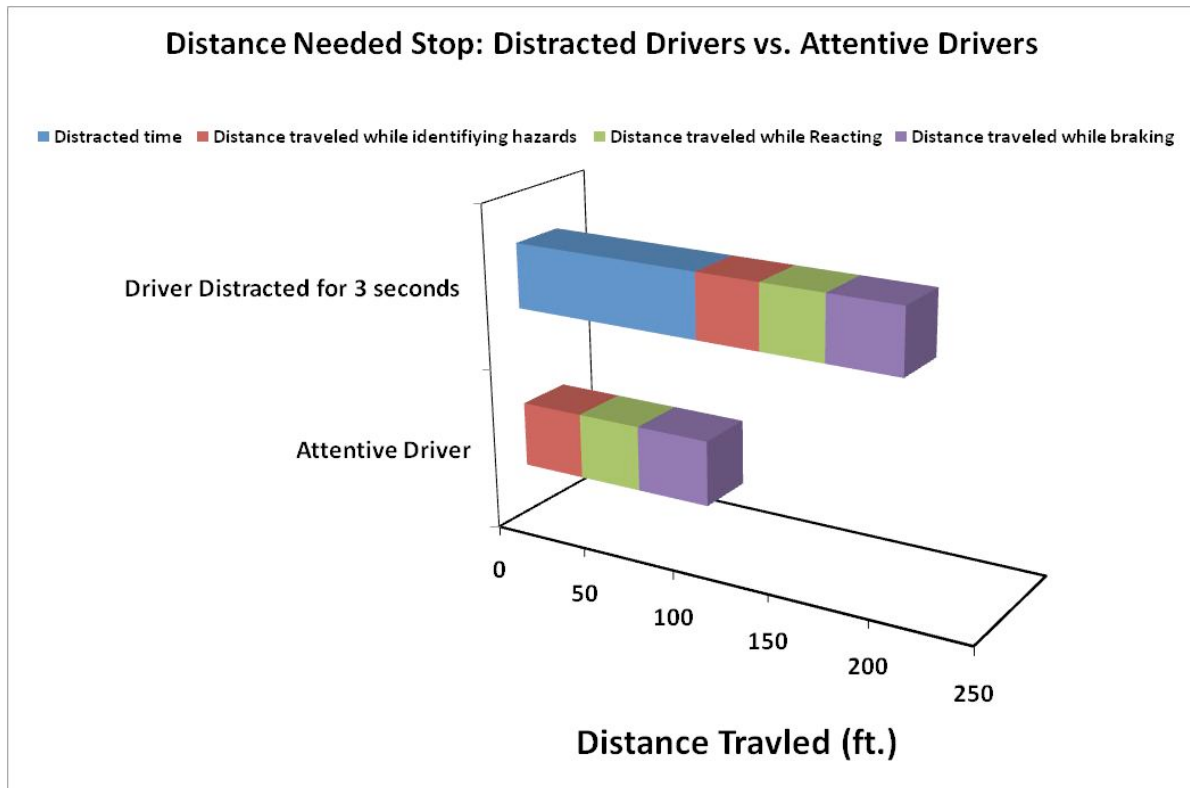
Background and related research:

Cell phones, music devices and fast food have all become a major part of American culture. For example, cellular phone use has rapidly increased from 38 million users in the 1980s to 210 million users in the late 1990s thus demonstrating the dependence people have on these devices.¹⁻⁴ However, safety concerns related to talking or texting on cellular phones, using global positioning devices (GPS) for navigation, and listening to music while driving continue to be documented. The main issue deals with the inability of the human brain to effectively perform multiple tasks while driving at the same time. These limits of human cognitive capacity have been well documented for the past four decades.⁵⁻⁸ This research demonstrates that the brain's ability to perform two or more tasks at the same time generally results in a decreased performance of each task depending on the complexity of the task and how the brain allocates priorities to each task. During every moment of the "Driving Task," vehicle operators are constantly being challenged by a changing environment and road conditions; by the actions of other drivers, bicyclists, and pedestrians; and by the actions and behavior of passengers and objects in the car. Many drivers also operate their vehicles under less than ideal conditions such as being tired or being physically/emotionally stressed. The sum effect of all these factors makes driving an extremely complex task even under the best of conditions.

Distractions can take attention away from the driving task and place the driver at an increased risk of crashing. For example, the average person under ideal conditions takes about $\frac{1}{4}$ of a second to identify a road hazard (such as seeing a child dart out between two cars), $\frac{1}{4}$ of a second for the brain process the situation, and another $\frac{1}{4}$ of a second to make a decision on how to avoid the hazard. If a driver is traveling at 30 mph in a school zone, that processing time translates to

about 33 feet before the driver even reacts to the situation. Once the driver identifies the hazard, they must react to it by applying the brakes. This costs the driver an additional $\frac{3}{4}$ of a second and another 33 feet. Finally, the vehicles itself takes about 3 seconds to engage the brakes, bringing the vehicle to a complete stop in approximately 38 feet. Thus the overall braking distance needed for an attentive driver on a dry road is roughly 104 feet. In contrast, for each second the driver is distracted an additional 33 feet is added to this number. Thus, if the driver is distracted with a three-second task the moment a child steps out into the street, it would take them 203 feet to completely stop the car (Figure 1).

Figure 1.



The magnitude of the problem is larger than previously imagined. While it is very hard to measure the actual number of crashes caused by cell phones, it is estimated that drivers are at far greater risk when talking or texting on phones, according to the recent study by the Virginia Tech Transportation Institute. In this study they documented an almost six times greater risk when dialing a phone and 23 times greater risk when texting. Similarly, other studies show that automobile drivers using a phone are four times more likely to crash than drivers not using a phone. This is comparable to drivers with blood-alcohol content of 0.08, the legal definition for drunken driving.⁹ The National Highway Traffic Safety Administration estimates that in 2003, 240,000 car crashes and 955 deaths occurred due to cell phone use. This may be an underestimation of the true number since it is particularly challenging for police and crash investigators to identify cell phone use as a factor contributing to a crash or death. Knowing this, the Harvard Center for Risk Analysis estimated that cell phone use was a factor in 6% of crashes in 2003. That estimation translated to 636,000 crashes involving 12,000 major injuries and 2,600 deaths.¹⁰ Similar statistics for other common driver distractions such as eating, grooming, reading, and smoking have not been extensively studied.

Distractions, however, are caused by more than just cell phones and texting devices. In 2001, the University of North Carolina's Highway Safety Research Center conducted a "naturalistic" study where they video recorded 70 drivers for 10 hours in a week and observed the types of activities drivers engaged in while operating their vehicles.^{11, 12} They reported that 15% of the time the vehicles were moving drivers were in an active conversation with passengers; 5% of the time they were preparing, eating or spilling food; 4% of the time they were reaching or leaning; 2% of

the time they were smoking; 1% of the time they were using a cell phone; and 1% they were adjusting the radio/CD/music device controls. In the same year, another study used video clips of 36 drivers to delineate the types of activities (other than driving) that drivers participate in. They found 15% of the clips showed drivers talking to passengers, 7% showed the drivers grooming, and 5% showed the driver using a cell phone.¹³

All of the aforementioned studies examined distracted drivers independent of the environment in which they were traveling through. One environment that is particularly vulnerable to distracted drivers is school zones. A recent Canadian study used spatial analysis to show that the 150 meter area around schools had the highest proportion of child-car collisions and proportion of fatalities as compared to areas 300 meters or more away from schools.¹⁴ Moreover, this study showed that 50% of these collisions occurred in months and times-of-day when children were most likely to be walking to or away from school. While this study is important in establishing that excessive risk exists in school zones, it does not describe factors that are associated with this risk. Previous studies have shown that factors associated with child pedestrians and car collisions include school density, population density, traffic volume, rush hour time periods, socioeconomic status, season, and the spatial relationship between schools, streets, and parking areas. To date, no studies have addressed the issue of distracted drivers in school zones.

Methods:

In order to better understand the magnitude and characteristics of distracted drivers in active school zones, the study's coordinators used observational road-side observations of drivers in active school zones. Observations were made by trained observers at 20 middle schools located in 15 states (Aurora, CO; Marietta, GA; Columbus, GA; Council Bluffs, IA; Coeur d'Alene, ID; Peoria, IL; Elkhart, IN; Detroit, MI; Springfield, MO; Greenville, NC; Raleigh, NC; Monroe, NC; Morristown, NJ; Reno, NV; Marysville, OH; Toledo, OH; Charleston, SC; Harrisonburg, VA; Vancouver, WA; Kent, WA).

Each study site had a Safe Kids coalition member serving as a study coordinator who was trained on data collection protocols through written materials, face-to-face meetings, and phone conference calls. After obtaining permission from school officials, each data collector was stationed approximately at the middle of the school zone road segment, assigned a lane of traffic and instructed to face traffic and record observations by looking through the front windshield of an approaching car as to avoid any obstruction from side window tinting. A paper data collection form was designed to simplify rapid documentation of pertinent driver and vehicle characteristics such as gender, seat belt use, type of vehicle (car or pickup/SUV/Minivan), vehicle classification (private or commercial). Each study site made multiple observations on three different days of the week during a normal school session. Observations were not made on Saturday, Sunday, holidays, teacher workdays, or on days with severe weather. Driver distraction rates were calculated as the number of drivers engaging in a distraction divided by the total number of

vehicles observed. The Wilson score method without continuity correction was used to calculate the confidence interval for the driver distraction rate.

Results:

Of the 41,426 cars that were observed traveling through an active school zone, one in six drivers were distracted (Table 1). Both male and females drivers had high distraction rates. It was calculated that for every 1,000 female drivers 187 were distracted and for every 1,000 male drivers 154 were distracted. Cell phone/electronics was the leading distracter, followed by eating/drinking/smoking, reaching/looking behind, grooming, and reading. Female drivers were more distracted by cell phones and grooming activities than men; however, males and females were distracted by eating, reaching behind, and reading about equally.

Table 1. Distracted driver rates per 1,000 vehicles in active school zones, academic year 2008-2009.

Type of distraction	Distracted drivers per 1,000 vehicles (95% CI)					
	Female		Male		Total	
Any distraction	187	(181, 192)	154	(149, 159)	170	(168, 174)
Cell phone/electronics	109	(105, 114)	87	(83, 91)	98	(96, 101)
Eating/drinking/smoking	45	(42, 48)	44	(41, 47)	44	(42, 46)
Reaching/looking behind	21	(19, 23)	18	(17, 20)	19	(18, 21)
Grooming	13	(11, 14)	6	(5, 7)	9	(8, 10)
Reading	3	(2.5, 4)	3	(2,4)	3	(2, 4)

The majority of distracted drivers were observed during the afternoon school zone hours as compared to the morning hours (Table 2). Distracted drivers appeared more frequently in school zones without flashing lights and in school zones that had a daily traffic volume of 10,000 or more cars. School zones that have an associated decrease in speed limit showed a higher distracted driver rate than school zones that did not change the speed limit. Drivers of larger vehicles such as sports utility vehicles, pickup trucks, and minivans were more distracted than car drivers. Females in commercial vehicles were significantly less distracted than females in private vehicles whereas males had the opposite trend where they were more distracted in commercial vehicles as compared to private vehicles. Regardless of gender, if the driver was not wearing their seatbelts then they were 35% more likely to be distracted as compared to drivers using seatbelts. Likewise, drivers in states that restrict the use of handheld electronics for all drivers (regardless of age) were 13% less likely to be distracted as compared to drivers in states that have no restrictions.

It was observed that unbelted female drivers were 40% more likely to be distracted as compared to belted female drivers (Figure 2a) and that female drivers observed in the afternoon school zone times were 29% more likely than female morning drivers to be distracted. When analyzing the distracted driving behaviors among males in school zones (Figure 2b), it was observed that unbelted males were 38% more likely to be distracted than belted males and that males on high traffic volume roads were 17% more likely to be distracted than male drivers on low volume roads. Likewise, males driving large vehicles (SUVs/pickup trucks/minivans) were 17% more likely to be distracted than males in cars.

Table 2. Characteristics of distracted drivers in active school zones, academic year 2008-2009

	Distracted rate per 1,000 cars (95% CI)		
	Female	Male	Total
Time of active school zone			
Morning (6:45-9:45am)	164 (157, 171)	143 (137, 150)	154 (149, 159)
Afternoon (1:15-5:00pm)	212 (204, 220)	164 (157, 172)	188 (182, 193)
School zone signs/flashers			
Present	176 (169, 183)	148 (141, 155)	162 (157, 167)
Not present	198 (191, 206)	160 (153, 167)	179 (174, 184)
Traffic volume (cars per day)			
≤10,000	174 (167, 182)	142 (135, 150)	159 (153, 164)
>10,000	203 (195, 211)	166 (159, 174)	184 (179, 190)
Speed limit decrease in active school zone			
Yes	196 (189, 203)	162 (155, 168)	179 (175, 184)
No	171 (162, 179)	141 (133, 149)	156 (150, 162)
Type of vehicle			
Car	180 (173, 187)	138 (131, 146)	162 (158, 168)
Pickup/SUV/Minivan	195 (187, 204)	162 (154, 169)	178 (172, 183)
Vehicle classification			
Private	187 (181, 192)	151 (145, 156)	170 (166, 173)
Commercial	144 (104, 197)	176 (160, 194)	173 (158, 190)
State restrictions			
Hand held law (all ages)	176 (156, 198)	140 (123, 159)	157 (143, 171)
Law prohibits teens/permit holders from using devices	182 (175, 191)	144 (137, 152)	164 (159, 170)
No state law	191 (184, 199)	163 (156, 170)	177 (172, 182)
Driver seatbelt			
Yes	172 (167, 178)	140 (134, 145)	157 (153, 161)
No	240 (222, 258)	193 (179, 207)	212 (202, 224)
Number of passengers			
0	200 (192, 208)	162 (155, 169)	180 (175, 185)
≥1	163 (155, 171)	140 (133, 148)	152 (147, 158)

Figure 2a.

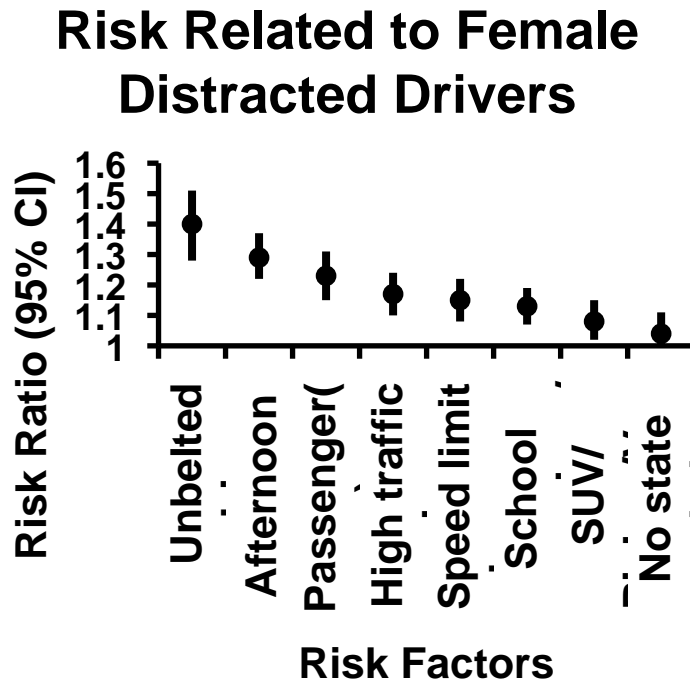
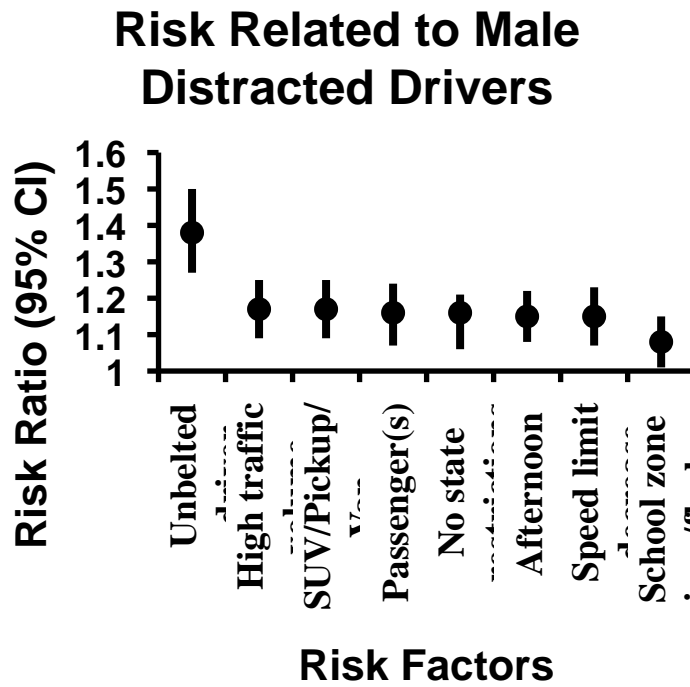


Figure 2b.



Discussion:

This study examined the rate of drivers engaging in distracting activities while traveling through active school zones. Analysis of the data indicates that the number of distracted drivers in an active school zones is high regardless of gender. Driver, vehicle and environmental characteristics - particularly unbelted drivers, driving during afternoon school zone time periods, and driving on streets with high traffic volume - were associated with increased rates of driver inattention. The latest National Highway Traffic Safety Administration (NHTSA) survey of electronic device distractions reported that 7.3% of drivers were distracted due to cell phones/electronic devices, an increase of 1% from the previous year.¹⁵ With 9.8% drivers observed talking on cell phones; the present study adds more evidence that cell phones usage continues to be an increasing trend among drivers.

Unbelted drivers (versus belted drivers) had the highest probability of being distracted as compared to other driver, vehicle, and environmental factors. This indicates that unbelted drivers may perceive and evaluate risks differently or have a personalities prone to risky behavior resulting in inappropriate decision making for perceived external benefits (e.g., saving time by grooming or eating in the car) or pleasure (e.g., a phone conversation with friends).

The distraction rates reported in this study were an underestimation of the true rate. Distractions due to emotional/mental states, cognitive distractions arising from radio listening and hands-free speech-based interfaces, and physical distractions from sneezing/coughing/itching were not

enumerated. Moreover, this study did not consider the presence of passengers as a distraction since the road side data collectors could not directly observe the interactions between the driver and the passenger to label the passenger as a true distraction. Assuming that the mere presence of at least one passenger was a true distraction, the overall baseline distraction rate would increase from 170 to 539 distracted drivers per 1,000 vehicles. Nevertheless, restricting the definition of distractions to situations that are observable from the road side maximizes the objectivity of reporting. However, laws intended to shift drivers from hand held cellular phones to hands-free systems or laws that shift use of window mounted GPS navigation systems to in-dashboard systems may decrease the observable distraction rate without decreasing the true distraction rate. In these cases, drivers are still engaged in non-driving tasks and continue to pose as a threat to pedestrians in school zones.

Acknowledgments:

This work was supported by a grant from FedEx Corporation. None of the authors have a financial interest or relationships with any entities that would constitute a conflict of interest. The author would like to thank Moira P. Donahue and Sally M. Williams for logistical support; Stephanie A. Russell for reviewing state laws; and the Safe Kids study coordinators: Leslie Feuerborn, Amanda Walpole, Christy Hubbard, Connie Gronstal, Sarah Nielsen, Kristan Creek, Hollie Lambert, Kristin Rosenthal, Daphne Greenlee, Ellen Walston, Siobhan Davis, Jennifer Cooke, Karen Jean Feury, Melissa Krall, Elizabeth Fries, Manda Rice, Kristin Wedding, Cari Cook, Doris Girt, and Deborah Will.

References

1. Brookhuis KA, De Vries G, De Waard D. 1991. The effects of mobile telephoning on driving performance. *Accident Analysis and Performance*, 23, 309-316.
2. Cellular Telecommunications Industry Association (CTIA). 1996. US Wireless Industry Survey Results: More than 9.6 Million Customers Added in 1995. News Release 5, 25 March.
3. Platt RW. 1997. Statistical commentary, *Injury Prevention*, 3, 87-88.
4. Stein AC, Parseghian Z, Allen RW. 1987. A simulator study of the safety implications of cellular mobile phone use. 31st Annual Proceedings of the American Association for Automotive Medicine. Hawthorne, CA, March, 181-200.
5. Kahneman, D. 1973, *Attention and Effort* (Englewood CA: Prentice Hall).
6. Wickens, CD. 1980. The structure of attentional resources. Nickerson R. (ed.). *Attention and Performance VIII* (Hillsdale: Erlbaum), 239-57.
7. Wickens, CD. 1984. Processing resources in attention. Parasuraman R, Davies DR (eds). *Varieties of Attention* (San Diego: Academic Press), 63-102.
8. Pashler, H. 1994. Dual-task interference in simple tasks: data and theory. *Psychological Bulletin*. 116, 220-244.
9. Strayer DL, Drews FA, Crouch DJ. (2006). A comparison of the cell phone driver and the drunk driver. *Hum Factors*. 2006; 48: 381-91.
10. Cohen, JT, Graham JD. (2003). A revised economic analysis of restrictions on the use of cell phones while driving. *Risk Analysis*. 23(1):5-17.
11. Stutts JC, Feaganes J, Rodgman E, Hamlett C, Meadows T, Reinfurt D, Gish K, Mercadante M, Staplin L. (2003). Distractions in everyday driving. AAA Foundation for Traffic Safety, Washington, DC.
12. Stutts JC, Feaganes J, Rodgman E, Hamlett C, Reinfurt D, Gish K, Mercadante M, Staplin L. (2003). The Causes and Consequences of Distraction in Everyday Driving. Proceedings of the 47th Annual Conference of the Association for the Advancement of Automotive Medicine, 235–252. Association for the Advancement of Automotive Medicine, Barrington, IL.
13. Sayer, Devonshire, Flannagan. 2005. Naturalistic driving performance during secondary tasks. Proceedings of the Fourth International Driving Symposium on Human Factors in Driver Assessment, Training and Vehicle Design.

14. Warsh J, Rothman L, Slater M, Steverango C, Howard A. 2009. Are school zones effective? An examination of motor vehicle versus child pedestrian crashes near schools. *Injury Prevention*. 15:226-229.
15. National Highway Traffic Safety Administration, 2008. Driver electronic device use in 2007. Report no. DOT HS-810-963. Washington, DC: US Department of Transportation.