

TRANSPORTATION RESEARCH BOARD  
*OF THE NATIONAL ACADEMIES*

**Research in Progress on Distracted Driving**

◆indicates project was funded with U.S. DOT funds either directly or through a State DOT using SPR funds.

### **Assessment of Distraction Caused By Billboards Using Eye Tracking System, Phase II◆**

Driver distraction is a major issue of concern. The growing number of accidents due to complexity in the road side environment is being considered a major problem. The objective of the project is to assess the extent of distraction caused by billboards by analyzing the driver's eye movement in the presence of billboards. The analysis is to be carried out in a simulator, as any distraction caused on the road would be dangerous. The eye tracking system tracks the eye movement of the driver as he drives and the scene camera arranged in the car gives a view of the road ahead of the driver. The data collected from the scene camera and the eye tracking system can later be combined. The combined data gives a video recorded by the scene camera. The video gives an idea of the safety effects of billboards on drivers.

Start date: 2007/6/1  
End date: 2008/12/31

Source Organization: Pennsylvania State University, University Park  
Index Terms: Driving simulators, Distraction, Roadside distractions, Roadside advertising, Tracking systems, Eye movements, Cameras, Research projects,

#### **Subjects**

Highways, Safety and Human Factors

#### **Sponsor Organization**

West Virginia Department of Highways  
1900 Kanawha Building East  
Charleston, WV 25365  
USA  
Phone: (304) 558-0444

#### **Project Manager**

Williams, Donny  
Phone: (304) 558-0444

#### **Performing Organization**

West Virginia University, Morgantown  
Morgantown, WV 26506  
USA

#### **Principal Investigator**

Martinelli, David R.  
Phone: (304) 293-0111

## **A Pilot Study for Distracted Driving in Teens With and Without ADHD**

<http://www.uab.edu/utc/Current%20Projects.htm>

Motor vehicle collisions (MVCs) are the leading cause of death for teenagers, accounting for approximately 1 in 3 deaths for this age group (National Center for Injury Prevention and Control [NCIPC], 2009). With advancing technology, the number of distractions to which drivers are exposed continues to increase and such distractions may especially increase the risk and severity of motor-vehicle related injury for teens because of their lack of experience (Neyens & Boyle, 2008). The purpose of the present study is to examine what effect two common forms of distractions (cell phone & text messaging) might have on increased motor-vehicle injury risk in teens with and without Attention-Deficit/Hyperactivity Disorder, Combined Type (ADHD-C) - a group that has been identified as at particular risk for injury (Barkley, Guevremont, Anastopolous, DuPaul, & Shelton, 1993).

Start date: 2009/6/22

End date: 2010/5/31

Source Organization: University of Alabama, Birmingham

Index Terms: Traffic accidents, Teenage drivers, Attention deficit hyperactivity disorder, Distracted drivers, Cellular telephones, Accident prone drivers, Collisions, High risk drivers, Crash injuries, Research projects

### **Subjects:**

Highways, Safety and Human Factors

### **Sponsor Organization:**

University of Alabama, Birmingham  
UAB University Transportation Center  
1530 Third Avenue South  
CH-19 401  
Birmingham, AL 35294  
USA

### **Project Manager:**

Underhill, Andrea  
Phone: (205) 934-2862  
Fax: (205) 975-8143  
Email: [Andrea.Underhill@ccc.uab.edu](mailto:Andrea.Underhill@ccc.uab.edu)

### **Performing Organization**

University of Alabama, Birmingham  
UAB University Transportation Center  
1530 Third Avenue South  
CH-19 401  
Birmingham, AL 35294  
USA

### **Principal Investigator**

Stavrinos, Despina  
Phone: (205) 934-7861  
Fax: (205) 975-8143  
Email: [dstavrin@uab.edu](mailto:dstavrin@uab.edu)

**Distracted and Drowsy Driving Intervention for Teen Drivers in Rural America◆**

<http://www.wti.montana.edu/Projects.aspx?id=458cfff8-355f-4b46-97f1-c1b9b8d6f976>

The goal of this project is to test a driver education program on the hazards of distracted and drowsy driving, and to quantify its effects on the behavior of novice teen drivers in rural communities.

Start date: 2008/7/1

End date: 2009/9/15

Source Organization: Montana State University, Bozeman

Index Terms: Teenage drivers, Distraction, Drowsy drivers, Rural areas, Fatigue (Physiological condition), Travel behavior, Research projects,

**Subjects**

Highways, Safety and Human Factors

**Sponsor Organization**

National Highway Safety Administration-Pacific  
Institute for Research & Evaluation  
11720 Beltsville Drive, Ste 900  
Calverton, 20705-3111  
USA  
Phone: 301-755-2710

**Project Manager**

Johnson, Mark  
Phone: 301-755-2710  
Email: [mjohnson@pire.org](mailto:mjohnson@pire.org)

**Performing Organization**

Montana State University, Bozeman  
<http://www.coe.montana.edu/wti/>  
Western Transportation Institute  
P.O. Box 174250  
Bozeman, MT 59717-4250  
Phone: (406) 994-6774  
Fax: (406) 994-1697

**Principal Investigator**

Ward, Nic  
Phone: (406) 994-5942  
Email: [nward@coe.montana.edu](mailto:nward@coe.montana.edu)

## **Age Related Changes in Cognitive Response Style in the Driving Task Part II♦**

In the first phase of this research, different patterns of physiological response were observed between younger and older drivers during a simulated cellular telephone conversation. Results of the study indicate that while younger drivers showed heart rate acceleration during the cell phone task, older adult drivers, as a group, showed no change. Questioning the apparent lack of reaction in the older drivers, and considering the literature on sensory intake and rejection which suggests that heart rate can increase or decrease depending on how individuals attend to cognitive processing demands, we then examined the data for presence of subgroups of heart rate response among each age group. This analysis revealed that there were individuals who showed heart rate acceleration and those who showed non-acceleration or deceleration reactions in both age groups, demonstrating that the overall difference in heart rate response was not a fixed pattern associated with aging, but a difference in the relative percentage of individuals expressing each response style. In a continuation of this research, we will further investigate the potential for differences in response style by age group using a more complex cognitive task that may further elucidate the effect of the secondary task on driving performance. Interactions between response style and age on simulated driving performance will be investigated. If significant, these interactions would suggest that in addition to age, response style is a major contributor to driving performance. The increasing presence of complex secondary tasks in the automobile suggests that outcomes of this research could significantly inform the development of regulation and education on the use of in-vehicle technology among different operators.

Start date: 2008/9/1

End date: 2009/8/31

Source Organization: Massachusetts Institute of Technology, Cambridge

Index Terms: Aged drivers, Aged, Younger drivers, Cognition, Cellular telephones, Behavior, Driver experience, Research projects,

### **Subjects**

Highways, Safety and Human Factors

### **Sponsor Organization**

Department of Transportation  
Research and Innovative Technology Administration  
1200 New Jersey Avenue, SE  
Washington, DC 20590  
USA

### **Performing Organization**

Massachusetts Institute of Technology, Cambridge  
Public Affiliates Program, Center for Transportation  
Studies  
77 Massachusetts Avenue, Room 1-153  
Cambridge, MA 02139-4307  
USA

### **Principal Investigator**

Reimer, Bryan  
Phone: (617) 452-2177  
Email: [reimer@mit.edu](mailto:reimer@mit.edu)

## **Age Related Changes in Cognitive Response Style in the Driving Task◆**

The presence of secondary tasks in the automobile appears to be increasing among drivers of all ages. The operation of these in-vehicle devices while underway produces an increase in workload and acute stress. According the Yerks-Dodson principle, a critical balance exists between maximum task performance and an individual's stress level. An increase in heart rate, respiration rate and skin conductance level typically corresponds with an increase in workload / stress. However, recent work shows that under a dual task condition driver age impacts the probability of heart rate acceleration. This project will conduct simulated experimentation that will focus on comparing response mechanisms of the younger adults with aged drivers. We hypothesize that patterns of physiological response will vary between the younger and older group. Furthermore, the older group will better balance the focus of attention, i.e. show less cardiac acceleration. We believe that over both age groups the shift in attentional focus will not compromise a basic simulated driving task. Outcomes of this research have profound policy implications on the use of secondary devices by different age groups. Objective: In this work we plan to investigate, how everyday secondary tasks such as cellular telephones internally impact drivers of different ages, i.e. to what state do drivers of different ages internalize the stress associated with the use of secondary technology in the car. According the Yerks-Dodson principle a critical balance exists between maximum task performance and an individual's stress level. Therefore, it is critical that the stress of the driving task be high enough for individuals to maintain a high level of performance but not overwhelm the driver to the point at which performance begins to fall. Physiological measurements such as heart rate, galvanic skin resistance and respiration are often used to gauge changes in stress and workload. Cardiac acceleration, increases in galvanic skin resistance and respiration rate are often linked to acute or short duration stressors (Backs & Seljos, 1994; Veltman & Gaillard, 1998).

Start date: 2006/9/1

End date: 2007/8/31

Source Organization: Massachusetts Institute of Technology, Cambridge

Index Terms: Aged, Aged drivers, Cognition, Cognitive impairment, Stress (Psychology), Cellular telephones, Distraction, Research projects,

### **Subjects**

Highways, Safety and Human Factors

### **Sponsor Organization**

Department of Transportation  
Research and Innovative Technology Administration  
1200 New Jersey Avenue, SE  
Washington, DC 20590  
USA

### **Performing Organization**

Massachusetts Institute of Technology, Cambridge  
<http://ctl.mit.edu/>  
New England University Transportation Center  
Engineering Systems Division  
1 Amherst Street, E40-279  
Cambridge, MA 01239

### **Principal Investigator**

Reimer, Bryan  
Phone: (617) 452-2177  
Email: [reimer@mit.edu](mailto:reimer@mit.edu)

## **Development and Evaluation of an Attention Maintenance Training Program**

This proposed research focuses on one of the key attributes that puts younger drivers at increased risk. In particular, we will focus on the finding that younger drivers pay less attention to the forward roadway and/or are more likely to be engaged in a distracting behavior. Distractions are estimated to cause some 20% - 30% of crashes among older teen drivers, and to be larger among newly licensed drivers than they are among more experienced drivers. Furthermore there is evidence to suggest that the longer time that younger drivers spend with their eyes off the forward roadway leads to an increased potential of an incident. Nevertheless, the data suggest that it may be possible to train newly licensed drivers to develop and adopt a more strategic scan pattern that allows successful completion of a task without a decrease in driving safety. Given both the increased number of in-vehicle electronic devices and the potential impact on traffic safety of a program designed to increase attention to the forward roadway, there is a definitive need to identify an effective attention maintenance training program. This research proposes such a training program, in the form of a Roadway Attention Maintenance Training (RAMT) program which aims to reduce the time that newly-licensed drivers spend with their eyes away from the forward roadway to under two seconds a glance, a duration below which the risk is minimal. The training will be developed as a computer-based training program and will consist of game like elements which make the benefits and costs associated with performing an in-vehicle secondary task similar to what they might be in the real world. Following development of RAMT, its effectiveness will be evaluated using a virtual world in a driving simulator environment where drivers' eye movements will be tracked to quantify their attention maintenance. The evaluation will then move to an on-road environment (closed course) to determine the extent to which the training translates to the real world driving environment. Given the national attention currently being focused on younger drivers, distracted driving, and traffic safety in general, it is anticipated that this research will serve as the foundation for larger-scale future research efforts at the national level.

Start date: 2008/7/1

End date: 2009/6/30

Source Organization: University of Massachusetts, Amherst

Index Terms: Accident prone drivers, Accident risk forecasting, Risk assessment, Younger drivers, Teenage drivers, Preventive maintenance, Attention,

### **Subjects**

Highways, Research, Safety and Human Factors, Education and Training

### **Sponsor Organization**

Research and Innovative Technology Administration  
University Transportation Centers Program  
Department of Transportation  
1200 New Jersey Avenue, SE  
Washington, DC 20590  
USA

### **Performing Organization**

University of Massachusetts, Amherst  
University Transportation Center, 214 Marston Hall  
Amherst, MA 01003  
USA

### **Principal Investigator**

Knodler, Michael A.  
Phone: (413) 545-0228  
Fax: (413) 577-1036  
Email: [mknodler@ecs.umass.edu](mailto:mknodler@ecs.umass.edu)

Fisher, Donald L.  
Phone: (413) 545-1657  
Fax: (413) 545-1027  
Email: [fisher@ecs.umass.edu](mailto:fisher@ecs.umass.edu)