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Turning the research we do into information for you!

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NSTSCE

National Surface Transportation
Safety Center for Excellence

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About NSTSCE

The National Surface Transportation Safety Center for Excellence (NSTSCE) located at the Virginia Tech Transportation Institute (VTI) was established by the Federal Public Transportation Act of 2005 to develop and disseminate advanced transportation safety techniques and innovations in both rural and urban communities.

NSTSCE uses state-of-the-art technology, including the Virginia Smart Road, to focus on four main research areas:

1. Safety devices and techniques that enhance driver performance;
2. Evaluations of the built roadway environment and infrastructure-based safety systems;
3. Safe mobility for vulnerable road users; and
4. Driver impairment.

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Along for the Ride

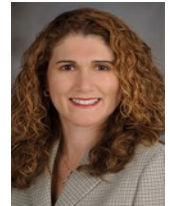
Our second issue of *Transportation Research Today* presents several completed and ongoing studies. We review a case study performed by Dr. Erin Mabry that reveals the importance of improving commercial motor vehicle (CMV) driver health and wellness. CMV drivers are key contributors of our economy. Without them we would not be able to have an efficient way of moving goods and services across our nation. We need to ensure that they receive encouragement and guidance to move towards a healthier lifestyle as part of this important career. We applaud the effort Schneider National, Inc. has put in their program and for allowing Dr. Mabry to document the drivers' experiences. An effort of the magnitude described in this study might not be feasible for all fleets. Therefore, NSTSCE has invested into putting a website together that will help fleets and drivers obtain training modules to assist with this and multiple other topics that will impact CMV driving safety. You will find more information about our new CMV Driving Safety website in this issue.

This issue also includes an article on infotainment systems and distraction as well as two sneak peeks into future articles under our Ongoing Studies section. These two projects will reveal how coaching teen drivers and the impact of quiet vehicles on pedestrians and bicyclists can influence the safety of vulnerable road users.

Please keep sending us your mile marker pictures along with the location of the photo. If your mile marker is selected for publication, you will receive photo credit.

Please feel free to contact us with your ideas and feedback at NSTSCE_Outreach@vti.vt.edu. Safe travels!

Myra Blanco
Outreach Coordinator, NSTSCE



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Working to Improve the Health & Wellness of Truck Drivers

By Scott Tidwell

Almost everyone encounters tractor-trailers in their daily travels. However, most people may not realize the type of lifestyle often required of truck drivers, especially those drivers working in long-haul operations. Current Federal regulations allow truck drivers to spend up to 11 hours per day driving and up to 70 hours driving in an 8-day period. These long driving hours coupled with frequently changing schedules such as late night or early morning shifts can lead to an unhealthy lifestyle. Limited access to healthy food options, lack of exercise, and irregular sleeping patterns are common among truck drivers.

A Look at the Facts

Overweight and obesity rates in commercial motor vehicle (CMV) drivers have been reported to range between 56 to 85 percent. This is alarming as these rates far outpace the obesity rate of the general U.S. adult population. Obesity is known to be a primary risk factor for many chronic conditions, including heart disease, Type 2 Diabetes, high blood pressure, sleep disorders, and osteoarthritis. A study conducted in 2012 indicated that obesity in CMV drivers was associated with a higher risk of crashes. Truck drivers routinely spend the majority of their day in the truck cab, between driving and sleeping in the sleeper berth. These long hours can reduce a driver's motivation as well as time for exercise.

CMV drivers are also exposed to a number of physical and psychological

stresses during the work day. The irregular work/rest schedules and high-mileage driving can take a toll on the drivers' bodies. Extended time away from home along with commonly driving alone can lead to daily frustrations. Research has shown that these factors can compromise the drivers' decision-making processes, roadway safety, and the drivers' long-term health. According to the U.S. Department of Labor (2012), CMV drivers account for 19 percent of all workplace fatalities and consistently rank among the top three occupations for total nonfatal injuries and illnesses.

Addressing the Problem

A leading U.S. truck carrier, Schneider National Inc. (SNI), began a health and wellness program in 2008. This health and wellness program is aimed at chronic disease prevention and management, ergonomic and injury prevention, on-site physical and occupational therapy, routine health screenings, nutrition and exercise education, and overall wellness coaching. The health and wellness program is administered through Atlas Ergonomics and United HealthCare at 12 SNI operating centers located across the U.S. and Canada and is available to approximately 17,000 employees. Spouses of employees are also eligible to enroll in the SNI health and wellness program. Results from one SNI operating center showed a reduction in cholesterol, triglycerides, glucose, and blood pressure and an increase in aerobic capacity after the first six months of participation.

The NSTSCE research team conducted a case study of SNI's

New Driving Safety Website



NSTSCE has launched a new website, **CMV Driving Safety**, with the goal of helping truck and bus fleets improve their driving safety. The website includes interactive modules covering driver distraction, driver drowsiness and fatigue, driver health, sharing the road, hours-of-service, and safety systems. Links to additional resources and information are also available. View online or download. No sign-up or registration required.

Begin improving your fleet safety today!



www.cmvdrivingsafety.org

health and wellness program and evaluated the opinions, perceptions, and program satisfaction of participating CMV drivers and program staff. The aim of the case study is to aid in the development of health and wellness programs at other CMV fleets.

Behind the Scenes

Of the approximately 17,000 SNI employees, 4,600 (includes drivers and non-drivers) had participated in the health and wellness program as of 2010. Of the participating CMV drivers, 54 percent were classified as obese. Participation is voluntary; however, a health insurance incentive is provided to encourage participation in the health and wellness program. SNI promotes the health and wellness program through a variety of ways, including posters at terminals, company newsletters, on-site presentations, and packets mailed to employees' homes. SNI found driver recruitment into the health and wellness program to be challenging, due largely to the drivers' worry about personal medical information being used to disqualify them from driving, in turn costing them a way to earn a living. It is important to address this fear from the start and all drivers are informed that their health-related results are protected by the Federal Health Insurance Portability and Accountability Act (HIPAA) and cannot be accessed by their employer. Additionally, SNI allows employees to use their own primary care doctor for the health screenings if the employee chooses.

Health & Wellness Program

SNI employees who enroll in the program begin by taking an online health assessment. This assessment includes questions related to safety and health behaviors such as seat belt use and exercise habits, job stress, work satisfaction, eating habits, and

preventative health exams. Participants then complete a biometric screening that includes height and weight measurements, blood pressure, and lipid and glucose analysis. The biometric screenings can be scheduled at any of the 12 SNI operating centers, the employee's primary care doctor, or by requesting a mail kit. About half of the participating drivers requested the mail kit.

Health professionals from Atlas Ergonomics and United HealthCare review all health assessments and biometric screenings with each participant one-on-one. During this review process, feedback and suggestions are provided to improve health behaviors and establish goals. Confidentiality is again stressed to all participants while making each interaction as personal and productive as possible. Follow-up meetings and phone calls are scheduled to give each health and wellness participant a chance to meet his or her goals and achieve a healthy and active lifestyle.

Health coaching strives to overcome roadblocks to good health. Several nutrition and exercise guides are available to drivers free of charge. Three-, six-, and twelve-month follow-up biometric screenings are also offered to allow participants to track their progress and maintain healthy behaviors. Any participants that are categorized high-risk are referred to a doctor for a follow-up visit for a more detailed health assessment. In cases where participants may be at severe risk for disease, he or she is contacted by a health coach and recommended to enroll in an additional health program such as wellness coaching that specifically targets smoking cessation, weight loss, nutrition, exercise, heart health, stress management, and diabetes are available to participants.

And the Drivers Reveal...

The NSTSCE research team interviewed 96 SNI drivers that participate in the health and wellness program. A majority of these drivers (61%) feel that the health and wellness program has resulted in better overall health and well-being. The top four education and coaching topics that the drivers utilized were exercising on the road, weight loss, hypertension prevention and control, and diabetes prevention and control.

Drivers were also asked what they liked and disliked about the program. Drivers were appreciative of their employer's concern and dedication to good driver health and felt the health professionals provided clear, easy to understand feedback and coaching. It was also important to drivers that the program is available on-site at the operating centers and no appointment is necessary.

“Instead of telling drivers to be healthier, it provides information and tools to actually live healthier.”

“I can do more things now that I had a hard time doing before, and have gotten in better shape.”

(Drivers quoted in Mabry et al., 2013)

While 59 percent of the drivers interviewed had no dislikes of the health and wellness program, some drivers did feel that the program should be available at more than 12 operating centers and that it is difficult for drivers with rotating schedules to have access to the health professionals. Also, the drivers with rotating schedules feel left out of the educational and fitness events as they are held at times while they tend to be sleeping or over-the-road. Privacy concerns were raised by a

number of drivers who still worried SNI would become aware of any medical condition and that would impact their employment status. Many drivers also suggested increasing the exercise component of the program and mentioned that having exercise rooms at each terminal would help them better achieve their health goals.

The End Result

Overall, the NSTSCE research team found that the SNI health and wellness program is viewed as a success. The majority of drivers who participate in the program report that their health has improved and would recommend this program to their fellow drivers. Drivers also report being more aware of their health and lifestyle and the daily choices they make regarding nutrition and exercise. Improving the health and wellness of CMV driver-employees is a major factor in reducing the turnover rate, maintaining lower insurance premiums, and increasing job satisfaction and production. For the drivers, they must understand the vital link between good health and maintaining their driving career.

A set of lessons learned and recommendations were developed as part of this case study that can be used by other fleets who may be interested in developing a health

and wellness program for their drivers.

The full case study is available online at <http://vtechworks.lib.vt.edu/handle/10919/24207>.

References

Howard, M. E., et al., *Sleepiness, sleep-disordered breathing, and accident risk factors in commercial vehicle drivers*. American Journal of Respiratory and Critical Care Medicine, 2004. 170 (9): p. 1014-21.

Mabry, E. J., Hickman, J., Hanowski, R. (2013). *Case Study on Worksite Health and Wellness Program for Commercial Motor Vehicle Drivers*. National Surface Transportation Safety for Excellence: Blacksburg, VA. Bureau of Labor Statistics. (2012). Nonfatal occupational injuries and illnesses requiring days away from work. Accessible at: <http://www.bls.gov/news.release/osh2.nr0.htm>

Bureau of Labor Statistics. (2012). Fatal occupational injuries by occupation and event or exposure. Accessible at: <http://www.bls.gov/news.release/cfoi.t03.htm>



Dr. Erin Mabry was the project lead for the Case Study on Worksite Health and Wellness Program for Commercial Motor Vehicle Drivers. Dr. Mabry is currently a research associate for the Center for Truck and Bus Safety at VTTI.

For more information, contact Dr. Mabry at emabry@vtti.vt.edu.

Announcement!



National Surface Transportation Safety Center for Excellence Subject Matter Expert Dr. Richard Hanowski will give a keynote address at the 9th

International Conference on Managing Fatigue, to be held in Perth, Australia. For more information on the conference, visit:

www.fatigueconference2015.com.au

Dr. Hanowski is internationally recognized as a leading researcher in the areas of driver distraction and driver fatigue. More information on Dr. Hanowski can be found in this issue's Researcher Profile.

Interested in becoming an NSTSCE stakeholder?



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Infotainment: Driving Enhancement or Dangerous Distraction?

By Paul Bartholomew & Vikki Fitchett

As cars become more advanced, the same is true for the range of entertainment and information systems that are available as options in new vehicles. These systems now offer so many different functions that radios have become just a small part of what is offered in most cars. The demand is there: drivers want to be entertained, informed, and connected during even the shortest of trips. NSTSCE researchers wanted to know if using these systems while driving is as low-risk as using a basic radio. Or, are the new and more advanced systems becoming a dangerous distraction?

This study – entitled *Distraction Index Framework* – looked into how often drivers who had access to these new and advanced “infotainment” systems were involved in a crash or near-crash situation. The study participants drove for approximately 4 weeks in cars equipped with high-functionality infotainment systems; however, it was left up to the participants whether or not to use the infotainment system. During the 4-week period, the study continuously collected data about the infotainment system usage and video from four different cameras installed in

the car recorded the driver’s face, a view over the driver’s shoulder, a close-up of the system in the car, and the forward roadway. The video recordings provided detailed information regarding the driver’s eyeglance patterns; for example, was the driver looking at the forward roadway, at the infotainment system, or in some other direction? The data was collected only while the car ignition was triggered.

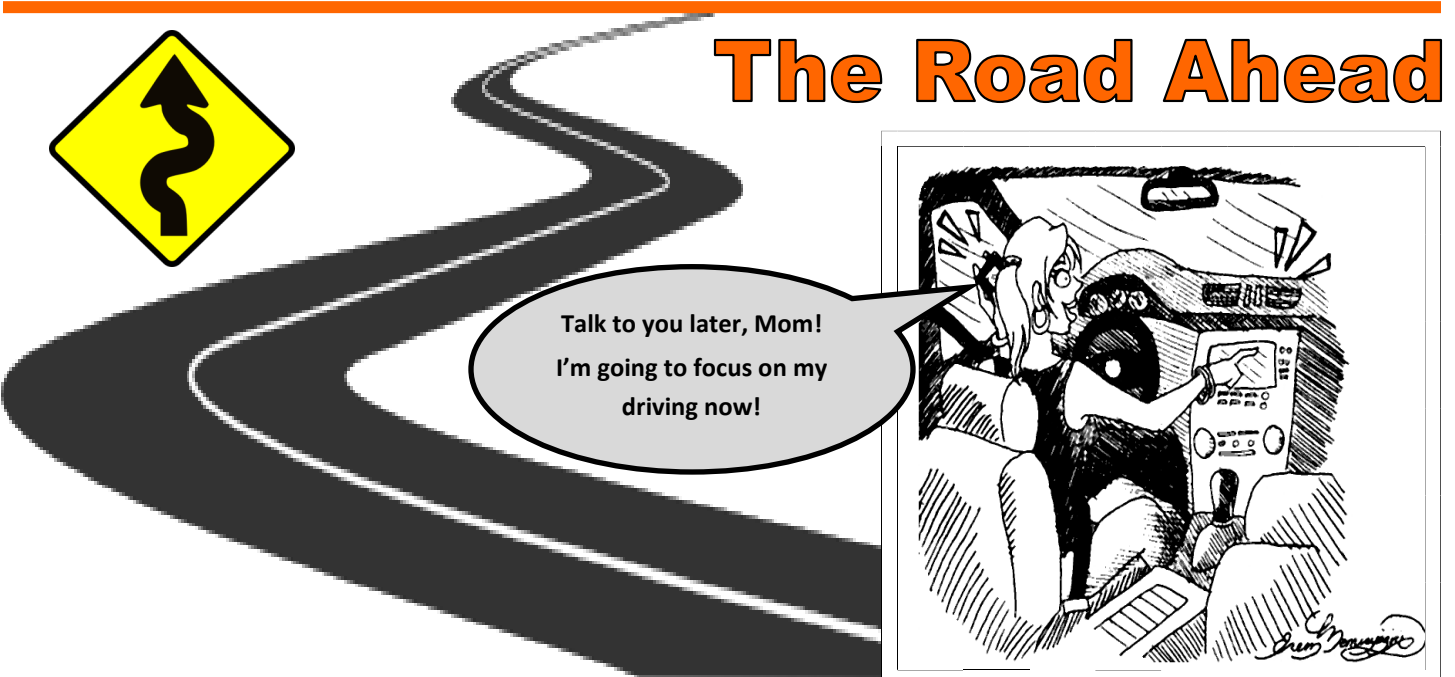
Breaking Down the Data

Trained data analysts sorted through all the video recordings and described each driver’s behavior and experience when driving the vehicle during the study period. The details that the data analysts made note of included any significant events (for example: another vehicle is crossing this vehicle’s path), how the driver reacted to the event(s), and whether or not the driver was glancing forward at the time of the event. Viewing the videos from the various cameras in sync allow the analysts to match the driver’s behavior with the events of interest. Data such as this is called *naturalistic*; this means that it is collected in real-world situations, not from laboratory or simulator settings.

“Seen as a whole, the data suggest that there was definitely some visual demand placed on the participants when they interacted with infotainment systems.”

(Perez and Hankey, 2013)

Because the focus of this study was to understand how drivers’ interaction with an infotainment system affects their driving behavior, the time frames surrounding each specific interaction with the system were split into three phases: pre-event (the 10 seconds prior to the onset of the interaction with the system), event (the interaction time itself, from first button press to final button press), and post-event (the 10 seconds after the infotainment system interaction). Each interaction with the infotainment system was in turn analyzed to determine which specific activities were taking place (for example: adjusting volume, navigation) and how long was spent on each activity.



What the Research Team Learned

Some longer infotainment activities did show an increase in lane deviations (that is, the driver would veer out of his/her designated lane when interacting with the infotainment system), and the data indicated a somewhat reduced tendency to respond to unexpected events on the road ahead, especially when those events were located in the peripheral visual field. Nevertheless, there were no crashes experienced by the study participants and only 46 near-crashes. A near-crash is the term used to define an event in which a sudden evasive maneuver must occur in order to prevent a conflict with another vehicle, person, animal, or structure.

The study concluded that use of infotainment systems had measurable demands on the driver's visual resources, yet the use of these systems

had limited or no measurable effect on the control of the vehicle.

Studying the naturalistic data gathered by the cameras and instrumentation utilized in this study has added to the body of knowledge regarding safe driving behavior, but additional studies will advance our understanding even further.

The final report for the *Distraction Index Framework* study is available online at <http://vtechworks.lib.vt.edu/handle/10919/23318>.

Reference

Perez, M. A., and Hankey, J. M. (2013). *Distraction Index Framework*. National Surface Transportation Safety Center for Excellence: Blacksburg, VA.



Miguel Perez, Ph.D., served as the project lead for the *Distraction Index Framework* study. Dr. Perez is Director of the Center for Data Reduction and Analysis Support at VTTI. His Ph.D. is in industrial engineering with a human factors option and he is also a Certified Professional Ergonomist.

For more information, contact Dr. Perez at miperez@vti.vt.edu.

NSTSCE Researcher Profile



Dr. Rich Hanowski is the subject matter expert for the NSTSCE focus area entitled Driver Impairment. Driver Impairment broadly defines conditions and states that may impact driving performance; examples include intoxication, fatigue, and distraction. Dr. Hanowski is also a Senior Research Scientist at VTTI and serves as the Director of the Center for Truck & Bus Safety. He has led several notable projects that have had significant impacts on transportation policy, including research on driver distraction and driver fatigue that served as the scientific foundations for federal legislation. Related to Driver Impairment, Dr. Hanowski has served on

numerous expert panels including a 2012 panel on "Fatigue and Motorcoach Driver Safety" for the Federal Motor Carrier Safety Administration. He also serves on an ongoing U.S. Department of Transportation international panel that began in 2010 to support U.S. and international government agencies on issues related to driver distraction. He is currently a member of a National Academy of Sciences panel on "Research Methodologies and Statistical Approaches to Understanding Driver Fatigue Factors in Motor Carrier Safety and Driver Health."

Transportation Tidbit

Did you know that one in four commercial motor vehicle drivers in the United States has obstructive sleep apnea?

Mabry, E.J., Baker, S., Hickman, J. & Hanowski, R. (2012). Case Study on the Impact of Treating Sleep Apnea in Commercial Motor Vehicle Drivers: Sleep Apnea Programs from Two Leading U.S. Carriers and Focus Group Findings.

Ongoing Studies

There are currently more than 50 studies being conducted under the NSTSCE program; featured below and on the following page are two of these ongoing studies.

Coaching Teen Drivers: Instilling Safe Driving Behaviors from the Start

By: *Vikki Fitchett*

The purpose of this project is to forward the concept of teen driver coaching and monitoring to eliminate behaviors that can lead to fatal and injury crashes. Teen drivers are three times more likely to get into a fatal crash than their adult counterparts due to causes such as excessive speed, alcohol use, distraction, and failure to recognize hazards (Williams, 2003). NSTSCE researchers had been approached by two Virginia counties (Bedford and Montgomery) to help design a program to mitigate what they believed to be a tragic and growing problem in their communities. The researchers recommended a “three-pronged” approach to help reduce

driver’s education program works, legal issues associated with teen drivers, insurance issues regarding teen drivers, parent-teen driving contracts, and how parents can be effective driving coaches for their teens. The program was subsequently expanded to Roanoke County.

The latest phase of this project involves instrumenting the vehicles that will be used by young drivers with new learner’s permits with mini data acquisition system units that record data for every trip that teenagers drive. The instrumentation provides both real-time and after the fact feedback to the



teen deaths and injuries: 1) Educating families about Parent-Teen contracts with elements of an enhanced graduated driver’s licensing (GDL) program, 2) Training of specific skills at a specially designed training facility, and 3) A teen driver monitoring and coaching program using advanced in-vehicle technology. This project incorporates all three parts, with special emphasis on the driver monitoring and coaching program.

Since the project began in 2009, members of the research team have been active in attending Parent/Teen Driver Night Programs in the two counties in order to educate 10th graders and their parents about the challenges that are unique to new drivers. Topics covered include the licensing process, how the

teens and their parents. As of April 2014, 88 out of 92 vehicles for the teen participants had been instrumented.

The NSTSCE researchers conducting this project have also been active in meetings of the Transportation Research Board Young Driver Subcommittee (Washington, D.C.) and DriveSmartVirginia (Richmond, VA); their goal is to have a positive impact on novice drivers starting with their very first experiences behind the wheel.

Reference

Williams, A. *Teenage Drivers: Patterns of Risk*. Journal of Safety Research 2003; 34:5-15.

An Assessment of Quiet Vehicles on Pedestrian and Bicyclist Safety

By: *Vikki Fitchett*

Electrically propelled vehicles (EPVs) are becoming more popular due to the many benefits they provide, examples of which are fuel cost savings, driving performance, environmental concerns for air quality and energy conservation, and incentive programs such as the use of high occupancy vehicle (HOV) lanes.

However, the low noise operation of these vehicles—when at low speeds—coupled with their increased numbers on roadways, has led to concerns for the safety of those who depend on sound for the detection, identification, and location of moving vehicles. Previous work has shown that audible detection of EPVs operating at higher speeds (30 mph and up) is not a problem, but numerous advocates for the visually impaired (such as the American Council for the Blind and the National Federation of the Blind, which represent 1.3 million visually impaired people in the United States) contend that visually impaired pedestrians are at increased risk of conflict with these quiet vehicles during low-speed operation and they have called for action on the part of auto makers and the regulatory community.

The term “quiet vehicle” can be used to describe any automotive vehicle that can operate at a lower noise level than that typically associated with a normal internal combustion engine-powered vehicle. This includes any vehicle that can operate in a purely electrically propelled mode in addition to human-powered vehicles, such as bicycles, scooters, and Segways®.

In response to these concerns and the results of related research, President Obama signed the Pedestrian Safety Enhancement Act of 2010 (PSEA) into law on January 4, 2011. This law directs the U.S.

Department of Transportation (DOT) to address the issue of increased risk to pedestrians posed by quiet vehicles through National Highway Traffic Safety Administration (NHTSA) Federal Motor Vehicle Safety Standards (FMVSS) within four years, that is, by July 4, 2015.

This project is focused on providing a comprehensive and concise overview of the apparent safety issues presented to pedestrians and pedalcyclists by the operation of QVs on roadways. The final project report will describe implemented and proposed countermeasure methods in addition to opportunities for future potential research to address knowledge gaps and improve overall understanding of the issues.

This project falls under the NSTSCE focus area of: *Safety Devices and Techniques that Enhance Driver Performance*. Andrew S. Alden is the lead researcher for this study.



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On Location

The Mile Marker 2 image on the cover was captured on Route 611 in Ocean City, MD by Scott Tidwell.



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