
8th International Driving Symposium
on Human Factors in Driver Assessment,
Training, and Vehicle Design



**DRIVING
ASSESSMENT
2015**

Snowbird
Salt Lake City, Utah, USA
June 22-25, 2015

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We thank all members of the Scientific Review Committee for their time and effort in evaluating the many full-paper submissions. The Honda Outstanding Student Award Paper Review Committee deserves special thanks for reviewing the student papers considered for the award.

At the University of Iowa Public Policy Center, we thank Peter Damiano, Director, Cher Carney, Michelle Reyes, Cheri Roe, Alex Sukalski, Madonna Weiss, Samantha Kornis, Phylliss Johnson, and Skyler Clarke. We also thank the following graduate students, Morgan Price, University of Iowa; Jennifer Merickel, University of Nebraska; as well as Rachel Hopman and Jonna Turrill, University of Utah.

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8th International Driving Symposium on Human Factors in Driver Assessment, Training and Vehicle Design June 22-25, 2015

All events are open to registered participants

Monday, June 22, 2015

2:00 pm – 6:30 pm	Early Registration Ballroom Lobby, Level B
2:00 pm – 6:30 pm	Exhibitor Set Up Ballroom 1, Level B
6:30 pm – 9:00 pm	Welcome Reception The Golden Cliff, Level B

Tuesday, June 23, 2015

7:15 am – 5:00 pm	Registration Open Ballroom Lobby, Level B
7:15 am – 8:30 am	Continental Breakfast Ballroom Lobby, Level B
7:30 am – 1:30 pm	Poster Session A Set Up Ballroom 1, Level B
8:00 am – 4:30 pm	Exhibitors Available Ballroom 1, Level B
8:30 am – 9:30 am	Toyota Distinguished Keynote Lecture Dr. Mary Czerwinski (Microsoft Research) Emotion Tracking for Health, Memory, and Well-being (1) Ballrooms 2 & 3, Level B
9:30 am – 10:00 am	Break (refreshments available at exhibition booth area) Ballroom 1, Level B
10:00 am – 11:30 am	Session 1 – Driver Distraction & Attention Moderator: Natasha Merat Ballrooms 2 & 3, Level B 10:00 am – Mental Workload of Voice Interactions with 6 Real-World Driver Interfaces (2) Joel Cooper (University of Utah & Precision Driving Research), David Strayer (University of Utah) 10:20 am – Characterizing the Effect of Videophone Conversations on Intersection Driving Performance (3) John Gaspar (University of Iowa), Ronald Carbonari, Henry Kaczmarski, Arthur Kramer (University of Illinois) 10:40 am – Car-aoke: Vocal Performances Indicate Distraction Effects of In-Car Music (4) Warren Brodsky, Matan Ziv (Ben-Gurion University of the Negev – <i>Israel</i>)

11:00 am – **Cognitive Distraction Impairs Drivers' Anticipatory Glances: An On-Road Study (5)** Francesco Biondi (University of Padova – *Italy*), Jonna Turrill, James Coleman (University of Utah), Joel Cooper (University of Utah & Precision Driving Research), David Strayer (University of Utah)

12:00 pm – 1:30 pm

Honda Luncheon and Outstanding Student Paper Awards
Conference Center Terrace Tent, Level 1

1:30 pm – 3:00 pm

Session 2 – Medical Issues in Driving

Moderator: Matt Rizzo
Ballrooms 2 & 3, Level B

1:30 pm – **Feedback from Naturalistic Driving Improves Treatment Compliance in Drivers with Obstructive Sleep Apnea (6)** Jeffrey Dawson, Lixi Yu, Nazan Aksan, Jon Tippin (University of Iowa), Matthew Rizzo (University of Nebraska), Steven Anderson (University of Iowa)

1:50 pm – **Agreement Between Physician Rating and On-Road Decision for Drivers with Multiple Sclerosis (7)** Hannes Devos, Maud Ranchet (Georgia Regents University), Mark Tant (Belgian Road Safety Institute – *Belgium*), Abiodun Akinwuntan (Georgia Regents University)

2:10 pm – **Comorbidities in Drivers with Parkinson Disease (8)** Maud Ranchet (Georgia Regents University), Mark Tant (Belgian Road Safety Institute – *Belgium*), Abiodun Akinwuntan, Hannes Devos (Georgia Regents University)

2:30 pm – **Pre-Frontal Cortex Activity of Male Drivers in the Presence of Passengers During Simulated Driving: An Exploratory Functional Near-Infrared Spectroscopy (fNIRS) Study (9)** Anuj Pradhan, Xiao-Su (Frank) Hu, Lisa Buckley, C. Raymond Bingham (University of Michigan)

3:00 pm – 4:30 pm

Break (refreshments available at exhibition booth area)
Ballroom 1, Level B

3:00 pm – 4:30 pm

Session 3 - Poster Session A

Ballroom 1, Level B

Investigating the Interaction between Helmet Field of View and Steering Behavior in a Novel Motorcycle Simulator (10) Antoine Morice (Aix-Marseille University – *France*), Violaine Sevrez (Lyon 1 University – *France*), Rob Gray (Arizona State University), Gilles Montagne (Aix-Marseille University – *France*)

Assessing the Distraction Potential of Changeable Highway Message Signs (11) Vaughan Inman (Leidos), Brian Philips (US DOT Federal Highway Administration)

Using Iterative Human Factors Methods to Assess Active Traffic Management Signage (12) Mary Anne Jeffers (Agilex), William Perez (Leidos), Brian Philips (US DOT Federal Highway Administration)

A Competence Based Exam for Prospective Driving Instructors: Construction, Validation, and Implications (13) Erik Roelofs, Maria Bolsinova, Angela Verschoor (CITO National Institute for Educational Measurement – *The Netherlands*), Jan Vissers (Royal Haskoning DHV – *The Netherlands*)

Serialization of Behavior During Car Following in Older Drivers (14)

Benjamin Lester, Sarah Hacker, Shaun Vecera (University of Iowa), Matthew Rizzo (University of Nebraska)

The Effects of Task Load and Vehicle Heterogeneity on Performance in the Multiple-Vehicle Tracking Task (15)

Martin Lochner (Commonwealth Scientific and Industrial Research Organization – *Australia*), Lana Trick (University of Guelph – *Canada*)

Exploring the Driving Behavior of Youth with an Autism Spectrum Disorder: A Driver Instructor Questionnaire (16)

Veerle Ross, Ellen Jongen, Marleen Vanvuchelen, Tom Brijs, Kris Brijs, Geert Wets (Hasselt University – *Belgium*)

Need for Revised Total Eyes-Off-Road Criterion in the NHTSA Distraction Guidelines: Track Radio-Tuning Data (17)

Richard Young (Wayne State University)

Effects of Non-Verbal Communication Cues on Decisions and Confidence of Drivers at an Uncontrolled Intersection (18)

Satoshi Kitazaki, Nathan Myhre (University of Iowa)

Comparison of Novice and Experienced Drivers Using the SEEV Model to Predict Attention Allocation at Intersections During Simulated Driving (19)

Alexander Bos, Daniele Ruscio, Nicholas Cassavaugh, Justin Lach (Central Michigan University), Pujitha Gunarathe (Toyota Motor Engineering & Manufacturing North America), Richard Backs (Central Michigan University)

Low Hanging Fruit: Use of Virtual Reality Driving Simulation in Department of Motor Vehicles to Assess Minimal Competence of Novice Drivers (20)

Daniel Cox, Matthew Moncrief (University of Virginia-Charlottesville), Matthew Rizzo (University of Nebraska), Donald Fisher (University of Massachusetts-Amherst), Ann Lambert, Sarah Thomas, Sean Eberhart (University of Virginia-Charlottesville), Rick Moncrief (Mbfarr, LLC)

Developing and Testing Operational Definitions for Functional and Higher Order Driving Instruction (21)

Johnathon Ehsani, Bruce Simons-Morton (*Eunice Kennedy Shriver* National Institute of Child Health and Human Development), Sheila Klauer (Virginia Tech Transportation Institute)

Eye Glance Analysis of the Surrogate Tests for Driver Distraction (22)

Li Hsieh, Sean Seaman, Richard Young (Wayne State University)

Linking GPS Data to GIS Databases in Naturalistic Studies: Examples from Drivers with Obstructive Sleep Apnea (23)

Jeffrey Dawson, Lixi Yu, Kelly Sewell, Adam Skibbe, Nazan Aksan, Jon Tippin (University of Iowa), Matthew Rizzo (University of Nebraska)

Wednesday, June 24, 2015

7:15 am – 5:00 pm	Registration Open Ballroom Lobby, Level B
7:15 am – 8:30 am	Continental Breakfast Ballroom Lobby, Level B
7:30 am – 1:30 pm	Poster Session B Set Up Ballroom 1, Level B
8:00 am – 4:30 pm	Exhibitors Available Ballroom 1, Level B
8:30 am – 10:00 am	Session 4 – Younger & Older Drivers Moderator: Neil Lerner Ballrooms 2 & 3, Level B 8:30 am – Training Working Memory of Older Drivers: The Effect on Working Memory and Simulated Driving Performance (24) Ariane Cuenen, Ellen Jongen Tom Brijs, Kris Brijs (Hasselt University – <i>Belgium</i>), Katrijn Houben (Maastricht University – <i>The Netherlands</i>), Geert Wets (Hasselt University – <i>Belgium</i>) 8:50 am – Experimental Effects of Pre-Drive Arousal on Teenage Simulated Driving Performance in the Presence of a Teenage Passenger (25) Bruce Simons-Morton (<i>Eunice Kennedy Shriver</i> National Institute of Child Health & Human Development), C. Raymond Bingham (University of Michigan), Kaigang Li (<i>Eunice Kennedy Shriver</i> National Institute of Child Health & Human Development), Jean Shope (University of Michigan), Anuj Pradhan (<i>Eunice Kennedy Shriver</i> National Institute of Child Health & Human Development), Emily Falk (University of Pennsylvania), Paul Albert (<i>Eunice Kennedy Shriver</i> National Institute of Child Health & Human Development) 9:10 am – Techniques for Reducing Speeding Beyond Licensure: Young Drivers’ Preferences (26) Yi-Ching Lee, Aditya Belwadi, Dana Bonfiglio, Leif Malm, Molly Tiedeken (Children’s Hospital of Philadelphia) 9:30 am – The Role of Parent Feedback and Vehicle Status on Supervised Driving in the Minnesota Teen Driver Study (27) Janet Creaser, Brandy Swanson, Nichole Morris (University of Minnesota)
10:00 am – 10:30 am	Break (refreshments available at exhibition booth area) Ballroom 1, Level B

10:30 am – 12:00 pm

Session 5 – Research Methods & Perspectives

Moderator: Anuj Pradhan
Ballrooms 2 & 3, Level B

10:30 am – **Using a Video Camera-Based Method to Gather Real World High Beam Usage Data (28)** Stephanie Whetsel Borzendowski, Ashley Stafford Sewall, Richard Tyrrell (Clemson University)

10:50 am – **Engaging with Highly Automated Driving: To be or Not to be in the Loop? (29)** Tyron Louw, Natasha Merat, Hamish Jamson (University of Leeds – *United Kingdom*)

11:10 am – **Naturalistic Driving Events: No Harm, No Foul, No Validity (30)** Ronald Knipling (Safety for the Long Haul Inc.)

11:30 am – **Analysis of Drivers' Head and Eye Movement Correspondence: Predicting Drivers' Glance Location Using Head Rotation Data (31)** Mauricio Muñoz (MIT AgeLab, New England University & University of Augsburg – *Germany*), Joonbum Lee, Bryan Reimer, Bruce Mehler (MIT AgeLab & New England University), Trent Victor (SAFER Vehicle and Traffic Safety Centre at Chalmers, Volvo Cars Safety Centre – *Sweden*)

12:00 pm – 1:00 pm

Buffet Lunch

Conference Center Terrace Tent, Level 1

1:15 pm – 2:00 pm

Distinguished Keynote Luncheon Lecture

Dr. Trent Victor
(SAFER Vehicle and Traffic Safety Centre at Chalmers & Volvo Cars Safety Centre – *Sweden*)

The Role of Attention in Increasingly Autonomous Driving (32)

Ballrooms 2 & 3, Level B

2:00 pm – 3:00 pm

Session 6 – Tribute to Old Friends & Their Legacy [Stephanie Binder, Cliff Nass, Raja Parasuraman]

Moderator: Dan McGehee
Ballrooms 2 & 3, Level B

- Tribute to Raja Parasuraman: Matthew Rizzo (U of Nebraska)
- Tribute to Cliff Nass: John Lee (U of Wisconsin-Madison)
- Tribute to Stephanie Binder: Christopher Monk (NHTSA)

3:00 pm – 4:30 pm

Break (refreshments available at exhibition booth area)
Ballroom 1, Level B

3:00 pm – 4:30 pm

Session 7 - Poster Session B

Ballroom 1, Level B

The Long-Term Effectiveness of Eco-Driving Training: A Pilot Study (33)
Yiping Wu, Xiaohua Zhao, Jian Rong (Beijing University of Technology – *China*)

Teenage Drivers Portable Electronic Device Use While Driving (34)
Johnathon Ehsani, Kaigang Li, Bruce Simons-Morton (National Institutes of Health)

Too Close for Comfort: Evaluating a Reward-Based Approach to Increase Drivers' Headway (35) Robert Ramkhalawansingh (University of Toronto – *Canada*), Lana Trick (University of Guelph – *Canada*)

Collision Detection in Cluttered Driving Scenes (36), Carissa Lemon, George Andersen (University of California, Riverside)

Pilot Study of Gaze Scanning and Intersection Detection Failures by Drivers with Hemianopia (37) Alex Bowers, Concetta Alberti, Alex Hwang, Robert Goldstein, Eli Peli (Schepens Eye Research Institute, Harvard Medical School)

(38) Withdrawn

Novice Driver Simulation Training Potential for Improving Hazard Perception and Self-Confidence While Lowering Speeding Risk Attitudes for Young Males (39) George Park, R. Wade Allen, Theodore Rosenthal (Systems Technology, Inc.)

Effect of Listening to Music as a Function of Driving Complexity: A Simulator Study on the Differing Effects of Music on Different Driving Tasks (40) Dong-Yuan (Debbie) Wang, Zachary Jimison, Dan Richard, Ching-Hua Chuan (University of North Florida)

Commercial Driver Medical Exams: Relationships Between Body Mass Index and Comorbid Conditions (41) Matthew Thiese (University of Utah), Gary Moffitt (Arkansas Occupational Health Clinic), Richard Hanowski (Virginia Tech Transportation Institute), Stefanos Kales (Harvard University), Richard Porter, Kurt Hegmann (University of Utah)

Effects of Fatigue on Real-World Driving in Diseased and Control Participants (42) Nazan Aksan, Jeffrey Dawson, Jon Tippin (University of Iowa), John Lee (University of Wisconsin-Madison), Matthew Rizzo (University of Nebraska)

Driving While Reading Using Google Glass Versus Using a Smartphone: Which is More Distracting to Driving Performance? (43) Jibo He, Jake Ellis, William Choi, Pingfeng Wang (Wichita State University)

A Web-Based Evaluation Tool to Predict Long Eye Glances (44) Ja Young Lee, John Lee (University of Wisconsin-Madison)

The Role of System Training and Exposure on Crash Warning Evaluation (45) Timothy Brown, Dawn Marshall (University of Iowa), Susan Chrysler (Texas A&M University)

Assessing Cognitive Distraction Using Event Related Potentials (46) James Coleman, Jonna Turrill, Rachel Hopman (University of Utah), Joel Cooper (University of Utah & Precision Driving Research), David Strayer (University of Utah)

5:00 pm – 5:45 pm	Load Shuttle Buses; Travel to Utah Olympic Park Complex (1 hr ride) – Valet Area Bell Desk, Level B
6:15 pm – 9:00 pm	Utah Olympic Park Open House
7:00 pm – 8:30 pm	Dinner Buffet
8:00 pm – 8:30 pm	Flying Ace All-Stars Show Meet the athletes immediately following performance
8:45 pm – 9:45 pm	Load Shuttle Buses; Travel back to Snowbird

Thursday, June 25, 2015

7:30 am – 1:00 pm	Registration Open Ballroom Lobby, Level B
7:30 am – 8:45 am	Continental Breakfast Ballroom Lobby, Level B
7:30 am – 8:30 am	Hybrid Poster Set Up Ballrooms 2 & 3, Level B
8:45 am – 10:15 am	Session 8 – Hybrid Presentations Moderator: Linda Boyle Ballrooms 2 & 3, Level B
	Validation of a Cognitive Screening Battery to Predict Fitness-to-Drive in Individuals with Multiple Sclerosis: A Preliminary Report (47) Abiodun Akinwuntan, Amanda Cornelison, Erika De La Cruz, Tionna Harris, Kallie Phillips, Hannes Devos (Georgia Regents University)
	Car-Truck Crashes in the National Motor Vehicle Crash Causation Survey (48) Ronald Knipling (Safety for the Long Haul Inc.)
	Association Between Cell Phone Restrictions and Teens' Self-Reported Cell Phone Use While Driving (49) Johnathon Ehsani, Bruce Simons-Morton, Jessamyn Perlus, Yunlong Xie, Paul Albert (<i>Eunice Kennedy Shriver</i> National Institute of Child Health and Human Development)
	Informative Collision Warnings: Effect of Modality and Driver Age (50) Mujthaba Ahtamad, Robert Gray (University of Birmingham – <i>United Kingdom</i>), Cristy Ho (University of Oxford – <i>United Kingdom</i>), Nick Reed (Transport Research Laboratory – <i>United Kingdom</i>), Charles Spence (University of Oxford – <i>United Kingdom</i>)
	Effects of Take-Over Requests and Cultural Background on Automation Trust in Highly Automated Driving (51) Sebastian Hergeth (BMW Group Research and Technology & Chemnitz University of Technology – <i>Germany</i>), Lutz Lorenz (BMW Group Research and Technology – <i>Germany</i>), Josef Krems (Chemnitz University of Technology – <i>Germany</i>), Lars Toenert (BMW China Services – <i>China</i>)

Towards the Validation of a Driving Simulator-Based Hazard Response Test for Novice Drivers (52) Pierro Hirsch (Virage Simulation – *Canada*), Francois Bellavance (HEC Montréal – *Canada*), Siavash Tahari, Jocelyn Faubert (Université de Montréal – *Canada*)

Pilot Results on Forward Collision Warning System Effectiveness in Older Drivers (53) Benjamin Lester, Lauren Sager, Jeffrey Dawson, Sarah Hacker, Nazan Aksan (University of Iowa), Matthew Rizzo (University of Nebraska), Satoshi Kitazaki (University of Iowa)

Capturing Voluntary, Involuntary, and Habitual Components of Driver Distraction in a Self-Reported Questionnaire (54) Susana Marulanda, Huei-Yen Winnie Chen, Birsan Donmez (University of Toronto – *Canada*)

Driver Sleepiness Assessed by Electroencephalography – Different Methods Applied to One Single Data Set (55) Martin Golz, David Sommer (University of Applied Sciences Schmalkalden – *Germany*), Jarek Krajewski (University of Applied Sciences Cologne – *Germany*)

From Few to Many: Using Copulas and Monte Carlo Simulation to Estimate Safety Consequences (56) Vindhya Venkatraman, John Lee (University of Wisconsin-Madison), Chris Schwarz (University of Iowa)

Do Drowsy Driver Drugs Differ? (57) Timothy Brown, Andrew Spurgin, Gary Milavetz, Gary Gaffney (University of Iowa), Robin Johnson (Advanced Brain Monitoring)

Understanding Driver-Automated Vehicle Interactions Through Wizard of Oz Design Improvisation (58) Brian Ka-Jun Mok, David Sirkin, Srinath Sibi, David Bryan Miller, Wendy Ju (Stanford University)

Predicting Secondary Task Involvement and Differences in Task Modality Using Field Highway Driving Data (59) Alina Sinelnikova (MIT AgeLab, New England University Transportation Center & University of Augsburg – *Germany*), Joonbum Lee, Bryan Reimer, Bruce Mehler, Joseph Coughlin (MIT AgeLab & New England University Transportation Center)

The Driver Has Control: Exploring Driving Performance with Varying Automation Capabilities (60) Mishel Johns, David Miller, Annabel Sun, Shawnee Baughman, Tongda Zhang, Wendy Ju (Stanford University)

10:15 am – 10:30 am

Break (refreshments available)
Ballroom Lobby, Level B

10:30 am – 12:10 pm

Session 9 – Driver Interface Issues

Moderator: Josh Domeyer
Ballrooms 2 & 3, Level B

10:30 am – **In-Vehicle Noise Alters the Perceived Meaning of Auditory Signals (61)** Neil Lerner, Jeremiah Singer, Daniel Kellman (Westat), Eric Traube (National Highway Traffic Safety Administration)

10:50 am – **A Secondary Assessment of the Impact of Voice Interface Turn Delays on Driver Attention and Arousal in Field Conditions (62)** Thomas McWilliams, Bryan Reimer, Bruce Mehler, Jonathan Dobres, Hale McAnulty (MIT AgeLab & New England University Transportation Center)

11:10 am – **The Effects of an Eco-Driving Interface on Driver Safety and Fuel Efficiency (63)** Daryl Hibberd, Hamish Jamson, Samantha Jamson (University of Leeds – *United Kingdom*)

11:30 pm – **Effectiveness of a Heads-Up Adaptive Lane Deviation Warning System for Middle-Aged and Older Adults (64)** Nazan Aksan, Lauren Sager, Benjamin Lester, Sarah Hacker, Jeffrey Dawson, Steven Anderson (University of Iowa), Matthew Rizzo (University of Nebraska)

11:50 pm – **The Incredible Shrinking Letter: How Font Size Affects the Legibility of Text Viewed in Brief Glances (65)** Jonathan Dobres, Bryan Reimer, Lauren Parikhal, Emily Wean (MIT AgeLab), Nadine Chahine (Monotype Imaging Inc.)

12:10 pm – 12:30 pm

Conference Wrap Up
Ballrooms 2 & 3, Level B

11:00 am – 12:45 pm

Box Lunches Available
Ballroom Lobby, Level B

SUMMARIES

1. TOYOTA DISTINGUISHED KEYNOTE LECTURE: Emotion Tracking for Health, Memory, and Well-Being Mary Czerwinski (Microsoft Research)

In this talk I will describe novel systems that allow users to reflect upon their moods and learn positive coping strategies for dealing with stress and depression. I will also describe systems and applications that perform mood detection in real time using mobile and wearable technology. We are exploring novel user interface applications to help users reflect upon and manage their affective experiences. Many questions remain from our work, in terms of how useful a system like this would be over the long term and how valuable a personalized, mobile, awareness system is. Finally, we feel that there is a huge opportunity in the remote familial space, or in a close social network, where knowing about the emotional health of separated loved ones or close friends comes in to play. These new research areas are also tightly coupled with privacy issues. A few examples of applications in these new areas will be presented.

2. Mental Workload of Voice Interactions with 6 Real-World Driver Interfaces Joel Cooper (Precision Driving Research), David Strayer (University of Utah)

Hands-free voice interaction is an increasingly common option in new vehicles. Recent research suggests that hands-free interactions with speech-to-text systems may require significantly more cognitive effort than previously anticipated. This high level of mental workload may both keep drivers from using the technology and potentially create additional safety concerns for the driver. However, little prior research has measured the cognitive demands of simple voice based tasks using real-world systems. The current study evaluated the mental demands of a small set of auditory-vocal vehicle commands using five 2013 and one 2012 model year OEM infotainment systems. Results indicate that well executed voice systems impose little additional cognitive demand while poorly executed systems may significantly elevate workload.

3. Characterizing the Effect of Videophone Conversations on Intersection Driving Performance John Gaspar (University of Iowa), Ronald Carbonari, Henry Kaczmarek, Arthur Kramer (University of Illinois)

The present study examined the efficacy of videophone conversations for enhancing conversation partner situational awareness and mitigating cell phone distraction during intersection drives. Younger and older drivers drove through simulated intersections in four conditions: undistracted, with an in-car passenger, with a remote partner who could see the driver and a subset of the driving scene via a videophone, and with a remote partner on a cell phone. Relative to the cell phone condition, passenger and videophone conversations enhanced situational awareness and mitigated distraction. Younger and older drivers showed similar benefits, although there were age-related costs to driving performance overall. Videophone information offers a simple and promising potential strategy to enhance partner situational awareness during cell phone conversations, even when the conversation partner can see only a subset of the driving scene.

4. Car-aoke: Vocal Performances Indicate Distraction Effects of In-Car Music Warren Brodsky, Matan Ziv (Ben-Gurion University of the Negev – *Israel*)

Drivers engage in a host of driving-unrelated tasks while on the road. Most frequently, drivers listen to music and sing-along with the words in a *karaoke* fashion. At times drivers accompany songs by pounding-out drum-kicks, fingering guitar-licks, singing background, and even dancing in their seat.

However, there is controversy over in-cabin music: Does background music facilitate driver performance via increased arousal leading to more focused concentration, or cause distraction placing drivers at greater risk. In an effort to shed light on the debate over the utility of in-car music, the current study explored how driving tasks might subsequently affect vocal performances during simulated driving. Eighteen young drivers recorded two versions of two songs (baseline *vs.* low-demand *vs.* high-demand driving). The results indicate that as the perceptual demands of the primary driving task increase, the performance of the secondary activity (i.e., karaoke-like singing) declines. That is, vocal performances during high-demand driving contained significantly more errors of both intonation/rhythm and lyrics compared to low-demand driving, while both were far less accurate than baseline recordings. Such a picture supports evidence that engaging in music activity does actually preoccupy vital mental resources. In-car music may not necessarily be handled very well, nor is it blocked-out entirely by drivers during high-demand driving – as previously reported in some literature. Singing along with in-cabin music background may contribute to increased risk for incidents, events, and near-crashes, and should be reconsidered by traffic scientists investigating human factors, vehicular control, and road safety.

5. Cognitive Distraction Impairs Drivers' Anticipatory Glances: An On-Road Study Francesco Biondi (University of Padova – *Italy*), Jonna Turrill, James Coleman, Joel Cooper, David Strayer (University of Utah)

This study assessed the impact of cognitive distraction on drivers' anticipatory glances. Participants drove an instrumented vehicle and executed a number of secondary tasks associated with increasing levels of mental workload including: listening to the radio or audiobook, talking on a handheld or hands-free cellphone, interacting with a voice-based e-mail/text system, and executing a highly demanding task (Operational Span task; OSPAN). Drivers' visual scanning behavior was recorded by four different high definition cameras and coded off-line frame-by-frame. Visual scanning behavior at road intersections with crosswalks was targeted because distraction is one of the major causes of accidents at these locations (NHTSA, 2010a). Despite the familiarity of the locations, results showed that as the secondary-task became more cognitively demanding drivers reduced the amount of anticipatory glances to potential hazards locations. For example, while interacting with a high fidelity voice-based email/text system, the probability of executing a complete scan of the intersection was reduced by 11% compared to the no-distraction control condition. These results document the effects of cognitive distraction on drivers' visual scanning for potential hazards and highlight the detrimental role of voice based systems on driving behavior.

6. Feedback from Naturalistic Driving Improves Treatment Compliance in Drivers with Obstructive Sleep Apnea Jeffrey Dawson, Lixi Yu, Nazan Aksan, Jon Tippin (University of Iowa), Matthew Rizzo (University of Nebraska), Steven Anderson (University of Iowa)

As part of a study in drivers with obstructive sleep apnea (OSA), we conducted a randomized clinical trial to assess whether individualized feedback can increase compliance with continuous positive airway pressure (CPAP) therapy. After completing 3.5 months of naturalistic driving monitoring, OSA drivers were randomized either to receive an intervention, which was feedback regarding their own naturalistic driving record and CPAP compliance, or to receive no such intervention. In the week immediately after the intervention date, drivers receiving feedback (n=30) improved their CPAP usage by an average of 35.8 minutes per night (p=0.008; 95% CI=9.6, 62.0) to a mean level of 296 minutes. By contrast, CPAP usage in the non-feedback group (n=36) decreased an average of 27.5 minutes per night (p=0.022; 95% CI=4.0, 51.0) to a mean level of 236 minutes. The mean group-specific changes were higher (better) in the feedback group than in the non-feedback group during

the first, second, and third weeks of follow-up ($p < 0.001$, $p = 0.001$, and $p = 0.027$, respectively). By weeks 4 through 10, the effect of the feedback had lost its significance ($p > 0.25$ in all cases). Our study suggests that CPAP compliance can be increased using individualized feedback, but that follow-up feedback sessions or reminders may be necessary for sustained improvement.

7. Agreement Between Physician Rating and On-Road Decision for Drivers with Multiple Sclerosis Hannes Devos, Maud Ranchet (Georgia Regents University), Mark Tant (Belgian Road Safety Institute – *Belgium*), Abiodun Akinwuntan (Georgia Regents University)

The recommendation of the referring physician is paramount in the decision making process of fitness to drive for individuals with multiple sclerosis (MS). This medical advice is carefully considered by fitness to drive officials when making a final decision. In this study, we sought to determine the reliability between physician recommendation and decision of the on-road assessor in 95 individuals with MS. The percentage agreement (p_o) and prevalence and bias adjusted kappa (PABAK) were used as measures of reliability. The on-road assessor found no concerns on the road in 87 (92%) of the individuals; 6 (6%) exhibited difficulties on the road that were of concern; and 2 (2%) were advised to discontinue driving based on the findings of the road test. The p_o between referring physician and on-road assessor was 83%. The PABAK showed a reliability coefficient of 0.76 ($p < 0.0001$). No differences were found in p_o between neurologists (83%) and general practitioners (88%, Fisher's Exact = 0.56). Binocular acuity correlated significantly with the on-road driving decision (Spearman $\rho = -0.30$; $p = 0.004$). We conclude that, in this sample of drivers with MS, physicians were most of the time accurate in their appraisal of their patients' driving capabilities.

8. Comorbidities in Drivers with Parkinson Disease Maud Ranchet (Georgia Regents University), Mark Tant (Belgian Road Safety Institute – *Belgium*), Abiodun Akinwuntan, Hannes Devos (Georgia Regents University)

Previous studies have shown that comorbidities have an impact on driving performance in older adults. No study has established the relationships between comorbidities and driving in persons with Parkinson disease (PD). The aims of this study were (1) to report the types of comorbidity in a group of 111 drivers with PD and (2) to identify whether the comorbidity associated with PD is a predictor of overall fitness-to-drive decisions, crashes, and validity duration of driving license. Results showed that 72 participants (64.9%) had only Parkinson disease, and 39 (35.1%) participants had one or more medical conditions in addition to PD. The most frequent comorbidities were visual disorders (26.4%), heart and blood disorders (16.2%), neurological disorders other than PD (11.8%), and locomotor disorders (11.8%). Contrarily to what we expected, we did not find any significant associations between comorbidities and overall fitness-to-drive decisions, car crashes, or validity duration of driving license. We conclude that in this sample of drivers with PD, comorbidity was not a significant predictor of overall fitness-to-drive decisions.

9. Pre-Frontal Cortex Activity of Male Drivers in the Presence of Passengers During Simulated Driving: An Exploratory Functional Near-Infrared Spectroscopy (fNIRS) Study Anuj Pradhan, Xiao-Su (Frank) Hu, Lisa Buckley, C. Raymond Bingham (University of Michigan)

Adolescents are more likely to be involved in motor vehicle crashes in the presence of peer passengers, and risky driving behaviors of male teenagers increase in the presence of male peer passengers. There could be several mechanisms of the influence of peer passengers, however it is evident that the male teenage driver with a male peer passenger makes riskier decisions than when alone. The developing teenage brain's activity is different from that of adults during decision-making,

especially in regions associated with impulse control, response inhibition, and risk taking. This study tested the feasibility of using functional near-infrared spectroscopy (fNIRS), a non-invasive brain imaging method that allows *in vivo* measurements of oxygenated and deoxygenated hemoglobin in cortical tissue, to study drivers' brain activation during simulated driving. Cortical activity was measured in participants driving alone and in the presence of a passenger. When at a dilemma zone at a signalized intersection participants showed increased activation in regions of the left and right medial pre-frontal cortex when driving with a passenger as compared to when driving alone.

10. Investigating the Interaction between Helmet Field of View and Steering Behavior in a Novel Motorcycle Simulator Antoine Morice (Aix-Marseille University – *France*), Violaine Sevrez (Lyon 1 University – *France*), Rob Gray (Arizona State University), Gilles Montagne (Aix-Marseille University – *France*)

While helmet wearing reduces the severity of injuries in motorcycle crashes, it may also increase the likelihood of getting involved into a traffic accident through a reduction in the rider's field of view. We thus investigated the perceptual effects of helmet wearing when riding a motorcycle. The task consisted of negotiating curves in a fixed-based simulator while the helmet visor vertical dimension and need to check the handlebar-mounted speedometer were manipulated. Decreasing the vertical aperture below roughly 30 deg significantly impaired a rider's ability to maintain their lane position and speed; with the effect of aperture being significantly greater when speedometer checking was required. The present findings provide further support for near/far point models of steering and help to quantify the tradeoff between physical and perceptual effects in helmet design.

11. Assessing the Distraction Potential of Changeable Highway Message Signs Vaughan Inman (Leidos), Brian Philips (US DOT Federal Highway Administration)

Two experiments were conducted to assess how changeable message signs (CMS) within the right-of-way affect driver behavior and attention. Experiment 1 evaluated whether repeated exposure to irrelevant messages would cause drivers to fail to respond to a safety critical message. Experiment 2 evaluated whether the presence of a driving irrelevant message designed to attract attention would cause drivers to fail to respond to a hazard in the roadway. In both experiments, drivers completed a lengthy (about 50 min) driving simulation in a freeway scenario with CMS every 0.8 km (0.5 mi). Dependent measures were gaze location, response to safety critical message (Exp. 1), and response to spilled load in roadway (Exp. 2). It was found that (1) when headways were short, drivers tend to focus on the roadway and not on a CMS; (2) repeated exposure to irrelevant messages did not cause drivers to miss safety critical messages; (3) salient CMS images (changing faces) did not cause failures to detect a roadway hazard, and (4) the frequency and duration of looks to salient images and travel time messages were similar.

12. Using Iterative Human Factors Methods to Assess Active Traffic Management Signing Mary Anne Jeffers (Agilex), William Perez (Leidos), Brian Phillips (US DOT Federal Highway Administration)

Active traffic management (ATM) is a technique for mitigation of recurrent and non-recurrent congestion. Two ATM tools were evaluated: variable speed limits and lane control signing. An iterative human factors approach included a series of four experiments: a laboratory assessment, a field study, and two dynamic driving simulations. This paper presents the evaluation of signing for one scenario, from among several, to provide an example of the evaluation methodology. That scenario involved closing two lanes on a multi-lane freeway where the exit ramp adjacent to the closed lanes remained open. Results were consistent

across experimental settings. The majority of drivers appeared to correctly comprehend the ATM signs in both static and dynamic environments. The combined results from the four experiments showed that the tested ATM signing could achieve about 66 percent driver comprehension and compliance in the presented scenario.

13. A Competence Based Exam for Prospective Driving Instructors: Construction, Validation, and Implications Erik Roelofs, Maria Bolsinova, Angela Verschoor (CITO National Institute for Educational Measurement – *the Netherlands*), Jan Vissers (Royal Haskoning DHV – *the Netherlands*)

In line with changed views on driver training and driver instructor preparation a competence-based instructor exam was introduced in the Netherlands. The exam consists of two parts: 1) multimedia theory tests, 2) a performance assessment. An implicit idea behind the innovated exam is that it can have a positive backwash effect on the quality of driver instructor preparation programs. This study aims to evaluate the reliability, validity and fairness of the theoretical tests, which appear in different versions across time. Data of 4741 prospective driving instructors, enrolled during the period between January 2010 and October 2012, were used for analysis. The results of IRT-analyses show that the theory tests yielded reliable and fair decisions, although misclassifications occurred across versions. The predictive validity of the theory tests for the final performance assessment was low. Implications for the design and maintenance of exam programs are discussed. Follow-up studies will focus on the question, whether the improved instructor exam contribute to safer drivers in the end.

14. Serialization of Behavior During Car Following in Older Drivers Benjamin Lester, Sarah Hacker, Shaun Vecera (University of Iowa), Matthew Rizzo (University of Nebraska)

Age-related declines in cognitive functioning can push older adults to adopt strategies that may or may not improve their driving safety. Previous research suggests one strategy involves performing complex driving tasks (e.g., right turn negotiation) in discrete steps ("serialization") rather than fluidly. The current study used simulator scenarios developed to test possible age-related serialization of behavior during complex car following. In all scenarios, participants closely monitored a lead vehicle using sustained attention. During multi-tasking scenarios, drivers performed an additional localization task designed to increase the demands on attention. The results demonstrate that older adults showed general impairments in multi-tasking and vehicle control during car following. Importantly, age-associated changes in task execution were observed, demonstrating older adults also serialize car following behavior under certain conditions. As a result, older drivers withdrew attention from the lead vehicle for several seconds. This pattern of behavior identifies a remediable situation where age-associated impairments may increase crash risk.

15. The Effects of Task Load and Vehicle Heterogeneity on Performance in the Multiple-Vehicle Tracking Task Martin Lochner (Commonwealth Scientific and Industrial Research Organization – *Australia*), Lana Trick (University of Guelph – *Canada*)

When crossing traffic at busy intersections, drivers must keep track of the changing positions of cyclists, pedestrians and other vehicles to avoid collision. Multiple-object tracking is the ability to monitor the positions of a number of selected moving objects (targets) among others (distractors) in a complex scene. Most young adults can track 3-5 items at once but older adults cannot track as many, a finding that may partially explain older drivers' increased risk at intersections. Because tracking represents an important component of driving, a variant of the multiple-object tracking task called multiple-vehicle was created to measure tracking performance in a driving simulator. However, it is unclear whether tracking while driving works the same as tracking carried out on its own. Laboratory studies suggest that tracking improves when the moving items are heterogeneous, and on

the road, it is far more typical that vehicles differ from one another rather than being all the same. Drivers were given the task of tracking the positions of 4 vehicles in a field of 8 on a highway, and the effects of task load (tracking alone, tracking while driving) on tracking performance were measured as a function of whether the target and distractor vehicles were homogeneous. Steering and headway maintenance variability were also assessed. The results indicated that heterogeneity only enabled better tracking when drivers were tracking in isolation. Heterogeneity had no significant effect on tracking when participants were tracking while driving though it did significantly reduce their steering variability.

16. Exploring the Driving Behavior of Youth with an Autism Spectrum Disorder: A Driver Instructor Questionnaire Veerle Ross, Ellen Jongen, Marleen Vanvuchelen, Tom Brijs, Kris Brijs, Geert Wets (Hasselt University – *Belgium*)

Youth with an autism spectrum disorder (ASD) depend to a great extent on friends and family for their transportation needs. Although little research exists, Cox et al. (2012) surveyed parents/caregivers of youth with ASD (previously) attempting to learn to drive. This study serves as an extension by surveying driver instructors. Several questions queried advice for teaching youth with ASD how to drive, and for improving the current driving education to better fit the needs of youth with ASD. Furthermore, respondents were asked to indicate whether specific characteristics, often associated with ASD, have an impact on driving ability. A total of 52 driver instructors reported potential problems when teaching youth with ASD to drive. Advice for teaching youth with ASD to drive mainly focused on a need for structure, clarity, visual demonstration, practice, repetition and an individualized approach. Results however also showed that the relation between ASD and driving performance might not always be negative but can be positive. Practical implications are provided.

17. Need for Revised Total Eyes-Off-Road Criterion in the NHTSA Distraction Guidelines: Track Radio-Tuning Data Richard Young (Wayne State University)

This study re-analyzes participant-level glance data from a NHTSA-sponsored test track study of nine radio-tuning tasks in five radios. NHTSA stated that in its judgment, all nine tasks met the definition of traditional manual radio tuning, and so collapsed the data across all participants to estimate an 85th percentile. NHTSA further stated that it combined that track percentile with the 85th percentile from a radio-tuning task in a separate simulator study, to set its total-eyes-off-road time (TEORT) acceptance criterion. Given NHTSA's statements, individual radio-tuning tasks should, in general, meet the criteria created from them. This study performed such an analysis, and found that this expectation was not met. Four out of nine radio-tuning tasks did not meet the criterion. One problem is that NHTSA did not allow for variability in its 85th percentile estimate. Additionally, TEORT values were higher in the simulator than track for the same task with age-matched data, meaning that if the track tasks had been run in the simulator then the 85th percentile TEORT may have been higher. These issues illustrate the need for revising the criteria based on an improved analysis of the data that NHTSA used to set those criteria. Without doing so, many commonly-accepted secondary tasks (including manual radio tuning in many vehicles) would not meet the current NHTSA Guidelines glance criteria. Revised criteria should be derived in a way that would provide the needed consistency with age-balance requirements of task-acceptability testing, as well as allowing robustness for variability in the percentile estimates.

18. Effects on Non-Verbal Communication Cues on Decisions and Confidence of Drivers at an Uncontrolled Intersection Satoshi Kitazaki, Nathan Myhre (University of Iowa)

Drivers read other drivers' intentions using various non-verbal communication cues in situations where traffic regulations play only a limited role. Although such communication is important to reach safe joint actions with other driver(s), effects of communication have not been fully understood. The objective of this study was to understand effects of communication cues on driver's decisions and confidence. Straight-cross-path and left-turn scenarios around an uncontrolled intersection were studied in an interview-based experiment using 65 subjects. The subject's car approached the intersection while another car was approaching the same intersection and sent communication cues consisting of various combinations of vehicle behaviors (constant speed, speeding up, and slowing down) and hand gestures (meaning "Go ahead" and "Stop"). Computer animations of the scenarios were presented to the subjects and terminated before the two cars reached the intersection. The subjects rated yielding frequency and confidence level for each cue combination in each scenario. The results showed that the vehicle behaviors and the hand gestures affected subjects' yielding frequencies and confidence levels. The cues also interacted with the priority rule in the left turn scenarios. The hand gestures were especially effective to consolidate subjects' decisions to yield or go with confidence when the priority rule was ineffective (i.e. in the straight-cross-path scenarios). The hand gestures were also effective to change the yielding frequencies to accept the cues conflicting with the effective priority rule (i.e. in the left-turn scenarios). Some requirements and recommendations for autonomous vehicle were discussed.

19. Comparison of Novice and Experience Drivers Using the SEEV Model to Predict Attention Allocation in Intersections During Simulated Driving Alexander Bos, Daniel Ruscio, Nicholas Cassavaugh, Justin Lach (Central Michigan University), Pujitha Gunarathe (Toyota Motor Engineering & Manufacturing North America), Richard Backs (Central Michigan University)

We compared the eye movements of novice drivers and experienced drivers while they drove a simulated driving scenario that included a number of intersections interspersed with stretches of straight road. The intersections included non-hazard events. Cassavaugh, Bos, McDonald, Gunaratne, & Backs (2013) attempted to model attention allocation of experienced drivers using the SEEV model. Here we compared two SEEV model fits between those experienced drivers and a sample of novice drivers. The first was a simplified model and the second was a more complex intersection model. The observed eye movement data was found to be a good fit to the simplified model for both experienced ($R^2 = 0.88$) and novice drivers ($R^2 = 0.30$). Like the previous results of the intersection model for the experienced drivers, the fit of the observed eye movement data to the intersection model for novice drivers was poor, and was no better than fitting the data to a randomized SEEV model. We concluded based on the simplified SEEV model, fixation count and fixation variance that experienced drivers were found to be more efficient at distributing their visual search compared to novice drivers.

20. Low Hanging Fruit: Use of Virtual Reality Driving Simulation in Department of Motor Vehicles to Assess Minimal Competence of Novice Drivers Daniel Cox, Matthew Moncrief (University of Virginia-Charlottesville), Matthew Rizzo (University of Nebraska), Donald Fisher (University of Massachusetts Amherst), Ann Lambert, Sarah Thomas, Sean Eberhart (University of Virginia), Rick Moncrief (Mcfarr, LLC)

Nationally, Departments of Motor Vehicles (DMV) license novice drivers based in part on on-road assessments. Intuitively it is assumed that such assessments are fair, reliable and valid measures of minimal driving competency. Upon further reflection, this would be difficult, given the subjectivity of

a huge range of driving examiners that approach this assessment with different training backgrounds, life distractions and biases from examination to examination, the different road, traffic, lighting and weather conditions from one examination and DMV center to the next, and the minimal driving challenges in such assessments. For example, a typical on-road test involves only a 4 mile road segment with 2 left turns, 4 right turns, 1 lane change, pulling into a turn lane, and 1 speed limit change. It does not include highway driving nor defensive driving maneuvers. Additionally, such on-road assessments are both potentially dangerous and time demanding/expensive. A less expensive, safer, more challenging, objective, reliable, and valid procedure may be the use of Virtual Reality Driving Simulation (VRDS) that administers consistent and more extensive driving challenges to all examinees, which is evaluated in an objective manner based on normative data from current safe drivers. This presentation describes the experience and presents the data from a project where VRDSs were set up in two DMV facilities and a Research facility. The goals of this project were to determine whether VRDS assessments are just as reliable, discriminating and acceptable to the public as on-road assessments, and whether performance on the simulator predicts future on-road driving mishaps.

21. Developing and Testing Operational Definitions for Functional and Higher Order Driving Instruction Johnathon Ehsani, Bruce Simons-Morton (*Eunice Kennedy Shriver* National Institute of Child Health and Development), Sheila Klauer (Virginia Tech Transportation Institute)

The amount and type of driving instruction provided to novice teen drivers during the learner period may be associated with future crash risk. The purpose of this study was to (1) operationally define two types of driving instruction: functional and higher order instruction, and to (2) test these definitions in a sample of newly licensed novice teenage drivers during the first ten hours of supervised driving. Functional driving instruction was defined as instruction that relates to the present time or immediate future; and related to specific events that are occurring during the drive itself. Higher order driving instruction was instruction that could be extrapolated to a future driving situation; that conveys general principles of driving related to potential events that occur. These operational definitions were tested in conversation occurring during driving instruction in a sample of 90 teen drivers, recruited within three weeks of receiving their learner permit. Teen drivers' vehicles were equipped with microphones; conversations were recorded and coded for each type of instruction that was observed. As expected, parents provided substantial driving-related instruction on a variety of topics. During the first ten hours of supervised driving only 17.5% of observed driving-related instructions was higher order. This test provides face validity of the operational definitions of driving instruction. These definitions may assist in quantifying the type and amount of driving instruction occurring during the supervised practice stage of licensure, and provide an empirical basis for evaluating the association between driving instruction and independent driving performance.

22. Eye Glance Analysis of the Surrogate Tests for Driver Distraction Li Hsieh, Sean Seaman, Richard Young (Wayne State University)

The purpose of this study was to examine the eye glance patterns of Detection Response Tasks (DRTs) for assessment of driver distraction during simulated driving. Several types of DRTs across visual, tactile and haptic modalities were used to investigate driver distraction by the ISO Driving Distraction working group. As part of the working group, we conducted a simulated driving study examining driver performance while engaging the primary driving task with visual-manual or auditory-verbal secondary tasks. Results of eye glance analysis showed that the visual DRTs increased visual load in driving more than the tactile DRT. Subsequently, the visual DRTs marginally

increased the total glance time for forward view by 6.27 seconds and significantly increased the detection response time by 135.79 ms than the tactile DRT. As for the secondary tasks, the visual-manual secondary task yielded significantly longer total eye-off-the-road time (effect size = 50.75 ms), as well as DRT response times than the auditory-verbal ones time (effect size = 55.85 ms). This study allowed us to examine the relationships between rated situational awareness, DRT performance, and glance patterns, yielding insights into the relationship between objective task performance measures and subjective ratings.

23. Linking GPS Data to GIS Databases in Naturalistic Studies: Examples from Drivers with Obstructive Sleep Apnea Jeffrey Dawson, Lixi Yu, Kelly Sewell, Adam Skibbe, Nazan Aksan, Jon Tippin (University of Iowa), Matthew Rizzo (University of Nebraska)

In naturalistic studies, it is vital to give appropriate context when analyzing driving behaviors. Such contextualization can help address the hypotheses that explore a) how drivers perform within specific types of environment (e.g., road types, speed limits, etc.), and b) how often drivers are exposed to such specific environments. In order to perform this contextualization in an automated fashion, we are using Global Positioning System (GPS) data obtained at 1 Hz and merging this with Geographic Information Systems (GIS) databases maintained by the Iowa Department of Transportation (DOT). In this paper, we demonstrate our methods of doing this based on data from 43 drivers with obstructive sleep apnea (OSA). We also use maps from GIS software to illustrate how information can be displayed at the individual drive or day level, and we provide examples of some of the challenges that still need to be addressed.

24. Training Working Memory of Older Drivers: The Effect on Working Memory and Simulated Driving Performance Ariane Cuenen, Ellen Jongen, Tom Brijs, Kris Brijs (Hasselt University – Belgium), Katrijn Houben (Maastricht University – the Netherlands), Geert Wets (Hasselt University – Belgium)

This study aimed to investigate in older drivers whether a working memory (WM) training would enhance WM, and whether improvement of WM transfers to enhanced driving ability. 54 older drivers participated in the study, but due to drop-out, 38 participants (mean age 70.34) remained in the sample. Participants were randomly assigned to a control (N=19) or an experimental condition (N=19). Each participant conducted a WM training during 25 days. During the pre-test and post-test, WM and driving ability were assessed. Results indicate that the training lead to an improvement of WM. In addition, there was an improvement of several driving measures, that was however independent of the level of WM improvement. These findings will be discussed.

25. Experimental Effects of Pre-Drive Arousal on Teenage Simulated Driving Performance in the Presence of a Teenage Passenger Bruce Simons-Morton (*Eunice Kennedy Shriver* National Institute of Child Health & Human Development), C. Raymond Bingham (University of Michigan), Kaigang Li (*Eunice Kennedy Shriver* National Institute of Child Health & Human Development), Jean Shope (University of Michigan), Anuj Pradhan (*Eunice Kennedy Shriver* National Institute of Child Health & Human Development), Emily Falk (University of Pennsylvania), Paul Albert (*Eunice Kennedy Shriver* National Institute of Child Health & Human Development)

Teenage passengers increase teenage driving risk, but this may be conditional on events and emotions immediately preceding driving. An experimental simulation study evaluated the effect of pre-drive arousal on risky driving in the presence of a confederate teenage passenger. In a two-by-two between-subjects design, participants were randomized to high or low pre-drive arousal and

passenger present or not present conditions. Prior to the drive participants played the Nintendo Wii video game, Rock Band™. In the high-arousal condition participants stood while playing high-energy Beatles songs; in the low arousal condition participants sat while playing low-energy Beatles songs. The manipulation produced differences in arousal by group. Group differences in risky driving were in the expected direction, but were not statistically significant at $p = .05$ on any of the three outcome measures, which included Failed to Stop (failing to stop at signalized intersections in the dilemma zone), Percent Time in Red (in intersections), and Pass Slow Vehicle (electing to pass a slow vehicle).

26. Techniques for Reducing Speeding Beyond Licensure: Young Drivers' Preferences Yi-Ching Lee, Aditya Belwadi, Dana Bonfiglio, Leif Malm, Molly Tiedeken (Children's Hospital of Philadelphia)

Young drivers need continued training and educational efforts beyond licensure. The latest in-vehicle monitoring technologies provide a promising way to monitor and advise driving behaviors in real-time. Literature to-date suggests limited success for changing driving behaviors via the use of in-vehicle monitoring technologies, and teens and parents have mixed perceptions about such devices. We argue that certain reinforcement techniques and parameters may lead to more sustainable behavioral changes. This paper describes the findings of an interview with young drivers on their perspectives of in-vehicle monitoring technologies and a feasibility driving simulator experiment that incorporated key reinforcement techniques. Eighteen young drivers participated in individual semi-structured interviews and 17 participated in the simulator experiment. Participants saw value in having a smartphone application-based system that can monitor their driving and provide positive recognition for safe behaviors and negative alerts for unsafe behaviors. Preliminary behavioral data from the simulator experiment showed mixed results. The findings show promise for incorporating reinforcement techniques in continued education beyond licensure but further research is needed to understand the timing for using such techniques.

27. The Role of Parent Feedback and Vehicle Status on Supervised Driving in the Minnesota Teen Driver Study Janet Creaser, Brandy Swanson, Nichole Morris (University of Minnesota)

This paper provides a brief quantitative and qualitative examination of supervised driving among teens in three study groups of the Minnesota Teen Driver Study. A Control group (N=92) served as the baseline comparison group against which the effects of two treatments were examined. The first treatment group received in-vehicle coaching about risky driving via a Teen Driver Support System (Partial TDSS), whereas the second treatment group received the in-vehicle coaching from the same system, which also reported monitored risky behaviors back to parents (Full TDSS). Overall, there were significant differences in the average number of miles driven by teens in the study groups. Average mileage driven also differed depending on vehicle status (shared vs. unshared). Teens in the Control and Partial TDSS groups who did not share a vehicle drove significantly more miles than teens in the Full TDSS group. Supervised driving patterns across the study groups as well as for shared versus unshared vehicles were also different. In general, the presence of parent feedback appeared to mediate how frequently teens were supervised throughout the study, regardless of vehicle status. However, parents, in general, allowed their teens to drive more frequently in risky conditions at the end of the study compared to the beginning.

28. Using a Video Camera-Based Method to Gather Real World High Beam Usage Data Stephanie Whetsel Borzendowski, Ashley Stafford Sewall, Richard Tyrrell (Clemson University)

The majority of traffic fatalities involving pedestrians occur at night and this is largely attributed to low illumination conditions. Yet, drivers tend to underuse their high beams despite the visibility

benefits afforded to them. In the present study we report high beam usage rates during an open-road drive using a video camera-based method. Measurements of low and high beam headlamp illuminance were also taken for all vehicles used in this study. The results indicate that drivers, on average, used their high beams 48% of the time possible. Furthermore, there was a moderately negative relationship between low beam output and high beam use indicating that drivers whose low beams produced less illumination tended to use their high beams more often. Future research should empirically investigate this relationship to lend further insight into the mechanism by which beam output influences beam usage. Research that improves our understanding of drivers' knowledge and use of high beams is likely to be important as headlighting technologies continue to advance.

29. Engaging in Highly Automated Driving: To be or Not to be in the Loop Tyron Louw, Natasha Merat, Hamish Jamson (University of Leeds – *United Kingdom*)

This desktop driving simulator study investigated the effect of engagement in a reading task during vehicle automation on drivers' ability to resume manual control and successfully avoid an impending collision with a stationary vehicle. To avoid collision, drivers were required to regain control of the automated vehicle and change lane. The decision-making element of this lane change was manipulated by asking drivers to move into the lane they saw fit (left or right) or to use the colour of the stationary vehicle as a rule (blue – left, red – right). Drivers' reaction to the stationary vehicle in manual control was compared to two automation conditions: (i) when drivers were engaged and observing the road during automation, and (ii) when they were reading a piece of text on an iPad during automation. Overall, findings suggest that drivers experiencing automation were slower to identify the potential collision scenario, but once identified, the collision was evaded more erratically and at a faster pace than when drivers were in manual control of the vehicle. Short (1-minute) periods of automation used in this study did not appear to impede drivers' ability to complete simple operational and tactical-level driving tasks, following a system initiated take-over request. Results suggest that until there is an effective strategy to help drivers regain situation awareness during the resumption of control from Highly Automated Driving, they should be encouraged to remain in the driving loop.

30. Naturalistic Driving Events: No Harm, No Foul, No Validity Ronald Knippling (Safety for the Long Haul Inc.)

This paper challenges the validity of vehicle-based Naturalistic Driving (ND) Safety Critical Events (SCEs) in relation to injury and fatal crashes. It asserts that mixed SCE datasets have no known or likely representativeness in relation to serious crashes and are likely invalid in regard to their causal factors. This argument is made in the context of ND attempts to associate truck driver Hours-of-Service parameters and safety. But the argument generally applies to other mixed SCE datasets. In part, the challenge is to a monolithic "Heinrich Triangle." Crashes are heterogeneous, both "horizontally" within any severity strata and "vertically" across strata. Serious crashes account for the vast majority of human harm, and are very different from minor crashes. Yet all crashes have, and are defined by, tangible external consequences. In contrast, SCEs are defined by driver maneuvers. Their datasets contain almost no crashes, let alone harm. As such, they are not properly part of the "triangle." Mixed SCE datasets are collections of multiple, disparate driver maneuvers chosen and defined by researchers. They are thus contrived, not analytically derived from the phenomenon of importance, serious crashes. No valid quantitative inferences about the genesis of crash harm can be made from such datasets. This deficiency does not invalidate all ND applications, however. And SCE and real crash datasets could be linked by systematic sampling and case weighting based on objective crash characteristics.

31. Analysis of Drivers' Head and Eye Movement Correspondence: Predicting Drivers' Glance Location Using Head Rotation Data Mauricio Muñoz (MIT AgeLab, New England University & University of Augsburg – *Germany*), Joonbum Lee, Bryan Reimer, Bruce Mehler (MIT AgeLab & New England University), Trent Victor (SAFER Vehicle and Traffic Safety Centre at Chalmers & Volvo Cars Safety Centre– *Sweden*)

The relationship between a driver's glance pattern and corresponding head rotation is not clearly defined. Head rotation and eye glance data drawn from a study conducted by the Virginia Tech Transportation Institute in support of methods development for the Strategic Highway Research Program (SHRP 2) naturalistic driving study were assessed. The data were utilized as input to classifiers that predicted glance allocation to the road and the center stack. A predictive accuracy of 83% was achieved with Hidden Markov Models. Results suggest that although there are individual differences in head-eye correspondence while driving, head-rotation data may be a useful predictor of glance location. Future work needs to investigate the correspondence across a wider range of individuals, traffic conditions, secondary tasks, and areas of interest.

32. DISTINGUISHED KEYNOTE LUNCHEON LECTURE: The Role of Attention in Increasingly Autonomous Driving Trent Victor (SAFER Vehicle and Traffic Safety Centre at Chalmers & Volvo Cars Safety Centre– *Sweden*)

33. The Long-Term Effectiveness of Eco-Driving Training: A Pilot Study Yiping Wu, Xiaohua Zhao, Jian Rong (Beijing University of Technology – *China*)

Eco-driving has been proven to have a great benefit in reducing vehicle fuel consumption in many developed countries. However, the potential of eco-driving on energy-saving in China is not very clear. Taking three taxi drivers from Beijing Beiqi Taxi Group Company as examples, the petrol consumption, travel distance and many other factors influencing vehicle fuel use before and after eco-driving training were collected through survey forms. The short-term and long-term effect of eco-driving was compared. The results showed that, taking one month as the statistical cycle, the benefit of eco-driving in saving fuel consumption averaged is 19.04%; while it reduced to 14.41% after four months from taking eco-driving training. Thus, drivers would partially regressed back to less economically driving behaviors and thus resulting in lower fuel savings after sometime. This study laid a foundation to evaluate the benefit of eco-driving in saving energy use.

34. Teenage Drivers Portable Electronic Device Use While Driving Johnathon Ehsani, Kaigang Li, Bruce Simons-Morton (National Institutes of Health)

Young drivers' crash risk increases when they engage in certain secondary tasks while driving. Using a sample of participants from the NEXT Generation Health Study who reported having an independent driving license and driving at least one day in the last 30 days ($n = 1,243$), the prevalence of portable electronic device use while driving was estimated. Two measures of prevalence were calculated: (1) engaging in the behavior at least once in the last 30 days; (2) percentage of days engaged in the behavior, relative to the number of days driven in the last 30 days. A total of 82.84% reported engaging in electronic device use while driving at least once in the last 30 days. Specifically, 71.13% made or answered a phone call, 64.84% read or sent a text message, 20.29% read or sent an email, 29.11% checked a website, 71.64% changed music, 12.80% used a tablet or computer, and 52.64% looked at directions or a map. Young drivers reported using electronic devices while driving on 19.06% of the days they drove. Males were more

likely to use tablet or computer while driving, teens from moderate and high affluence households were more likely to check websites, and rural participants were less likely to look at directions or a map than urban participants. The number of days participants reported driving in the last 30 days, but not self-reported miles driven, was associated with a higher likelihood of using an electronic device while driving.

35. Too Close for Comfort: Evaluating a Reward-Based Approach to Increase Drivers'

Headway Robert Rhamkhalawansingh (University of Toronto – *Canada*), Lana Trick (University of Guelph – *Canada*)

Tailgating is often implicated as a leading contributor to rear-end collisions but this behaviour is difficult to remediate because drivers are poor at estimating their own headway. Our first goal was to compare novice and fully licensed drivers as they applied existing headway interventions in a driving simulator. Our second goal was to develop an automated, reward-based approach to encourage longer headways. We first compared headway in the driving simulator to previous studies on real-world car following behaviour by asking drivers to (i) achieve what they perceived to be the minimum safe headway or to (ii) employ the common "2 second rule" intervention. We observed a close agreement between the headways achieved in the simulator and those achieved in prior real-world car-following paradigms. We then implemented our headway evaluation system and compared headway across instruction type: (i) minimum safe headway, (ii) "2 second rule", or (iii) the headway evaluation system. We observed that fully licensed motorists maintained the longest headways while using our system. While drivers reported that the headway evaluation system was easy and appealing to use, they did not foresee continuing to use the device in the future. The current system may be beneficial for driver training applications or to promote situation awareness during the use of automated driver assistance systems such as adaptive cruise control.

36. Collision Detection in Cluttered Driving Scenes Carissa Lemon, George Andersen (University of California, Riverside)

The purpose of the present experiment was to examine whether drivers' detection of collisions was altered when the driving scene was cluttered with scene objects. In this experiment stationary scene objects were manipulated by positioning them behind an approaching object and driver motion induced. We found that observers' collision detection performance (d') decreased with the presence of scene objects. These results indicate that the ability to detect a collision is altered by the presence of scene objects. In addition, performance was dependent on display duration, with greater sensitivity at increased durations. Moreover, the results showed a significant criterion shift between scene objects present and scene objects absent, with a decrease in identifying a collision object (hit rate) when scene objects were present but no difference in identification of a collision event when scene objects were absent. This suggests that the decreased performance was due to the inability to accurately determine a collision event because of apparent motion of background scene objects due to driver motion. Because the displays used in this experiment are akin to driving in a cluttered environment, the results of this research have important implications regarding driving safety and crash rates particularly in urban environments with complex scenes. Specifically, the results suggest that one factor in cluttered driving scenes is the apparent motion of background scene objects due to driver motion.

37. Pilot Study of Gaze Scanning and Intersection Detection Failures by Drivers with Hemianopia Alex Bowers, Concetta Alberti, Alex Hwang, Robert Goldstein, Eli Peli (Schepens Eye Research Institute – Harvard Medical School)

In a prior study, intersection detection failures of individuals with hemianopia were strongly associated with inadequate head scanning; however, eye position was not tracked. In this pilot study, we tracked eye and head movements, and examined the relationship between gaze scanning and detection of pedestrians at intersections in a driving simulator. Gaze scan deficits, in particular not scanning sufficiently far into the blind hemifield, were the main reason for detection failures at the extreme edge of the clear-sight triangle in the blind hemifield. In addition, the gaze data revealed detection failures due to looked-but-failed-to-see events. The results suggest that HH drivers may be at increased risk for collisions at intersections.

38. Withdrawn

39. Novice Driver Simulation Training Potential for Improving Hazard Perception and Self-Confidence While Lowering Speeding Risk Attitudes for Young Males George Park, R. Wade Allen, Theodore Rosenthal (Systems Technology, Inc.)

Despite the potential for improving hazard perception skills, novice driver training interventions run the risk of student overestimations in driving skills and increased risk-taking, e.g., speeding—particularly for young male drivers. Provided is the simulator performance and survey (driver self-confidence and speeding risk attitude) data of simulator trained and no-trained students from a high school driver education intervention, $N = 316$. Multivariate analysis of simulator performance measures and survey results at pre/post-test showed that simulator trained drivers had better hazard perception and higher driver self-confidence than no-trained drivers at semester end. While no strong sex differences were found for driving performance, males showed higher self-confidence and speed risk attitudes. Females lowered their speed risk attitudes regardless of training group. However, only simulator trained males lowered their speeding attitude while no-trained males showed no change. Driving simulation training that provides repeated collision events may help novice male drivers in particular by mediating the effects of over self-confidence from driving skill acquisition programs.

40. Effect of Listening to Music as a Function of Driving Complexity: A Simulator Study on the Differing Effects of Music on Different Driving Tasks Dong-Yuan (Debbie) Wang, Zachary Jimison, Dan Richard, Ching-Hua Chuan (University of North Florida)

Research in regards to music's effects on driving performance has been mixed. Previous research has found that music adds to mental workload. Other research has found that high mental workload is related to poorer driving performance in simulation. In this study, mental workload was manipulated by varying visual complexity and type of task (i.e., car-following or braking for unexpected obstacles). It was found that steering variance and delay in car-following response were reduced by music under low-workload conditions, while number of collisions with cars and number of lane excursions were increased under high-workload conditions. A practice effect was also found, with participants performing better when listening to music with more practice.

41. Commercial Driver Medical Exams: Relationships Between Body Mass Index and Comorbid Conditions Matthew Thiese (University of Utah), Gary Moffitt (Arkansas Occupational Health Clinic), Richard Hanowski (Virginia Tech Transportation Institute), Stefanos Kales (Harvard University), Richard Porter, Kurt Hegmann (University of Utah)

There are an estimated 5.7 million Commercial Motor Vehicle (CMV) drivers in the United States in 2012. Health and Safety of CMV drivers are of high consequence group because of: occupational risks from the size and speed of their vehicles, frequently poor health status, poor health care utilization, and the large impact of truck crashes on public health and safety. CMV drivers pass a commercial driver medical examination (CDME) to maintain licensure. CDME examiners document multiple potentially disqualifying health conditions. CMV drivers reportedly have poor health status, which may be attributed to lifestyle and occupational factors (e.g., improper diet, inadequate physical activity, poor sleep hygiene, shift work), yet few data are reported analyzing relative importance and relationships of these factors. CDMEs conducted between 2005 and 2012 among 88,246 commercial drivers were analyzed. Associations between measured Body Mass Index (BMI) categories and CDME findings, as well as driver certification were examined. 53.3% of drivers were obese (BMI>30.0 kg/m²) with half of those being morbidly obese (BMI>35.0 kg/m²). After adjustment for age and gender, obese drivers were statistically significantly less likely to be certified for the full 2 year period and significantly more likely to report many factors including heart disease, hypertension, diabetes mellitus, nervous disorders, sleep disorders, and chronic low back pain (all p<0.0001). BMI is related to many factors, some of which have been associated with increased crash risk. BMI screening may be a useful tool. Interventions for BMI reduction may have an impact on comorbidities.

42. Effects of Fatigue on Real-World Driving in Diseased and Control Participants Nazan Aksan, Jeffrey Dawson, Jon Tippin (University of Iowa), John Lee (University of Wisconsin-Madison), Matthew Rizzo (University of Nebraska)

This study evaluated real world driver errors and sleepiness in 66 drivers with Obstructive Sleep Apnea (OSA) and 34 matched controls (24 younger and 22 older). Driving errors and driver state were derived from analyses of video data from "black-box" event recorders. Sleep fragmentation data in OSA was derived from actigraphy for 15 days prior to beginning standard treatment (positive airway pressure, PAP) and 15 days after beginning PAP treatment. Prior to starting PAP, OSAs appeared sleepier than controls in general and particularly at intersections, while making safety errors following nights with high levels of fragmented sleep compared to matched controls. Adverse effects of sleep fragmentation during the pre-PAP phase were reduced post-PAP. Greater hours of PAP-use were associated with lower sleepiness and errors on the road. PAP-use was associated with a decrease in high sleep fragmented nights. Findings suggest reduction in acute sleepiness is unlikely to be the only mediating factor that explains the driving safety benefits of PAP in OSA.

43. Driving While Reading Using Google Glass Versus Using a Smartphone: Which is More Distracting to Driving Performance? Jibo He, Jake Ellis, William Choi, Pingfeng Wang (Wichita State University)

Using a phone while driving leads to distraction and impaired driving performance. When reading text on a phone, the act of looking away from the road could cause driving impairment. Wearable displays like Google Glass might reduce the visual impairment caused by looking away, even if they do not overcome other factors contributing to impaired driving. However, such devices could also increase impairment by giving drivers the mistaken impression that they can pay attention to both the display and the road simultaneously or impair visual processing by superimposing visual information in the

driving scenes. We compared driving performance in a simulated naturalistic driving task while drivers read text on Google Glass or on a smartphone. As expected, reading on Google Glass and the smartphone both impaired driving performance by increasing lane variations, but drivers using Google Glass showed less lane variation compared to smartphone users. To the extent that these metrics reflect better driving performance, Google Glass might somewhat reduce the costs of reading text while driving.

44. A Web-Based Evaluation Tool to Predict Long Eye Glances Ja Young Lee, John Lee (University of Wisconsin-Madison)

We present a web-based evaluation tool that simulates drivers' eye glances to interface designs of in-vehicle information systems (IVISs). This tool computes saliency of each location of a candidate interface and simulates eye fixations based on the saliency, until it arrives at the region of interest. Designers can use this tool to estimate the duration of drivers' eye glance needed to find regions of interest, such as particular icons on a touch screen. The overall goal of developing this application is to bridge the gap between guidelines and empirical evaluations. This evaluation tool acts as an interactive model-based design guideline to help designers craft less distracting IVIS interfaces.

45. The Role of System Training and Exposure on Crash Warning Evaluation Timothy Brown, Dawn Marshall (University of Iowa), Susan Chrysler (Texas A&M University)

This research paper explores the role that familiarity with crash warning systems has on the evaluation of those systems. Prior research has not been consistent in its treatment of providing system training and exposure to participants. The potential impact of these differences in methodology on key measures of response and outcome is unknown. Ninety-six participants completed this study that crossed system training with prior exposure to the warning to systematically evaluate these effects for both forward crash warning (FCW) and lane departure warning (LDW) systems evaluations. Prior exposure to the alerts led to changes in engagement with the distraction task for both FCW and LDW events. Training on the system influenced outcomes of the FCW events with less severe outcomes for participants who were aware they had the system. There is also evidence that driver who were aware of the system's presence but did not have prior exposure to it were less likely to complete the experiment successfully. The results of this study point to an advantage in not provide prior system awareness training in terms of longer commitment times to allow the crash warning events to materialize when prior exposure to the alerts is provided.

46. Assessing Cognitive Distraction Using Event Related Potentials James Coleman, Jonna Turrill, Rachel Hopman (University of Utah), Joel Cooper (University of Utah & Precision Driving Research), David Strayer (University of Utah)

This report examines the utility of using Event-Related Brain Potentials (ERPs) to evaluate cognitive distraction in the context of driving an automobile. Across two studies, ERPs (both P300 latency and P300 amplitude) were found to be effective in quantifying the cognitive workload experienced by drivers when they interact with in-vehicle voice-command systems.

47. Validation of a Cognitive Screening Battery to Predict Fitness-to-Drive in Individuals with Multiple Sclerosis: A Preliminary Report Abiodun Akinwuntan, Amanda Cornelison, Erika De La Cruz, Tionna Harris, Kallie Phillips, Hannes Devos (Georgia Regents University)

In a previous study, we identified five cognitive tests that together predicted the outcome of a comprehensive driving evaluation of 44 individuals with multiple sclerosis (age = 46 ± 11 years, 84% females) with 91% accuracy, 70% sensitivity, and 97% specificity. In this study, we sought to validate the predictive accuracy of the five tests in a different cohort of individuals with multiple sclerosis. Sixty-three participants (age = 49 ± 9 years, 89% females) were administered the five cognitive tests. Participants were also administered a standardized practical on-road driving test. Performance on the road test was judged by completing a 16-item checklist of very important driving skills. A raw score of 45 or more out of 50 maximum points was classified as "pass" and below 45 as "fail". Performance on the five cognitive tests was used to predict the pass/fail outcome of the on-road test. Study results showed that all five variables each had significant association with the on-road test raw score. The five tests together explained 44% of the variance of the pass/fail classification. Participants' "pass" or "fail" performance on the road test was predicted with 83% accuracy, 67% sensitivity, and 85% specificity. The short battery of five tests appears to be a valid predictor of fitness-to-drive of individuals with multiple sclerosis and more accurate at predicting individuals who will pass the on-road evaluation (85% specificity) than those who will fail (67% sensitivity).

48. Car-Truck Crashes in the National Motor Vehicle Crash Causation Survey Ronald Knipling (Safety for the Long Haul, Inc.)

The National Motor Vehicle Crash Causation Survey (NMVCCS) provided in-depth investigative data on pre-crash factors and other characteristics of 5,471 crashes involving light passenger vehicles ("cars"). Within the dataset, 199 crashes, representing 79,721 crashes nationally, were collisions between cars and large trucks. These 199 car-truck crashes constitute the second largest U.S. truck in-depth crash investigation dataset ever compiled, but its findings have not previously been published. NMVCCS is a significant source of information about the genesis of car-truck crashes. This includes variables relating to crash configurations, critical reasons, associated factors, and conditions of occurrence. Findings supplement and generally corroborate those from the Large Truck Crash Causation Study. However, NMVCCS data are more recent and represent a wider range of crash severities. Cars were more likely than trucks to be the encroaching/precipitating vehicle in car-truck collisions. Overall, 71.0% of assigned Critical Reasons (CRs) were to the car. Cars were more likely to be out-of-control prior to impact and to violate rights-of-way. Associated, contributing factors relating to driver impairment or stress were noted more frequently for car drivers. Trucks were more likely to be assigned vehicle-related CRs and associated factors, however. Nationally, about 80% of truck-related fatalities occur in car-truck crashes. Understanding their genesis is essential for the development of effective countermeasures.

49. Association Between Cell Phone Restrictions and Teens' Self-Reported Cell Phone Use While Driving Johnathon Ehsani, Bruce Simons-Morton, Jessamyn Perlus, Yunlong Xie, Paul Albert (*Eunice Kennedy Shriver* National Institute of Child Health & Human Development)

The purpose of this study was to describe the association between a range of cell phone restrictions and self-reported cell phone use while driving among teen drivers. Methods: U.S. high school students (N=780) from 14 states completed questionnaires, including items on cell phone use while driving. Cell phone restrictions for each state were identified using the Public Health Law Research

Distracted Driving Law database and divided into five categories. Associations between cell phone restrictions and self-reported cell phone use while driving were estimated as odds ratios, adjusting for driving exposure. Results: In states with cell phone restrictions, teens were less likely to report talking or texting while driving, relative to teens in states with no restrictions. Talking and texting while driving were significantly less likely in states with texting restrictions for all drivers. All driver texting restrictions combined with teen hand-held phone restrictions were significantly associated with lower texting but not talking while driving. Conclusions: The presence of restrictions appears to be better than no restrictions with respect to self-reported teen cell phone use. Further research is needed to determine whether restrictions applying exclusively to teen drivers or restrictions for all drivers provide the greatest safety benefit.

50. Informative Collision Warnings: Effect of Modality and Driver Age Mujthaba Ahtamad, Robert Gray (University of Birmingham – *United Kingdom*), Cristy Ho (University of Oxford – *United Kingdom*), Nick Reed (Transport Research Laboratory – *United Kingdom*), Charles Spence (University of Oxford – *United Kingdom*)

Research has revealed that when drivers are presented with an informative tactile collision warning, they are able to produce faster braking reaction times (BRTs) which may potentially reduce the likelihood and severity of rear-end collisions. To expand on this research, we investigated the effectiveness of unimodal (tactile) and multisensory (audiotactile) informative collision warnings for younger and older drivers. In line with our previous results, driver BRTs were significantly faster when they were presented with an informative signal as compared to a non-informative signal and a control condition in which no warnings were presented. The results also revealed that the unimodal informative warning was just as effective as the multisensory warning. Intriguingly, older drivers exhibited faster BRTs than younger drivers, and were significantly faster following the presentation of multisensory warning signals. Finally, this study identifies the need to compare new configurations of informative tactile collision warning signals.

51. Effects of Take-Over Requests and Cultural Background on Automation Trust in Highly Automated Driving Sebastian Hergeth (BMW Group Research & Technology and Chemnitz University of Technology – *Germany*), Lutz Lorenz (BMW Group Research and Technology – *Germany*), Josef Krems (Chemnitz University of Technology – *Germany*), Lars Toenert (BMW China Services – *China*)

Appropriate automation trust is a prerequisite for safe, comfortable and efficient use of highly automated driving systems (HADS). Earlier research indicates that a drivers' nationality and Take-Over Requests (TOR) due to imperfect system reliability might affect trust, but this has never been investigated in the context of highly automated driving. A driving simulator study ($N = 80$) showed that TORs only temporarily lowered trust in HADSs, and revealed similarities in trust formation between German and Chinese drivers. Trust was significantly higher after experiencing the system than before, both for German and Chinese participants. However, Chinese drivers reported significantly higher automation mistrust than German drivers. Self report measures of automation trust were not connected to behavioral measures. The results support a distinction between automation trust and mistrust as separate constructs, short- and long-term effects of TORs on automation trust, and cultural differences in automation trust.

52. Towards the Validation of a Driving Simulator-Based Hazard Response Test for Novice Drivers Pierro Hirsch (Virage Simulation – *Canada*), Francois Bellavance (HEC Montréal - *Canada*), Siavash Tahari, Jocelyn Faubert (Université de Montréal – *Canada*)

Underdeveloped hazard perception skills are associated with the higher crash risk of young novice drivers. Some driver licensing authorities use hazard perception tests (HPTs) that measure reaction times or multiple-choice responses to brief driving scenes videotaped from a vehicle traveling at legal speeds. To date, evaluations of the association between HPT scores and novice driver crash rates have been mixed. Several possible explanations for this are: high-risk novice drivers may offset good HP skills by exceeding the speed limit; current HPTs do not capture behavioral responses to hazards from candidates whose attention is engaged in the driving task; there is no established typology of driving hazards that might produce a finer-grained analysis of test results, and; current measures of HP ability may lack sensitivity. To address these potential flaws, we developed a driving simulator-based Hazard Response Test (HRT) in which drivers respond to sixteen programmed hazard events derived from a proposed typology that combines visible or hidden, real or potential conflicts, while driving over three continuous routes. The study results indicate no statistically significant difference in crash rates between young novice and experienced drivers. However, a novel, composite measure called the Continuous Time to Collision (C-TTC) did discriminate between young novice and older experienced drivers. Additional research on the validation of this measure and further refinement of the hazard typology could contribute to the creation of a standardized, driving simulator-based HRT for use in the evaluation of novice, professional and aging drivers.

53. Pilot Results on Forward Collision Warning System Effectiveness in Older Drivers Benjamin Lester, Lauren Sager, Jeffrey Dawson, Sarah Hacker, Nazan Aksan (University of Iowa), Matthew Rizzo (University of Nebraska), Satoshi Kitazaki (University of Iowa)

Advanced Driver Assistance Systems (ADAS) have largely been developed with a “one-size-fits-all” approach. This approach neglects the large inter-individual variability in perceptual and cognitive abilities that affect aging ADAS users. We investigated the effectiveness of a forward collision warning (FCW) with fixed response parameters in young and older drivers with differing levels of cognitive functioning. Drivers responded to a pedestrian stepping into the driver’s path on a simulated urban road. Behavioral metrics included response times (RT) for pedal controls and two indices of risk penetration (e.g., maximum deceleration and minimum time-to-collision (TTC)). Older drivers showed significantly slower responses at several time points compared to younger drivers. The FCW facilitated response times (RTs) for older and younger drivers. However, older drivers still showed smaller safety gains compared to younger drivers at accelerator pedal release and initial brake application when the FCW was active. No significant differences in risk metrics were observed within the condition studied. The results demonstrate older drivers likely differ from younger drivers using a FCW with a fixed parameter set. Finally, we briefly discuss how future research should examine predictive relationships between domains of cognitive functioning and ADAS responses to develop parameter sets to fit the individual.

54. Capturing Voluntary, Involuntary, and Habitual Components of Driver Distraction in a Self-Reported Questionnaire Susana Marulanda, Huei-Yen Winnie Chen, Birsan Donmez (University of Toronto – *Canada*)

To maximize the effectiveness of strategies for mitigating driver distraction, it is crucial to understand the factors underlying drivers’ engagement in distractions. This article describes a step toward an improved version of the Susceptibility to Driver Distraction Questionnaire (SDDQ), namely the

development of an exploratory questionnaire based on findings from the original SDDQ. In this exploratory questionnaire, the Theory of Planned Behaviour continues to serve as the framework for investigating voluntary distractions, relating intentional actions to attitudes, perceived behavioural control, and perceived social norms regarding distractions. Involuntary distractions are captured by investigating the difficulty associated with ignoring information that is not critical for safe driving. A new component of habitual behaviours is also added to measure distractions that involve minimal conscious control, yet were once intentional and goal-driven. The resulting exploratory questionnaire will be used in an upcoming online survey study to determine the items that most effectively capture voluntary, involuntary, and habitual distraction. An improved SDDQ will be generated based on analyses of this pending study.

55. Driver Sleepiness Assessed by Electroencephalography – Different Methods Applied to One Single Data Set Martin Golz, David Sommer (University of Applied Sciences Schmalkalden - *Germany*), Jarek Krajewski (University of Applied Sciences Cologne – *Germany*)

An overview of several methods of electroencephalography (EEG) analysis in order to assess driver sleepiness is presented. All methods were applied to one single data set obtained from overnight driving simulations in our lab. 10 young adults (age 22.4 ± 4.1 years) participated and drove on rural roads; time on task was 7 x 40 min and time since sleep ranged between 16 and 22 hours. Results show large inter-individual variability of all variables and moderate correlation coefficients to one subjective and one objective independent variable of driver drowsiness. Only one method, the detection of microsleep-like EEG patterns, provides a variable with strong increases immediately before sleepiness related crashes. It is concluded that EEG analysis should attach more importance to short-term patterns and should renounce the analysis of spectral power in four bands.

56. From Few to Many: Using Copulas and Monte Carlo Simulation to Estimate Safety Consequences Vindhya Venkatraman, John Lee (University of Wisconsin-Madison), Chris Schwarz (University of Iowa)

With the introduction of more advanced vehicle technology, it is paramount to assess its safety benefit. Advanced driver assistance systems (ADAS) can reduce crashes and mitigate crash severity, if designed appropriately. Driver behavior models are integral to the ADAS design process, complementing time and resource intensive human participant experiments. We introduce a method to model driver responses to forward collision events by quantifying multivariate behavior with copulas and Monte Carlo simulation. This approach capitalizes on the data from small samples of crash events observed in naturalistic or simulator studies. Copulas summarize data by capturing the underlying joint distribution of variables, and Monte Carlo methods can be used to repeatedly sample from these distributions. A driver model can be parameterized with these samples, and run on a desktop driving simulation environment.

57. Do Drowsy Driver Drugs Differ? Timothy Brown, Andrew Spurgin, Gary Milavetz, Gary Gaffney (University of Iowa), Robin Johnson (Advanced Brain Monitoring)

This research paper explores how different drug mechanisms within a single class of drugs can produce different profiles of driving impairment. Prior research has failed to consider these mechanistic differences and often utilizes less controlled study methodologies. The potential impact of differing mechanistic effects is important for practitioners but remains unclear for most drugs. Twenty-nine licensed drivers in good general health completed one of two miniSim™ studies using a validated, standardized, driving impairment scenario. Both drugs caused degradation in lateral control

measures of standard deviation of lane position (SDLP) and number of lane departures, however only diphenhydramine was found to cause a significant change in steering bandwidth. The studied drugs differed in their effects on all longitudinal driving measures with diphenhydramine effecting speed and alprazolam effecting the standard deviation of speed. Difference in therapeutic mechanism of action results in differing pharmacodynamic driving performance outcomes. This analysis reinforces the importance of careful consideration of a drug's specific mechanism of action when considering a sedating drug's impact on a patient's ability to safely operate a motor vehicle.

58. Understanding Driver-Automated Vehicle Interactions Through Wizard of Oz Design

Improvisation Brian Ka-Jun Mok, David Sirkin, Srinath Sibi, David Bryan Miller, Wendy Ju (Stanford University)

This paper describes a Wizard of Oz study that was performed to gather insights on how automated vehicles (NHTSA's Levels of Automation 2 and 3) should interact with human drivers. Twelve design improvisation sessions were conducted inside a driving simulator with interaction and interface design experts. The participants drove through a simulated course with various terrain and road conditions, while the two human operators (wizards) controlled the audio and driving behavior of the car. Through the feedback collected in these sessions, insights in five areas were discovered: drivers' desire for shared control, transitions in driving mode, response latency, addressing requests, and drivers' trust in the car. Additional examining yielded potential concepts and ideas that may be implemented and tested in future work.

59. Predicting Secondary Task Involvement and Differences in Task Modality Using Field

Highway Driving Data Alina Sinelnikova (MIT AgeLab & New England University Transportation Center and University of Augsburg – *Germany*), Joonbum Lee, Bryan Reimer, Bruce Mehler, Joseph Coughlin (MIT AgeLab & New England University Transportation Center)

This study examined differences in the impact of visual-manual and auditory-vocal based radio tuning tasks on field driving performance. Engagement in visual-manual tuning tasks were associated with higher steering wheel reversal rates than baseline driving. Both visual-manual and auditory-vocal based tuning tasks were associated with higher variances in speed maintenance compared to baseline driving. Models were built to utilize driving performance measurements as input to a classifier that aimed to distinguish between the three states (i.e., baseline driving, visual-manual tuning, and auditory-vocal tuning). Baseline driving could be classified from visual-manual tuning at an accuracy of over 99% and from auditory-vocal based tuning at an accuracy of 93.3%. Models could differentiate between the modalities at an accuracy of 75.2 % and between the three classes at an accuracy of 81.2%. Results suggest that changes in driving performance associated with visual-manual based tuning are statistically distinguishable from auditory-vocal based tuning. While not being free of visual-manual demand, tasks that involve auditory-vocal interactions appear to differ from visual-manual in how they impact driving performance.

60. The Driver Has Control: Exploring Driving Performance with Varying Automation

Capabilities Mishel Johns, David Miller, Annabel Sun, Shawnee Baughman, Tongda Zhang, Wendy Ju (Stanford University)

As vehicle automation becomes more capable and prevalent, an understanding of how drivers will interact with automation systems of varying capabilities will be of critical importance. In this study, we compare the performance of drivers on takeover of control from varying types of automation systems (single-function and combined function). Participants drove a 20-minute course with sections

of automated driving, and with several traffic events designed to elicit a driver response. Structured transfers of control between automated and manual driving modes occurred following a 7-second countdown at fixed locations on the course. Significant differences were found between groups in terms of lane-keeping ability immediately after taking control following a period of automated vehicle control or partial driver/automation control, but significant differences were not found in accident evasion ability, even five seconds after resuming full control.

61. In-Vehicle Noise Alters the Perceived Meaning of Auditory Signals Neil Lerner, Jeremiah Singer, Daniel Kellman (Westat), Eric Traube (National Highway Traffic Safety Administration)

Research on driver perception and interpretation of auditory signals has generally been conducted under conditions of low-to-moderate ambient in-cab noise. In a series of four experiments, the effects of various ambient noise conditions on the perceived meaning of auditory signals were investigated. Noise conditions that may be realistically anticipated in the course of normal driving altered the perceived urgency and meaning of signals. The presence and extent of such changes was a function of the specific auditory signal, the ambient noise condition, and their interaction. The results indicate that in-vehicle auditory signal design criteria developed only under low-to-moderate ambient noise conditions are not likely to be sufficient. The significant signal-by-ambient noise interaction further suggests that multiple noise backgrounds must be considered.

62. A Secondary Assessment of the Impact of Voice Interface Turn Delays on Driver Attention and Arousal in Field Conditions Thomas McWilliams, Bryan Reimer, Bruce Mehler, Jonathan Dobres, Hale McAnulty (MIT AgeLab & New England University Transportation Center)

Voice interface use has become increasingly popular in vehicles. It is important that these systems divert drivers' attention from the primary driving task as little as possible, and numerous efforts have been devoted to categorizing demands associated with these systems. Nonetheless, there is still much to be learned about how various implementation characteristics impact attention. This study presents a secondary analysis of the delay time between when users finish giving commands and when the system responds. It considers data collected on 4 different production vehicle voice interfaces and a mounted smartphone in field driving. Collapsing across systems, drivers showed an initial increase in heart rate, skin conductance level, and off-road glance time while waiting for a system to respond; a gradual decrease followed as delays continued. The observed attentional and arousal changes are likely due to an increase in anticipation following a speech command, followed by a general disengagement from the interface as delay times increase. Safety concerns associated with extended delay times and suggestion of an optimal range for system response times are highlighted.

63. The Effects of an Eco-Driving Interface on Driver Safety and Fuel Efficiency Daryl Hibberd, Hamish Jamson, Samantha Jamson (University of Leeds – *United Kingdom*)

Real-time, in-vehicle guidance on eco-driving is likely to produce substantial improvements in vehicle fuel economy. However, the benefits of such in-vehicle systems should be achieved without impairing driver safety. A simulator study evaluated both visual and haptic eco-driving feedback systems, which provided advice on gas pedal usage. Hill driving scenarios with variable traffic density were used to test drivers' relative prioritization of safe and fuel-efficient driving. A visual, second-order display and a haptic force feedback gas pedal created the smallest errors in gas pedal usage and so maximized fuel efficiency. The visual display increased time spent looking away from the road, implying reduced driver safety. Participants were worse at eco-driving in more demanding, high traffic conditions.

Drivers appeared to prioritize safety over eco-driving, however safety margins were shorter in the high density traffic condition, despite the degradation in eco-driving performance. The findings suggest which modality could be most appropriate for presenting in-vehicle eco-driving guidance, and hint that these systems should advise drivers based on the prevailing traffic conditions.

64. Effectiveness of a Heads-Up Adaptive Lane Deviation Warning System for Middle-Aged and Older Adults Nazan Aksan, Lauren Sager, Benjamin Lester, Sarah Hacker, Jeffrey Dawson, Steven Anderson (University of Iowa), Matthew Rizzo (University of Nebraska)

46 participants (24 younger and 22 older) completed at least one out of four simulated drives designed to test the effectiveness of an Adaptive Lane Deviation Warning (LDW) system, and they drove through both a warnings-on and warnings-off version of each drive. Findings showed that LDW was effective in reducing reaction time for lane deviation corrections for both older (by 1.2 seconds) and younger drivers (by 1.6 seconds). The older and younger drivers did not differ in correction RTs when the warnings were turned off. But older drivers showed slower correction RTs than younger drivers in the warning-on drives. The data indicate that these benefits were specific to LDW rather than general improvement in driving performance. Cognitive processing speed emerged as a particularly robust predictor of benefits from the LDW compared to other domains of cognitive function.




65. The Incredible Shrinking Letter: How Font Size Affects the Legibility of Text Viewed in Brief Glances Jonathan Dobres, Bryan Reimer, Lauren Parikhal, Emily Wean (MIT AgeLab), Nadine Chahine (Monotype Imaging Inc.)

As in-vehicle interfaces have become miniature computers with user-facing LCD screens, the complexities of designing for them have increased tremendously. Given their safety-critical nature, designers must carefully consider every aspect of the vehicle's digital interface. Recent research has suggested that even the typeface used to display the interface's text can have significant impacts on driver behaviors such as total off-road glance time and secondary task completion time. Here we outline a psychophysical method for rapidly assessing the glance-based legibility of two different typefaces (a "humanist" and a "square grotesque") presented in two different sizes (3mm and 4mm). Consistent with previous research, we find that humanist type is more legible than square grotesque. We also find that text is empirically less legible at 3mm compared to 4mm, and that this effect is especially pronounced for the square grotesque typeface. Legibility thresholds were also found to increase linearly with age, more than doubling across the age range studied. We hypothesize that the square grotesque's intrinsic design characteristics cause it to scale poorly at small sizes and lose important details, especially in suboptimal display conditions.






Driving Assessment 2015 Conference Honda Outstanding Student Paper Award Winners Where are They Now?




DA2001 Award Winners

	<p>Abiodun Emmanuel Akinwuntan, Ph.D., Associate Professor and Associate Dean, College of Medicine, Georgia Regents University, Augusta, Georgia</p> <p>Since winning the Honda Award in 2001, Dr. Akinwuntan obtained a Ph.D. in Neurorehabilitation from the Katholieke Universiteit Leuven, Belgium in 2004, a Post Graduate Certificate in Education from the University of East London, England in 2005, and now is on the faculty at the Medical College of Georgia. His automotive research and teaching concentrates on rehabilitation outcomes after a neurological impairment; the use of simulation and virtual technologies in improving activities of daily living after a neurological impairment; neurophysiology and neurology.</p>
	<p>Ghulam H. Bham, Ph.D., Assistant Professor, Missouri University of Science and Technology</p> <p>After winning the Honda award in 2001, Dr. Bham completed his Ph.D. from the University of Illinois at Urbana-Champaign in 2003. Dr. Bham has led several research projects as PI for the Missouri Department of Transportation and the Smart Work Zone Deployment Initiative pooled fund study administered by the Iowa State University for the Federal Highway Administration. He has worked on research projects for the Illinois Department of Transportation, the Arkansas Highway and Transportation Department (AHTD), and the Alaska Department of Transportation and Physical Facilities. Dr. Bham has worked as a consultant on several large-scale transportation projects internationally. He designed a 120 km rural highway along the rugged coastal terrain in Pakistan. He has performed feasibility studies and economic analyses for bridges, highways and interchanges for different government agencies including two major interchanges in the city of Karachi, one of the largest cities in the world. He has also completed studies for the National Highway Authority (NHA) of Pakistan.</p>
	<p>Christian Jerome, Ph.D., Research Psychologist, US DOT - National Highway Traffic Safety Administration</p> <p>Since winning the Honda award in 2001, Dr. Jerome earned a Ph.D. in Applied Experimental Psychology at the University of Central Florida. He manages a program of research that helps direct the agency to issue safety regulations for advanced technologies and safety applications. The objective of this research program is to determine guidelines for the development of connected vehicle interfaces which will help to minimize driver workload by eliminating distractions related to Dedicated Short Range Communications (DSRC)-based devices as a contributing factor to crashes due to poorly designed controls and displays. This goal is aimed at controlling the ever-present and growing threat to safety represented by driver distraction, which is a factor in many crashes. The approach is to evaluate driver distractions and other human factors related to ITS, leveraging the convergent findings of epidemiological studies, experimental studies, and analyses of crash data.</p>





DA2003 Award Winners

	<p>William J. Horrey, Ph.D., Senior Research Scientist, Center for Behavioral Sciences, Liberty Mutual Research Institute for Safety</p> <p>Since winning the Honda Award in 2003, Bill obtained his Ph.D. in Engineering Psychology from the University of Illinois and now works as a senior research scientist at the Liberty Mutual Research Institute for Safety in Hopkinton, MA. His current research focuses on driver calibration with respect to skill, risk and performance, impairments due to distraction and fatigue, and on-board monitoring systems. He is currently the Chair of the Transportation Research Board Vehicle User Characteristics committee and is an Associate Editor for the Human Factors Journal. He is also the past Chair of the Surface Transportation Technical Group for the Human Factors and Ergonomics Society</p>
	<p>Omer Tsimhoni, Ph.D., Global Innovation Leader, Connected vehicle, infotainment, and HMI.</p> <p>Since winning the Honda Award in 2003, Omer Tsimhoni obtained a Ph.D. at the University of Michigan. He spent three years as an assistant research scientist at UMTRI. From 2008-2014 he was at the GM Advanced Technical Center in Israel. In 2015 he moved to GM in Warren, Michigan where is a Global Innovation Leader in Connected vehicles, infotainment, and HMI. His areas of interest are in automotive speech interaction, contextual HMI, driving simulators, and user experience innovation. His research focus has been on driver performance while using in-vehicle devices (driver distraction). He has broad experience in on-the-road experiments, simulator laboratory experiments, and computational modeling of human performance. He has conducted several driving simulator experiments to further the understanding and quantification of the visual demands of driving in relation to the use of in-vehicle systems. His research has involved in-vehicle navigation systems, data entry using keyboards and speech recognition, the effect of driving while listening to text-to-speech email messages, head-up displays, and night vision enhancement systems. Dr. Tsimhoni has published over 80 technical reports, conference proceedings, and journal articles.</p>
	<p>Sarah (Batchelder) Viamonte, Ph.D., M.S.P.H., Director, Neuropsychology Service, National Jewish Health</p> <p>Dr. Viamonte completed her doctoral degree in Medical/Clinical Psychology at the University of Alabama at Birmingham. She also earned her MSPH in Health Care Organization and Policy at UAB. She completed internship training in neuropsychology at the Minneapolis Veterans Affairs Medical Center and completed a neuropsychology fellowship at The Nebraska Medical Center. She is now the director of the Neuropsychology Service at National Jewish Health in Denver, Colorado. She is the President-elect of the Colorado Neuropsychological Society and is on the Board of Directors for the National Academy of Neuropsychology</p>




DA2005 Award Winners

	<p>Bobbie Seppelt, M.Sc., Ph.D., Research Scientist at Touchstone Evaluations, Inc.</p> <p>Dr. Bobbie Seppelt is a research scientist at Touchstone Evaluations, Inc. – an independent human factors and cognitive science research firm based in the Detroit area. Prior to joining Touchstone in 2012, she conducted research on human-machine interface design for supervisory control systems as a postdoctoral research associate in the Industrial and Systems Engineering department at the University of Wisconsin. She received her Ph.D. in Industrial Engineering in 2009 from the University of Iowa and her M.S. in Engineering Psychology in 2003 from the University of Illinois at Urbana-Champaign. Her research interests include driver-vehicle interface design, operator trust and reliance on automation, and automated driving systems integration.</p>
	<p>Amit Paul, M.Sc., Head of Retail Pricing and Analytics, Hastings Direct</p> <p>Following the Honda award in 2005, Amit graduated from the University of Iowa with a M.Sc. in Industrial and Human Factors Engineering. He then joined the Strategy and Analytics Group of HSBC Bank. His experience in data analysis, statistics and decision science at Iowa helped him in performing at HSBC. After working with HSBC for 3 years, he decided to pursue an MBA at the London Business School to develop his management and leadership skills. His MBA concentration is finance and private equity. Post MBA, Amit continued in business analytics and strategy with American Express and most recently at Barclays as Head of Risk Management. Currently, he leads a multi-disciplinary team as Head of Retail Pricing and Analytics at Hastings Direct, a general insurance company.</p>
	<p>Matthew Romoser, Ph.D., Assistant Professor of Industrial Engineering at Western New England University</p> <p>Since winning the Honda Award in 2005, Matthew Romoser obtained his Ph.D. in Industrial Engineering in September 2008 from the University of Massachusetts Amherst. He now works an assistant professor of industrial engineering at Western New England University where he teaches human factors engineering and is continuing his work in training and transportation human factors. His dissertation focused on simulator-based driver training for older adults. He has been involved with the cognitive side of Human Factors Engineering since leaving General Electric in 1998 where he worked as a design and application engineer. His research interests include education and training human factors, transportation human factors, computer-assisted instruction, human-computer interface, usability analysis, and the cognitive aspects of human interaction with machines and computers in the workplace. His past research at UMass has included studying mental rotation and spatial reasoning in college students. Ultimately, the results of these experiments will be used to increase the effectiveness of online tutors and computer training programs.</p>



DA2007 Award Winners

	<p>Eve Mitsopoulos-Rubens, Ph.D., Senior Policy Officer, Road User Access and Mobility, VicRoads, Melbourne, Australia</p> <p>Following her 2007 Honda award, Dr. Mitsopoulos-Rubens finished her Ph.D. work and began a research fellowship at Monash University in Australia. She concentrated on research on driving simulators, young drivers, Intelligent Transport System (ITS) and driver distraction. Currently, she is a Senior Policy Office with Road User Access and Mobility, VicRoads, Melbourne, Australia.</p>
	<p>Rayka Mohebbi, M.S., Application Developer at Element Payment Services, Phoenix, Arizona</p> <p>Since winning the Honda Award in 2007, Ms. Mohebbi obtained a M.S. in Human Factors Engineering from Arizona State University and worked as a Research Scientist Contractor to the Air Force Research Lab PALM (Performance and Learning Models) team. She was involved in the ongoing Spatial Visual Working Memory Research. Since October 2011, she is an Application Developer with Element Payment Services in Chandler, Arizona.</p>
	<p>Rebecca Reed-Jones, Ph.D., Assistant Professor of Applied Human Sciences, University of Prince Edward Island</p> <p>Since winning the Honda Award in 2007, Rebecca Reed-Jones obtained a Ph.D. in Biomechanics at the University of Guelph. Her work concentrated on the visual control of human locomotion. Part of this research was conducted at the University of Birmingham (UK) and was made possible by being awarded the Canadian Society for Biomechanics student travel grant. In 2010, Rebecca was appointed Assistant Professor with the College of Health Sciences at the University of Texas at El Paso (UTEP). At UTEP, she continued her research in sensory integration and movement control graduating several graduate students under her supervision. In 2013, Rebecca made a move to Canada's east coast and was appointed Assistant Professor of Applied Human Sciences at the University of Prince Edward Island</p>
	<p>Jeffrey Scott, M.Sc., User Experience Analyst, Charles Schwab, Denver, CO</p> <p>Currently, Jeff is a user experience analyst who advocates for usability and user adoption. He provides design recommendations based on Human Factors analysis to ensure a user-centered design.</p> <p>A champion for human factors, human-centered design, and user experience in complex technical systems. Fourteen years in the U.S. Air Force applying human factors principles to improve user performance and reduce/prevent errors.</p>

DA2009 Award Winners

	<p>Martin Lavallière, Ph.D. Postdoctoral fellow at HEC Montreal and Visiting Fellow at MIT AgeLab and Center for Transportation & Logistics</p> <p>Martin Lavallière is currently a postdoctoral fellow at HEC Montréal where he works on the evaluation of motor vehicle collisions and their impacts on the workforce. Dr Lavallière completed a Postdoctoral fellow at the MIT AgeLab and Center for Transportation & Logistics (2013-2015). His research interests include driving, aging, cognitive distractions and human-machine-interface. Dr. Lavallière received his Ph.D. in kinesiology from Université Laval (Québec city, Canada). His Ph.D. focused on evaluating on-road and visual search behaviors of drivers in order to better understand the effects of aging and whether a simulator-based training program combined with driving specific feedbacks can improve safe driving behaviors in older drivers. In addition to his research, he is chair of the Quebec national board of road safety.</p> <p>Specialties: Road safety, driver performance, on-road and in-simulator evaluation, aging and specific health related problems (TBI, OSA, Driving under the influence), distractions behind the wheel.</p>
	<p>Petra Hoggarth, BA (Hons), Ph.D., – Clinical Psychologist, Princess Margaret Hospital, Christchurch, New Zealand</p> <p>Since winning the Honda award in 2009, Petra Hoggarth went on to finish her PhD concerning prediction of driving ability in healthy older adults and adults with Alzheimer’s Disease and mild cognitive impairment. She also completed her training in clinical psychology and is now a clinical psychologist at an older adult psychiatric service in Christchurch, New Zealand. Her interests include the assessment and management of cognitive impairment in older adults and how this is provided in the primary care system. She continues her interest in driving assessment of cognitively impaired older adults by both providing advice in clinical matters arising in her workplace, and in providing education to primary care physicians in detecting possibly unsafe older drivers for further driving assessment.</p>
	<p>Arne Stinchcombe, Ph.D., Research Analyst, Division of Aging and Seniors, Public Health Agency of Canada</p> <p>Arne Stinchcombe received his PhD in Psychology from the University of Ottawa in 2011. His dissertation focused on the relationship between attention and road complexity as examined through a driving simulator. As a graduate student he gained experience working on interventions to support safe driving, methodological issues in driving simulation, and psychosocial determinants of driver safety. He has recently completed a research project examining simulated driving behavior of older adults with dementia. In 2011, Dr. Stinchcombe joined the Public Health Agency of Canada working on injury prevention among older adults. He maintains an independent program of research focused on driver safety and continues to be affiliated with the University of Ottawa.</p>

DA2011 Award Winners

 A portrait of Russell S. Pierce, a man with a beard and glasses, wearing a dark suit, white shirt, and patterned tie. He is standing in front of a brick building.	<p>Russell S. Pierce, Ph.D., -- Research Psychologist, National Highway Traffic Safety Administration</p> <p>Russell S. Pierce completed his Ph.D. at the University of California, Riverside with the submission of a dissertation entitled <i>3D Spatial Attention and Aging</i> and now works at the National Highway Traffic Safety Administration as a Research Psychologist in the Office of Behavioral Safety Research. The experiments described in his two proceedings papers, that won Honda awards in 2011 and 2013, were included in the aforementioned dissertation and in a 2014 paper published in <i>Accident Analysis & Prevention</i> under the title <i>The effects of age and workload on 3D spatial attention in dual-task driving</i>. A manuscript representing detailed eye-tracking analyses and a third experiment in the same series is under preparation. His current research interests include young/novice driver safety, older driver safety, attention, automation, and naturalistic driving study data.</p>
 A portrait of Thalia Taylor, a woman with dark hair, wearing a blue jacket. She is smiling and standing outdoors with other people in the background.	<p>Thalia Taylor, Ph.D.</p> <p>Since winning the award Thalia completed her PhD at the University of Massachusetts Amherst in Industrial Engineering and Human Factors.</p>

DA2013 Award Winners

	<p>Alexandra S. Mueller, M.A., Ph.D. Candidate – Psychology, University of Western Ontario, Ontario, Canada</p> <p>Since winning the Honda Award in 2013, Alexandra has continued her Ph.D. dissertation research on how humans perceive visual motion at the University of Western Ontario. The main focus of her research has been the perception of visual acceleration and deceleration, abilities that are directly relevant to the monitoring of the environment while driving a vehicle. Her most recent project concerns the role of smooth pursuit eye movements in the ability to detect changes in speed. She has also been investigating claims that there are differences in the way that acceleration and deceleration are perceived. Other areas of her dissertation research concern the effects of stimulus complexity and location on the ability to perceive acceleration. She will be completing her dissertation in 2015 and plans to take up a postdoctoral fellowship to pursue research on motion perception in the driving environment and behind-the-wheel performance.</p>
	<p>Kuan-Hua Chen, Ph.D Candidate – Neuroscience, University of Iowa</p> <p>Since winning the Honda Award in 2013, Kuan-Hua Chen has continued his research investigating the effect of emotion on driving behaviors in aging population. Recent projects, including dissertation work, have examined the dynamic process of emotion generation and emotion regulation, and how normal aging and pathological aging (e.g. Parkinson’s Disease) can influence those processes, thereafter affect driving safety. Kuan-Hua has applied an integrated approach to quantify the dynamic change of emotion (combining EEG, GSR, Heart Rate, startle reflex), and have used multiple driving simulator systems to study the effect of emotion on decision making and vehicle control during driving.</p>
	<p>Russell S. Pierce, Ph.D., -- Research Psychologist, National Highway Traffic Safety Administration</p> <p>Russell S. Pierce completed his Ph.D. at the University of California, Riverside with the submission of a dissertation entitled <i>3D Spatial Attention and Aging</i> and now works at the National Highway Traffic Safety Administration as a Research Psychologist in the Office of Behavioral Safety Research. The experiments described in his two proceedings papers, that won Honda awards in 2011 and 2013, were included in the aforementioned dissertation and in a 2014 paper published in <i>Accident Analysis & Prevention</i> under the title <i>The effects of age and workload on 3D spatial attention in dual-task driving</i>. A manuscript representing detailed eye-tracking analyses and a third experiment in the same series is under preparation. His current research interests include young/novice driver safety, older driver safety, attention, automation, and naturalistic driving study data.</p>

**DA 2015 Daily Schedule
Snowbird, Salt Lake City, Utah**

Monday, June 22	Tuesday, June 23	Wednesday, June 24	Thursday, June 25
<p>2:00 PM - 6:30 PM Early Registration 2:00 PM - 6:30 PM Exhibitor Set Up 6:30 PM - 9:00 PM Welcome Reception</p>	<p>7:15 AM - 5:00 PM Registration Open 7:15 AM - 8:30 AM Continental Breakfast 7:30 AM - 1:30 PM Poster Session A Set Up 8:00 AM - 4:30 PM Exhibitors Available 8:30 AM - 9:30 AM Toyota Distinguished Keynote Lecture Dr. Mary Czenwinski (<i>Microsoft Research</i>) 9:30 AM - 10:00 AM Break 10:00 AM - 11:30 AM Session 1 – Driver Distraction & Attention 12:00 PM - 1:30 PM Honda Luncheon & Outstanding Student Paper Awards 1:30 PM - 3:00 PM Session 2 – Medical Issues in Driving 3:00 PM - 4:30 PM Break 3:00 PM - 4:30 PM Session 3 – Poster Session A 4:30 PM - 5:00 PM Poster Session A Tear Down</p>	<p>7:15 AM - 5:00 PM Registration Open 7:15 AM - 8:30 AM Continental Breakfast 7:30 AM - 1:30 PM Poster Session B Set Up 8:00 AM - 4:30 PM Exhibitors Available 8:30 AM - 10:00 PM Session 4 – Younger & Older Drivers 10:00 AM - 10:30 AM Break 10:30 AM - 12:00 PM Session 5 – Research Methods & Perspectives 12:00 PM - 1:00 PM Buffet Lunch 1:15 PM - 2:00 PM Distinguished Keynote Lecture Dr. Trent Victor (<i>SAFER Vehicle & Traffic Safety Centre at Chalmers & Volvo Cars Safety Centre-Sweden</i>) 2:00 PM - 3:00 PM Session 6 – Tribute to Old Friends & Their Legacy 3:00 PM - 4:30 PM Break 3:00 PM - 4:30 PM Session 7 – Poster Session B 4:30 PM - 5:00 PM Poster Session B Tear Down 5:00 PM - 5:45 PM Load Shuttle Buses to Utah Olympic Park Complex 6:15 PM - 9:00 PM Utah Olympic Park Open 7:00 PM - 8:30 PM Dinner Buffet 8:00 PM - 8:30 PM Flying Ace All-Star Show 8:45 PM - 9:45 PM Load Shuttle Buses; Travel back to Snowbird</p>	<p>7:30 AM - 1:00 PM Registration Open 7:30 AM - 8:45 AM Continental Breakfast 7:30 AM - 8:30 AM Hybrid Poster Set Up 8:45 AM - 10:15 AM Session 8 – Hybrid Presentations 10:15 AM - 10:30 AM Break 10:30 AM - 12:10 PM Session 9 – Driver Interface Issues 12:10 PM - 12:30 PM Conference Wrap Up 11:00 AM - 12:45 PM Boxed Lunches Available</p>