



Exponent[®]
Engineering & Scientific Consulting

David M. Cades, Ph.D.

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Professional Profile

Dr. Cades specializes in human factors investigations of vehicle and aircraft operator behavior, including perception response time, visual perception, nighttime visibility, and distractions and has investigated the effects of advanced driver assistance systems (ADAS) and highly automated vehicles (HAVs) on driver behavior. He also has expertise in the evaluation and development of warnings and instructions for a wide range of consumer and industrial products. He utilizes his background in human factors and usability testing to support his work in these areas. He received his Ph.D. in Human Factors and Applied Cognition from George Mason University in 2011.

At Exponent, Dr. Cades has investigated vehicle operator behavior of automobiles, commercial trucks, bicycles, motorcycles, and aircraft. He has evaluated the adequacy of warnings on products and in their manuals and he has applied his experience to projects involving safety- and health- related user behaviors of industrial equipment, kitchen appliances, video game entertainment systems, consumer electronics, sports and recreation equipment, home theater products, and personal protective equipment.

Dr. Cades has expertise in the testing and analysis of how interruptions and distractions affect performance. He has investigated the negative effects of distractions in environments, including, but not limited to, driving, aviation, healthcare, offices, and classrooms. He has applied this knowledge to see how distractions can cause errors that lead to accidents. With respect to aviation, specifically, he has collected over forty hours of data from airline pilots performing safety critical flight tasks with interruptions and distractions. Dr. Cades has performed on-road evaluation of ADAS including auto-braking, collision mitigation and warning, blind spot indication, and lane departure warning.

Dr. Cades also has expertise in evaluating and designing graphical user interfaces including devices for use in automobiles and aircraft. He has previously been employed in the field of usability and user experience digital product design. He has investigated the effects of manual and voice-activated infotainment devices in automobiles. He also designed a dashboard display to assist drivers in maintaining safe speeds while driving in adverse conditions and explored how aging and glare affect people's driving ability. For commercial aircraft, he has worked with pilots, air traffic controllers, and airline operations in support of FAA's NextGen initiative.

In Dr. Cades's graduate work, he has utilized and presented on various statistical methods and has authored papers on driver behavior with respect to in-vehicle displays and devices, flight deck performance with novel systems and interruptions, the effects of glare on human vision, how attributes of interruptions affect task performance, ways to improve how people handle distractions, interruptions' effects in different environments, and various statistical approaches for predicting and understanding research outcomes.

Academic Credentials & Professional Honors

Ph.D., Psychology, George Mason University, 2011

M.A., Psychology, George Mason University, 2007

B.S., Human Factors, Tufts University, summa cum laude with high honors, 2003

New Investigator Award from APA Division of Experimental Psychology (Division 3), 2012

NASA Graduate Student Researchers Program grant \$30,000 annual, 2008-2011

North American Finalist for Enhanced Safety of Vehicles automotive design competition, 2009

Recipient of the Deflorez Prize in Human Engineering, 2003

Licenses and Certifications

PADI Certified Open Water Scuba Diver

Prior Experience

User Experience Consultant, User Centric, 2010

Research Assistant, Lighthouse International, 2003-2005

Usability Engineering Intern, American Institutes for Research, 2002-2003

Human Factors Intern, Electronic Ink, 2001

Human Factors Intern, Verizon Laboratories, 2000-2001

Professional Affiliations

Human Factors and Ergonomics Society 2001-present

- Computational Modeling Technical Group
- Cognitive Engineering Technical Group
- Aerospace Technical Group
- Surface Transportation Technical Group
- Product Design Technical Group

Society of Automotive Engineering 2011-present

- Voting member of Safety and Human Factors Steering Committee 2015-present

George Mason Human Factors and Ergonomics Society Student Chapter 2005-2011

- President 2006-2007

Human Factors and Ergonomics Society Potomac Chapter Fall 2006-2011

American Psychological Association 2006-present

- Division 21 - Applied Experimental and Engineering Psychology

Usability Professionals Association 2006-2011

Association for Psychological Science 2006-2011

Cognitive Science Society 2008-2011

Publications

Krake A, Jonas R, Hoyos C, Crump C, Lester B, Cades D, Harrington R. Effects of Training on Learning and Use of an Adaptive Cruise Control System. SAE Technical Paper 2020-01-1033, 2020, doi: 10.4271/2020-01-1033.

Hoyos C, Lester BD, Crump C, Cades DM, Young, D. 2018. Consumer perceptions, understanding, and expectations of Advanced Driver Assistance Systems (ADAS) and vehicle automation. In Proceedings of the Human Factors and Ergonomics Society Annual Meeting 2018 Sept; 62(1):1888-1892, Sage CA: Los Angeles, CA: SAGE Publications.

Moorman HG, Niles A, Crump C, Krake A, Lester BD, Milan L, Cloninger C, Cades DM, Young D. Lane-keeping behavior and cognitive load with use of lane departure warning. SAE Technical Paper 2017-01-1407, 2017, doi:10.4271/2017-01-1407.

Crump C, Krake A, Lester BD, Moorman HG, Cades DM, Young D. Driver behavior with passive and active vehicle safety system. Proceedings of the Transportation Review Board 2017 Annual Meeting.

Cades DM, Crump C, Lester BD, Reed S, Barakat B, Milan L, Young D. Differing perceptions of advanced driver assistance systems (ADAS). Proceedings of the Human Factors and Ergonomics Society Annual Meeting 2016 Sept; 58(1):265-269.

Kim R, Lester BD, Schwark J, Cades DM, Hashish R, Moorman H, Young, D. Gaze behavior during curb approach: The effect of mobile device use. Proceedings of the Human Factors and Ergonomics Society Annual Meeting 2016 Sept; 60(1):1580-1584.

Cades DM, Crump C, Lester BD, Young D. Driver distraction and advanced vehicle assistive systems (ADAS): Investigating effects on driver behavior. 7th International Conference on Applied Human Factors and Ergonomics (AHFE 2016) and Affiliated Conferences; 4th International Conference on Human Factors in Transportation. 2016.

Foroughi CK, Werner NE, McKendrick R, Cades DM, Boehm-Davis DA. Individual differences in working memory capacity and task resumption following interruptions. Journal of Experimental Psychology: Learning, Memory, and Cognition Advance online publication. <http://dx.doi.org/10.1037/xlm0000251>. 2016, February 15.

Barakat B, Crump C, Cades D, Rauschenberger R, Schwark J, Hildebrand E, Young D. Eye tracking evaluation of driver visual behavior with a forward collision warning and mitigation system. Proceedings, Human Factors and Ergonomics Society Annual Meeting 2015 Sept; 59(1):1321-1325.

Krauss D, Cades D Dewar R. Driver Distraction. In: Forensic Aspects of Driver Perception and Response. 4th Edition. Krauss D (ed), Tucson, AZ: Lawyers and Judges Publishing Company, Inc., 2015.

Cades D, Kim R, Krauss D. In-vehicle technology and the driver. In: Forensic Aspects of Driver Perception and Response. 4th Edition. Krauss D (ed), Tucson, AZ: Lawyers and Judges Publishing Company, Inc., 2015.

Crump C, Cades D, Rauschenberger R, Hildebrand E, et al. Driver reactions in a vehicle with collision warning and mitigation technology. SAE Technical Paper 2015-01-1411, 2015. doi:10.4271/2015-01-1411.

Werner NE, Cades DM, Boehm-Davis DA. Multitasking and interrupted task performance. In: The Wiley Handbook of Psychology, Technology, and Society. Rosen LD, Cheever NA, Carrier LM (eds), John Wiley & Sons, Lrd, Chichester, UK, March 2015; ch22, 436-452.
doi:<http://onlinelibrary.wiley.com/doi/10.1002/9781118771952.ch22/summary>

Crump C, Cades D, Rauschenberger R, Hildebrand EA, Young DE. Dynamic on-road method for evaluation of Advanced Driver Assistance System (ADAS). Proceedings, 3rd Annual World Conference of the Society for Industrial and Systems Engineering, pp. 77-81, San Antonio, TX, October 20-22, 2014. ISBN: 97819384960-2-8.

Perlmutter, S, Cades DM, Heller, MF, Giachetti, RS, Sala JB, Arndt, SA. Effects of mobile technology use on walking. Proceedings, 58th Human Factors and Ergonomics Society Annual Meeting, 2014.

Quartuccio, J, Franz S, Gonzalez, C, Kenner, NM, Cades DM, Sala JB, Arndt, SA, McKnight, PE. Seeing is believing: The use of data visualization to identify trends for cycling safety. Proceedings, 58th Human Factors and Ergonomics Society Annual Meeting, 2014.

Khan FS, Krauss DA, Alper SJ, Droll J, Arndt SR, Lakhiani SD, Cades DM. Do people heed warnings at gas stations? Proceedings, 2nd Annual World Conference of the Society for Industrial and Systems Engineering, pp. 114-117, Las Vegas, NV, November 5-7, 2013. ISBN: 97819384960-1-1.

Cades DM, Young D, Glazek, K, Nauhaus, G, Alper S. Motorcoach seat belt use rates in the United States. Proceedings, 2nd Annual World Conference of the Society for Industrial and Systems Engineering, pp. 283-288, ISBN: 97819384960-1-1, Las Vegas, NV, November 5-7, 2013.

Werner NE, Cades DM, Boehm-Davis DA, Chang J, Kahn H, Thi, G. Understanding interruption resiliency: Individual differences in spatial ability and working memory capacity in resumption. Proceedings, Human Factors and Ergonomics Society 55th Annual Meeting, 2011.

Cades DM, Boehm-Davis DA, Trafton JG, Monk CA. Mitigating disruptive effects of interruptions through training: What needs to be practiced? *Journal of Experimental Psychology: Applied* 2011; 17(2):97-109.

Cades DM, Arndt SR, Kwasniak AM. Driver distraction is more than just taking eyes off the road. *Institution of Transportation Engineers Journal* 2011; 81(7).

Nelson E, Kidd D, Cades D. Examining patterns of simulator sickness during increased exposure to a motion-based driving simulator over time. *Journal of the Washington Academy of Sciences* 2010; 96(3):1-14.

Werner NE, Cades DM, Boehm-Davis DA, Peterson MS, Alothman SJ, Zhang X. Individual differences in resuming interrupted tasks. *Journal of the Washington Academy of Sciences* 2010; 96(3):35-49.

Barrow J, Cades D, Kidd D, Nelson E, Roberts D. Managing speed in inclement conditions using an in-vehicle interface. Proceedings, 2nd International Conference on Automotive User Interfaces and Interactive Vehicle Applications, 2010.

Cades DM, Kidd DG, King EB, McKnight PE, Boehm-Davis DA. Factors affecting interrupted task performance: Effects of adaptability, impulsivity, and intelligence. Proceedings, 54th Human Factors and Ergonomics Society Annual Meeting, 2010.

Cades DM, Werner NE, Boehm-Davis DA, Arshad Z. What makes real-world interruptions disruptive? Evidence from an Office Setting. Proceedings, 54th Human Factors and Ergonomics Society Annual Meeting, 2010.

Werner NE, Cades DM, Boehm-Davis DA, Peterson MS, Alothman SJ, Zhang X. Where was I and what was I doing? Individual differences in resuming after an interruption and implications for real-world distractions. Proceedings, Washington Academy of Sciences 2010 Capital Science Conference, 2010.

Nelson E, Kidd DG, Cades DM. The effect of repeated exposures to simulated driving on ratings of simulator sickness. Proceedings, Washington Academy of Sciences 2010 Capital Science Conference, 2010.

Werner NE, Cades DM, Boehm-Davis DA, Peterson MS. Resuming after an interruption: Exploring the roles of spatial and goal memory. Proceedings, Human Factors and Ergonomics Society 53rd Annual Meeting, San Antonio, TX, October 19-23, 2010.

Barrow JH, Cades DM, Kidd DG, Nelson E, Roberts D. SLIC: Speed limit for inclement conditions. Proceedings, 2009 Eye and the Auto Conference hosted by the Detroit Institute of Ophthalmology, Detroit, MI, 2009. (Note that all authors contributed equally).

Cades DM, Jones SM, Werner NE, Boehm-Davis DA. Knowing when to switch tasks: Effectiveness of internal versus external cues. Journal of the Washington Academy of Sciences 2008; 94(3):93-109.

Kidd DG, Cades DM, Horvath DJ, Jones SM, Pitone MJ, Monk CA. Listen up! Do voice recognition systems help drivers focus on the road? User Experience Magazine: A publication of the Usability Professionals' Association 2008; 7(4):10-12.

Cades DM, Werner NE, Trafton JG, Boehm-Davis DA, Monk CA. Dealing with interruptions can be complex, but does interruption complexity matter: A mental resources approach to quantifying disruptions. Proceedings, Human Factors and Ergonomics Society 52nd Annual Meeting, New York, NY, September 22-26, 2008.

Cades DM, Kidd DG, McKnight PE. Where is the real-world variance? A generalizability theory approach to understanding interruptions in naturalistic environments. Abstract, Proceedings, III European Congress of Methodology, pp. 20-21, Oviedo, Spain, July 8-12, 2008.

Kidd DG, Cades DM, McKnight PE. Generalizability theory in laboratory interruptions research: Estimating variance to improve future research. Proceedings, III European Congress of Methodology, pp. 20, Oviedo, Spain, July 8-12, 2008.

Cades DM, Trafton JG, Boehm-Davis DA, Monk CA. Does the difficulty of an interruption affect our ability to resume? Proceedings, Human Factors and Ergonomics Society 51st Annual Meeting, pp. 234-238, Baltimore, MD, October 1-5, 2007.

Cades DM. Measuring individual differences over and above experimental manipulations. Proceedings, International Society for the Study of Individual Differences 13th Biennial Meeting, Giessen, Germany, July 22-27, 2007.

Cades DM, Trafton JG, Boehm-Davis DA. Mitigating disruptions: Can resuming an interrupted task be trained? Proceedings, Human Factors and Ergonomics Society 50th Annual Meeting, pp. 368-371, San Francisco, CA, October 16-20, 2006.

Presentations

Werner NE, Cades DM, Boehm-Davis DA, Peterson MS, Alothman SJ, Zhang X. Where was I and what

was I doing? Individual differences in resuming after an interruption and implications for real-world distractions. Presented at research symposium at the University of the District of Columbia (UDC), 2010.

McKnight PE, Kidd DG, Cades DM, Kendra MS. Generalizability theory applications in program and policy evaluation: An introduction and application to quasi-experimental and experimental designs. Presented at Evaluation 2009, 23rd Annual Conference of the American Evaluation Association, 2009. (Symposium - all authors presented equally).

Najab J, Cades DM, Kidd DG. A gentle introduction to Bayesian Analysis. Presented at Evaluation 2009, 23rd Annual Conference of the American Evaluation Association, 2009. (Symposium - all authors presented equally).

Barrow JH, Cades DM, Kidd DG, Nelson E, Roberts D. SLIC: Speed limit for inclement conditions. Paper and Poster presented at Enhanced Safety of Vehicles conference, Stuttgart, Germany, 2009. (Note that all authors contributed equally).

Barrow JH, Cades DM, Kidd DG, Nelson E, Roberts D. SLIC: Speed limit for inclement conditions. Paper presented to National Highway Traffic Safety Administration for design competition of Enhanced Safety of Vehicles conference, Fairfax, VA, 2009. (Note that all authors contributed equally).

Cades DM, Boehm-Davis DA, Trafton JG. Interruptions in the office: An observational field study. Poster presented at the 2007 American Psychological Association Division 21, Division 19, and Human Factors and Ergonomics Society Potomac Chapter Annual Symposium on Applied Experimental Research, Fairfax, VA, 2007.

Krall J, Cades DM, McKnight PE. Predicting baseball winners using just noticeable differences. Poster presented at the 2007 annual conference of the Association for Psychological Science, Washington, D. C., 2007.

Higgins KE, White JM, Cades DM, Ciaccio V, Liu L. Effect of age on transient adaptation at low light levels. Poster presented at Optical Society of America Annual Meeting, Tucson, AZ, 2005.

Higgins KE, White JM, Asami R, Liu L, Rosenthal B, Ciaccio V, Cades DM, Gauthier H. Physiology of glare and readaptation (including age differences). Presented at National Highway Traffic Safety Administration Workshop on Headlamp Safety Metrics: Balancing Visibility and Glare, July 2004.

Higgins KE, White JM, Cades D, Ciaccio V, Liu L. Early dark adaptation: Effect of age. Presented at the annual meeting of The Association for Research in Vision and Ophthalmology (ARVO), May 2006.

Other Articles

Scully ID, Scally S, Clark R, Carey MR, Cades DM, Harrington R. Safety and Regulatory Considerations of Advanced Driver Assistance Systems (ADAS). Article in American Bar Association Tort Trial and Insurance Practice Section's Committee News; Fall 2020.

Cades DM, Senatore C, Campbell JL, Harrington R, Wood D. Automated and Assistive Vehicle Technology: Opportunities and Challenges. Article in American Bar Association Tort Trial and Insurance Practice Section's The Brief Fall 2019; 49 (1), pp. 16-25.

Cloninger C, Cades DM, Nauhaus G, Harley E. Reconstructing witnessed events: Sources of error in eyewitness perception and memory. Feature Article in The Illinois Association of Defense Trial Counsel IDC Quarterly 2019; 29 (1).

Cades DM, Skow E, Brinkerhoff RS. Technology advances affecting walking and driving. Common defense: A member publication of Kentucky Defense Counsel, Inc.; Spring/Summer 2017.

Cades DM, Carey MR, Crump C, Cloninger C, Young D. Drivers and driverless vehicle revolution: understanding the changing role of the driver. *Westlaw Journal Automotive* 36 (24), May 31, 2017.

Cades DM, Crump C, Cloninger C, Young D. Drivers and driverless vehicle revolution: understanding the changing role of the driver. Article at the Defense Research Institute's Product Liability Meeting 2017. Las Vegas, Nevada.

Cades DM, Skow E, Brinkerhoff RS. Understanding the effects of mobile technology on walking and driving. Article in the Michigan Defense Trial Counsel E-Letter; Volume 7, No. 2. 2016.

Cades DM, Brinkerhoff RS, Skow E. Understanding the changing nature of walking and driving. Feature Article in the Iowa Defense Counsel Association Defense Update Summer 2016; Volume XVIII, No. 3.

Cades DM, Arndt, SR, Sala, JB, Krauss, DA. What you need to know about the distracted driver. Feature Article in The Illinois Association of Defense Trial Counsel Quarterly 2013; 23(4).

Khan FS, Cades DM, Krauss, DA. Cyclist and pedestrians vs. cars: Cars win! A human factors perspective. Feature Article in The Illinois Association of Defense Trial Counsel Quarterly 2012; 22(3): 30-33.

Khan FS, Krauss DK, Alper S, Droll JA, Arndt SR, Lakhiani SD, Cades DM. Do people heed warnings at gas stations? In: Newsletter of Michigan Defense Trial Counsel 2012 Spring; 2(4).

Barrow JH, Cades DM, Kidd DG, Nelson E, Roberts D. SLIC: The in-vehicle speed management device. Technical report submitted to judges at National Highway Traffic Safety Administration representing Enhanced Safety of Vehicles design competition. (Note that all authors contributed equally), 2009.

Mintz FE, Smith CF, Cades DM, Fedota J, Henrickson SE. What can I do for you? An evaluation of university and professional organizational roles in the development of student training. Technical report submitted to the executive council of the Human Factors and Ergonomics Society, 2005.

Peer Reviewer

Reviewer for *Journal of Experimental Psychology: Applied*, 2010-present

Reviewer for *Behavior Research Methods Journal*, 2010-present

Reviewer for *Human Factors Journal*, 2009-present

Reviewer for *International Journal of Human Computer Studies*, 2008-present