



university of  
groningen



umcg

# ABSTRACT BOOK

# IC<sup>2012</sup> TTP

The 5th International Conference on  
Traffic and Transport Psychology  
29-31st August 2012, Groningen, The  
Netherlands



[www.icttp2012.com](http://www.icttp2012.com)



# Groningen City Map



# Welcome

When we three years ago, led by our deceased chairman Professor Rothengatter, submitted a tender to organise the 5th ICTTP, we did not have the faintest idea about how much would happen in between. In February 2010 Talb Rothengatter died unexpectedly and the formal scientific chair of Transport and Environmental Psychology was removed. However, the group members maintained their cooperation within the Department of Psychology of the University of Groningen and we accepted the invitation by the Board of the ICAP Working Group 13 (Traffic and Transport Psychology) to organize ICTTP-5 anyway, on our personal authority. So, it is a great honour for us to have you all here in the vibrant city of Groningen to attend an inspiring conference with colleagues from about all relevant disciplines that we can think of.

The city of Groningen is what we call a nice provincial capital, a relatively small city of about 186.000 citizens. As a lively university city Groningen has the youngest average population (mean age is about 36.5 years) in the Netherlands. It also has a long and turbulent history, which becomes evident from the historic warehouses, courts and buildings. In 2005 Groningen was proclaimed the city with the best city centre in the Netherlands because of its charm. We urge you to experience all of this while you are here. So please explore and enjoy the historic city centre of Groningen!

Currently, over 50,000 students are registered at the Hanze Hogeschool (University of Applied Sciences) and the University of Groningen altogether, where they can choose amongst almost 200 courses. The University of Groningen itself has nine faculties, divided over 150 buildings scattered around the city and close surroundings. The University is the third biggest university in the Netherlands, after the universities of Amsterdam and Utrecht. Furthermore, our University is almost 400 years old (founded in 1614), so in two years' time we commemorate our 400 Year existence, four centuries of the second oldest University of the Netherlands (after the University of Leiden).

The 5th ICTTP conference focuses on the interaction between theory and practice, which is especially important because of the relevance of transport and traffic psychology for society. The conference provides a platform for communication between young and established researchers, but also between scientists and practitioners. The ultimate aim of this conference is to provide impetus and provide a common basis for the future of research in traffic psychology, which is aimed towards the next generation of traffic psychology researchers. In European Universities over 200 PhDs are involved in research regarding traffic and transport psychology. They will be the ones that decide the future research agenda in this area. The 5th ICTTP conference in Groningen will hopefully be remembered by them as an exciting starting point.

- Karel Brookhuis, Ben Lewis-Evans, Linda Steg, Ayca Berfu Unal, & Dick de Waard,  
Organising Committee, ICTTP 2012



## Sponsors & Exhibitors



**Photography:** Maarten de Waard & Alzbeta Talarovicova

**Design:** Ben Lewis-Evans

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## Organising Committee

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## Additional support & organisation



<http://www.groningencongresbureau.nl>

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# Keynote Speakers

**Prof Frank McKenna, Department of Psychology, University of Reading & Perception and Performance, UK.**

How should we think about the three E's - education,  
engineering and enforcement?

9:00 - 10:00, Blauwe zaal, 29th August

Dr. Frank McKenna has a BSc from the University of Glasgow and a Ph.D from University College London. He started his research career in Cambridge investigating human error and accident involvement and has spent more than twenty years working and publishing in the area. He sits on the editorial board of the international journal Accident Analysis and Prevention, is a member of the Parliamentary Advisory Council for Transport Safety and sits on advisory boards for the AA motoring trust, and the Royal Society for the Prevention of Accidents.



**Prof Satoshi Fujii, Department of Urban Management, Kyoto University, Japan**

Psychological strategies for attitude and behaviour change in  
mobility management

9:00 - 10:00, Blauwe zaal, 30th August



Dr. Satoshi Fujii is a professor of transportation planning and behavioural-psychological analysis of transportation in the Department of Urban Management at Kyoto University. He has been engaged in the research on attitude and behaviour of transportation and has worked on soft measures to change attitude and behavior of travel from car use into sustainable transportation modes. His research also includes travel demand modeling, cognitive decision making, and social dilemmas. He is currently an executive director of Corporation of Japanese Conference on Mobility Management, a chief editor of IATSS Review, and a member of editorial boards of Behaviormetrika, Journal for Transportation and Land-Use, and Journal of Human Environmental Studies.

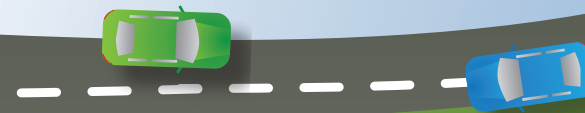


**Prof. Serge Hoogendoorn, Delft University of Technology, The Netherlands**  
**Tracing Traffic Dynamics: With innovative traffic data to a better theory**  
9:00 - 10:00, Blauwe zaal, 31st August

Dr. Serge Hoogendoorn is chair of the Traffic Management, Transport & Planning department of the Delft University of Technology and Professor of Traffic Flow Theory and Simulation, a staff member of the TRAIL Research School on Transport and Logistics, a freelance consultant for different Dutch firms and agencies, the chair of the Network Management foundation and a staff member of the Expert Centre for Traffic Management in addition to being the author of over 100 journal publications, 50 book chapters and 150 conference papers. His research involves theory, modelling, and simulation of traffic and transportation networks, focusing on innovative approaches to collect detailed, microscopic traffic data and the use of these data to underpin the models and theories.



**T2013** International Conference  
**25-28 August 2013**  
Brisbane, Queensland, Australia



## 20th International Council on Alcohol, Drugs and Traffic Safety Conference

**25-28 August 2013** Brisbane Convention and Exhibition Centre, Brisbane, Queensland, Australia

T2013 will present a global forum at which all those involved in Road Safety and Injury Prevention, Research, Policy, Education and Enforcement, particularly from the fields of Drugs and Alcohol, can meet with researchers, academics and professionals to discuss and present on the latest work being undertaken in these areas.

The conference themes will provide a great opportunity for a broad range of presentations, workshops, symposia and discussion, and dedicated programs will be offered for young scientists, early career researchers, students and those from low and middle income countries.

Designed to encourage a strong program of both industry and academic presentations, keynote speakers will be drawn from both Australia and overseas, and bring new and innovative research and practice to the conference.

For more information: [www.t2013.com](http://www.t2013.com) or contact via email: [t2013@qut.edu.au](mailto:t2013@qut.edu.au)

### Who should attend:

Academics, researchers and practitioners in the areas of:

- Public Health
- Law
- Medicine
- Economics
- Law Enforcement
- Public Policy
- Education
- Human Factors and Psychology





### Smart Eye

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SMART EYE develops and markets 3D Remote Eye Tracking systems that give a person's 3D information on gaze direction, head position and angles, eyelid opening, pupil size and many more - in real time! The systems, available in 60 or 120 Hz, are well-known for its flexibility and robustness, allow free head movements with a large head box and are very accurate, easy to use and fast to initiate. With the powerful analysis software that we provide, you can create dynamic ROI's, heat maps and get the statistics.

SMART EYE PRO is the multi-camera solution that gives you up to 360 degrees visual field by using up to 8 cameras in one system and it is totally insensitive to ambient light.

The system is used in the most complex environments and applications with installations in automobiles, airplanes, trucks, trains, simulators, control rooms and other demanding environments.

ANTI SLEEP is a compact one-camera solution that is specially designed for automotive in-cabin real-time measurements of driver head pose, gaze direction and eyelid closure to detect driver fatigue, drowsiness and inattention.



### ST Software

info@stsoftware.nl  
www.stsoftware.nl

ST Software is a specialized driving simulation company. It continues the work from the late 1990's at the former Traffic Research Centre of the University of Groningen where a new generation research driving simulator had been developed. In the year 2000 the activities were privatized making the software available to the community of behavioural scientists.

The simulation system was specifically designed from the needs and perspective of researchers and could be operated without the requirement of high-skilled technical staff. The validity and realism of the task environment was another prime target for which the autonomous agents based traffic simulation has been a core principle from the beginning. Driving task conditions are created with the aid of the scenario scripting tool. Which also enables stimulus presentation, secondary tasks, data gathering, performance analyses, data exchange to physiological devices, driver feedback, etcetera..

At present ST Software provides turn-key driving simulation systems for research and driver training. As well as support and solutions for specific requirements. The basic driver cabin is the 'Jentig' cockpit as shown but any combination of driver cabins and display system is possible: from desk-top devices to real sized cars.





## Science Plus

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Science Plus Group distributes the Vienna Test System and more specific the VTS Traffic, the no. 1 testbattery for fit-to-drive testing. VTS Traffic has been made by the Schuhfried company, the world leader company in computerized psychological testing.

Schuhfried has a long tradition in traffic psychology and is working together with traffic and medical psychologists all over the world. Schuhfried recently started a scientific cooperation with prof. Wiebo Brouwer (UMCG Groningen, The Netherlands) regarding a study amongst elderly drivers. Schuhfried emphasizes the importance of well-validated tests, and is always looking for new scientific partners.

Science Plus Group is one of Schuhfried's partners in distributing the Vienna Test System. With a history of 15 years in reselling the VTS Traffic, we are one of Schuhfried 'oldest' partners. The VTS Traffic is being used by many organizations in traffic psychology, like HR companies, governmental bodies, universities and clinics.

Next to the Vienna Test System, Science Plus Group offers many other scientific software programs in psychology, statistics, and more. We demonstrate the fit-to-drive battery VTS Traffic in our booth during the ICTTP 2012. We would like to invite you to have a look and get a free catalog and demo DVD!

# SCHUHFRIED

*passion for psychology*

## SCHUHFRIED

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www.schuhfried.com

SCHUHFRIED has been involved with traffic psychological assessment since 1959 and has from the first been the market leader in this field. Through sound research work SCHUHFRIED sets new standards, driving forward the development of traffic psychology and thus contributing to traffic safety and the maintenance of mobility.

The Vienna Test System TRAFFIC is the standard tool worldwide in traffic psychological testing, because SCHUHFRIED's computer-based assessment of fitness to drive builds on more than 50 years of customer feedback, research and development. The tests have been specifically developed for use in traffic psychology and are thus precisely tailored to the issues involved. They have been validated on traffic psychology issues. Relevance and validity have been investigated and demonstrated in numerous studies. Many countries use traffic psychology tests from SCHUHFRIED as an effective means of boosting safety on the road. Tests are approved by the relevant authorities, such as the Ministry of Transport, for use in the legal context. More than 1,350 Vienna Test Systems are currently in use by driving assessment agencies worldwide.

# IC 2012 TTP programme

Tuesday, 28th of August 2012

15:00 - 19:00	Registration open (Fontein Patio, UMCG)
18:00 - 19:00	Welcome Reception - This reception is offered to you by the University of Groningen, the Municipality of Groningen and the Province of Groningen (Fontein Patio)

Wednesday, 29th of August 2012

7:30 - 8:30	Registration open (Fontein Patio)
8:30 - 9:00	Opening Ceremony (Blauwe zaal)
9:00 - 10:00	Keynote (Blauwe zaal) <b>How should we think about the three E's - education, engineering and enforcement?</b> Frank McKenna
10:00 - 10:30	Morning break and refreshments (Fontein Patio)

	Blauwe zaal	Rode zaal	Room 16	Ronde zaal	Room 10	Room 9	Room 4
10:30 - 12:30	<p><b>Symposium: Behavioural Adaptation: Translating theory into action 1</b></p> <p>Contemporary Models of Behavioural Adaptation - Ben Lewis-Evans</p> <p>Experimental considerations when designing theoretically-based behavioral adaptation studies - Michael Manser</p> <p>Behavioural adaptation and roadway ITS: the forgotten chapter - Marieke Martens</p> <p>Behavioural adaptation to roadway countermeasures - Richard van der Horst</p>	<p><b>Personality and behaviour</b></p> <p>Thirty-day self-reported risky driving behaviors of ADHD and non-ADHD drivers - Tova Rosenbloom</p> <p>Effects of age and gender identity on driving behaviors - Ludvine Gueho</p> <p>Drivers' biased perception of other drivers' aberrant behaviours - Henriette Wallén Warner</p>	<p><b>Older Road Users 1</b></p> <p>Don't wait until it's too late: Evaluation of a refresher course for older drivers - Pål Ulleberg (C)</p> <p>Does driving license have any positive effect on elderly bicyclists' behavior? - Masahiro Tada</p> <p>On-road visual search and executive functions in elderly drivers - Esko Lehtonen</p> <p>Meta-cognitive skill training for elderly drivers using "mirroring" method - Hiro Ota</p>	<p><b>Symposium: Acceptability of transport policies</b></p> <p>An experimental study on policy makers' communication about a congestion charge, individual value preferences, perceptions of arguments and acceptability - Cecilia Jakobsson Bergstad</p> <p>Policies Aimed to Change Car Use: Policy Characteristics, Social Norms and the Acceptability of Policies - Judith de Groot</p>	<p><b>Cycling 1</b></p> <p>Safely on a bike - Harry Derriks</p> <p>Motorists' perceptions of cyclists and cycling infrastructure: US Experiences - Jennifer Dill</p> <p>Traffic safety culture among Norwegian bicyclists - Tor-Olav Nævestad</p> <p>Electrical assisted cycling in the Netherlands: imago and willingness to purchase - Ingrid Hendriksen</p> <p>Bicycle users' risk perception, satisfaction and route choice - Gabriele Prati</p>	<p><b>Symposium: Field Operational Test</b></p> <p>Statistical modeling of safety events in naturalistic driving data: An application to speed regulation systems - Guillaume Saint Pierre</p> <p>Driver behaviour and acceptance analysis of multiple Advanced Driver Assistance Systems within the field operational test "euroFOT" - Mohamed Benmimoun</p> <p>Visual behavior effects on forward collision warnings in real traffic conditions – a field operational test study. - Claudia Wege</p>	<p><b>Driver distraction and inattention</b></p> <p>Is the 'useful field of view' affected by hearing impairment? - Nicholas Herbert</p> <p>What distracts young drivers? - Terry Lansdown (C)</p> <p>Change Blindness: Effects of sadness and anger - Christophe Jallais</p> <p>Distraction: Comparing its effects with the frequency of exposure in different road user groups - Matt Staton</p>



	Blauwe zaal	Rode zaal	Room 16	Ronde zaal	Room 10	Room 9	Room 4
10:30 - 12:30	<p>The role of acceptance in behavioural adaptation - Samantha Jamson</p> <p>Driving styles among Norwegian drivers: Prevalence of violations, errors and lapses - Renata Torquato</p> <p>The on-road behaviour of school students in Belgium - Mark Sullman (C)</p>	<p>Locus of Control and driver behaviour in a Brazilian sample - Guilherme Olandoski</p> <p>Driving styles among Norwegian drivers: Prevalence of violations, errors and lapses - Renata Torquato</p> <p>The on-road behaviour of school students in Belgium - Mark Sullman (C)</p>	<p>Accident risk, behaviour and habits of older cyclists - Carmen Hagemeister</p>	<p>Accepting costs: When do environmental values predict the acceptability of car use reduction measures? - Martijn Keizer</p> <p>Parking fees, acceptability and effects on car use to work - Petter Christiansen</p> <p>A Synthesis of Theoretical Insights on the Acceptability of Transport Policies - Graham Parkhurst</p>	<p>Cyclists' subjective evaluations of risk are associated with heart rate and response to challenge - John A. Groeger (C)</p>	<p>EuroFOT impact assessment method and results - Eline Jonkers</p> <p>Intelligent Speed Adaptation field trials: implications for large scale deployment - Frank Lai</p>	
	Lunch (Fontein Patio)						
	Blauwe zaal	Rode zaal	Room 16	Ronde zaal	Room 10	Room 9	Room 4
13:30 - 15:30	<p><b>Symposium: Social Psychology of Sustainable Transport</b></p> <p>Sustainable transport: expert and public views on policies and technologies - Dimitrios Xenias</p> <p>Alone in my car: how mode use affects social perceptions - Birgitta Gatersleben</p> <p>Social influence on attitudes to electric vehicles - Caroline Orlebar</p> <p>Adoption of electric mobility – an analysis of likely early adopters in Germany - Elisabeth Dütschke</p> <p>Identity, Behaviour and Resistance to Change in Regular Travel - Niamh Murtagh</p>	<p><b>Risk and hazard perception</b></p> <p>Reduction of car-bicycle conflicts at intersections by early driver information systems – the role of threat anticipation and visual obstruction - Frederik Naujoks</p> <p>Identifying overconfidence among drivers - Mojtaba Moharrer</p> <p>Reading, driving and attention - Joanne White</p> <p>Distance information of congestion warnings: False-alarm effects when the given distance information is not correct? - Ingo Totzke</p>	<p><b>Road Safety Education 1</b></p> <p>Applying Behavioural Change Techniques to road safety education - Stephen Stradling (C)</p> <p>Will attitudes towards safety improve after the introduction of a new driver licence training for young mopedists? - Christina Stave</p> <p>Automatic Evaluation Method of Safe Driving Skill Based on Driving Behavior Analysis and Its Application to Safe Driving Lecture - Masahiro Tada</p> <p>A coaching program for young drivers in their first period of solo driving: which target group is attracted? - Erik Roelofs</p>	<p><b>Symposium: Driver attention, perception, and road design</b></p> <p>Self-explaining rural road design: The effects of road design on expectations - Gert Weller</p> <p>Driving behavior at transitions from highway to secondary roads: a simulator study - Caroline Ariën</p> <p>Design induced behaviour: An on-road study of driver behaviour at rail level crossings - Michael Lenné</p> <p>Driver Age and Distraction on the Use of an Intersection Crossing Assist System - Michael Manser</p>	<p><b>Symposium: Drugs &amp; Driving/Impaired driving</b></p> <p>Introduction - Karel Brookhuis</p> <p>Effects of dex-troamphetamine on simulated driving performance before and after sleep deprivation - Anna Vadeby</p> <p>Effects of the combination of two drugs (hypnotic and analgic) on driving performances in aged subjects - Catherine Bertehlon</p> <p>Effects of alcohol and ecstasy on simulated driving performance and traffic safety - Janet Veldstra</p>	<p><b>Symposium: Visibility/ Shared Space</b></p> <p>The Effects of Compensatory Scanning Training on Mobility for Hemianopia Patients - Gera de Haan</p> <p>AutO-Mobility: safe driving with a visual impairment in the Netherlands - Bart J.M. Melis-Dankers</p> <p>How to measure spatial abilities in visually impaired people? - Frank Steyvers</p> <p>Communication in Shared Space - Pieter de Haan</p>	<p><b>Driver behaviour measurement</b></p> <p>SDLP: a simple measure? - Mark Vollrath (C)</p> <p>The Lane Change Task's (LCT) measures and metrics: What do they tell us about driver's secondary task demand? - Anja Katharina Huemer</p> <p>Concurrent Validity of Some Psychological Methods for Assessing Predisposition Towards Safe Driving - Anna Uczak</p> <p>Towards a definition of safety for individual driver's lane behaviour - Roald van Loon</p>

	Blauwe zaal	Rode zaal	Room 16	Ronde zaal	Room 10	Room 9	Room 4
13:30 - 15:30		<p>An Investigation into the Factors affecting the Perception of a Train's Travelling Speed - Helen. E. Clark (C)</p> <p>Real-life driver reactions time to danger as a function of situational and driver-centered variables - Daniele Ruscio</p>			<p>Driving performance of occasional and heavy cannabis users during single doses of dronabinol (10 and 20 mg) and placebo. - Jan Ramaekers</p>		<p>Efficacy of Dynamic Traffic Management Measures: The Influence of Complexity and Situational Awareness - Raymond Hoogendoorn</p>
15:30 - 16:00	Afternoon break and refreshments (Fontein Patio)						
	Blauwe zaal	Rode zaal	Room 16	Ronde zaal	Room 10	Room 9	Room 4
16:00 - 18:00	<p><b>Symposium: Driver behaviour modelling 1</b></p> <p>Driving Behavior Model from the Brain Science point of view and the applications to safe-driving training program - Koji Tanida</p> <p>Facets of driver behaviour: the benefit of hindsight - John A Groeger</p> <p>Quantifying the Zero Risk theory algorithmically - Jami Pekkanen</p> <p>Risk Perception in Driving - An Integrated Framework for Representing Core Assumptions of Risk Models of Driver Behaviour - Otto Lappi</p>	<p><b>Attention and mental workload</b></p> <p>Task controlled anticipatory eye movements while driving require executive control - Esko Lehtonen</p> <p>Visual search while driving: Effects of vehicle prevalence on vehicle detection - Mike Lenné (C)</p> <p>Prospective memory and driving behaviour: differential effect of time-based and event-based intentions - Steven Trawley</p> <p>Dividing and Focussing Attention Hazards in Virtual Nottingham - Panos Konstantopoulos</p> <p>Decision-making at signalised intersections as function of cognitive load - Robert Kaul</p>	<p><b>Policy</b></p> <p>Run-off-road crashes: a multidisciplinary in-depth study on types and contributory factors - Ragnhild Davidse (C)</p> <p>Risky driving and recorded driving offenses: A follow-up study - Sirpa Rajalin</p> <p>Behaviour at fixed-site urban speed cameras - Stephen Stradling</p> <p>A Comprehensible Framework for Applying Behavioural Insights in Mobility-Related Policy and Modelling - Nina Schaap</p> <p>Making knowledge exchange between theory and practice a reality: a practical model to enhance road casualty reduction on a decreasing budget - Laura Hurst</p>	<p><b>Pedestrians</b></p> <p>Hazard perception abilities among child-pedestrians in a Dome-settings Environment - Anat Meir</p> <p>Walking behavior of university students in Greece: A descriptive and inferential analysis - Ioannis Politis</p> <p>Social norms of accompanied young children and observed crossing behaviors - Tova Rosenbloom (C)</p> <p>Pedestrians' risk perception— an investigation among Brazilian students - Renata Torquato</p> <p>Effects of daytime running lights on vulnerable road users - Christina Platho</p>	<p><b>Symposium: The Relationship Between Emotional Well-Being and Satisfaction with Work Commutes</b></p> <p>Life Satisfaction and Satisfaction with the Work Commute - Margareta Friman</p> <p>How satisfaction with work commute differs among Sweden, Netherland and Japan? - Satoshi Fujii</p> <p>How satisfaction with trip legs affect whole trip satisfaction? - Haruna Suzuki</p> <p>Travel mode change, satisfaction with travel, and happiness - Lars Olsson</p> <p>Studying Pedestrians' Well-Being in Urban Contexts - Dick Ettema</p>	<p><b>Symposium: Electric vehicles: A tool for transition to more sustainable mobility patterns?</b></p> <p>Capturing heterogeneity in the EV market: a segmentation of likely early adopters and mainstream consumers in the UK. - Jillian Anable</p> <p>Driven by symbolic motives: adoption of the electric car - Ernst Noppers</p> <p>Electric vehicles: Sustainable concepts from a user perspective - Anja Peters</p> <p>When people change mobility behaviour and use electric vehicles or multimodal transport? – An evaluation of attitudes, needs and external conditions in private households - Franziska Dombrowski</p>	<p><b>Advertising</b></p> <p>The threat of losing respect: a comparison of anti-speeding message themes on young male drivers' speeding behaviour - Bernice Plant</p> <p>Physical threat versus social threat: what puts the brakes on male drivers? - Julia Irwin</p> <p>Fear-appeal road safety messages: The effects of message modality on driving behaviour. - Shane Curran</p> <p>The impact of threat appeals on driver behaviour: A meta-analysis of experimental research 1990-2011 - Rachel Carey (C)</p>



	Blauwe zaal	Rode zaal	Room 16	Ronde zaal	Room 10	Room 9	Room 4
16:00 - 18:00						<p>Charging patterns in electric vehicle users: Evidence for interaction styles from field study data. - Thomas Franke</p> <p>Driver's behavioural adaptation in response to electric mobility - Elodie Labeye</p>	
18:00 - 19:00	Poster Session 1 (Fontein Patio)						

### Thursday, 30th of August 2012

9:00 - 10:00	Keynote (Blauwe zaal) <b>Psychological strategies for attitude and behaviour change in mobility management.</b> Satoshi Fujii						
10:00 - 10:30	Morning break and refreshments (Fontein Patio)						
	Blauwe zaal	Rode zaal	Room 16	Ronde zaal	Room 10	Room 9	Room 4
10:30 - 12:30	<p><b>Symposium: Effect of ADAS use on Information processing processes</b></p> <p>Introduction - Trent Victor (C)</p> <p>Behavioural adaptation to "Visual Distraction Alert Systems" - Claudia Wege</p> <p>Effect of Forward Collision Warning Systems on information processing: An electrophysiological study - Mercedes Bueno García</p> <p>The effect of preliminary information about ACC: a matched sample driving simulator study. - Matthias Beggiato</p>	<p><b>Sustainable Transport</b></p> <p>Carpooling: when you try it, you adopt it A point on psychological factors involved in the practice - Isabelle Richard</p> <p>Supporting the implementation of a university carpooling program through transport psychology research - Filyra Vlastou</p> <p>The Role of the Built Environment and Psychology on Bicycling and Walking Behavior: What Matters? What Comes First? - Jennifer Dill</p> <p>An extended trial of ecodrive training in a commercial fleet - Mark Symmons</p>	<p><b>Substance impaired driving</b></p> <p>Neurocognitive bases of sex differences in DWI behaviour - Thomas G. Brown (C)</p> <p>Do students plan their drinking behavior? - Emmanuel Kemel</p> <p>Will they really never ever drink and drive in the future? A preliminary result from interviews with disqualified drink drivers in Japan - Kazuko Okamura</p> <p>Medicinal drug use and driving: The effects of benzodiazepines and opioids on simulated driver performance. - Mike Lenné</p>	<p><b>Symposium: Quality improvement in road safety education</b></p> <p>Adherence to and efficacy of the Checkpoints program implemented in driver licensing agencies - Marie Claude Quimet</p> <p>Understanding parents' attitudes to and knowledge of their role in road safety education - Jennifer Oxley</p> <p>The role of parents in informal traffic education; Questionnaire study of parents' knowledge, needs and motivation - Jolieke Mesken</p> <p>Development of an educational checklist for road safety education - Jan Visser</p>	<p><b>Symposium: Factors influencing interactions between car drivers and two wheelers</b></p> <p>Bicyclists Visual Search Behavior - David Shinar</p> <p>Improving car drivers' detection of motorcyclists in a car DRL environment - Viola Cavallo</p> <p>An Investigation of Powered-Two-Wheelers' Acceptability towards Conspicuity Treatments and influencing factors - Lars Rößger</p> <p>Exploring cyclists' experiences of aggressive behaviour while sharing roads and paths - Roslyn Poulos</p>	<p><b>Symposium: Auditory Distraction</b></p> <p>The Disparate Signatures of Cognitive and Visual Distraction on Driving Performance - Joel Cooper</p> <p>"Sing, sing a song..." Is singing while driving more dangerous than listening to music? - Christina Rudin-Brown</p> <p>Strategies to deal with the auditory distraction induced by radio-listening while driving - Ayca Berfu Unal</p> <p>A Viable Alternative Music Background As Mediated Intervention For Increased Driver Safety - Warren Brodsky</p>	<p><b>Infrastructure and road safety</b></p> <p>Driving behaviour and experience of two types of road works - Jos Vrieling</p> <p>Differences in driving behaviour at a signalised intersection between the green and yellow phase. - C.W.A.E. (Kirsten) Duivenvoorden</p> <p>Effects of visual design in tunnels in a simulator study - Why were there gender differences? - Christopher Patten (C)</p> <p>Variable message signs design as a case for visuospatial cognition - Antonio Lucas-Alba</p>

	Blauwe zaal	Rode zaal	Room 16	Ronde zaal	Room 10	Room 9	Room 4
10:30 - 12:30	<p>Behavioural adaptation to an adaptive active collision avoidance system with respect to enhanced mental workload - Wilfried Hajek</p> <p>Effects of learning and aging in a dual-task driving environment - Vera Berthon-Donk</p>	<p>The effect of information provision under non-recurrent traffic congestion on driver route choice - Eftihia Nathanail</p> <p>The use of Smartphones in the collection of travel behavior data - Sven Vlassenroot (C)</p>	<p>Alcohol ignition interlocks in all new vehicles? Disagreement between general public and criminal justice professionals. - Igor Radun</p>	<p>Intervention Mapping: evidence-based intervention design as the standard approach in traffic safety education - Rob Ruiter</p>	<p>Does experience of one type of two-wheeler affect behaviours and attitudes to other types of two-wheelers? - Narelle Haworth</p>		<p>The effects of combinations of road features in Europe - results of ERASER - Maura Houtenbos</p>
12:30 - 13:30	Lunch (Fontein Patio) - An <b>IAAP Division 13 Business Meeting</b> will be held in the Ronde zaal from 12:45 to 13:15 (members and non-members welcome)						
	Blauwe zaal	Rode zaal	Room 16	Ronde zaal	Room 10	Room 9	Room 4
13:30 - 15:30	<p><b>Symposium: Behavioural Adaptation: Translating theory into action 2</b></p> <p>Updating Risk Allostasis Theory to better understand Behavioural Adaptation - Neale Kinnear</p> <p>Potential negative behavioural adaption by young novice drivers to in-vehicle technologies, training programs and licensing policies - Teresa Senserrick</p> <p>Is there a biological basis for road safety-related behavioural adaptation? - Christina Rudin-Brown</p> <p>Before the behaviour: considering behavioural adaptation as part of the design process - Oliver Carsten</p>	<p><b>Acceptance of new technology and policies</b></p> <p>Trusting and accepting automation technology in cars - Frank Verberne</p> <p>Determinants of hydrogen refueling facility acceptance: a model based on the technology acceptance framework - Nicole Huijts</p> <p>Acceptability determinants of advanced driver assistance systems - Jens Schade (C)</p> <p>Drivers' choice in speed support. Defining the acceptability of Intelligent Speed Assistance. - Sven Vlassenroot</p> <p>Consumer perceptions of innovative cars - Mariette Pol</p>	<p><b>Older Road Users 2</b></p> <p>Mandatory screening of older drivers and population-based road accident risk: a critical review - Heikki Summala (C)</p> <p>Older drivers' perceptual sensitivity to vehicle approach - Damian Poulter</p> <p>Self regulation of driving among older adults (65+): Relation with driving style, subjective health and capability and accident involvement - Irene Diamant</p> <p>Baby boomers' mobility patterns and preferences. What are the implications for future transport? - Anu Siren</p>	<p><b>Symposium: Driver attention and distraction: Eyes on the road</b></p> <p>Eyes wide shut: Distraction having the eyes on the road - Marieke Martens</p> <p>Seven Myths about Cognitive Distraction and Driving - Richard Young</p> <p>Enhanced Lane Keeping during Verbal Distraction: the Effect of Lead Car Presence - Natasha Merat</p> <p>How distracting and how dangerous are roadside billboards? - David Shinar</p> <p>Effects of billboards on drivers' hazard anticipation and vehicle management behaviors: Study on a driving simulator - Donald Fisher</p>	<p><b>Mode choice 1</b></p> <p>Investigating interrelations among personal psychological factors and their influence on mode choice: Empirical evidence from a medium income area in Concepcion, Chile - Alejandro Tudela</p> <p>Commuter's Travel Behavior: A Study of Behavioral Intention to Use Bus Rapid Transit in Jakarta Nurlyta Hafiyah</p> <p>Identification and modelling of travel behaviour determinants in order to find successful interventions - Marieke Martens (C)</p> <p>Psychology and voluntary travel behavior change: is research guiding practice? - Arlie Adkins</p>	<p><b>Symposium: Road safety attitudes and surveys</b></p> <p>Looking for patterns in self-reported attitudes and speeding behaviours using factor analysis of responses and cluster analysis of respondents - Stephen Stradling</p> <p>SARTRE4: Motivations and travelling styles of non motorized road users - Gerald Furian</p> <p>SARTRE4: Comparison of different road user groups - Gerald Furian</p> <p>Cross cultural adaptation of the Traffic Climate Scale - Tina Gehlert</p> <p>Traffic light compliance by civilians, soldiers and military officers - Tova Rosenbloom</p>	<p><b>Fatigue</b></p> <p>Fatigue: State awareness and self-regulation among car drivers - Ragnhild Davidse</p> <p>Unaware drowsiness deeply in the pupil - Shirakata Tetsuro</p> <p>Identification of relevant feedback characteristics for driver fatigue detection systems - Katja Karrer-Gauss</p> <p>When does an accident happen during a trip? - Tsuneo Matsuura</p> <p>A users' perspective on in-vehicle fatigue warning systems - Christina Platho (C)</p>



	Blauwe zaal	Rode zaal	Room 16	Ronde zaal	Room 10	Room 9	Room 4
13:30 - 15:30		Dealing with Parking Pricing: User Reactions towards differentiated Pricing Structures - Angela Francke	Experienced cognitive problems, self-rated changes in driving skills, driving-related discomfort and self-regulation of driving in old drivers - Annette Meng	Visual Clutter and Roadside Distractions: The challenge to good traffic engineering and human factors practice - Jerry Wachtel  Potentially distracting objects along freeways: A policy perspective - Paul Schepers	Considering personal factors into demand discrete choice models. A critical review on tools and measurements - Alejandro Tudela		
15:30 - 16:00	Afternoon break and refreshments (Fontein Patio)						
	Blauwe zaal	Rode zaal	Room 16	Ronde zaal	Room 10	Room 9	Room 4
16:00 - 18:00	<b>Symposium: Driver behaviour modelling 2</b>  Why the DBQ Should Return to its Roots - Markus Mattsson  The role of anticipation in the causation of accidents - Mark Vollrath  How the ITERATE driver model can improve micro simulation - Magnus Hjalmdahl  Does the Driver Behaviour Questionnaire measure the same latent constructs in different respondent groups? An Exploratory Structural Equation Modeling study - Markus Mattsson  Skin conductance and cognitive estimates while driving through narrow gaps: implications to driver behavior theories - Heikki Summala	<b>Electric Vehicles</b>  Drivers' acceptance of limiting vehicle dynamics of electric vehicles - Marcus Schmitz  Designing human centered charging technology for electric vehicles by integrating factors from psychological research in the development of future systems - Ulf Hahnel  Who adopts electric vehicles? The role of car attributes and identity - Geertje Schuitema (C)  Drivers' Adaptation to Electric Vehicles in the UK Ultra Low Carbon Vehicle Demonstrator Programme: Facilitators and Challenges. - Mark Burgess	<b>In car distraction</b>  A Field Study of Drivers' Handheld Mobile Phone Use: Prevalence and Predictors - Bryan Porter (C)  Can the Psychological Refractory Period paradigm be used to reduce distraction-related vehicle crashes? - Daryl Hibberd  Modelling the visual demand of in-vehicle user-interfaces: A consideration of different task characteristics - Gary Burnett  How do phoning, texting, operating a navigation system, and following route guidance while driving affect experienced drivers' performance? - Allert Knapper	<b>Symposium: Innovations in novice driver training and licensing: An international perspective</b>  Evaluating a pre-drivers' training scheme - Ian Glendon  Accompanied Driving From Age 17 in Germany: Interaction between the Novice Drivers And Their Accompanying Adults - Walter Funk & Bernhard Schrauth  Innovations in graduated driver licensing in the USA - Jean Shope  The experiences of novices in an enhanced graduated driver licensing program in Queensland, Australia - Bridie Scott-Parker	<b>Symposium: Social cognition and driver behaviour</b>  The Development of Young People's Perceptions of Driving - Andrew Tolmie  The Social Cognitive Determinants of Offending Drivers' Speeding Behaviour - James Thomson  Using an extended theory of planned behaviour to examine the potential within cognition change interventions to reduce the commission of driving violations - Mark Elliott  Did the introduction of the automated speed control system change speeding intention and motivation among young drivers? - Patricia Delhomme	<b>Symposium: Cyclists' behaviour</b>  Research methods for studying naturalistic bicycling: Practicalities and ethics - Ian Walker  Naturalistic cycling studies: understanding how cyclists and drivers interact on the roads - Marilyn Johnson  The effects of cyclists at rural intersections on driving behaviour: a driving simulator study - C.W.A.E. (Kirsten) Duivenvoorden  Bicyclists' behaviour in two-way bicycle lanes in one-way city streets - Torkel Bjørnskau  A survey of safety-relevant motives, attitudes and behaviors of German cyclists - Ariane von Below	<b>Road Safety Education 2</b>  Retuning the crash magnets: diversion from prosecution courses for skill and attitude deficit - Stephen Stradling  The effect of commentary driver training on hazard perception and performance in a driving simulator - Angela Young  Young military learner drivers: The benefit of e-training on driving test performance - Lisa Dorn (C)  A visual-scanning task for learning to drive: a driving simulator study - Peter van Leeuwen

	Blauwe zaal	Rode zaal	Room 16	Ronde zaal	Room 10	Room 9	Room 4
16:00 - 18:00	Towards an enhanced model of driving behaviour: sketching the road ahead - Oliver Carsten	Trajectory of adaptation in the BMW MINI E Trial: From prior motivations to habituated familiarity. - Margaret Harris	Exploring the mechanisms of mobile telephone distraction on driving: Self- versus other-oriented speech in a dual task - Ian Walker	The experience of parents and other supervisors in a graduated driver licensing program in Queensland, Australia - Barry Watson  Feedback interventions for parents and novices during and after accompanied driving - Tsippy Lotan	Evaluation of a mandatory risk-education program for learner drivers in Sweden - Sonja Forward	A case-control study of cyclists' crash risk - Anja Huemer	
18:00 - 19:00	Poster Session 2 (Fontein Patio)						
19:30 - 22:30	<b>Conference Dinner</b> (Akerk, Akerkhof 2, 9711 JB, Groningen)						

### Friday, 31st of August 2012

9:00 - 10:00	Keynote (Blauwe zaal) <b>Tracing Traffic Dynamics: With innovative traffic data to a better theory.</b> Serge Hoogendoorn						
10:00 - 10:30	Morning break and refreshments (Fontein Patio)						
	Blauwe zaal	Rode zaal	Room 16	Ronde zaal	Room 10	Room 9	Room 4
10:30 -12:30	<b>Symposium: Behavioural adaptation of drivers in response to ADAS use</b>  Introduction - Alexandra Fort  Which solutions for negative behavioural adaptations to Advanced Driver Assistance Systems? - Giulio Francesco Piccinini  How save do drivers who are familiar with using ADAS feel & how does it affect their behaviour? - Juliane Haupt	<b>Young and novice drivers</b>  Perceptual Learning of Hazards by Novice Drivers: Theory and Longitudinal Data - Jeff Caird  Exploring the role of dorsolateral prefrontal cortex in the processing of hazardous driving situations. - Peter Chapman (C)  Who intends to take post-test driver training? A segmentation of novice drivers in Great Britain - Shaun Helman	<b>Symposium: Identity and car use</b>  Green identity, green travel? The role of pro-environmental self-identity in predicting travel behaviour - Lorraine Whitmarsh  The relationship between values and self-identity in transport behaviour - Ellen Van der Werff  'When it comes to how I travel, who am I?' - Niamh Murtagh  My car is a reflection of me; does identification affect driver attitudes and behaviours? - Birgitta Gatersleben	<b>Symposium Cyclists - Mobility and Health</b>  Is cycling healthy? - Hans Nijland  Electrical assisted cycling: a new mode for meeting the physical activity guidelines? - Ingrid Hendriksen  The application of an extended theory of planned behaviour to understand cycling intentions: The UK iConnect study. - Tim Jones  Does improved objective safety indirectly affect bicycle use via improved subjective safety? - Paul Schepers	<b>Symposium: Needs of road users with special challenges: Requirements for a transport system for all</b>  Can different features in the pedestrian environment increase accessibility/ usability and safety/security for people with impaired vision when walking outdoors? - Mai Almén  Problems and barriers to urban infrastructure and public transportation for people with mobility impairments: higher education and technological innovation as basis for improvement - Daniel Bell	<b>Symposium: Law and Driver Behavior: a cross cultural view</b>  What Should Be Next for U.S. Traffic Laws and Enforcement? Moving Forward with One Future Research Agenda - Bryan Porter  Good, Bad, and Ugly - Türker Özkan  Traffic violations and enforcement in Germany - Tina Gehlert  Law and Behavior in Brazil: the challenge of putting David and Goliath in the same room! - Alessandra Bianchi	<b>Motorcyclists</b>  Powered two-wheeler riders' acceptability and acceptance of advanced rider assistive systems and on-bike information systems - Vanessa Beanland  A different perspective on the role of conspicuity in motorcycle crashes - Saskia de Graen (C)  When disobedience becomes habit: Effects of travel behaviours of motorcyclist on repetitive traffic violations in three Indonesian cities - Tri Basuki Joewono

	Blauwe zaal	Rode zaal	Room 16	Ronde zaal	Room 10	Room 9	Room 4
10:30 -12:30	<p>Behavioural adaptation of older drivers in response to Advanced Driver Assistance Systems (ADAS) - Mandy Dotzauer</p> <p>Behavioural adaptation of the unequipped driver to small time headways held by automated vehicles in the traffic - Magali Gouy</p>	<p>Laboratory Based Hazard Perception and Speed Choice Tests Help Identify Young Drivers at Risk - Nicola Starkey</p> <p>The importance of aggressiveness and attitudes towards traffic safety for risky driving of Lithuanian young drivers - Laura Seibokaite</p> <p>Effects of driving experience depending on cognitive tasks demands - Chloé Freydier</p>			<p>Drivers with hearing loss and the design of driver support systems ? a simulator study - Birgitta Thorslund</p> <p>How persons with cognitive functional impairments post stroke manage the use of buses in public transport - Ralf Risser</p> <p>A systems approach to address mobility limitations - walkability as a cornerstone. - Rob Methorst</p>		<p>Judging the approach speed of motorcycles and cars under different lighting conditions - Mark Gould</p> <p>Motorcyclists' intention to exceed the speed limit on roads limited to 90 km/h: mediating and moderating factors of the behavioural intention - Chloé Eyssartier</p>
12:30 - 13:30	Lunch (Fontein Patio)						
	Blauwe zaal	Rode zaal	Room 16	Ronde zaal	Room 10	Room 9	Room 4
13:30 - 15:30	<p><b>Symposium: Highly Automated Driving</b></p> <p>Driver assistance and cognitive processes: Are they always positively linked? - Elke Muhrer</p> <p>The effect of automation level on situation awareness: A Driving-simulator study of advanced driver assistance system - Martin Baumann</p> <p>Transitions between different levels of automation in a highly automated vehicle: Study results of the project HAVEit - Anna Schieben</p>	<p><b>Social Cognition</b></p> <p>The role of mindfulness in an extended TPB framework to understand drivers' speeding intentions in school zones. - Suhaila Abdul Hanan</p> <p>Representation of traffic and social perception of risk factors for drivers in accidents - Rosival Lagares</p> <p>The social dilemma of traffic flow improvement: using the example of Connected Cruise Control - Malte Risto</p>	<p><b>Cycling 2</b></p> <p>Policy advice to promote cycling to work in the Netherlands - Ingrid Hendriksen (C)</p> <p>Key events and their effects on cycling behaviour in - Dar-es-Salaam Alphonse Nkurunziza</p> <p>Fast Feelings - An experimental study of cycle helmets' effect on cycling pace and emotional reactions - Aslak Fyhri</p> <p>Exploring bicyclists' distraction and inattention in middle size Greek cities - Nikolaos Eliou</p>	<p><b>Symposium: Driver experience, awareness and (change) detection</b></p> <p>Change detection and driving performance on familiar roads - Samuel Charlton</p> <p>Drivers' ability to detect changes in timing at signalized intersections - Jaap Vreeswijk</p> <p>Change detection in variable speed limits: failed to look or looked but failed to see? - Ilse Harms</p> <p>Predicting change: a more robust measure of hazard perception? - David Crundall</p>	<p><b>Road safety in developing nations</b></p> <p>Cross-cultural comparison of attitudes towards traffic law and traffic officials - South Africa and Sweden as case studies - Marion Sinclair (C)</p> <p>Psychometric Parameters: Drinking and Driving Behavior and Perception of Risk Scale: Brazilian Population - Marina Cuffa</p> <p>Traffic Psychology in Brazil: From the road safety to sustainable mobility - Fábio Henrique Vieira de Cristo e Silva</p>	<p><b>Symposium: Fitness to drive in (older) drivers with brain disorders</b></p> <p>Fitness to drive: skill or ability? - Wiebo Brouwer</p> <p>Can neuropsychological testing predict crash involvement for older drivers? - Catarina Lundberg</p> <p>Predictors of fitness to drive in people with Parkinson disease: a confirmation study - Hannes De Vos</p> <p>Lateral deviations on a driving simulation task in stroke patients with and without neglect - M.E. Van Kessel</p>	<p><b>Symposium: Sanctions and Incentives</b></p> <p>The unwanted effect of making rules salient - Kees Keizer</p> <p>Where's the fun in driving? Hedonic and normative determinants of sustainable driving behavior - Jan Willem Bolderdijk</p> <p>Making small numbers count: environmental and financial feedback to promote eco-driving - Ebru Dogan</p>



	Blauwe zaal	Rode zaal	Room 16	Ronde zaal	Room 10	Room 9	Room 4
13:30 - 15:30	<p>Mitigation strategy for driver out-of-the-loop due to highly automated driving - Frank Lai</p> <p>Who Guides Who in Haptic Guidance? - Erwin R. Boer</p>	<p>How to foster a low-noise and environmentally friendly driving style - Maja Fischer</p> <p>Introducing “social forgivingness”: how the traffic setting influences the extent to which car drivers are inclined to compensate for potentially unsafe acts of other road users at intersections. - Maura Houtenbos (C)</p>	<p>A Study about Factors of Side Crash between Bicycle from Sidewalk with Vehicle - Mio Suzuki</p>	<p>Drivers' ability to respond to traffic conflicts using Adaptive Cruise Control - Linda Boyle</p>	<p>The relationship Between Driver's Background and Traffic Accident (Case Study in Yogyakarta, Indonesia) - Ahmad Munawar</p> <p>Driver observations contrasted with self-reported driving behaviours: a case study from Pakistan - Oliver Carsten</p> <p>Cross-cultural hazard perception: Comparing the UK and Malaysia - Phui Cheng Lim</p>	<p>Neuropsychological evaluation of fitness to drive in Huntington disease - Hannes De Vos</p> <p>Lateral position control in nystagmus patients: A driving simulator study of initial performance and effects of training - Esther Metting</p>	
15:30 - 16:00	Afternoon break and refreshments (Fontein Patio)						
	Blauwe zaal	Rode zaal	Room 16	Ronde zaal	Room 10	Room 9	Room 4
16:00 - 18:00	<p><b>Symposium: Measuring Hazard Perception</b></p> <p>Discussant - David Shinar</p> <p>What might hazard perception contribute to road safety? - Frank P. McKenna</p> <p>Drivers' hazard perception ability: new evidence for the validity of tests and training. - Mark Horswill</p> <p>Comparing measures of Hazard Perception and Hazard Reactions - Ruth Madigan</p> <p>The advantage and use of Survival Analysis in analyzing response times in driving related hazard perception paradigms - Yisrael Parmet</p>	<p><b>Assistance and warning systems</b></p> <p>The multi-driver simulation as a tool for the evaluation of traffic efficiency-orientated driver-assistance systems - Dominik Mühlbacher</p> <p>Associating brainwaves and lateral driving control in a simulator; developing criteria for an brain-based adaptive cruise control. - Chris Dijksterhuis (C)</p> <p>Likelihood alarms in highly automated vehicles: Strategies to prepare the driver for erratic automation behaviour - Matthias Heesen</p>	<p><b>Symposium: The role of feedback technology in reducing novice driving risk</b></p> <p>Experimental evaluation of event-based feedback on novice teenagers' driving - C. Raymond Bingham</p> <p>The impact of video-based feedback among learner drivers on post-license solo driving behaviour. A small scale ND pilot study - Michael Gatscha</p> <p>How to increase young drivers' acceptance to install in-vehicle monitoring systems and use it effectively - Tsippy Lotan</p>	<p><b>Symposium: History of road safety research</b></p> <p>A quantitative approach to study the history of road safety research - Marjan P. Hagenzieker</p> <p>From Gibson and Crooks to Damasio: The role of psychology in the development of driver behaviour - Truls Vaa</p> <p>The combat against drug effects on traffic safety - Karel Brookhuis</p> <p>The history of road safety policy and knowledge in an institutional context - Charlotte Bax</p>	<p><b>Emotion and driving</b></p> <p>Drivers' emotional responses to an emergency braking event within a medium-fidelity simulator - Richard Donkor (C)</p> <p>The role of positive and negative affect in influencing drivers' feelings of risk and visual search in hazardous situations. - Peter Chapman</p> <p>Anger and visual attention while driving - Amanda Stephens</p> <p>Effects of movement artefacts on validity of skin conductance measures - Jami Pekkanen</p>	<p><b>Symposium: Traffic Psychology in Latin-America countries: ways to a traffic safety culture</b></p> <p>On psychological issues in traffic engineering. A review of the state of the practice in the Chilean context - Alejandro Tudela</p> <p>Social Perception of Car Verification and No-car-day Programs in Mexico City - Javier Urbina-Soria</p> <p>Traffic Psychology Research in Argentina - Fernando Poo</p>	<p><b>Mode choice 2</b></p> <p>Theory of planned behaviour and travel mode choice: Role of attitude, subjective and descriptive norm, perceived control, and self efficacy - Inge Brechan (C)</p> <p>Who are those multi-modal commuters? - Eva Heinen</p> <p>Investigation of behavioral stage for change as a stratification parameter for mode choice interpretation - Ioannis Politis</p>

	Blauwe zaal	Rode zaal	Room 16	Ronde zaal	Room 10	Room 9	Room 4
16:00 - 18:00	<p>A robust theory of hazard anticipation and driving safety: Effects of Experience, Age, Cognitive Load, and Eccentricity - Donald Fisher</p> <p>Assessing the role of the precursor in hazardous events in a driving simulator - David Grundall</p>	<p>An auditory-visual display for supporting drivers on unsignalised intersections - Joost De Winter</p> <p>What is more effective in critical intersection situations? – A comparison of different warning strategies - Mark Vollrath</p> <p>Acceptance of a new driver assistance system for merging into motorway traffic - Anke Schwarze</p>	<p>Strengths and limitations of technology-based feedback to reduce young driver risk - Robert Foss</p>	<p>Road safety and road safety research in the past and future challenges - Alfred Shalom Hakkert</p>		<p>Environmental psychology on the Move: Aims and Creation of the Mobility Psychology Research Group at the University of Brasília - Hartmut Günther</p> <p>Traffic Psychology in south Brazil: the Sustainable Traffic and Transportation Research Group. - Alessandra Bianchi</p>	<p>A mixed-methods approach exploring active and non-active travel modes: Enjoyment, Environmental Attitudes and Habit - Gregory Thomas</p>
18:00 - 19:00	Closing Ceremony (Blauwe zaal)						



# IC 2012 TTP poster programme

Wednesday, 29th of August 2012

<p>18:00-19:00</p>	<p><b>[1a]</b> Background Music As A Risk Factor For Distraction Among Young Drivers: And IVDR Study - Brodsky, W.</p> <p><b>[2a]</b> Driving stereotype change: A tipping point in the public perceptions of electric vehicles? - Burgess, M.</p> <p><b>[3a]</b> Altering speed perception through the spatial adaptation of music within a vehicle - Burnett, G.</p> <p><b>[4a]</b> The Difference in the Hazard Perception Ability Between Accident-Involved and Accident-Free Motorcycle Riders - Cheng, S.K.</p> <p><b>[5a]</b> The contribution of safe driving training in educating drivers to risk perception - Ciceri, R.</p> <p><b>[6a]</b> Testing of Rehabilitation Program for Traffic Violators in Saudi Arabia - Dabil, S.</p> <p><b>[7a]</b> The relation of attitudes and time perception to the practicing of eco-driving among French car drivers - Dogan, E.</p> <p><b>[8a]</b> Effects of Planned Behaviour, Identity and Social Identity on Motorcyclists' Intentions to Speed - Elliott, M.</p> <p><b>[9a]</b> Bicycle and university: possible solutions to increase urban mobility among undergraduate students in Curitiba - Brazil - Franco, C.</p> <p><b>[10a]</b> The influence of safety driving public service commercials on drivers' behavior according to their sensation seeking level - Frolova, D.</p>	<p><b>[11a]</b> Relation between road aggression and locus of control - Grunt-Mejer, J.</p> <p><b>[12a]</b> New Dutch education intervention program alcohol and traffic - Hegeman, G.</p> <p><b>[13a]</b> The DUI offenders profile: the role of personality and antisocial attitudes - Jornet-Gibert, M.</p> <p><b>[14a]</b> Response of part-time belt users to enhanced seat belt reminder systems of different duty cycles and duration - Kidd, D.</p> <p><b>[15a]</b> The possibility of reducing cyclists' unrealistic optimism by changing the stereotypical image of victims in bicycle-related accident - Kinosada, Y.</p> <p><b>[16a]</b> TASEVAL: An example of interventional program for traffic penal violators - Ljarcio, J.I.</p> <p><b>[17a]</b> Travel to work. Effects on choice of mode of transport of information on advantages and disadvantages of the car or subway - Lois García, D.</p> <p><b>[18a]</b> Development and Validation of Aggressive Driving Scale - Malomo, B.</p> <p><b>[19a]</b> Reeducation for Spanish recidivist driver offenders. Study about their attitudes towards traffic safety - Marti-Belda, A.</p> <p><b>[20a]</b> Rest and Accident of Taxi Drivers - Nakamura, A.</p>	<p><b>[21a]</b> A Comparative Experiment on health benefit of Bicycle path conditions using indirect Energy Consumption Estimation Method - Notake, S.</p> <p><b>[22a]</b> A Cross-Cultural Study on Driving Anger with Chinese and Japanese Drivers - Oehl, M.</p> <p><b>[23a]</b> Temporal stability of self-reported driving behaviors - Poo, F.</p> <p><b>[24a]</b> Risk perception and traffic mobility of spinal cord injured people - Puchades, R.</p> <p><b>[25a]</b> The relationship between driving behaviours and cognitive functions among elderly drivers - Renge, N.</p> <p><b>[26a]</b> Driver education using a tablet device and movies of accidents recorded by drive recorders - Shimazaki, K.</p> <p><b>[27a]</b> Is it possible to predict traffic infractions from psychological test results? - Silva, F.H.V.C.</p> <p><b>[28a]</b> Will attitudes towards safety improve after the introduction of a new driver licence training for young mopedists? - Stave, C.</p> <p><b>[29a]</b> So, you think your road is really safe? Effects of different segregated lane types on motorcyclist causality risk in Malaysia - Tarigan, A.</p> <p><b>[30a]</b> Time management as a way to change the behavior of drivers, the perpetrators of accidents - Tarnowski, A.</p>	<p><b>[31a]</b> Experimental analysis of drivers' attitudes toward in-vehicle warning system at stop controlled intersections - Tetsuo, M.</p> <p><b>[32a]</b> On the role of personality when assessing the role of transport upon social exclusion - Tudela, A.</p> <p><b>[33a]</b> Linking the visual search skills of safe driving to executive functions among young novice drivers - Wang, W.</p> <p><b>[34a]</b> Culture as a new paradigm in traffic safety - Ward, N.</p>
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18:00-19:00

**[40b]** Acute effects of analgesics on driving performance in a highway surrounding depending on age - Berthelon, C.

**[41b]** Charging up and charging out? Drivers' experiences of electric vehicles - Burgess, M.

**[42b]** The relationship between driver's behavior and parenting styles - Cardoso, L.

**[43b]** Initial Development of Psychological Road Audits: Combining Human Factors, Safe Design and Traffic Psychology - Castro, C.

**[44b]** Impact of framed messages on drivers' speed - Chaurand, N.

**[45b]** New drivers and expertise: a study to investigate the relationship between attention and the perception of hazard during the driving experience - Confalonieri, F.

**[46b]** Implicit vs. Explicit: Safety and perceptual motor skills in driving - Dogruyol, B.

**[47b]** Analysis of causal effects within the theory of planned behaviour as applied to driving - Elliott, M.A.

**[48b]** Evaluation of the impact on driver behaviour of a new warning signage for automatic speed cameras: how drivers respond - Eyssartier, C.

**[49b]** Exploratory approach to teenage moped and light motorcycle driving : between risk-taking and safety - Gaymard, S.

**[50b]** Functional Aspects for a reliable perception of frontal light pattern at Motorcycles - Hagen, K.

**[51b]** Towards a Stochastic Model of Driving Behavior in case of Exceptional Events: A Bayesian Network Modeling Approach - Hoogendoorn, R.

**[52b]** The Effect of Navigation Voice on Trust and Attention during Route-Finding within a Driving Simulator - Large, D.

**[53b]** Task-Driven System Exploration Enhances Subsequent Instruction Effects: Testing the Applied simTD Vehicle-to-x Human Machine Interface - Mahr, A.

**[54b]** Preventing globe of death effect : validating attention scale for motorcyclist - Maoski, F.

**[55b]** Effect of tendency to take risks in daily life on future accident involvement - Moriizumi, S.

**[56b]** Reducing road traffic noise – how to design effective interventions - Moser, S.

**[57b]** A long-term evaluation study on the "Temporary Stop To See"(TSTS) campaign-Effectiveness of the campaign found twenty two years after the first campaign in 1989 - Nagatsuka, Y.

**[58b]** A comparison between self-assessed and instructor-assessed driving skills of Japanese licensed drivers - Nakai, H.

**[59b]** A measure of drivers' justifications for traffic violations - Neto, I.

**[60b]** An Experimental Study on the Relationship between Visual Information and Behavior for Bicycle Facility Design - Okawa, T.

**[61b]** Comparing drivers' performance in simulated hazardous situations with the functioning of the three attentional networks - Roca, J.

**[62b]** The relation between executive functioning and risky driving in young novice drivers - Ross, V.

**[63b]** Comfort and Intervention Behavior of Drivers in Highly Automated Vehicles with Headway Control - Siebert, F.W.

**[64b]** Minimising consumers' psychological distance when assessing potential mass-market uptake of electric vehicles - Skippon, S.

**[65b]** Traffic control of freight vehicles in Germany: from manual to automatic direction out of the highway - Skottke, E-M.

**[66b]** Findings and recommendations from the Scottish Young Driver Debate - Stradling, S.

**[67b]** Methodological guidelines and diagnostics methods for assessment of drivers' psychological eligibility in Czech Republic - Sucha, M.

**[68b]** Are Malaysian's Angry Drivers? - Sullman, M.

**[69b]** Efficacy of motorcycle licensing test to discriminate between new and experienced riders - Symmons, M.

**[70b]** The Influence of Criticality and Predictability of Surrounding Traffic Lane Change Manoeuvre on Driver's Mental Workload - Teh, E.

**[71b]** Drinking & Driving: Perception of Indian truck drivers - Vinayak, S.

**[72b]** An Objective Evaluation of an Education-Based Distracted and Drowsy Driving Intervention for Rural Teen Drivers - Ward, N.

**[73b]** Assessing the quality of service in public transport - Tsami, M.

## Symposium - Behavioural Adaptation: Translating theory into action 1

Wednesday 29th of August, Blauwe zaal, 10:30-12:30

### Contemporary Models of Behavioural Adaptation

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Traffic Psychology, much like Psychology as a whole, is without a central guiding theory or model, and as a result much of Traffic Psychology is atheoretical in nature. This creates a fragmented picture of driver behaviour and contributes to the difficulties in understanding and accounting for the behavioural adaptation of drivers to road safety initiatives.

In the last decade or so many new models to explain driver behaviour have been published, and a selection of these will be addressed. The differences between these models in terms of behavioural adaptation will be covered. However the main focus will be on the similarities and agreement amongst these models, such as the increasingly functional view of the role of emotion and feelings in driver behaviour and behavioural adaptation.

### Experimental considerations when designing theoretically-based behavioral adaptation studies

Manser, M.<sup>1</sup>, Creaser, J., & Boyle, L.

HumanFIRST Program, University of Minnesota, United States<sup>1</sup>

There has been an increased focus on the theoretical foundations and practical implications of behavioral adaptation relative to vehicle and infrastructure-based systems. Studies examining behavioral adaptation have employed a variety of methodology and measurement techniques, however, there has been no formal work discussing the variations and utility of these techniques. The current work will identify and discuss prominent methodological and measurement issues within behavioral adaptation studies. Relative to measurement techniques it is important to consider specific behavior types, in terms of discrete, serial, and continuous motor skills, that may be indicative of behavioral adaptation. In addition, measures should be sensitive to the frequency with which behaviors may change, the timeframe over which behavioral adaptation may occur, and the potential for behavioral adaptation due to discontinuation of system use. Methodological issues to be addressed include the use of control groups to isolate the presence of behavioral adaptation, the period of time over which a study is conducted, testing environments, and the identification of confounds that may influence measure variables under investigation. Collectively, addressing methodology and measurement issues is important so that so that valid study measures can be selected and so that internal validity and generalizability can be maximized.

### Behavioural adaptation and roadway ITS: the forgotten chapter

Martens, M.<sup>1</sup>

TNO, the Netherlands<sup>1</sup>

Although quite some attention is paid to behavioural adaptation issues for driver support systems, BA to roadway ITS is less well documented. Roadway ITS is introduced for its beneficial effects on throughput, safety and emissions. However, negative effects are often neglected. This paper

illustrates revealed and theoretical examples of ITS effects that were not designed for. For example: Even though dynamic speed limits are designed to provide throughput benefits during periods of high flow, the presence of the signs and speed enforcement cameras reduce the average speeds also beyond peak hours, increasing general travel times, so even if speed limits are not displayed. Also, dynamic adaptation of speed limits has unexpectedly shown to decrease capacity on some sections and to increase the percentage of rat running traffic to avoid the road section. A more dramatic illustration of BA is shown in case of weather warnings. An automatic fog detection warning system even had an adverse impact in the case of heavy fog with extremely low visibility distances. The activated system resulted in an increase in speed compared to the situation without the fog warning system. Different applications and BA effects are discussed.

### Behavioural adaptation to roadway countermeasures

van der Horst, R.<sup>1</sup>

TNO, the Netherlands<sup>1</sup>

Most roadway countermeasures taken intent to adapt drivers' behaviour in a safe and efficient manner. Usually, increasing traffic safety and improving traffic efficiency should go together for interventions in the roadway infrastructure. The driving task becomes more and more complex, traffic management scheme vary over the day and night and also the drivers' population will change the coming years with an increasing share of older road users. This paper will mainly focus on roadway countermeasures but now and then in combination with traffic management measures.

Examples of measures that illustrate behavioural adaptation effects include the Probability of stopping as a function of type of traffic signal control (fixed-time versus vehicle-actuated), the removal of reflector posts along rural roads in Finland, open asphalt road surfacing of motorways, the removal of centre-line markings on access roads according to the Sustainable Safety concept, the application of raised pavement markings and profiled edge markings on motorways, switching off public lighting on motorways, and the effectiveness of the A16 fog-signalling system.

From the examples given it can be concluded that road designers and traffic engineers should take behavioural adaptation effects (both positive and negative) into account when evaluating the effectiveness of their traffic safety measures.

### The role of acceptance in behavioural adaptation

Jamson, S.<sup>1</sup>

University of Leeds, United Kingdom<sup>1</sup>

There are numerous models of acceptability, which have been used to attempt to explain or predict the likelihood that a user will find a system attractive enough to use or buy and hence how might their behaviours adapt as a result. Neilsen's (1993) framework of acceptability is rooted in usability engineering and fundamentally asks "can an individual use the system?". It focusses on issues such as ease of use and reliability. In contrast, Rogers (1995) model of patterns of adoption poses the question "who will use the system?". Researchers have sought to integrate these and other models (e. g. Adell, 2009) and it is noteworthy that several key constructs overlap (perceived usefulness and usability feature regularly) and that several models include an intervening variable which reflects an

individual's intention to use a system or product. Other variables may include risk-taking, sensation seeking, complacency, locus of control, amongst others. Thus acceptance could be framed as how much a system is liked, how much it would be used, or how likely it is that someone would buy it. Why should we be trying to predict or measure acceptance when we think about behavioural adaptation? One good example is for the purposes of undertaking impact analyses that require information on take up and use. For example in the UK ISA project – we modelled a linear increase in ISA impact (accident reduction) with increasing penetration. But these penetration rates are hypothetical and depend, of course, on take up and use (use- for a voluntary system). The results of field studies can be used; however this depends on the system under consideration. The UK voluntary ISA project was able to do this to some extent (Jamson,2006) but it can be more difficult for other systems such as FCW as it may be activated infrequently.

This presentation will discuss the key issues in the field of acceptance and how it relates to behavioural adaptation and attempt to bring together relevant literature in the area.

### Personality and behaviour

Wednesday 29th of August, 10:30 - 12:30 - Rode zaal

#### The role of acceptance in behavioural adaptation

Jamson, S.<sup>1</sup>

University of Leeds, United Kingdom<sup>1</sup>

The present study aims to compare differences in reported risky driving behaviors of drivers – males and females – having and not having Attention Deficit Hyperactivity Disorder (ADHD), by using a checklist of driving behaviors based on the Driving Behavior Questionnaire (DBQ). Unlike the studies which employ the DBQ by asking the subjects to fill the questionnaire once, in this present study, the participants were asked to report their behaviors on a daily basis for 30 consequent days. The checklist included two factors of risky driving behavior: Violation and Faults. Thirty-eight drivers – 10 males and 9 females with ADHD, and 9 males and 10 females without ADHD (N-ADHD) as control groups – participated in the study. The results showed that the mean of the unsafe behaviors of ADHD was higher, i.e., less safe driving, compared to that of N-ADHD. However, a statistically significant effect was found only between male ADHD and male N-ADHD for the Faults. In order to check the effect of the length of the study, the 30 days duration of the research was divided into three consecutive periods. The reported driving habits of the female ADHD showed safer behaviors than those of the males. Unlike the findings of N-ADHD of both genders, which showed a tendency towards safer driving reports in the three periods, both genders of the ADHD showed higher rates of Faults, i.e., a decrease in safety driving reports, in the three periods. The findings suggest that ADHD drivers differ from the N-ADHD drivers in making driving mistakes, i.e., Faults, due to their lack of sustained attention, but not in making Violations. However, some of the results in the present study were not very strong. Possible explanations for this as well as methodological considerations are discussed, and further research is suggested.

#### Effects of age and gender identity on driving behaviors

Gueho, L.<sup>1</sup> & Granie, M-A.

IFSTTAR - MA, France<sup>1</sup>

Globally, men, and particularly young men, are involved in more crashes than women. Understanding and explaining this “gender specificity” in risky behaviors become a major public-

health issue. Current studies highlighted the causal relation between masculinity and risky behavior.

The present study aims to validate a new version of the Driver Behaviour Questionnaire among a French population and to observe the effect of the different driving behaviors on age and gender identity.

612 drivers (320 women and 205 men) aged 18-79 completed 2 measures : the driving behaviors (41 items) and gender role conformity (27 items). A PCA identified 6 factors which explained 39.9% of the total variance: inattention errors, ordinary violations, positive driver behaviors, aggressive violations, mistakes and inexperience errors.

Results show that men report more aggressive violations and less inexperience errors than women. Moreover, we observe that masculinity reinforces ordinary violations and aggressive violations and inhibits inattention and inexperience errors. Femininity reinforces positive driver behavior and inhibits inattention errors, ordinary violations, mistakes and errors inexperience. Finally, it shows an effect of age on ordinary violations, positive driver behaviors and inexperience errors.

The relationship between masculinity, age and risky behaviors will be discussed and particularly the effect of social roles and gender stereotypes, leading to the enhancement of risk taking among men.

#### Drivers' biased perception of other drivers' aberrant behaviours

Wallén Warner, H.<sup>1</sup> & Aberg, L.

IDalarna University, Sweden<sup>1</sup>

The first aim of the present study was to examine the presence of biased perception of other drivers' aberrant behaviours measured by the driver behaviour questionnaire (DBQ) in Sweden and Turkey, respectively. The second and third aims were to examine the presence of gender and age differences in this biased perception. A sample of 228 Swedish and 302 Turkish drivers completed a questionnaire including questions based on the driver behaviour questionnaire. The results showed that in both Sweden and Turkey the participants reported committing both aggressive and ordinary violations as well as errors and lapses less frequently than other drivers. In both countries, women compared to men report that there were larger differences between themselves and other drivers in how often they commit aggressive- and ordinary violations. These differences were due to the fact that women reported committing aggressive and ordinary violations less often than men as well as perceived that other driver committed these violations more often than what men did. In Sweden, older compared to younger drivers reported that there were larger differences between themselves and other drivers in how often they committed aggressive violations. In Turkey older compared to younger drivers reported that there were larger differences between themselves and other drivers in how often they committed errors. These differences were due to the fact that older drivers reported committing aggressive violations/errors less often than younger drivers. These results will be further discussed.

#### Locus of Control and driver behaviour in a Brazilian sample

Olandoski, G.<sup>1</sup> & Bianchi, A.S.

Universidade Federal do Paraná, Brazil<sup>1</sup>

In recent decades, rates of Brazilian traffic accidents appear as a public health problem. The group with the highest percentage of accidents is the young drivers. In Brazil, the psychological evaluation is still required in the process for obtaining a license to drive. The objective of this research was to provide a reliable survey for professionals who work with traffic elucidating aspects of the personality of young drivers and thus can guide psychological and educational practices most



appropriate for them, and providing statistical correlations between locus of control and errors, lapses and violations behaviors as predictors of accidents. The questionnaires used for this purpose were Brazilians' adaptation of the scale Locus of Control for traffic (Laujunen & Özkan, 2005), with 17 questions, and DBQ (Lawton et al., 1997) containing 28 questions. The subjects were 456 college students (57% men) from public and private institutions of the city of Curitiba and metropolitan region. The age ranged from 19 to 60 years ( $M = 24.17$ ). The results showed a higher incidence of drivers with average external locus of control ( $M = 4.03$ ) and internal Locus of Control explained the ordinary violations.

#### **Driving styles among Norwegian drivers: Prevalence of violations, errors and lapses**

Torquato, R.<sup>1</sup> & Sagberg, F.

Institute of Transport Economics, Norway<sup>1</sup>

The Driver Behaviour Questionnaire (DBQ) aims to measure different classes of drivers' aberrant behaviour. Although the DBQ has been used worldwide to our knowledge, this is the first study conducted in Norway with the 28-item DBQ. 1225 drivers answered the questionnaire and results showed that males reported committing aggressive and ordinary violations more often than females, while females reported more lapses than males. Drivers aged 18 to 37 years reported committing both ordinary and aggressive violations more frequently than the other age groups. All aberrant behaviours were positively and significantly intercorrelated, the strongest relationship being found between errors and lapses. The risky behaviours most frequently reported in this study are discussed in relation to specific countermeasures pointed out in the research literature. Studies focusing on driving behaviour are important to understand more about different driving styles, so that efforts to diminish the incidence of errors and violations and thus contribute to a safer road traffic could be developed.

#### **The on-road behaviour of school students in Belgium**

Sullman, M.<sup>1</sup>, Stephens, A.N., & Harrod, K.

Canfield University, United Kingdom<sup>1</sup>

The present study aimed to investigate both the on road behaviour of Belgian school students and the validity of the Adolescent Road User Behaviour Questionnaire (ARBQ) in a sample of students attending school in Belgium. In total, 294 adolescents completed the ARBQ along with measures of their self-reported accident involvement and sensation seeking behaviour. Confirmatory Factor Analysis supported the original factor structure of: "Unsafe road crossing", "Playing on the road" and "Planned protective behaviour" for the 21-item version of the questionnaire, but not for the full scale. Males were found to engage more often in unsafe crossing behaviour and playing on the roads. There were also age differences, with unsafe road crossing increasing with age and engagement in planned protective behaviours improving with age. Those who reported being involved in an accident also reported more frequent engagement in unsafe crossing, playing on the roads, thrill seeking behaviour and lower levels of behaviour inhibition. Therefore, this study confirms that the ARBQ is a useful tool for investigating safety-related behaviours that contribute to accident involvement.

#### **Older road users 1**

Wednesday 29th of August, 10:30 - 12:30 - Room 16

#### **Don't wait until it's too late: Evaluation of a refresher course for older drivers**

Ulleberg, P.<sup>1</sup>, Bjørnskau, T., & Fostervold, K.I.

Department of Psychology, University of Oslo, Norway<sup>1</sup>

The effect of a refresher course for older drivers was estimated on the basis of a sample of 2100 accident-involved drivers aged 70 years or more. Using the method of induced exposure, drivers who had taken the refresher course before turning 75 years of age were found to have 35 % lower accident risk compared to older drivers without the course (adjusted for confounding variables such as age, gender, exposure, compensatory driving skills, violations and errors). On the other hand, drivers who had taken the refresher course when they were 75 years of age or older, had the same risk as drivers without the refresher course. The refresher course thus seems to have a beneficial effect upon safe mobility, given that the driver completes the course before turning 75 years of age. One possible explanation of this age-dependent effect of the refresher course is that the ability to learn new skills declines rapidly with ageing.

#### **Does driving license have any positive effect on elderly bicyclists' behaviour?**

Renge, K.<sup>1</sup> & Tada, M.

Tezukayama University, Japan<sup>1</sup>

Accident analysis showed that elderly bicyclists in Japan without driving license were involved in many more traffic accidents than those with driving license. The present study is aimed at showing what kinds of positive effects of having a driving license were demonstrated by elderly bicyclists' behavior on roads. Forty-eight elderly bicyclists (21 with and 27 without driving license) drove on certain test courses of driving school, which included several intersections with and without traffic signals. Their searching head movements and driving speed were measured by using three-axis wearable gyro sensors with GPS module. A participant wore a cap with one gyro sensor so that his/her searching head movements and speed could be analyzed while they were riding a bicycle. The results showed that elderly bicyclists without driving license showed poorer performance of searching head movements at intersections than those with driving license. The former drove at higher speed at intersections than the latter. The results demonstrated that elderly bicyclists without driving license showed more riskier behavior than those with driving license. It is strongly recommended that training or social intervention for elderly bicyclists is developed in the near future in order to improve their risk-avoiding skills as bicyclists.

#### **On-road visual search and executive functions in elderly drivers**

Lehtonen, E.<sup>1</sup>, Dahlström, I., Hiltunen, H., & Summala, H.

Traffic Research Unit, University of Helsinki, Finland<sup>1</sup>

Anticipatory visual search is important for safe driving. Previous research has indicated that anticipatory visual search is interfered by executive load, for example in multitasking situations. Also, both visual search and multitasking tend to impair with aging. We studied effects of both cognitive load (self-paced serial addition test) and manual vs. automatic transmission on the visual search field among elderly drivers in city driving. Additionally, the multitasking performance was assessed using a computerized version of Trail Making test (the B/A score). 18 elderly driver (62-74 years), with lifetime experience of driving but none of the automatic transmission, drove a test route in urban traffic four times during two days. On both days, drivers drove once with manual and once with automatic transmission car.

During drives, their eye movements were recorded. Each time, part of the route was repeated with and without a cognitively loading secondary task. Both cognitive load and slow multitasking score predicted significant narrowing of visual search field. There was no effect between the transmission types. Even though manual transmission is a classical example of driver multitasking, automatic transmission did not prove as less demanding during two days of practice.

#### **Meta-cognitive skill training for elderly drivers using “mirroring” method**

Ota, H.<sup>1</sup>  
Tohoku Institute of Technology, Japan<sup>1</sup>

Meta-cognitive skill is important for safe driving. Drivers, however, tend to have over-estimation on their driving performance compared with their reality. The elderly drivers especially have the over-estimation, which may lead them to risky behavior. The new education method has been developed for the purpose of making older drivers aware of their reality. In the education program, participants were firstly asked to evaluate their safety using five-scale, and then observed the other drivers' behavior in a T type intersection which was previously videotaped. The participants who showed over-estimation on their driving performance at the beginning changed their self evaluation to lower after the observation of other drivers. The participants' driving performance was evaluated before- and after-education for checking the education effects.

#### **Accident risk, behaviour and habits of older cyclists**

Hagemeister, C.<sup>1</sup> & Tegen-Klebingat, A.  
Department of Psychology, Dresden University of Technology, Germany<sup>1</sup>

We interviewed 206 cyclists from 60 to 90 years of age in Saxony (Germany) in a large town, small towns and rural areas. They were asked if they had had an accident after their 59th birthday and described this accident. In 66% of the accidents, no other road user was involved. Cyclists who lived in the large town were more likely to have had an accident, cyclists who violated more traffic rules (ran red lights, cycled on the footpath). No effect was found for age, gender, distance cycled. Difficulties getting on or off the bike made an accident more likely. The compensation of several ailments was important: The probability for an accident is higher for cyclists who cycled on days when they felt less well, cyclists who did not postpone an appointment if they could not cycle or did not want to, cyclists with impaired vision who did not restrict cycling to known routes, a tendency for more accidents was found for cyclists with a hearing aid who did not use it in traffic. This points at the fact that for older cyclists risk perception and adequate compensation is more important than their physical state per se.

### **Symposium - Acceptability of transport policies** Wednesday 29th of August, 10:30 - 12:30 - Ronde zaal

#### **An experimental study on policy makers' communication about a congestion charge, individual value preferences, perceptions of arguments and acceptability**

Jakobsson Bergstad, C.<sup>1</sup>, Reimers, M., Nilsson, A., & Martinsson, J.  
Department of Psychology, University of Gothenburg, Sweden<sup>1</sup>

An important part of the implementation of controversial policy measures such as congestion charging is the communication between policy makers and the public. This is a web-based experimental study aiming at studying acceptability of a suggested congestion charge and different

types of arguments. The arguments were either framed as environmental, stressing gains such as sustainability both locally and globally, or economic arguments stressing gains such as reduced travel times, improved health and the use of revenues for investing in roads etc. The aim was further to investigate the relationships between biospheric and egoistic value preferences and the assessments of the arguments quality. The final sample consisted of 503 participants divided into three experimental conditions (economic arguments, environmental arguments and combined) and one control group. A generally low acceptability of the suggested charge was found, but it was significantly higher in all the experimental conditions. The egoistic arguments yielded the highest mean acceptability, and 28 percent of the respondents supported a charge being implemented in their city compared to 14 percent in the control group. Biospheric values were related to a more positive evaluation of the arguments in the environmental argument condition and more negative when judging the economic arguments.

#### **Policies Aimed to Change Car Use: Policy Characteristics, Social Norms and the Acceptability of Policies**

de Groot, J.<sup>1</sup> & Schuitema, G.  
Bournemouth University, United Kingdom<sup>1</sup>

The implementation of policies to reduce car use is often perceived to be essential in order to safeguard the environmental quality. However, there is often lack of public support for transport policies that are generally believed to be effective, especially for push measures. This study examined how policy characteristics (i.e. push versus pull measure and high versus low cost behaviour targeted) and social norms influence policy acceptability. Results of a mixed 2x2x2 subjects design among 123 participants showed three main effects: (i) pull measures were evaluated as more acceptable than push measures; (ii) opposed to policies targeting low cost behaviour (“littering”), policies targeting high cost transport behaviour were less acceptable, which confirms the difficulty of implementing policies aiming to change transport behaviours; and, (iii) if a majority of a public supported a policy, acceptability was also higher than if a minority supported a policy. The results showed two interaction effects, that is, push measures were particularly perceived as unacceptable when: 1) they targeted high cost behaviour, and, 2) when a weak social norm was experienced. This result implies that coercive transport policies, which are often not acceptable, will be more acceptable if a majority supports this measure.

#### **Accepting costs: When do environmental values predict the acceptability of car use reduction measures?**

Keizer, M.<sup>1</sup>, Steg, L., & de Groot, J.I.M.  
Department of Psychology, University of Groningen, the Netherlands<sup>1</sup>

Most car users know that car use causes environmental problems. However, research shows that measures that enhance environmental quality by reducing car use are unacceptable, especially if they are personally costly (financially or because they enforce behavior change). This suggests that environmental considerations, such as personal values, only influence the acceptability of less-costly measures. To test this, we compared how well environmental values and self-reported car use (a proxy for the perceived costs associated with a policy measure) predicted acceptability of high and low cost car-reducing measures. We expected that individuals' values would predict acceptability of less-costly measures irrespective of their car use, but that car use would predict acceptability of costly measures irrespective of environmental values, because these costs deter car users.

6,045 respondents in seven European countries indicated how acceptable they found costly (car tax increase) and non-costly (improving public transport) measures to reduce car use. In each country,

we found that reported car use strongly predicted acceptability of tax increases, while personal values strongly predicted acceptability of public transport improvements. These results indicate that individuals follow their environmental values when evaluating non-costly measures, but that these values are overruled by individual costs when costly measures are evaluated.

#### **Parking fees, acceptability and effects on car use to work**

Christiansen, P.<sup>1</sup>

Institute of transport economics, Norway<sup>1</sup>

There is a growing literature on parking as a measure to reduce traffic. In recent years, national and local authorities have introduced several restrictions connected to e.g. parking fees. For instance, the Norwegian Public Road Authorities has recently begun to charge employees for parking at work. Our approach is to use this as a case study and analyze the effects based on changes in mode of choice and acceptability. This paper offers new insight into how parking fees influence working trips. It will also describe how employees react to the measure and the importance of earmarking the revenues.

We have gathered a comprehensive set of data, including three surveys and manual counts of the use of available parking spaces. The first survey was sent out during spring 2011. The second survey was sent out one month after the parking fees was implemented. A third survey will be sent out in spring 2012. We can, thus, study effects in both short and long term.

Our paper aims at documenting the successful and unsuccessful effects of parking fees and identifies important factors which can make parking instruments more efficient and acceptable.

#### **A Synthesis of Theoretical Insights on the Acceptability of Transport Policies**

Parkhurst, G.<sup>1</sup>

Centre for Transport and Society, University of the West of England, United Kingdom<sup>1</sup>

Different theoretical perspectives inform our understanding of the extent to which citizens accept policy interventions. Political studies considers policy change as arising from a contest between rival political ideas: according to the success with which policy communities 'frame' problems and solutions, such as in terms of fairness or efficacy, they attract greater support from key actors and the wider public. Planners emphasise participative consultation, following the principle that early involvement of affected communities enables them to shape proposals, both altering their material consequences and increasing citizens' perceived 'ownership'. Psychology considers acceptability through constructs including habit, attitudes, attitude dissonance, social norms, self-presentation, trust relationships and prosociality; phenomena which influence beliefs about, support for and compliance with new policies. Nonetheless, both flagship and routine policies continue to experience considerable resistance. The paper considers why this is the case through a synthesising analysis drawing on the three perspectives, illustrated with examples from car restraint policies and major transport infrastructure schemes. It is concluded that knowledge about what enhances acceptability is unlikely to be sufficient to render a fundamentally unjust or divisive policy acceptable, but can alter outcomes where opposition arises due to differences of perspective, limited information, uncertainty about outcomes and low trust.

#### **Safely on a bike**

Derriks, H.<sup>1</sup> & Berveling, J.

Kennisinstituut voor Mobiliteitsbeleid, the Netherlands<sup>1</sup>

In recent years the Netherlands has seen a sharp increase in the number of serious road traffic injuries. A disproportionate number of these injuries are found among older cyclists. Given this undesirable development the Ministry of Infrastructure and Environment nominated the safety of older road users in its Road Safety Action Program 2011-2012 as a priority theme.

The solution of the problem is usually sought in improved infrastructure. This may include measures such as better and wider cycle paths and removing obstacles. This approach should be continued, but there are also opportunities outside the physical domain. In this paper, besides the physical environment and the bicycle, there is also explicit attention for human quirks and limitations. It's ultimately all about how people handle their vehicles and infrastructure. Further analysis of the biases of people and the psychological heuristics they use, can provide more insight into the causes of accidents. In addition to this individual component, we pay attention to the social environment. Safe behavior is also guided by the impact of social, descriptive and prescriptive, norms. The study is based on a literature review, an expert meeting and two focus groups.

#### **Motorists' perceptions of cyclists and cycling infrastructure: US Experiences**

Dill, J.<sup>1</sup> & Monsere, C., & McNeil, N.

Urban Studies and Planning, Portland State University, United States<sup>1</sup>

Cycling rates in large US cities are low compared to many European cities. As a result, many drivers are not cyclists themselves, and do not encounter cyclists often on the road. Anecdotal evidence indicates a level of conflict between motorists and cyclists that should concern policy makers. This research explores the perceptions of motorists towards cyclists and cycling infrastructure in two U.S. cities that are experiencing increasing rates of cycling: Portland, Oregon and Washington, DC. Data were collected through mail and intercept surveys, sampling drivers near new, innovative (for the US) infrastructure, including cycle tracks and bike boxes. The analysis looks at motorists' perceptions of changes in driving safety and convenience related to the new cycling facilities, as well as broader support for cycling. We examine different categories of motorists, including whether they cycle and demographics (e.g. age and gender). In both cities, motorists who are also cyclists generally have more favorable perceptions of cycling infrastructure. While not unexpected, this does indicate that as cycling rates increase in US cities, conflict between motorists and cyclists should decline. Motorists generally appreciated the increased separation between motor vehicles and cyclists that the new facilities provided and often thought that driving safety improved, though some facilities were thought to increase levels of inconvenience. A large share of motorists in DC felt that cyclists often disobeyed traffic laws. The paper examine how these perceptions influence support for cycling.

#### **Traffic safety culture among Norwegian bicyclists**

Nævestad, T.<sup>1</sup> & Elvebakk, B.

Institute of Transport Economics, Norway<sup>1</sup>

Recent research suggests that the safety culture perspective may have great potential for improving traffic safety. Although it traditionally applies to organizations, new research suggests that the concept of traffic safety culture should be applied to the analytical unit of peer-groups. Peer-group



membership influences traffic safety behaviour, risk perception and identity. This perspective is, however, largely applied to youths, and the extent to which peer group membership influences the traffic safety behaviour of adults is unknown. The present study compares bicycle traffic safety culture between a group of young and a group of adult bicyclists. Bicycle traffic safety culture is measured as particular bicycle behaviours (e.g. helmet use, bicycling under the influence of alcohol) and risk perceptions related to those behaviours. In order to measure the hypothesized importance of peer-group membership, the analysis examines the relationship between respondents' bicycle behaviours and risk perceptions with that of spouses, close female friends, close male friends and colleagues or class mates. Results indicate that respondents' traffic safety behaviour is socioculturally founded, as their traffic safety behaviour is influenced by their beliefs regarding what friends do and what behaviour friends regard irresponsible. Implications for traffic safety interventions are discussed.

#### **Electrical assisted cycling in the Netherlands: image and willingness to purchase**

Hendriksen, I.<sup>1</sup> & Maessen, M.

TNO, Expert Center Life Style, Leiden, the Netherlands<sup>1</sup>

In recent years, the number of electrical assisted bicycles (EABs) in the Netherlands has been growing considerably. So far, especially older adults are using the EAB, but other target groups are emerging. The increased use of EABs by commuters can have positive effects on the environment, the accessibility of cities and public health. Several campaigns among employees were implemented focusing on gaining experience with this relatively new phenomenon.

A campaign was evaluated focusing on the effect of short time use of the EAB among employees on image and willingness to purchase. In several companies commuters could lend an EAB for several days. Questionnaire results showed that the campaign improved the image of the EAB in 75% of the participants. Although to a lesser extent, the image of the EAB also improved in the non-participants group. Furthermore, almost half of the participants indicated to have intentions to buy an EAB. Six months after the campaign, 10% of the participants actually bought an EAB.

Short time use of an EAB results in a better image and a higher willingness to buy an EAB in participants and non-participants. It is expected that similar campaigns can stimulate EAB use among employees.

#### **Bicycle users' risk perception, satisfaction and route choice**

Prati, G.<sup>1</sup>, Pietrantoni, L., Bertoni S., & Rupi, F.

University of Bologna (Italy), Italy<sup>1</sup>

This study investigated cyclists' risk perception and satisfaction with road conditions and characteristics, and the importance of attributes influencing bicyclists' route choice preferences. We interviewed 285 cyclists riding to work in two signalized intersections with different bicycle lanes in the city of Bologna (Italy): the first was a well-connected, separated cycle path, the second was a path shared with pedestrian. 146 (51.2%) participants were female. Participants were most satisfied with the speed of the bicycle lane, whereas the satisfaction with the road surface was lower. Participants indicated that the presence of a bicycle lane and the travel speed were the most important factors in route choice. The presence of high volume of motor traffic and high speed of vehicles in the road had the highest levels of risk perception. Participants also rated as risky the presence of roundabouts and unsignalized intersections. The average rating of risk perception concerning bicycle use in general was just above the midpoint. There were no differences between experienced and casual bicyclists in these measures, but differences were in safety, in bicycle lane

presence and connection between users of the two different paths. There were small gender differences in some of these measures.

#### **Cyclists' subjective evaluations of risk are associated with heart rate and response to challenge.**

Pakrashi, V.<sup>1</sup>, Byrne, E., Comerford, S., & Groeger, J.A.

University College Cork, Ireland<sup>1</sup>

This study sought to contrast cycling during a manoeuvring proficiency challenge with cycling over a mixed network urban route, using objective measures of performance (speed, accuracy during the challenge), subjective ratings of risk (urban route) and physiological response (heart-rate, challenge and urban route), with the aim of attempting to develop unobtrusive measures of cycling risk. Twelve male cyclists wore head mounted video recorders and heart-rate monitors as they negotiated a controlled manoeuvring proficiency challenge (slalom, cornering, gap judgement) and a 5.4km urban route (cycled twice, clockwise and counter-clockwise). As has been observed in car drivers with galvanic skin response (e.g. Taylor, 1964), subjective ratings of risk and heart-rate changes are reliably related across cyclists. However, and more importantly, we show that at this holds at an individual level, and is further enhanced when referenced to both a resting baseline, and the response to a standard challenge (derived from the proficiency test).

### **Symposium - Field Operational Tests (FOTs)**

Wednesday 29th of August, 10:30 - 12:30 - Room 9

#### **Statistical modeling of safety events in naturalistic driving data: An application to speed regulation systems**

Saint Pierre, G.<sup>1</sup> & Andrieu, C. A.

French Institute of Science and Technology for Transport, Development and Networks, France<sup>1</sup>

Collecting data from vehicles is no longer a technical challenge and many research projects are using large instrumented fleets to collect data for different purposes. EuroFOT is the first European Field operational tests currently undergoing in Europe to assess the global impact of driving assistance systems, while naturalistic driving studies are well developed in the United States. The great size of datasets is a shared characteristic and researchers are developing algorithms to automatically extract events which can be either safety or system-use related. From a methodological point of view, there is a need to use suitable statistical models to fit the naturalistic driving context characterized by driver-specific correlations and repeated measurements. Such models are widely used in epidemiology and this paper will first recall the mathematical background and then explain how to adapt them for different experimental plan. Various illustrative examples coming from the EuroFOT evaluation of the speed regulation systems (Speed Limitor and Cruise Control) will be presented. Generalized Estimated Equations models and Generalized Linear Mixed Models are compared to classical methods to assess the system impact on over-speeding events occurrences. The models performances are discussed and different confounding effects are analyzed (speed limit etc.).

#### **Driver behaviour and acceptance analysis of multiple Advanced Driver Assistance Systems within the field operational test "euroFOT"**

Benmimoun, M.<sup>1</sup> & Eckstein, L.

Institut für Kraftfahrzeuge, RWTH Aachen University, Germany<sup>1</sup>

The euroFOT project is the first large-scale Field Operational Test (FOT) of multiple Advanced

Driver Assistance Systems (ADAS) in Europe. It evaluates the impact of eight ADAS functionalities on safety, traffic efficiency, environment, driver behaviour and user-acceptance in **everyday life** situations with ordinary drivers by collecting data from instrumented vehicles. By offering valuable information for the short- and long-term impact of ADAS the euroFOT project aims to encourage the deployment of ADAS. Altogether, about 1000 vehicles equipped with different ADAS technologies take part in the field operational test which is carried out at various operation sites across six European countries. The project will end in June 2012.

The analysis of the collected data is focused on several aspects. Within the impact assessment effects on safety, traffic efficiency and environment are analysed. This analysis is mainly based on objective data collected from the vehicle's CAN-Busses and video data. Moreover driver related aspects are considered. Besides driver behaviour, acceptance, trust and mental workload are also analysed by subjective data that is gathered in questionnaires, which are filled in at specific experiment times. The current analyses show a very positive feedback on acceptance as well as positive effects on the driver behaviour.

#### **Visual behavior effects on forward collision warnings in real traffic conditions – a field operational test study.**

Wege, C.<sup>1</sup>, Will, S., & Victor, T.

Volvo Technology Corporation, Sweden<sup>1</sup>

The Euro-FOT dataset offers new possibilities to study responses to forward collision warnings (FCW) in naturalistic settings. This set-up generates, unlike previous driving simulator studies, authentic eye movement reactions to warnings.

The general intended effect of a FCW is to alert the driver prior to a rear-end impact and thereby speeding up drivers responses to front obstacles. That should especially be true in two safety threatening cases. Case one is a rapid change of the traffic situation associated with the risk of a rear-end crash (e.g. hard braking events). Case two is a driver being inattentive to the forward roadway (e.g. driver is engaged in secondary task). In both circumstances the key role of a FCW is to (re) direct glances to the road.

To investigate truck drivers visual behavior associated with collision avoidance warnings, 60 EuroFOT FCW-events were analyzed. We conducted frame-by-frame video annotations 30 seconds prior and 15 seconds after each recorded alerts.

Our statistical analyses was carried out separately for the two mentioned FCW-use-cases. For case 1 our results show that the FCW directs an increasing percentage of glances towards the location where the warning is issued. For drivers being engaged in a secondary task (case 2), the influence is even stronger. This unintended FCW-effect with potentially severe consequences points to the difficulty in designing human machine interfaces. Recommendations for display positions are given because currently all truck manufactures display FCWs in the instrument cluster resulting in eyes being taken off the road.

#### **EuroFOT impact assessment method and results**

Faber, F.<sup>1</sup>, Van Noort, M., & Bakri, T.

TNO, The Netherlands<sup>1</sup>

"ITS are widely expected to deliver a major contribution to the improvement of road safety. Insight in the safety benefits of ITS is an important ingredient in the deployment of ITS. Assessing these

benefits is one of the research goals of the EuroFOT project, a large scale field trial that involves more than five hundred instrumented vehicles on the road all over Europe. Most of these vehicles have one or more ITS applications on board, including continuously operating ones like ACC.

This presentation describes the method that is used in EuroFOT to assess the safety impact of the continuously operating systems, as well as the results. This approach has some similarities to existing methods but includes novel aspects to handle the fact that the systems are continuously active, and to deal with specific limitations and conditions of the tests and test data of EuroFOT. The paper further describes the results of the method applied to the large data sample from the FOT.

#### **Intelligent Speed Adaptation field trials: implications for large scale deployment**

Lai, F.<sup>1</sup>, Carsten, O., & Birang, V.

Institute for Transport Studies, University of Leeds, United Kingdom<sup>1</sup>

Speeding is a universal road safety problem across borders. It occurs to all types of drivers, and on all categories of roads. Statistical evidence shows that a high proportion of cars travelling over the speed limits and that speeding has long been the most common traffic offence dealt with by police action. Intelligent Speed Adaptation (ISA) is a driver support system which brings the speed limit information into the vehicle. In terms of its intervention to the driver's speed-control task, it can be defined as advisory (visual and auditory warning given upon exceeding speed limit) or intervening ISA (fuel supply controlled and brake activated upon exceeding speed limit). Both types of ISA system have been trialled on a long-term basis in the UK. The trial with intervening ISA collected 460,000 miles of driving data contributed by 80 drivers, while the trial with advisory ISA recorded 2.8 million miles of driving data from 402 drivers. This paper compares the results from the two field trials with respect to the effect of ISA on curtailing speeding as well as the impact of system configuration on drivers' acceptance of ISA. The implications for large scale deployment of ISA are discussed.

#### **Driver distraction and inattention**

Wednesday 29th of August, 10:30 - 12:30 - Room 4

#### **Is the 'useful field of view' affected by hearing impairment?**

Herbert, N.<sup>1</sup>, Merat, N., Thyer, N. J., & Isherwood, S. J.

Institute for Transport Studies, University of Leeds, United Kingdom<sup>1</sup>

Poor performance on 'the useful field of view' test (UFOV) has been linked to negative driving outcomes, particularly in older adults (Clay et al., 2005). Research has also shown that auditory distracters have a detrimental effect on the performance of UFOV (Wood et al., 2006) and evidence suggests that this effect grows with the increasing complexity of the auditory task (Pomplun et al., 2001). As hearing impaired (HI) individuals may need to expend more perceptual effort than their hearing counterparts to decode an auditory message (Gatehouse & Gordon, 1990), their performance on UFOV may be hindered to a greater extent by auditory distracters. This theory is supported by the fact that HI individuals' ability to recognise road signs is poorer in the presence of auditory distracters (Hickson et al., 2010). We tested this hypothesis in a laboratory setting by asking HI and non-HI subjects to complete a UFOV in the presence of an auditory distracter. We hypothesised that the extra attention required by HI individuals to perform the auditory task would degrade their UFOV performance to a greater extent than their hearing counterparts. Results of this study and their implication on safe driving performance of HI individuals will be discussed.

### What distracts young drivers?

Lansdown, T.<sup>1</sup>

Heriot-Watt University, United Kingdom<sup>1</sup>

If you are a male aged between 15-24 years in the United Kingdom, the most likely reason for you to die, would be in a road traffic incident. Four out of five of these incidents involve driver inattention. For example, texting, tiredness or temper resulting in a failure to focus on the primary task.

An internet-based survey was undertaken to consider typical distraction-related behaviours undertaken by drivers in the UK. It explored frequency, severity and subjective ratings for distraction-based undertaken behaviours.

Results indicate that cellular telephone use was both rated as the most highly distracting activity, and further was undertaken relatively frequently by respondents. Analysis revealed young drivers were significantly more prepared to write text messages and use add-on media devices than other drivers. Using a calculated index for distraction, young drivers were found to be significantly more likely to undertake distracting behaviours than their older counterparts. Self-reported accidents supported this finding. Further, male drivers were also found to be significantly more willing to perform distracting tasks while driving.

Intervention opportunities to mediate these socially undesirable behaviours are reviewed and subsequently discussed.

### Change Blindness: Effects of sadness and anger

Jallais, C.<sup>1</sup>, Gabaude, C., Bellot, E., & Sanchez, H.

IFSTTAR - LESCOT, France<sup>1</sup>

Change blindness is defined as the inability to detect changes occurring to an object located in a scene during a saccade. When attention is focused on one location, changes made at another one may not be noticed because participants do not have a detailed representation of the changing location in the scene. The level (central or marginal) of interest (i.e., if the change done concerns the traffic light, then the level is seen to be central for an intersection) was manipulated here with a modified version of the flicker paradigm to test the impact of emotions (neutral, anger and sadness) on the spatial locations of attention.

Sadness and anger have been shown to lead to inattention. On one hand, the irrelevant thoughts linked to sadness decrease the attentional resources and can lead to inattention. On the other hand, anger can slow down the visual information processing, i.e., drivers exposed to anger are slower to detect atypical hazards and road signs. Here, we expect that the sadness group will be slower to detect changes made in low interest locations and that the number of saccades and fixations will be greater in the anger group. Analyses are still in progress.

### Distraction: Comparing its effects with the frequency of exposure in different road user groups

Staton, M.<sup>1</sup>

Cambridgeshire County Council, United Kingdom<sup>1</sup>

Many studies have examined either the effect or the frequency of exposure to distraction among drivers. This study examined both the effects and the frequency of exposure to distractions and considered the role of memory and the prefrontal cortex in differences in distraction reported

according to the drivers' age and experience.

This study used a self-reported questionnaire to determine the frequency with which 200 drivers engaged in different distracting activities, any resulting accident/near-miss involvement and their perceptions of the effect distractions had on their driving.

The study found evidence to support the general consensus in the field that there is a link between frequency of distraction and accident/near-miss involvement. In addition, the study identified that the age and experience of a driver are related to their frequency of distraction whilst driving; with similar downward trends for distraction according to the drivers' age and experience.

The study suggests that the development of the prefrontal cortex, propensity to 'sensation seeking' behaviour and the acquisition of memory are factors in drivers' exposure to distraction and that: (i) practice of simultaneous tasks in a controlled environment; and/or (ii) a psychosocial approach, supported by heterogeneous legislation; could be utilised in the mitigation of distracting behaviours.

## Symposium - Social Psychology of Sustainable Transport

Wednesday 29th of August, 13:30 - 15:30 - Blauwe zaal

### Sustainable transport: expert and public views on policies and technologies

Xenias, D.<sup>1</sup> & Whitmarsh, L.

Cardiff University, United Kingdom<sup>1</sup>

We compared carbon-reducing transport preferences between experts (N=53) and British public (N=40), using open ended questions, attitudinal scales, AHP (analytic hierarchy process) and ranking of preferences. Priority for reduction in transport demand was clear for both samples in qualitative measures. However, quantitative measures revealed that experts preferred techno-economic measures and the public prioritised behaviour change and public transport improvement. This replicates earlier findings of discrepancies between experts and public, reflected in preference strength for certain options; some options also varied with individuals' values, suggesting that expertise does not fully account for variation in attitudes, consistent with cultural studies of risk (e.g., Kahan et al., 2010), and Stern's (2000) Value-Belief-Norm model of environmental behaviour. Replicating this expert-public divergence is important for public engagement in policy-making, as well as for the risk literature, because different perspectives and values imply a need for a broader definition of expertise in transport policy making; it also implies that the public may not accept transport policies/ technologies designed by expert only groups - underlining the importance of early public engagement. Additional qualitative analysis of transport preferences helped understand differences in how preferences are expressed (cf. analytic vs. experiential processing; Weber, 2010), emphasising the complementary strengths of mixed methods.

### Alone in my car: how mode use affects social perceptions

Gatersleben, B.<sup>1</sup>, Murtag, N., & White, E.

University of Surrey, United Kingdom<sup>1</sup>

When we walk we are exposed to more sensory information from the outside world than when we drive. This paper examines how this may affect social perceptions. We know that when individuating information is not available social judgments are affected by unconsciously activated stereotypes. Social perceptions of drivers may therefore be different from those of pedestrians or bus users. A

survey (n = 644) showed that social perceptions were indeed related to amount of walking and social contact. In an on-line experiment people (n = 245) were shown a video of a group of youths play-fighting in an urban park. They saw this film either from the perspective of a car passenger, a cyclist, a pedestrian or a bus user. Those who saw the video from a pedestrian perspective found the young people significantly less irritating, more pleasant and less threatening than those who were in a car. A further study examines whether these findings can be attributed to stereotype activation (using a lexical decision task). The studies raise important questions about the effect of car use on the quality of life in communities which may not only relate to physical (e.g., pollution) but also the social issues.

#### **Social influence on attitudes to electric vehicles**

Skippon, S.<sup>1</sup>, Axsen, J., & Orlebar, C.

Shell Technology Centre, Thornton, United Kingdom<sup>1</sup>

Battery electric vehicles (BEVs) could contribute substantially to reductions in transport CO<sub>2</sub> emissions. However conventional approaches to understanding potential uptake may not take adequate account of processes of social influence on consumer preferences. This study explored two social influences: what using a BEV signals about the user to other people, and how social interactions between users and non-users influence the preferences of both. 56 out of 500+ employees at a single workplace were given the use of a BEV, then completed an attitudinal questionnaire, including a vignette experiment in which they attributed personality traits to a typical BEV user. High conscientiousness, openness and agreeableness were attributed to typical BEV users. Subsequently 9 of them, plus 12 colleagues who had not participated, completed 2-hour interviews including social mapping exercises. A majority of interviewees reported at least one social interaction that influenced their preferences. Influence occurred, not as simple diffusion of information, but as a result of participants "translating" information into their own contexts of lifestyle and self-concept. Social contacts perceived as "technical experts" were influential regarding discussions of technical BEV controversies, but family and recreational friends were more influential regarding perceptions of the overall fit of BEVs with the participants' lifestyles.

#### **Adoption of electric mobility – an analysis of likely early adopters in Germany**

Dütschke, E.<sup>1</sup>, Peters, A., & Schneider, U.

Fraunhofer Institute for Systems and Innovation Research ISI, Germany<sup>1</sup>

Electric vehicles are currently promoted as a promising option to increase energy-efficiency and sustainability of transport systems. For a successful diffusion of electric vehicles, it is important to target development and marketing as well as policy measures towards likely early adopters. In this paper we draw on Rogers' diffusion of innovation model (2003) in order to identify the early adopters of electric mobility with a focus on Germany.

For this analysis we use data (1) from an online survey (N = 969) among actual users of electric vehicles, consumers interested in adopting electric vehicles in the future and consumers who are not well informed about electric vehicles so far and (2) from participants (N=2306) of fleet trials in the eight German model regions for electric mobility.

The results point out that perceived compatibility with own needs, habits and values, perceived advantages regarding costs and environmental aspects and social norms play an important role for the adoption of electric vehicles. We draw conclusions for marketing and policy measures to promote electric mobility, such as improving information, demonstration and opportunities to test EVs in daily life and designing routines so that they are easy to manage in daily life.

#### **Identity, Behaviour and Resistance to Change in Regular Travel**

Murtagh, N.<sup>1</sup>, Gatersleben, B., & Uzzell, D.

Dept of Psychology, University of Surrey, United Kingdom<sup>1</sup>

Work on transportation has suggested identities as a factor in travel behaviour. However there has been little empirical work investigating this relationship, and existing theoretical approaches to identity have not been harnessed. In two studies, we aimed to (a) provide empirical support for the relationship between identities and travel behaviour and (b) test a specific linkage proposed by theory, that is, that identity threat contributes to resistance to change travel behaviour. In Study 1, participants (N=267) completed the Twenty Statement Test and measures of habitual travel on regular journeys. In Study 2, participants (N=300) were asked to rate their intention to change their travel behaviour in response to 8 travel-related vignettes, half of which were designed to invoke identity threat. Both studies were conducted in England with suburban working adults. Study 1 supported identities as significant in predicting travel mode. Study 2 found a robust statistical relationship between identity threat and resistance to change, controlling for habitual travel mode, trait reactance and prior intention to change. The studies provide empirical support for identity as an influence on travel behaviour on regular journeys. The findings contribute to theory on resistance to change, and have implications for policy on encouraging sustainable behaviours.

#### **Risk and hazard perception**

Wednesday 29th of August, 13:30 - 15:30 - Rode zaal

#### **Reduction of car-bicycle conflicts at intersections by early driver information systems – the role of threat anticipation and visual obstruction**

Naujoks, F.<sup>1</sup> & Neukum, A.

University of Würzburg, Department of Psychology, Center for Traffic Sciences (IZVW), Germany<sup>1</sup>

Future communication technologies (e.g. C2x-communication) provide the possibility of early information about hazardous situations, for example car-bicycle conflicts at urban intersections. Effects of such information systems will possibly depend on the degree of sight obstruction and driver expectations specific to the context of the driving situation. Using a fixed-based driving simulator, n=20 participants encountered different crossing-path scenarios of varying predictability: drivers had right of way ("unpredictable") or had to give way ("predictable") to a cyclist passing an intersection from the left. The crossing bicyclist was either visible ("no visual obstruction") during the approach on the intersection or concealed by parked cars ("visual obstruction"). Information about the oncoming conflict was provided via head-up-display and accompanied by an unobtrusive acoustic signal. The information was displayed three seconds before the latest possible braking onset to avoid the collision. Effects on avoidance behaviour were strongest in the unpredictable condition.

#### **Identifying overconfidence among drivers**

Moharrer, M.<sup>1</sup>

Institute for Transport Studies/ University of Leeds, United Kingdom<sup>1</sup>

This study introduces and discusses a new method for finding drivers' level of Overconfidence by first assessing their level of perceived skill and comparing that with their level of actual skill. This is to overcome two issues in past studies in the area of drivers' Overconfidence: First, most studies



have assessed drivers' Overconfidence by using through questionnaires solely. Questionnaires can help us finding the level of perceived skill but they do not provide the level of actual skill, which is needed for assessment of Overconfidence. Second issue is the way questions of those questionnaires have been designed. There is ambiguity behind the "baseline driver" that is being used in the current studies, such as "average driver" and "novice driver". The new method provided by this study aims to overcome both mentioned methods. This study assesses each individual's level of actual skill using a driving simulator in order to overcome mentioned issue regarding using questionnaire alone which only provides us with level of perceived skill. Another improvement is the design of a new visual method which overcomes the current issue with the way the "baseline driver" is introduced and the ambiguity behind it.

#### Reading, driving and attention

Chekaluk, E.<sup>1</sup>, White, J., & Irwin, J.  
Macquarie University, Australia<sup>1</sup>

Successfully being able to process rapidly changing information in a visual environment is essential for driving. Some previous research has suggested that reading ability is negatively linked to driving performance when assessing knowledge of, and responses to, road signs. To date, however, no study using realistically simulated driving conditions has shown such a relationship. Our study used a non-clinical sample that were assessed on reading ability and asked to drive through a simulated environment. Results showed that driving errors in relation to road signs can be predicted by reading, with poorer readers performing worse. In addition there was a weak relationship between reading ability and spatial memory during driving. The results are discussed in the theoretical context of an underlying perceptual deficit in reading ability.

#### Distance information of congestion warnings: False-alarm effects when the given distance information is not correct?

Totzke, I.<sup>1</sup>, Volk, M., Naujoks, F., Krüger, H.-P.  
Center for Traffic Sciences (IZVW), University of Wuerzburg, Germany<sup>1</sup>

It is assumed that warning systems, that alert the driver prior to critical driving situations (e.g. congestion tails), might be beneficial while driving. However, only a few studies have focused on warnings with incorrect distance information. In a driving simulator with a motion system, warnings were provided to N=12 participants (24-50 years) en route to the tail of a congestion. Two different kinds of congestion tails were simulated: In the first, the speed of the surrounding traffic was abruptly reduced before the tail of the congestion was reached and in the second, the speed of the surrounding traffic was gradually reduced. In one half of the simulated runs, the correct distance to the congestion was indicated and updated regularly on a warning display. In the other half, the given distance was incorrect (i.e. the tail of the congestion was positioned approx. 1km closer to the vehicle than the distance indicated). The congestion warnings were first presented 3.3km prior to the congestion tail. Drivers were asked to work on a secondary task (handling a menu system) during the entire run. A within-subjects design was realized. The results are discussed in the context of false-alarm effects of warnings on driving.

#### An Investigation into the Factors affecting the Perception of a Train's Travelling Speed

Clark, H. E.<sup>1</sup>, Perrone, J. A., Isler, R. B., & Charlton, S.G.  
School of Psychology, University of Waikato, New Zealand<sup>1</sup>

The prevalence of collisions between motor vehicles and trains at railway level crossing junctions has been a high-profile issue for many years in New Zealand. Mistakes made in judging a train's

arrival could, in part, be attributed to motorists being unknowingly subjected to a size illusion. Previous research has found that humans perceive large objects (e.g. trains) as moving more slowly than smaller objects (e.g. motorcars) travelling at the same speed. Generally these studies have involved participants viewing approaching stimuli from a stationary position. However, decisions on whether to proceed through a level crossing often occur when motorists are still moving. Research has not yet determined whether self-motion has a bearing on size/speed effects. The present study examines whether a motorist's self-motion impacts on their ability to perceive the speed of other vehicles, in particular trains. The driving simulator-based experiments employ two-alternative forced-choice procedures to test whether observers can reliably discriminate between the approach speeds of a train and a car while in motion; and signal detection theory methods to establish how probability-of-collision thresholds may be linked to participant judgment. Such research can help explain the high incidence of level crossing collisions; in New Zealand, and worldwide.

#### Real-life driver reactions time to danger as a function of situational and driver-centered variables

Ruscio, D.<sup>1</sup> & Balestra, M.  
Università cattolica del Sacro Cuore - Milano, Italy<sup>1</sup>

The main issues in studies about reaction time (RT) to danger emerging from literature are subject expectation, urgency, age, cognitive load, risk perception, type of setting and stimuli (H. Summala, 2000). The steps that define the RT are not always univocal, focusing differently on perception-reaction time, gas-pedal response, and brake-movement time (Groegger, 2000). Moreover driver response is not always considered till the very end of the braking manoeuvre, while drivers still keep monitoring the outcome and efficacy of their response (Ciceri, 2006).

The present research tackles these issues in a real-life setting, comparing the responses to danger on real car with behavioral patterns emerging from driving-simulators data from literature. We recorded with a rate 100/Hz the real driving performance and non-verbal behavior in a reaction-to-danger task, manipulating the stimuli type (in-vehicle lights and foam rubber obstacle) and drivers expectations, on a sample controlled for age, gender, BMI and scoring in BIS-11 and DBQ.

Results show significant differences in the RT phases for different situation and personal variances. The importance of non verbal behavior is also pointed out as it regularly anticipates the response on the brake. Giving us interesting information for drivers education, road safety and accident reconstruction.

#### Road safety education 1

Wednesday 29th of August, 13:30 - 15:30 - Room 16

#### Applying Behavioural Change Techniques to road safety education

Stradling, S.<sup>1</sup>, Fylan, F., & Scott, H.  
Edinburgh Napier University, United Kingdom<sup>1</sup>

Behavioural Change Techniques (BCTs) have been successfully deployed in changing a number of health behaviours. Abraham & Michie (2008: A taxonomy of behavior change techniques used in interventions. *Health Psychology*, 27, 379-387) identified twenty six techniques used in health psychology. These BCTs, plus one other adapted from forensic psychology, are classified here

into nine groupings: giving information about negative consequences of the unwanted behaviour; teaching about how to undertake the target behaviour; planning to undertake the target behaviour and barriers to achieving it; agreeing to undertake the target behaviour; support for undertaking the target behaviour; implementing the acquisition and maintenance of the target behaviour; monitoring progress in developing the target behaviour; managing and coping with change; and feeling good through identifying incentives to acquiring and maintaining the target behaviour. A range of typical UK road safety education interventions are assessed for the presence – and absence – of these BCTs. Implications for the design and evaluation of such interventions and the development of behaviour change theory are discussed.

#### **Will attitudes towards safety improve after the introduction of a new driver licence training for young mopedists?**

Stave, C.<sup>1</sup> & Forward, S. E.

Swedish Road and Transport Research Institute, Sweden<sup>1</sup>

#### **Background**

To improve traffic safety a new driving license category (AM) for mopeds was introduced in October 2009. This means that mopedists have to complete a new form of training including both theory and practice.

#### **Aim**

This study aims at evaluating drivers' perception of risk before and after the new program was introduced. Furthermore the content of the program, compliance to course curriculum, teachers and pupils' performance and attitudes was investigated.

#### **Method**

Two studies were performed. The first study was a before and after study including 1861 participants aged 15-18 years old (901 before and 960 after). In this study a web-survey was used including a number of social psychological construct. The second study was a process evaluation of five different driving schools using direct observations, questionnaires and interviews.

#### **Results**

The results are presently analyzed and will be presented at the conference. So far data indicate that the practical aspect of the training is most appreciated and that the education focuses more on rules and regulations rather than perception of risk.

#### **Automatic Evaluation Method of Safe Driving Skill Based on Driving Behavior Analysis and Its Application to Safe Driving Lecture**

Tada, M.<sup>1</sup>, Noma, H., Okada, M., & Renge, K.

ATR, Japan<sup>1</sup>

To reduce the amount of traffic accidents, a lot of effort has been made for the improvement of vehicle and road safety equipment. However, generally the number of traffic accidents is still at high level. In addition to improving vehicles and roadside safety, driving behavior should also be considered for traffic accident reduction. In this paper, we propose an automated method for evaluating driving skill by measuring safe driving behavior using wearable sensors. By using wireless 3D-gyro sensors together with GPS and knowledge database of driving instructors, our method automatically evaluates drivers' visual scanning behavior/pedal operation patterns at accident prone areas (e.g. potentially dangerous intersections) from the viewpoint of active safety. Through experiments performed in real traffic environments using 23 drivers, we have confirmed that

our method allows to point out shortcomings in drivers' visual scanning behavior/pedal operation patterns with precision of 91% and recall of 90%. As the next step, we have applied our method to safe driving lecture given by a driving school and have trained 513 drivers aged from 22 to 73. Questionnaire result shows that 96% of all trained drivers are favorable to our method.

#### **A coaching program for young drivers in their first period of solo driving: which target group is attracted?**

Roelofs, E.<sup>1</sup> & Visser, J.A.M.M.

Cito, the Netherlands<sup>1</sup>

Throughout Europe second phase training programs for young drivers have been introduced to foster higher order driving skills to help reducing their accident risk: e.g. balancing task complexity and level of driving proficiency, self-reflection, awareness of emotions during driving. The development of these skills asks for some form of coaching, resulting in higher levels of self-regulation on the part of the young driver. This paper report on a Dutch second phase coaching program, referred to as the 'Drive Xperience (DX)', aimed at young novice drivers. As the program still runs on a voluntary basis, the question is which target group is actually addressed.

Descriptive analyses were carried out on web-based assessment data of over 2000 drivers, who participated in the program. Their profiles were compared against those of leased-car drivers (n=600) who participated in driver safety programs, and against data from a reference sample of young drivers, taken from a survey, carried out in 2005.

Results show that, compared to the other groups, DX participants tend to drive at higher speeds than is permitted, that they react with irritation towards other drivers, but at the same time have a more positive self-image. Implications of these findings will be discussed.

### **Symposium - Driver attention, perception, and road design**

Wednesday 29th of August, 13:30 - 15:30 - Ronde zaal

#### **Self-explaining rural road design: The effects of road design on expectations**

Weller, G.<sup>1</sup>, Koch, N., Krause, J., & Schlag, B.

Technische Universität Dresden, Germany<sup>1</sup>

Self-explaining roads (SER) are designed in such a way that they are in line with the expectations of the road users (Theeuwes & Godthelp, 1995; Weller & Dietze, 2011). For roads to be self-explaining "unique behaviour [...] should be linked to unique road elements" (Theeuwes, 2000, p.21). Similar to affordances (Gibson, 1986), and according to a model developed by Weller (2010), these elements should automatically evoke the right expectations, resulting in the right behaviour. However, little is known about which elements are behaviourally relevant and which characteristic values are distinguished by road users. In order to fill this research gap, several online-surveys were conducted in which subjects had to rate real and simulated pictures of road scenes, some of them differing in just one element. Subjects were asked for their expectations and behavioural intentions. To estimate the external validity of these ratings, speed was measured during driving experiments and with radar on some cross-sections also used in the pictures. The results showed at least a relative validity of speed data. Furthermore, it was possible to identify selected design elements and element characteristics which proved to influence expectations and be behaviourally relevant throughout all surveys.

### Driving behavior at transitions from highway to secondary roads: a simulator study

Ariën, C.<sup>1</sup>, Brijs, K., Ceulemans, W., Jongen, E.M.M., Daniels, S., Brijs, T., & Wets, G.

Transportation Research Institute (Hasselt University), Belgium<sup>1</sup>

This study will investigate the transition from highways to secondary roads. Such transitions require suitable design in order to evoke a mental and behavioral 'reset' in the driver. Two driving simulator studies (60 participants each) are executed to examine the effect of two possible 'reset' moments: (1) the highway exit and (2) the intersection at the junction of the highway exit and the secondary road. In the first experiment four highway exit designs are investigated: (a) straightforward and curved with overall deflection of (b) 45°, (c) 90° and (d) 180°. The junction with the secondary road is a priority intersection. During the second experiment participants first take a 90° deflecting highway exit and then pass by one of the four junction types: (a) traffic lights, (b) priority intersection, (c) roundabout and (d) acceleration lane. Each participant completes two experimental trips which both consist of a highway section followed by a secondary road section and two of the four different design conditions randomly implemented. Speed, lateral control and drivers' mental load (by means of Rating Scale Mental Effort) are investigated.

### Design induced behaviour: An on-road study of driver behaviour at rail level crossings

Lenné, M.<sup>1</sup>, Beanland, V., Filtzess, A., Stanton, N., & Triggs, T.

Monash University Accident Research Centre, Australia<sup>1</sup>

Crashes at highway-rail grade crossings represent a significant problem worldwide. Advances in driving assessment methods, such as the provision of on-road instrumented test vehicles, now provide researchers with the opportunity to further understand driver behaviour at highway-rail grade crossings in ways not previously possible. In this study 25 participants drove a pre-determined route in regional Victoria, incorporating 9 rail level crossings, using an instrumented On-Road Test Vehicle (ORTEV). Drivers provided verbal commentary whilst driving the route, and a range of other data were collected, including eye fixations, forward, cockpit and driver video, and vehicle data (speed, braking, steering wheel angle, lane tracking etc). Participants also completed a post trial cognitive task analysis interview. Of particular interest in the analysis was how the design of passively and actively controlled level crossing controls would influence driver decision making and behaviour. The analysis presented gives insight into the driver and wider systems factors that shape behaviour at highway-rail level crossings, and highlights the utility of using a multi-method, instrumented vehicle approach for gathering data regarding driver behaviour in different contexts.

### Driver Age and Distraction on the Use of an Intersection Crossing Assist System

Manser, M.<sup>1</sup>, Becic, E., & Creaser, J.

HumanFIRST Program, University of Minnesota, United States<sup>1</sup>

Rural intersection crashes represent a significant proportion of roadway crashes and subsequent fatalities. Research has suggested that perceptual challenges, such as poor estimates of time to contact, are contributing to a general gap acceptance/rejection problem at these intersections. In response to this problem and the notion that re-engineering an intersection to address perceptual challenges can be cost prohibitive, traffic safety professionals have developed an intersection driver support system consisting of an in-vehicle signing application. The system augments perceptual capabilities by providing gap rejection information to a driver in addition to the normally available vision-based information. The purpose of the current work was to examine the potential benefits of providing augmented information in addition to normal visual information on driver decision-making. We also examined whether driver age impacted system use and whether intersection-crossing performance may be impacted by a concurrent secondary task. Results indicated that the

augmented information improved intersection crossing performance, such as a reduced probability of accepting critical gaps, that no negative 'distracting' influence was observed, and that younger and older drivers benefited equally from system use. Results will be discussed in terms of augmented perceptual capabilities and traffic safety.

### Symposium - Drugs & Driving/Impaired driving

Wednesday 29th of August, 13:30 - 15:30 - Room 10

### Effects of dextroamphetamine on simulated driving performance before and after sleep deprivation

Hjälmdahl, M.<sup>1</sup>

VTI, Sweden<sup>1</sup>

Rationale: Stimulant drugs are commonly abused and also used to promote wakefulness, yet their effects on driving performance during sleep deprivation have been poorly studied in experimental studies.

Objectives: We aimed to assess the effects on fundamental driving parameters during simulated driving of two doses of d-amphetamine and further to assess the interaction between d-amphetamine and sleep deprivation

Methods: A double blind, placebo controlled experiment including eighteen healthy, male volunteers was conducted.

Results: The participants felt more alert when taking a dose of d-amphetamine than when taking placebo and the effect was stronger for the higher dose. However, the data did not show any evidence that taking d-amphetamine prevented the subjects from successively becoming sleepier during the night. A significant main effect of dose was found for three out of the five primary indicators where the lower dose led to improved driving while the results for the higher dose were less clear. Regarding sleep deprivation, a main effect was found for four of the primary indicators and three of the secondary indicators. The results showed impaired driving in all cases but one. We found no interactions between dose and sleep deprivation.

Conclusions: Our results suggest that impaired driving due to fatigue is not compensated by administration of d-amphetamine. The positive effects of 10 mg was not further improved or even sustained when increasing the dose to 40 mg. This might indicate that at still higher doses commonly taken by addicts, there are few or no positive effects of d-amphetamine.

### Effects of the combination of two drugs (hypnotic and antalgic) on driving performances in aged subjects

Bocca, M-L.<sup>1</sup>, Amato, J.N., Marie, S., Lelong-Boulouard, V., Paillet-Loilier, M., Coquerel, A., Denise, P., & Berthelon, C.

INSERM U1075, UFR de Médecine, University of Caen, France<sup>1</sup>

The majority of older adults regularly use several medications, in particular due to an increase of insomnia with age, but also due to an increase of pain. Paradoxically, most of experimental studies on drugs effects are conducted on healthy young subjects.

The aim of the present study was to evaluate the effects of the combination of zolpidem 10 mg taken at bedtime and codoliprane taken at awakening (codeine 20 mg - paracetamol 400 mg) in aged subjects. It was a cross-over, double-blind, placebo-controlled study. Four combinations were tested: placebo-placebo, zolpidem-placebo, zolpidem-codoliprane, placebo-codoliprane.

Subjects performed three driving test at 9.00 am : monotonous, urban and car following. Sixteen healthy subjects aged 55 to 65 years participated in this experiment.

Standart Deviation of Lateral Position (SDLP) was significantly increased both with zolpidem and with codeine-paracetamol alone. The combination of these two drugs are less clear but tendencies were found. Results are not significant with urban driving test.

Globally, results confirms that zolpidem or codoliprane in aged subjects impair driving performance, a result no found in young subjects. Although unexpected, the combination of two drugs did not clearly impair the driving behaviour in the highway driving task

#### Effects of alcohol and ecstasy on simulated driving performance and traffic safety

Veldstra, J.<sup>1</sup>

Dept. of Psychology, the Netherlands<sup>1</sup>

Rational An increasing number of fatal road-accidents have been reported in which ecstasy was found in the blood of drivers. Studies on the acute effects of ecstasy co-administered with alcohol on driving performance are relatively sparse.

Objective The present study was designed to establish the extent of driver impairment as a consequence of ecstasy or combined ecstasy and alcohol use as compared to driving under the influence of 0.5 ‰ and 0.8 ‰ alcohol.

Results Alcohol and ecstasy mainly influenced automated driving performance such as lateral and speed control. Small to no effects of the substances were found on more complex driving behaviour. Combined use led to impaired driving for some, but not all, drivers. Participants rated their own performance to be slightly worse than normal in both studies.

Conclusions There was a dissociation between subjective perceptions and objective performance decrements. This is an important notion for traffic safety since it may affect a driver's judgment of whether or not it is safe to drive. For example, an intoxicated individual might decide to drive because the feelings of alertness caused by ecstasy cloud the impairing effects of other drugs such as alcohol, thereby creating a potentially serious risk for traffic safety.

#### Driving performance of occasional and heavy cannabis users during single doses of dronabinol (10 and 20 mg) and placebo.

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Maastricht University, Dept. of Neuropsychology & Psychopharmacology, the Netherlands<sup>1</sup>

Dronabinol (Marinol®) is a cannabinoid that is used for the treatment of chronic pain, anorexia in AIDS and other wasting diseases, and as an antiemetic medication in cancer patients undergoing chemotherapy. The active ingredient dronabinol is synthetic  $\Delta^9$ -tetrahydrocannabinol (THC), which is known to cause driving impairment when smoked. The present study was designed to assess the acute and chronic effects of orally administered dronabinol on actual driving performance and the Standard Field Sobriety Test (SFST). Twelve occasional and twelve heavy cannabis users (14

males/10 females) performed a road tracking and car-following test in normal traffic after single doses of dronabinol (10 and 20mg) and placebo. It was hypothesized that occasional users would be impaired on these tests and that heavy users would show less impairment due to tolerance. The main outcome measure was Standard deviation of lateral position (SDLP; i.e. weaving) is the prime measure of road tracking control. Time to speed adaptation (TSA) was the prime reaction time measure in the car-following test. Percentage of impaired individuals on the SFST and subjective high on a visual analogue scale were secondary measures. Occasional users showed increased SDLP ( $p=0.008$ ) and TSA ( $p=0.011$ ) under the influence of dronabinol as assessed by superiority tests. The SFST did not discriminate between treatments. Subjective high was significantly elevated under the influence dronabinol ( $p=0.000$ ) in occasional and heavy users. It is concluded that, Dronabinol impairs driving performance in occasional and heavy users in a dose-dependent way. Equivalence tests demonstrated that dronabinol induced increments in SDLP were bigger than impairment associated with BAC of 0.5 mg/mL in occasional and heavy users, although the magnitude of driving impairment was generally less in heavy users. The SFST is not sensitive to clinically relevant driving impairment observed after oral THC.

#### Symposium - Visual impairment and mobility/Shared Space

Wednesday 29th of August, 13:30 - 15:30 - Room 9

#### The Effects of Compensatory Scanning Training on Mobility for Hemianopia Patients

de Haan, G.<sup>1</sup>, Heutink, J., Melis-Dankers, B., Tucha, O., & Brouwer, W.

Clinical and Developmental Neuropsychology/University of Groningen/PhD Student, the Netherlands<sup>1</sup>

Homonymous hemianopia, the most common form of Homonymous Visual Field Defects (HVFD), refers to a loss of perception over half the field of vision, affecting both eyes, due to acquired postchiasmatic brain injury. Because of a spatially disorganized visual search strategy, patients with HVFD have particular difficulties with reading and visual exploration, which have far-reaching, disabling repercussions on their domestic and vocational lives. We performed a randomised controlled trial to study the effect of compensatory scanning training on mobility among 60 patients with hemianopia. Treatment (18.5 hours of training during a 10-week period) consists of increasing the understanding of the field defect and its consequences; increasing the amplitude of saccadic eye movements and training of systematic, spatially organized visual search on a wide visual display; and transfer to visual activities of daily living. Outcome measures consist of physiological, cognitive, behavioural and subjective measures such as questionnaires, eye tracking, visual search tasks, mobility tasks and driving tests. Some interesting initial results will be presented.

#### Auto-Mobility: safe driving with a visual impairment in the Netherlands

Melis-Dankers, B.J.M.<sup>1</sup>, Heutink, J., Kooijman, A.C., & Brouwer, W.H.

Royal Dutch Visio, department KEI, the Netherlands<sup>1</sup>

Objectives: The rehabilitation program Auto-Mobility supports visual impaired people to gain sufficient practical fitness to drive. In Europe, driving is prohibited with visual acuity [BCVA] less than 0.5 or horizontal visual field less than 120 degrees. The Netherlands is the only European country which allows the use of a bioptic telescope [BTS] when driving. For people with restricted visual field due to homonymous hemianopia, a saccadic scanning training [SCT] is developed to optimise the viewing strategy.

Methods: We demonstrated by scientific research that smooth driving using an BTS was possible.



As a result, the Dutch driving regulations were adapted to allow BTS-driving. Visio trained over 100 rehabilitation and driving specialists and implemented the BTS-driving program and the scanning training nationally. In addition the website [www.auto-mobiliteit.org](http://www.auto-mobiliteit.org) was launched to inform the public.

Results: Over 400 visually impaired people signed in for AutO-Mobility. About 70% of the applicants is allowed to follow training and driving lessons. At this moment 45 BTS driving licenses have been issued. If driving is considered unsafe, alternatives for independent mobility are discussed with the patient.

Conclusion: AutO-Mobility supports visual impaired people to drive independently. The program prepares them for the official fitness to drive test in which they are allowed to demonstrate smooth and safe driving in normal traffic.

### How to measure spatial abilities in visually impaired people?

Steyvers, F.<sup>1</sup>

Department of Psychology, University of Groningen, the Netherlands<sup>1</sup>

For the measurement of spatial abilities in sighted persons various tests exist. However, since these rely on vision, they are useless for visually impaired persons (VIPs). This study aimed at founding two self-constructed vision-free tests for spatial ability measurement of VIPs on existing conventional spatial ability tests. To do so, a group of sighted participants was selected to match a group of VIPs for which test data were already available on the two vision-free tests. They were also exposed to the vision-free tests, added with conventional tests for spatial ability. In this way a kind of tri-angular comparison was made between the test results to correlate the results of the sighted people with the VIPs, and to correlate the two vision-free tests with conventional with-vision tests within the sighted participants group. The results showed that some, but not all, aspects of spatial abilities, may be measured with the vision-free tests.

### Communication in Shared Space

de Haan, P.<sup>1</sup>

Knowledge centre Shared Space, the Netherlands<sup>1</sup>

The key issue on shared space says it works because communication between road users is possible and comes instead of communicating with traffic signs. So signs, lines and lights should be redundant and public space is designed to facilitate meetings between all users in public space. That idea was put up by the late Hans Monderman. It's likely it works like that and field observations and evaluations point in that direction.

Switching off traffic lights in the Netherlands and the UK show that there are no big changes in flows and it seems that speeds have gone down and number of accidents even so. Still there is little scientific support for this. There are even more questions than answers. Meanwhile the concept of Shared Space is put into policy and practise more and more So research and experiments are needed to find out the nature and content of the communication.

We can see communication with:

- Signs
- The cues from landscape and environment
- Travel companions
- Other road users

- Digital signs within cars and (an overload of) information

This leads to questions like:

- How does this communication look like?
- How does this communication work?
- What's the content of the communication?
- Which form of communication has priority?
- Who is leading/starting?
- Is it free of cultural influence?

We can present some of the answers.

### Driver behaviour measurement

Wednesday 29th of August, 13:30 - 15:30 - Room 4

### SDLP – a simple measure?

Vollrath, M.<sup>1</sup>

Department of Engineering and Traffic Psychology, Germany<sup>1</sup>

The standard deviation of lane position (SDLP) is one of the most frequently used parameters to describe the quality of lane keeping. It increases with engagement in secondary tasks which visually distract the driver and it decreases when driver engage in cognitive tasks but keep their eyes on the road. It also reacts to intoxication and fatigue and may be used to detect these impaired driver states. However, in literature the values reported differ widely which is mainly due to different situations (e.g., low speed vs. high speed) and different measurement procedure (e.g. rate of measurement). By using data from a simple driving simulation (the lane change task LCT) with different kinds of distraction the effect of different measurement procedure is examined and presented. Using data from driving simulator experiments conducted with a city scenario, a rural road, and a large highway, the effect of different speeds is assessed. Based on these comparisons, recommendations for computing the SDLP are derived.

### The Lane Change Task's (LCT) measures and metrics: What do they tell us about driver's secondary task demand?

Huemer, A.K.<sup>1</sup> & Vollrath, M.

Technische Universität Braunschweig Traffic and Engineering Psychology, Germany<sup>1</sup>

The Lane Change Task (LCT; Mattes, 2003) was developed as a test procedure to measure secondary task demand while driving and is implemented as an ISO standard (ISO 26022:2010). Studies on training effects (Petzoldt, Bär, Ihle & Krems, 2011; Huemer & Vollrath, submitted) and sensitivity (Young, Lenné & Williamson, 2010) showed additional regulatory needs concerning training procedure and instructions for participants, but also revealed some sensitivity questions for the metrics described in the ISO-norm. In a within-subject design, 25 well-trained participants completed the LCT procedure with four additional tasks (two visual-manual tasks: SuRT & CTT, a cognitive arithmetic task and a pure manual task) in two difficulties, each. Data was analyzed according to the ISO-proposed "adaptive" model as well as to the "basic" model and both models are processed on distance as well as on task time basis. Effects of the baselines used for comparison are also examined by relating data to the different baselines that are proposed in the ISO standard. First analyses show differences between the "adaptive lane change models" depending on the

baselines. Data analysis is at this time still in progress, complete data will be presented at the conference.

#### **Concurrent Validity of Some Psychological Methods for Assessing Predisposition Towards Safe Driving**

Luczak, A.<sup>1</sup> & Tarnowski, A.

Central Institute for Labour Protection - National Research Institute, Ergonomic Department, Laboratory of Physiology and Hygiene of Work, Poland<sup>1</sup>

The study verified the methodology of drivers' psychological testing regarding the validity and reliability of selected psychomotor and cognitive tests used in assessing drivers' predisposition towards safe driving: simple reaction, combined reaction, cross, R-W, Poppelreuter and Couvé tests. Three groups of drivers (n=1266), aged 21-74, participated in the study: professional and non-professional drivers never involved in heavy road crashes, and non-professional drivers – offenders in heavy road crashes. Validity was evaluated with criterion-oriented validity, whereas reliability with test-retest and split-half methods as well as Cronbach's alpha. The results showed statistical significant differences between drivers-offenders and drivers not involved in heavy road crashes in reflexes, attention, speed and dexterity of work and hand-eye coordination. Therefore, these features are critical for safe driving. Moreover, R-W, simple reaction and cross tests can be recommended as valid and reliable in assessing psychological predisposition towards safe driving. Furthermore, the ROC (receiver operating characteristics) curve suggests that standards permitting people to be professional drivers as well as non-professional drivers should be higher than current ones. Transport psychologists should discuss this problem.

#### **Towards a definition of safety for individual driver's lane behaviour**

van Loon, R.<sup>1</sup>

TNO, the Netherlands<sup>1</sup>

To assess lateral control performance in drivers, lane behaviour indicators such as the mean lane position, standard deviation of lane position and time-to-line-crossing are the most frequently used measures. For lane position, the commonly accepted (qualitative) proposition is that increased lane swerving indicates reduced vehicle control and hence a decreased level of safety. For time-to-line-crossing, a rule of thumb is that a value of less than 1s implies a decreased level of safety (e.g. an increased risk of lane exceedance). However, a quantitative relationship with safety similar to the one between speed and safety or between speed variability and safety does not yet exist for lane behaviour indicators. In the current study, we intend to establish a link between this type of driving behaviour in individual drivers and the level of safety, using data from both studies related to impaired driving and studies not related to impaired driving. The results from this study can be a first step in ultimately setting cut-off values for safe driving based on individual behavioural indicators.

#### **Efficacy of Dynamic Traffic Management Measures: The Influence of Complexity and Situational Awareness**

Hoogendoorn, R.<sup>1</sup>, Vreeswijk, J., Hoogendoorn, S.P., Brookhuis, K.A., Van Arem, B., & Van Berkum, E. Delft University of Technology, the Netherlands<sup>1</sup>

Behavior of road users (e.g. route choice, driving behavior) is a critical factor in the efficacy of measures applied in the context of Dynamic Traffic Management (DTM). In order for drivers to make well-informed decisions, it is required that information provided by DTM measures is perceived. In this regard, situational awareness is a psychological construct of high importance.

Situational awareness is defined as the perception of elements in the environment within a volume of time and space, the comprehension of their meaning and the projection of their status in the near future. With regard to the relationship between situational awareness and the efficacy of DTM measures three aspects are relevant: spatial awareness, system awareness and task awareness. A driving simulator study was performed to analyze to what extent complex interaction with other traffic and the complexity of DTM measures influence spatial awareness and system awareness. The complexity of interactions with traffic was simulated by the induction of speed changes of the lead vehicles. Whereas the complexity of DTM measures was induced by exposing participants to maximum speed limit signs and route information with an increasing level of complexity and ambiguity. Spatial awareness and system awareness were measured through eye fixations using a new data collection and analysis technique. Furthermore, a psycho-spacing car following model was estimated to measure spatial awareness, while the compliance to the DTM measures was considered another measure for system awareness. The influence of complex interactions with other traffic as well as of the complexity of DTM measures was analyzed through Multivariate Analyses of Variance.

#### **Symposium - Driver behaviour modelling 1**

Wednesday 29th of August, 16:00 - 18:00 - Blauwe zaal

#### **Driving Behavior Model from the Brain Science point of view and the applications to safe-driving training program**

Tanida, K.<sup>1</sup>

Honda R&D Co.,Ltd. Automobile R&D Center, Japan<sup>1</sup>

Many People have believed that human behavior is explained as cognition-judgment-operation loop. But recently, the brain scientists have been elucidating the fact that there is anticipation before cognition in the brain processing. The TP-theory (Temporal Predictive behavior model) is a model which applies anticipation-operation-comparison loop as new information processing with temporal frame to human behavior including car driving. Driving behavior is separated into five different levels of temporal anticipation windows. Each window consists of both feed-forward loop and feed-back loop. Why people feel stress in driving? Why people can synchronize traffic environment, or not? This TP-theory can also give answers for these questions from subjective (feelings) point of view, although the model is developed for human behavior. This article firstly gives the general explanation about the TP-theory. Next, one example is illustrated where we created and conducted curriculum for safety driving training based on the TP-theory, and the validity of the application of the theory is discussed.

#### **Facets of driver behaviour: the benefit of hindsight**

Groeger, J.A.<sup>1</sup>

School of Applied Psychology, University College Cork, Ireland<sup>1</sup>

Groeger (2000) identified four facets of driver behaviour which were hypothesised to underlie drivers' responses to risk: Detection, Option Appraisal/Evaluation, Response Selection and Action Implementation. Together these were thought of as incorporating cognitive, somatic and motor determinants of whether, how, and how successfully drivers might respond to risks of which they may or may not have awareness. In the decade since this framework was published a wide variety of results have been published which, I will argue, fit very well with the four facet framework, and can be used to make explicit not only the operation, interaction and the neurological underpinnings

of these facets but, more importantly, allow testable predictions to be made.

Ref. Groeger, J.A. (2000). *Understanding Driving: Applying Cognitive Psychology to a complex everyday task*. Hove, UK: Psychology Press.

#### **Quantifying the Zero Risk theory algorithmically**

Pekkanen, J.<sup>1</sup>

Traffic Research Unit and Cognitive Science, Institute of Behavioural Sciences, University of Helsinki, Finland<sup>1</sup>

The Zero Risk theory, as most other models of driver behavior, has so far eluded quantification, perhaps due to some difficulty to operationalize central concepts. In this paper, the theory is restated in more computationally explicit principles, while maintaining the original theme of maneuvering in risky situations without forming an estimate, or experiencing a feeling, of risk. The general idea is to estimate expected future situations from perception prototypes matching the current sensory input, and matching these estimates to learned behavioral patterns. Riskiness is not estimated explicitly at any point, but is signaled when no learned expectancy matches the perception, or no behavioral pattern matches the expectancy, i.e. when the routine driving heuristics do not seem cover the situation. On the algorithmic level, the new formulation enables application of well established concepts and techniques from machine learning and cognitive psychology, namely prototypes and clustering, winner takes all networks, state prediction and reinforcement learning. In addition to discussing the formulation, a preliminary implementation in form of a simulated vehicle following model is presented and evaluated.

#### **Risk Perception in Driving - An Integrated Framework for Representing Core Assumptions of Risk Models of Driver Behaviour**

Lappi, O.<sup>1</sup>

Cognitive Science & Traffic Research Unit, Institute of Behavioural Sciences, University of Helsinki, Finland<sup>1</sup>

A central goal of driver behavior modeling is to understand how information in the road environment is perceived, processed, and used adaptively. One important aspect is the capacity for risk perception. A computational analysis of five important risk models of driver behavior is given. These are: (1) Fuller's Risk Allostasis Theory (2) Taylor's constant emotional tension model (3) Wilde's Risk Homeostasis Theory (4) the Zero Risk Theory of Nätänen & Summala and (5) the Safety Margin Model of Summala. It is demonstrated how - despite differences in the terminology and definitions in their originally stated form - these theories can be profitably represented within a common framework, based on a common set of definitions of fundamental assumptions. Three sets of core assumptions are identified: those underlying all five theories and establishing the basis of a common mechanistic framework, those shared by risk control theories (1-3) but not zero risk theories (4 & 5) and those shared by zero risk theories but not risk control theories. A common computational framework allows one to pinpoint clearly what propositions the models differ on, and what propositions they share, and derive differentiating empirical predictions, thus opening up the possibility of crucial experiments.

#### **Attention and mental workload**

Wednesday 29th of August, 16:00 - 18:00 - Rode zaal

#### **Task controlled anticipatory eye movements while driving require executive control**

Lehtonen, E.<sup>1</sup>, Lappi, O., & Summala, H.

Traffic Research Unit, University of Helsinki, Finland<sup>1</sup>

Anticipation of potential hazards is important for safe driving. Experienced drivers continually monitor the environment, visually searching for cues that indicate potential hazard. With experience, drivers learn where the cues are most probably to be found. Consequently, these cue locations receive more visual attention in form of anticipatory eye movements.

We studied anticipatory eye movements on a rural road in two on-road experiments with an instrumented car. In both studies, normal driving was compared to driving under cognitively loading secondary task to investigate the effect of executive working memory load on anticipatory eye movements.

Drivers used road junctions and the occlusion points of curves as cue locations. Cognitive load decreased looking time at these cue locations while the locations remained spatially the same. Results suggest that while identification of cue locations is relatively automatic, shifting attention to them requires executive control.

#### **Visual search while driving: Effects of vehicle prevalence on vehicle detection**

Lenné, M.<sup>1</sup>, Beanland, V.B., & Underwood, G.

Monash University Accident Research Centre, Australia<sup>1</sup>

Driving is a complex task that requires constantly searching the environment in order to detect multiple targets (i.e., other vehicles and potential hazards). However, visual attention research indicates that observers' expectations significantly predict what they will notice. In visual search paradigms observers easily detect high frequency targets, but often fail to detect low frequency targets that appear on 1% of trials (Wolfe, Horowitz, & Kenner, 2005). We conducted a driving simulator study to investigate whether the search prevalence effect could account for "looked but failed to see" errors while driving. Target vehicles were motorcycles and buses, both of which represent approximately 1% of on-road vehicular traffic. Target prevalence (high, low) was manipulated between subjects: half the drivers encountered a high frequency of buses and low frequency of motorcycles, and half encountered a high frequency of motorcycles and low frequency of buses. Target salience was also manipulated within subjects: half the targets were low salience and half were high salience. It was hypothesised that drivers would be more likely to detect high frequency targets, and would detect them faster (i.e., from farther away), compared to low frequency targets, and that target frequency effects would interact with both vehicle type and salience.

#### **Prospective memory and driving behaviour: differential effect of time-based and event-based intentions**

Trawley, S.<sup>1</sup>, Stephens, A.N., Madigan, R., & Groeger, J.A.

University College Cork, Ireland<sup>1</sup>

Driver inattention is the momentary failure of drivers to appropriately attend to the driving task. Such distraction is problematic because it can result in injurious or even fatal road traffic accidents. There is some evidence to suggest that driving performance is compromised when drivers maintain

and implement a prospective memory or delayed intention task. In this study we examined the effect of implementing an intention on driving performance. Specifically, by contrasting the consequences of undergoing a time-based versus event-based prospective memory task on driving performance. Traditionally, time-based tasks are considered to be more attentionally demanding than event-based (McDaniel & Einstein, 2000). Twenty-four participants drove two simulated routes through a busy town centre while their behavioural responses were recorded. Drivers were required to follow a lead vehicle and maintain a fixed headway throughout both drives and, in one drive, performed a concurrent errand task. The time-based errand task required drivers to make a specified response at regular intervals while the event-based errand task was location specific. In contrast to predictions, drivers given event-based errands showed greater difficulty in mirroring speed changes in the lead vehicle compared to drivers in the time-based group.

#### **Dividing and Focussing Attention Hazards in Virtual Nottingham**

Konstantopoulos, P.<sup>1</sup>, Chapman, P., & Crundall, D.  
University of Nottingham, United Kingdom<sup>1</sup>

Driving environment is complex and full of potential hazards. Safe driving depends on driver's ability to monitor multiple sources. However, dividing attention across multiple potential hazards must give way to focussing upon one actual hazard when it occurs. Previous research has used the term Dividing and Focussing attention (DF) for these situations. Also, it has been stated that novice drivers find it more difficult to cope with DF hazards than experienced drivers. In order to further investigate this issue, we developed several simulated scenarios on which the driver needs to monitor two hazard precursors (e.g. two pedestrians on either side of the road). Eventually, one of these precursors turns into an actual hazard (e.g. one of the pedestrians walks into the road) on which the driver has to allocate attention and adjust driving behavior. A motion-based driving simulator was used to conduct this study. Participants drove around virtual Nottingham, a high-definition database (LiDAR scan), while their driving behaviour was recorded. The results are discussed in relation to DF hazard behaviour, driving experience and gender.

#### **Decision-making at signalised intersections as function of cognitive load**

Kaul, R.<sup>1</sup> & Baumann, M.  
DLR German Aerospace Center, Germany<sup>1</sup>

The demands on a driver, approaching a signalised intersection can be high, e.g. due to complex intersection layouts, high traffic densities, or the signal change from green to yellow. If the traffic light changes from green to yellow, the driver has to make a decision (stop vs. go). The decision-making process is influenced by a variety of different factors. Also psychological factors, like perceptual cues as part of bottom-up processes and higher cognitive control structures (top-down processes) are influencing the decision-making process. An experiment was conducted to investigate the influence of perceptual cues and cognitive load (low vs. high) on the stop/go behaviour at signalised intersections. The results show that the existence of perceptual cues is influencing the stop/go behaviour and high cognitive load impairs reaction times after signal change. It is concluded that in highly demanding traffic situations, the decision-making process is based on simple driving heuristics, to reduce the cognitive demands of the situation.

#### **Policy**

Wednesday 29th of August, 16:00 - 18:00 - Room 16

#### **Run-off-road crashes: a multidisciplinary in-depth study on types and contributory factors**

Davidse, R.<sup>1</sup>, Doumen, M.J.A., van Duijvenvoorde, K., & Louwerse, W.J.R.  
SWOV Institute for Road Safety Research, the Netherlands<sup>1</sup>

Run-off-road crashes are responsible for one third of all fatal crashes in the Netherlands. As the numbers of these crashes show a slower decline than other types of crashes, a multidisciplinary in-depth study was conducted to gain insight in the factors and circumstances that have an influence on the occurrence and the outcome of run-off-road (ROR) crashes. A total 59 ROR crashes were studied in detail based on interviews with all drivers involved and road inspections of all crash locations. For each of the crashes, the in-depth team tried to determine the course of events and which factors had played a role in the occurrence of the crash and possible injuries. A distinction was made between factors related to the driver of the vehicle, to the vehicle itself, to the road, and to general conditions at the time of the crash. All relevant factors were selected, as the starting point of the analysis was that a crash is the consequence of a confluence of events and that multiple factors play a role in the causation of crash and injury. After all 59 crashes had been described in this manner, crashes with similar crash processes (comparable combination of contributory factors) were grouped into types of ROR crashes. Seven types of ROR crashes were identified. This paper describes the prototypical scenarios of these types of ROR-crashes and the contributory factors that were most frequently encountered.

#### **Risky driving and recorded driving offenses: A follow-up study**

Rajalin, S.<sup>1</sup>, Radun, I., & Summala, H.  
Liikenneturva (Central Organization for Traffic Safety in Finland), Helsinki, Finland, Finland<sup>1</sup>

This research is a follow-up of the study that compared the recorded offenses between 134 drivers stopped by the police because of sustained risky driving and 121 control drivers selected at the same locations (Rajalin, S. (1994). The connection between risky driving and involvement in fatal accidents. Accident Analysis and Prevention, 26, 555-562). Almost twenty-five years after the collection of the original data, we were able to trace 96.5% of the cases (97.8% for the "risky" and 95% for the control drivers). The preliminary analysis of the driver records showed similar findings to the original study: the risky drivers continue to have more traffic offenses than the control drivers do. In addition to the analysis of recorded offenses, we collected a questionnaire data in 2011 with more than 60% response rate. The findings are discussed in terms of driving exposure, age, profession, and attitudes about traffic safety.

#### **Behaviour at fixed-site urban speed cameras**

Stradling, S.<sup>1</sup>, Broughton, P., & Fylan, F.  
Edinburgh Napier University, United Kingdom<sup>1</sup>

Drawing on the work of Corbett (Corbett C. & Simon, F. (1999) The Effects of Speed Cameras: How Drivers Respond. UKDETR, Road Safety Research Report No.11) this presentation reports the proportions of self-reported conformers, compliers, manipulators and defiers at fixed-site speed cameras in built-up locations, using data from a recent, large UK sample of car drivers, and compares them with a sample of P2W riders and with car drivers detected speeding and diverted from prosecution to a Speed Awareness Course (SAC). Respondents were invited to indicate the speed they would normally be doing before, at, and after a speed camera in a 30mph zone. Additional sub-categories of nervous conformers, late compliers, and full, partial and released



manipulators are reported. More riders than drivers report observing the speed limit before, at and after a camera. The presence of approximately equal proportions of conformers, compliers and manipulators in the SAC group poses problems for addressing both skill and attitude deficits in a single half-day course.

#### **A Comprehensible Framework for Applying Behavioural Insights in Mobility-Related Policy and Modelling**

Schaap, T.<sup>1</sup> & Van de Riet, O.A.W.T.

Netherlands Institute for Transport Policy Analysis KiM, the Netherlands<sup>1</sup>

Behavioural responses to mobility-related policy measures often differ from ex ante expectations, and insights clarifying these responses are currently dispersed. This paper is the result of an attempt to gather a first set of mechanisms from social psychology and behavioural economics together. A cogent and comprehensible framework is presented, consisting of three categories: individual, social, and physical level mechanisms. This framework can be of assistance in shaping evidence-based policy measures that make optimally efficient use of available means, as well as helping to explain the different effects of deployed policy measures. At its base lies the insight that behaviour can originate from both conscious and subconscious decisions and mechanisms. The framework's validity, coherence and completeness was discussed in a session by experts with backgrounds in social psychology, behavioural economics, and policy analysis. This resulted in a set of five additional mechanisms that can be used in shaping policy measures and in explaining their behavioural effects. Next, the extended framework was applied in a test case involving practitioners from the field of transport policy, who subsequently stated that it was useful and insightful for working systematically with the framework, and that it was helpful in developing policy measures. The framework's completeness and applicability are discussed, as well as suggestions for further research.

#### **Making knowledge exchange between theory and practice a reality: a practical model to enhance road casualty reduction on a decreasing budget**

Hurst, L.<sup>1</sup>, Husband, P., Hellier, E., Hewson, P., & Wellings, P.

Plymouth University, United Kingdom<sup>1</sup>

In the UK there is a statutory requirement on local government to aid road casualty reduction. While Cornwall Council was successful in reaching their 2010 casualty reduction targets, it had no evidence to suggest which initiatives contributed to this achievement and which did not. Much of the research in traffic psychology is done without having any impact on practice, and much 'best practice' in road safety is based on intuition rather than evidence. Cornwall Council recognised an evidence-based approach was required to meet future targets and ensure interventions were gaining the best possible return on investment. There is a framework within the UK, for partnership between business and academia known as 'Knowledge Transfer Partnership' (KTP). The KTP is a government funded project that puts a recent graduate in the workplace with supervision from their employer and a University. Cornwall Council has used this mechanism to embed an evidence-based practice into road casualty reduction. The approach begins with case studies of priority risk groups. The research and collision data is critically appraised and an understanding of the implications for road safety interventions, in terms of relative need and effectiveness, is developed. Change management groups are formed with road safety practitioners, where recommendations from the research can be embedded in practice. The groups allow evidence to be communicated effectively from researcher to practitioner, allowing a sustainable, affordable mechanism for bridging the gap between theory and practice.

#### **Pedestrians**

Wednesday 29th of August, 16:00 - 18:00 - Ronde zaal

#### **Hazard perception abilities among child-pedestrians in a Dome-settings Environment**

Meir, A.<sup>1</sup>, Oron-Gilad, T., Tapiro, H., & Parmet, Y.

Dept. of Industrial Engineering & Management, Ben-Gurion University of the Negev, Israel<sup>1</sup>

Traffic crashes are a major cause of death and injury among children. The present study examined child and adult pedestrians' perception of hazards through a crossing decision task. Twenty-one adults (20-27 years-old) and twenty-five young-children (eight 7-9-year-olds, five 9-10-year-olds and twelve 10-13-year-olds) were requested to observe 18 traffic-scene scenarios presented in a Dome-setting environment (DSE) simulating a typical city in Israel from a pedestrian's perspective, and to press a response button whenever they believed it was safe to cross. Consistent with our hypothesis, results have shown that as pedestrians' age and experience-level increase, their awareness towards potential hazards (i.e., obscured field of view from where a hazard instigator might appear) rises and their ability to anticipate forthcoming events while performing road-crossing task is enhanced. Moreover, both the 9-10-year-olds and the 10-13-year-olds presented a less decisive performance compared to both the experienced-adult pedestrians and the 7-9-year-olds. The study used an innovative paradigm to investigate child-pedestrians' conceptions regarding road-crossing situations. Understanding child-pedestrians shortcomings in accurately evaluating traffic situations may contribute to the effort of creating intervention techniques which may increase their awareness to potential hazards and lead towards reducing their over-involvement in traffic crashes. Conclusions and implications for DSE will be discussed.

#### **Walking behavior of university students in Greece: A descriptive and inferential analysis**

Politis, I.<sup>1</sup>, Papaioannou, E-M., Apostola, T., & Rural & Basbas, S.

Department of Civil Engineering/Aristotle University of Thessaloniki/Associate Researcher, Greece<sup>1</sup>

No one can argue the fact that the urban environment plays a vital role in promoting sustainable ways of travelling in cities, like cycling and walking. The demand for safety and security conditions is greater when students are in the core of interest, since they are used to perform their trips by foot. In this paper, the walking behavior of university students is being examined and commented. The study area is the largest University of Greece, Aristotle University of Thessaloniki, which is located at the city center; a highly populated area where heavy traffic conditions are being observed daily. A revealed preference questionnaire survey was conducted in 958 students, whereas 450 of them participated also in a stated preference experiment. Various statistical tests were performed in order to identify the potential interrelation between the psychological background of the responders, their attitudes, preferences and values, their current travel behavior, as well as their willingness to improve the walking environment in and around the University Campus.

The identification of behavioral parameters which can affect the choices and the preferences of the end user is proving to be one of the most success factor that policy makers and takers should take into consideration.

#### **Social norms of accompanied young children and observed crossing behaviors**

Rosenbloom, T.<sup>1</sup>, Sapir-Lavid, Y., & Hadari-Carmi, O.

Department of Management, Israel<sup>1</sup>

#### **Introduction**

Social norms for accompanied young children and crossing behaviors were examined in two studies

conducted in an Ultra-Orthodox Jewish community in Israel.

#### Method

In Study 1, road behaviors of young children crossing with and without accompaniment and older children were observed, and the actual social norm for accompanied school children younger than 9-years-old was examined. In Study 2, the perceived norm of accompaniment was tested by questionnaires.

#### Results

Young children who crossed without accompaniment exhibited poorer crossing skills compared to older children and to young children crossing with accompaniment. In the four locations observed, the actual accompaniment rate ranged between 15%–60%. The perceived social norm for child accompaniment was lower than the actual norm.

#### Conclusions

The discussion refers to both theoretical issues and their practical implications.

#### **Pedestrians' risk perception— an investigation among Brazilian students**

Torquato, R.<sup>1</sup> & Bianchi, A. S.

Federal University of Parana/ Institute of Transport Economics, Brazil<sup>1</sup>

Risk perception is one of the factors that has been used to explain risk behaviours in traffic. This research aimed to investigate traffic risk perception among pedestrians in Brazil. 303 undergraduate students completed a 30- item questionnaire that depicted pedestrians' risk behaviours. The participants evaluated the degree of safety of those behaviours on a 6-point scale. Significant differences between gender and age groups were found. Men rated risk behaviours as safer than women and so did the youngest compared to adults. The findings are consistent with researches about traffic injuries and accidents that link gender and age as risk factors to be considered. This study presents a methodological contribution to traffic psychology with the development of a new instrument, and a special contribution to public policy makers in Brazil pointing out risk perceptions that must be considered.

#### **Effects of daytime running lights on vulnerable road users**

Platho, C.<sup>1</sup>, Kolrep, H., Böhm, M., Kühn, M., & Gehlert, T.

Human-Factors-Consult GmbH, Germany<sup>1</sup>

The European Commission has decided that from 2011 onwards new types of passenger cars have to be equipped with dedicated Daytime Running Lights (DRL) to increase road safety. However, studies investigating DRL-related safety gains for motorists and safety risks for vulnerable road users draw an inconclusive picture. On behalf of the German Insurers Accident Research (UDV) and in cooperation with the Technical University of Berlin, HFC conducted a series of three studies to examine the effects of DRL on car drivers and vulnerable road users. The field study, which is reported here, was conducted in Denmark and Germany in autumn 2009. (DK: DRL-obligation since 1990; D: no DRL-obligation in 2009). 50 subjects followed a given route leading them towards urban intersections. Gaze behavior towards cars with (mainly low-beam) DRL and without DRL as well as towards vulnerable road users was assessed. While DRL did not influence gaze behavior in bright conditions, in cloudy and rainy conditions cumulative gaze durations were 240 ms ( $p < .05$ ) longer for cars using DRL compared to cars without DRL. However, gaze behavior towards vulnerable road users was not affected by DLR in any condition. Our findings concerning vulnerable road users were supported in the complementary laboratory and simulator study. In the laboratory

study neither low-beam headlights nor dedicated DRL (halogen) impaired the detection and identification of vulnerable road users. In the simulator study no influence of DRL on driving and gaze behavior was detected either.

### **Symposium - The Relationship Between Emotional Well-Being and Satisfaction with Work Commutes**

Wednesday 29th of August, 16:00 - 18:00 - Room 10

#### **Life Satisfaction and Satisfaction with the Work Commute**

Friman, M.<sup>1</sup>, Olsson, L.E., Gärling, T., Ettema, D., & Fujii, S.

Karlstad University, Sweden<sup>1</sup>

In a mail survey of 951 residents of three urban areas of Sweden, satisfaction with their most recent work commutes was measured using self-report rating scales developed in previous research. The ratings were aggregated to index measures of two affective (stressed versus relaxed, alert versus sleepy) and one cognitive (high versus low standard) satisfaction component. Positive correlations were demonstrated with a measure of affect balance constructed from self-reports from memory of frequency times intensity of daily negative affects experienced last month subtracted from frequency times intensity of daily positive affects experienced last month. The affect balance measure was in turn positively correlated with ratings of overall life satisfaction. The results also showed that feelings during the work commutes were predominantly positive or neutral. Explanatory factors include desirable physical exercise from walking and biking, as well as that short commutes provide a buffer between the work and private spheres. For longer work commutes, social and entertainment activities would either increase positive affects or counteract stress and boredom.

#### **How satisfaction with work commute differs among Sweden, Netherland and Japan?**

Fujii, S.<sup>1</sup>, Suzuki, H., Friman, M., Olsson L.E., Gärling, T., & Ettema, D.

Department of Urban Management, Kyoto University, Japan<sup>1</sup>

We have developed satisfaction with travel scale in previous research. The ratings on the scales were aggregated to index measures of two affective (stressed versus relaxed, alert versus sleepy) and one cognitive (high versus low standard) satisfaction component. In this presentation we will report the comparative analysis on satisfaction with work commute between Sweden, Netherland and Japan, using the data of samples of car users in the countries. In the analysis, we will firstly see how such ratings differ among the countries. We will then investigate the determinants of the difference while considering difference of distribution of personal attributes (such as age, sex, and others) and trip attributes (such as travel time duration, commuting travel mode, and others), and the difference of the attributes of work commute environment (such as the level of average traffic congestion). Lastly, we will see the difference of satisfaction with travel among the countries while controlling by the abovementioned variables that affect on the satisfaction. We will discuss why this differences were found while considering differences that were not measured in this research such as cultural difference.

### How satisfaction with trip legs affect whole trip satisfaction?

Suzuki, H.<sup>1</sup>, Fujii, S, Friman, M., Olsson L.E., Gärling, T., & Ettema, D.

Department of Civil and Environmental Engineering, Yamaguchi University, Japan<sup>1</sup>

It was shown that subjective well being with partial activities affected subjective well being for the total activities. Thus, it is presumed that satisfaction with trip-leg would affect satisfaction with whole trip. In this presentation, we compared four aggregation models, that is peak-end model, summation model, average model, duration weighted average model– for representing how people aggregate satisfaction with travel experienced for the trip legs of work commutes into an overall satisfaction with the work commutes. We analyzed data from surveys of commuters implemented in the three largest cities in Sweden.(n=713) The Satisfaction with Travel Scale (STS) were used to measure satisfaction with travel, both satisfaction with trip-legs and with overall trip. As a result of analysis, it was shown that STS for overall trip was more explained by duration weighted average model than other models. In the many previous studies, Peak-end rule has supported to explain how remembered utility is aggregated from instant utilities. However, peak-end model is refuted in this study.

### Travel mode change, satisfaction with travel, and happiness

Olsson, L.<sup>1</sup>

Karlstad University, Sweden<sup>1</sup>

A panel study was performed in Sweden during 2009 to 2011 studying possible effects on happiness of changes in mode. One group of habitual car users (n=40) and one group of new residents (n=57) were given 2 months of free public transport. Questionnaires were distributed on several occasions regarding mode use, satisfaction with travel, and happiness. A control group (n=50) was also recruited, answering the same questionnaires, without taking part in the intervention. The results showed that a change in mode did not significantly influence happiness, neither affect balance or satisfaction with life. During the intervention, feelings of travel stress decreased as car use reduced. However, 9 and 18 months after the intervention started car use had increased and returned to initial levels, so had the feelings of travel stress. No positive long term effect of the intervention on future public transport use was observed. The results support previous findings that mode in itself only play a minor role for happiness. The results furthermore show that the effectiveness in giving away free public transport may be questionable.

### Studying Pedestrians' Well-Being in Urban Contexts

Ettema, D.<sup>1</sup>, Smajic, I, & Dijst, M.

Utrecht University, the Netherlands<sup>1</sup>

Research in mobilities (Sheller and Urry, 2006) and transportation (Jain and Lyons, 2008; Ettema and Verschuren, 2007; Mokhtarian et al., 2001) emphasizes the intrinsic value of travel and its relevance for travellers' subjective well-being (SWB). Therefore, investigating cognitive and affective responses to travelling and how they are affected by the travel context is an important research objective. To date, studies of travel well-being have predominantly relied on recall methods such as surveys (Ettema et al., 2011) or interviews (Jain and Lyons, 2008). However, such recall approaches run the risk of memory bias, since individuals' memory of emotions is questionable. This paper tests an alternative approach to measuring well-being during travel, namely by using respondents' own Smartphones to collect data while a trip is made (experience sampling). This avoids memory errors and allows respondents to provide quantitative and qualitative responses. Yet, the fact that respondents deliver responses during their trip will influence the experienced

well-being to some extent by definition. The data collection by Smartphone is compared with a paper-and-pencil experience sampling method and an ex ante paper-and-pencil recall questionnaire, allowing for a comparison of mode (Smartphone vs. paper-and-pencil) and timing (in situ vs. recall). Data was collected among Utrecht University students for walking trips in Utrecht. Comparisons are made of the recorded behavior, evaluations of the walking trips in terms of well-being, fear and liveliness and qualitative assessment of the data collection methods based on focus groups. Tentative substantive conclusions will be drawn regarding location characteristics and well-being during walking.

### Symposium - Electric vehicles: A tool for transition to more sustainable mobility patterns?

Wednesday 29th of August, 16:00 - 18:00 - Room 9

#### Capturing heterogeneity in the EV market: a segmentation of likely early adopters and mainstream consumers in the UK.

Anable, J.<sup>1</sup>, Schuitema, G., Kinnear, N., Stannard, J., Skippon, S.

The Centre for Transport Policy, University of Aberdeen, United Kingdom<sup>1</sup>

The recent focus on electric vehicles as a potential low carbon pathway for transport has led to speculation about the demographic characteristics, attitudes and travel patterns of typical 'early adopters'. This paper uses results of a UK-wide survey to understand (i) whether there is more than one early adopter segment and (ii) the characteristics of potential 'mainstream' adopters who are vital to sustain market momentum.

A two-part questionnaire informed by prior qualitative work plus innovation and behavioural theory was administered to elicit responses to battery electric vehicles and plug-in hybrid electric vehicles. The sample consisted of UK drivers who had purchased new cars within the last five years (N=4,250 (wave 1), 2,729 (wave 2)). Using factor and cluster analysis applied to a broad set of attitudinal indicators, eight segments were discovered. Each represents a unique combination of self-reported likelihood to adopt a BEV/ PHEV, underlying belief structures, anxieties, travel patterns and the importance attached to symbolic, affective and instrumental motives. This paper identifies the characteristics of groups who are more or less likely to adopt EVs in the short and medium term. It then poses questions about the possible changes to consumer preferences as the market penetration of vehicles intensifies.

#### Driven by symbolic motives: adoption of the electric car

Noppers, E.<sup>1</sup>, Keizer, K.E., Bolderdijk, J.W., & Steg, L.

Social Psychology / University of Groningen, the Netherlands<sup>1</sup>

Besides stressing environmental benefits, stakeholders typically promote electric cars (EVs) by stressing how consumers can cope with the functional drawbacks of these vehicles. However, based on Steg (2005), we argue that cars not only have instrumental benefits, but also affective and symbolic (signaling) functions. We hypothesize that, especially for early adopters, non-instrumental factors, such as self-expression and status concerns, play a key role in the interest in EVs, and we also expect that consumers do not recognize the relative impact of these concerns on their buying intentions. A questionnaire study among potential car buyers supported our hypotheses. When asked how important different attributes of EVs are, respondents rated instrumental, such as reliability and driving range, and environmental attributes as most important. However, the actual interest in EVs was predicted by evaluations of symbolic and environmental attributes of EVs, while

instrumental attributes did not play a significant role when the other motives were controlled for. Our findings suggest that persuading early adopters should focus more on the signaling functions of EVs and less on coping with functional drawbacks.

Steg, L. (2005). Car use: lust and must. Instrumental, symbolic and affective motives for car use. Transportation Research-A, 39 (2), 147-162.

#### **Electric vehicles: Sustainable concepts from a user perspective**

Peters, A.<sup>1</sup>, Dütschke, E., & Schneider, U.

Fraunhofer Institute for Systems and Innovation Research ISI, Germany<sup>1</sup>

The actual potential of electric vehicles (EVs) as sustainable means of transport will depend on the vehicle types, on the energy mix for loading the vehicles, as well as on actual vehicle use. With regard to a sustainable vehicle use, sharing concepts seem most favourable. Within various studies using focus groups and surveys, we investigated, amongst others, (a) the acceptance and intention of using EVs via car-sharing, (b) the importance of environmental aspects, such as usage of renewable energy or environmental design of EVs, (c) preferences with regard to vehicle type and characteristics which influence its environmental impact.

The results indicate that potential and actual users want to be able to fulfil their mobility needs comfortably and without excessive restrictions and costs, but also in an environmental friendly way. Though participants still prefer the classical model of vehicle ownership, car-sharing is perceived as a feasible option for using EVs. Moreover, it is important for participants that the vehicle itself is energy economical. We draw conclusions for marketing and policy measures to promote a sustainable implementation of electric mobility, such as developing intelligent mobility concepts and providing opportunities to test EVs within these mobility concepts in daily life.

#### **When people change mobility behaviour and use electric vehicles or multimodal transport? – An evaluation of attitudes, needs and external conditions in private households**

Dombrowski, F.<sup>1</sup> & Harms, S.

Helmholtz-Centre for Environmental Research - UFZ, Germany<sup>1</sup>

Steadily increasing private car-use generates a number of economical, ecological, and social problems. Therefore, changes in individual travel behaviour are necessary that lead to a more sustainable transport system. One possibility is the promotion of new technologies like electric vehicles or other non-car means of transport.

However, upon what condition people change their mobility behaviour, and which psychological factors support or impede the adoption of alternative means of transport? What role does an own car play in fulfilling real transport demands of private households, and which role might electric vehicles play in meeting those demands?

These questions have been analysed with 20 in-depth interviews with private car-owner households in different socio-demographic and spatial settings. The evaluation of attitudes, needs and daily mobility patterns give an answer which kind of households can be considered as possible adopters of electric vehicles and multimodality.

#### **Charging patterns in electric vehicle users: Evidence for interaction styles from field study data.**

Franke, T.<sup>1</sup>, Cocron, P., Neumann, I., Bühler, F., & Krems, J. F.

Chemnitz University of Technology, Department of Psychology, Germany<sup>1</sup>

With the introduction of Electric vehicles (EVs) new elements of mobility will gain importance. Charging instead of refuelling is a major defining element of electric mobility. We examined charging behaviour from a psychological perspective focusing on user-system interaction styles. Within two field studies EVs were leased to a total sample of 80 users for a 6-month period. Users had access to private and public charging opportunities. They were repeatedly interviewed and filled out questionnaires as well as charging diaries. In accordance to previous research on user interaction with mobile phone batteries (Rahmati & Zhong, 2009) we identified two different interaction styles in charging the EV: charging based on battery feedback (e.g. low battery) vs. charging based on external triggers (e.g. each second day). These styles were related to other psychological variables. The results have implications for user-centred design of electric mobility systems as well as the efficient use of renewable energies.

#### **Driver's behavioural adaptation in response to electric mobility**

Labeye, E.<sup>1</sup>, Sornette D., Moreau F., & Brusque B.

IFSTTAR LESCOT, France<sup>1</sup>

The electric car (EV) is becoming a new form of mobility that involves changes in the driving habits of drivers. Indeed, a recent study observed via a collection of self-reported data 25 users who drove for 6 months an EV. The results showed how EV characteristics induce changes in the different levels of control of the driving task: the strategic level is modified by new route planning due to the limited range, the tactical level by the interactions with other road users to deal with the silent nature of the EV and the operational level by the new braking behaviours due to regenerative braking.

The aim of our research is to study drivers' behavioural adaptation in response to EV characteristics using a more experimental approach. Ten experts in driving of EV drove on a same route, a month apart, 2 instrumented vehicles, an EV and a traditional vehicle (TV). Both of them were equipped with video, GPS, accelerometers and other sensors to record driver's behaviour and vehicle dynamics. The objective was to highlight the difference in the driving task due to the properties of EV compared to those of TV. We observed how the reduced sound of the vehicle actually changes driver's interactions with pedestrians, how the charge saving need impacts on driver's choice in terms of vehicle dynamics, and how the regenerative braking function substitutes for driver the brake pedal.

#### **Advertising**

Wednesday 29th of August, 16:00 - 18:00 - Room 4

#### **The threat of losing respect: a comparison of anti-speeding message themes on young male drivers' speeding behaviour**

Plant, B.<sup>1</sup>, Irwin, J. D., Chekaluk, E.

Department of Psychology, Macquarie University, Australia<sup>1</sup>

Previous research suggests that anti-speeding advertisements that contain both social threat themes and positive emotional appeals may be effective. However, it is unknown whether these



apparent benefits can be attributed to the message theme (i.e., the social threat), the emotional appeal (i.e., evoking positive emotions), or only their combined effects. The driving speeds of 17–25 year-old male drivers were measured prior to and immediately after exposure to an anti-speeding advertisement using a driving simulator. Participants were randomly assigned to a driving scenario containing an anti-speeding billboard advertisement which depicted either a physical threat or a social threat – in both cases the level of response efficacy (absent), message frame (negative), and emotional appeal (neutral-negative) was held constant. The results revealed that the anti-speeding advertisement with a social threat had an effect on reducing young drivers' maximum driving speeds, but the anti-speeding advertisement containing a physical threat did not lead to significant reductions in participants' speeding behaviour. Given that the social threat theme was effective in the absence of a positive emotional appeal, it appears that anti-speeding advertisements containing social threat themes may be more effective when aimed at young male drivers compared to physical threat themes.

#### Physical threat versus social threat: what puts the brakes on male drivers?

Irwin, J.<sup>1</sup>, Reza, F., & Chekaluk, E.  
Psychology, Macquarie University, Australia<sup>1</sup>

This study compared the effectiveness of an appeal using physical threat with that of one using a social threat in trying to change the speeding behaviour of young male drivers. One hundred and thirty two males participated in the study. They were randomly allocated to one of six experimental conditions: A physical, social or control appeal, which was either high or low in response efficacy. The participants' responses to the advertisements were measured in terms of driving behaviour on a simulator and their self reported accounts of message effectiveness and message rejection. The results highlighted that the low response efficacy social-based advertisement was the only appeal that induced slower driving speeds on the simulator. In addition, sensation seeking had been examined as a possible moderator of the effectiveness of the appeals and it was found that the socially based appeal was equally effective on both high and low sensation seekers. With respect to how the participants viewed the effectiveness of the messages, the high response efficacy physical-based appeal was considered to be the most effective and the social-based appeal was deemed to be the least effective by the high sensation seekers. The results both supported and contradicted previous findings.

#### Fear-appeal road safety messages: The effects of message modality on driving behaviour.

Curran, S.<sup>1</sup> & Sarma, K. M.  
National University of Ireland, Galway, Ireland<sup>1</sup>

The effectiveness of fear-based health information campaigns has been the subject of considerable research and debate. Among those involved in road safety research and practice there is a sense that these campaigns are not necessarily effective, without being able to fully articulate the different determinants of effectiveness. This study seeks to determine if the medium of message delivery impacts on driving behaviour, and focusing in particular on the presence or absence of audio and visual images. It is argued that message medium impacts on the extent and nature of fear arousal, which in turn impacts on driving outcomes. A 4-Group experiment was conducted, with participants randomly allocated to condition (auditory information, visual information, full advertisement, neutral advertisement), and change in simulated driving behaviour from pre to post providing the dependent measure. Findings will be of interest to those involved in the design of road safety campaigns and will further inform the literature on fear and threat-based health promotion campaigns.

#### The impact of threat appeals on driver behaviour: A meta-analysis of experimental research 1990-2011

Carey, R.<sup>1</sup>, McDermott, D. T., & Sarma, K. M.  
School of Psychology, National University of Ireland Galway, Ireland<sup>1</sup>

Research examining the impact of threat-based road safety messages on risky driving has reported inconsistent findings. A meta-analysis of the experimental literature (1990-2011), dealing with the impact of threat appeals on driver behaviour, was conducted.

Studies adopting an experimental design, using a behaviour-based dependent variable, were included in the analysis. A search of on-line databases and contact with leading authors in the area led to the identification of 23 studies that met our inclusion/exclusion criteria. Of these 23 studies, 15 examined the difference between participants exposed to threat appeals, and those exposed to neutral information. These 15 studies contributed 77 effect size entries and a total sample size of 3537. Statistical values (i.e., p, t, means and standard deviations) were extracted from the identified studies and converted to effect sizes. Due to the wide range of studies, random effects models were chosen as the computational model across all analyses.

The results indicate that, while threat appeals have a significant impact on the level of fear aroused in individuals, this does not translate into reduced risky driving intentions or behaviour. Findings have important implications for the role of threat-based appeals in road safety campaigns and for experimental research in the area.

#### Symposium - Effect of ADAS use on Information processing processes

Thursday 30th of August, 10:30 - 12:30 - Blauwe zaal

#### Behavioural adaptation to "Visual Distraction Alert Systems"

Wege, C.<sup>1</sup> & Victor, T.  
Volvo Technology Corporation, Sweden, Sweden<sup>1</sup>

This research presents the assessment of adaptation processes of two Distraction-Alert-Systems addressing different aspects of visual behaviour. The tested systems are based on real-time audio feedback regarding driver's off-road glances varying in alert-transparency (warning threshold based on a single-long-glance with or without regarding individuals glance history) and alert-reliability (degree of predetermined false warnings). All combinations are tested with 56 professional truck drivers who were driving on a simulated highway scenario while sending text messages on a portable device.

Key findings show that Visual-Distraction-Alert-Systems promote an adaptation process regarding the driver's interaction coordination with the vehicle and the environment. Alerts cause distracted drivers to be less inattentive, thus resulting in 40% more eyes-on-road time while glances away are 32% shorter. A positive adaption effect, hence safety effect, is indicated by all driving- and visual performance measures. Comparing alert-transparencies reveals significant behavioural differences favouring a warning algorithm which takes into account a driver's glance history (30% more on-road glances). False warnings seem to be a less relevant issue. Consequently, via the present kind of visual scanning monitoring the human is made aware of incidents of loss of driving control – while adapting to a re-allocation of attention.

### Effect of Forward Collision Warning Systems on information processing: An electrophysiological study

Bueno García, M.<sup>1</sup>, Fort, A., Ndiaye, Deleurence, P., & Fabrigoule, C.

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Rear-end collisions represent approximately 30% of all car crashes and has a large economic impact on society. Driver inattention has been identified as the most important contributing factor in rear-end collisions. In this context, Forward Collision Warning Systems (FCWS) have been developed specifically to warn drivers of potential collisions. The main objective of this work is to evaluate the impact of a surrogate FCWS according to its reliability and the attentional state of the driver. Participants were required to avoid collisions with a lead motorcycle in a simplified simulator across three different conditions: driving with a perfect FCWS, with an imperfect FCWS or without a FCWS. In half of the scenarios they simultaneously performed a secondary cognitive task (i.e. dual task). Driving performance measures were recorded along with electrophysiological measures. Results at behavioural level found 1) slower drivers' reaction times when in a dual-task condition; and 2) a benefit of the FCWS in the primary task (i.e. driving). Electrophysiological results revealed 1) a disruption of the target processing by the secondary task at sensory and at higher cognitive neural levels; and 2) a compensatory effect of the alert in dual task. In conclusion, these data shed new light on how an alert can affect the processing of the visual scene.

### The effect of preliminary information about ACC: a matched sample driving simulator study.

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Adaptive cruise control (ACC) aims to support the driver by partly automating speed and headway distance control. However, it cannot be assumed that all users acquire a comprehensive mental model about ACC functionality and limitations before using it the first time. The present study investigated the effects of preliminary information on trust, acceptance, situation awareness and the mental model of ACC over time. A two-way (3×3) repeated measures mixed design was used with three system descriptions as between-subjects factor (realistic, idealised, wrong) and three consecutive trials as within-subjects factor. Preliminary information differed in the amount of information about system limitations: The realistic description informed participants of all potential system failures; the idealised omitted some information and the wrong description included additional information about potential failures that, however, did not occur during driving. A matched sample of 51 participants was allocated to one of the three experimental conditions and drove the same 56-km highway track in a fixed-base driving simulator three times within six weeks. The impact on situation awareness, trust, acceptance and the mental model of ACC as well as the changes over time are presented.

### Behavioural adaptation to an adaptive active collision avoidance system with respect to enhanced mental workload

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Development and Research/BMW Group, Germany<sup>1</sup>

Adaptive advanced driver assistance system, which adapt warning (e.g. pre-warning with forward collision warning system) and comfort (e.g. distance with the active cruise control) rules to the workload of the driver would be the next step in direction of a "driver aware vehicle" as it was proposed by MIT Agelab. Assumed that drivers accepting adaptive systems and don't adapt their risk behavior to the more secure driving situation as proposed in the risk homeostasis theory, the adaptive behavior of such system will help preventing crashes in high workload situations.

To explore these assumptions a first research in a fixed driving simulator has been done. One group drove with a conventional ACC whereas the other group drove with an adapted ACC, which changed distance when workload increased. A modified AttrakDiff as well as general questions to acceptance has been answered with and without clarification of the new features of the adaptive ACC and showed that after clarification there are significant differences in acceptance between both systems. In an emergency braking situation, objective data (brake reaction time, negative velocity) indicated that drivers are using the higher distance to the leading car for a slower and therefore safer deceleration.

### Effects of learning and aging in a dual-task driving environment

Berthon-Donk, V.<sup>1</sup>, Grosjean, M., & Rinkenauer, G.

IfADo, Germany<sup>1</sup>

Driving is a complex task which involves the parallel use of cognitive and sensory-motor functions to guarantee a safe maneuvering of the car. In-Vehicle Information Systems (IVIS) have been developed to support drivers in this task. However, recent research has shown that those systems often increase task complexity, creating dual-task situations that can cause driver distraction, especially for older drivers. In this study we sought to examine the effect of practice and aging on driving and secondary task performance in a highly controlled environment. In particular, we conducted a laboratory experiment that combined a standardized driving task with a secondary visual search task as surrogate IVIS. The primary goals of the study were to (1) examine the effect of practice over multiple sessions, and (2) explore whether older drivers develop specific strategies to better cope with demanding dual-task situations. Results indicate that the amount of dual-task interference decreased with practice for both age groups, as evidenced by improved performance on the driving and secondary task across sessions. It seems that an improvement on the driving task allowed a better coordination of sensory-motor and cognitive processes which allow older adults to better cope with dual-task situations.

### Sustainable transport

Thursday 30th of August, 10:30 - 12:30 - Rode zaal

### Carpooling: when you try it, you adopt it A point on psychological factors involved in the practice

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Nowadays, environmental issues are political and social dilemmas in which personal and common interests have to be dealt with in order to lead to sustainable development. Various local and global initiatives, such as technological innovations or communication, pursue behavior change. Pro-environmental acts are numerous, and are the result of individual will. Carpooling seems to be an ecological gesture, but it implies cooperation and coordination between at least two people (Richard, 2011). The aim of this research is to identify and to analyze several psychosocial factors that could explain the adoption of carpooling. Our survey was carried out among members of a carpooling website (N =118). It had the objectives of measuring effective carpooling behavior and decisional processes, and comparing members who actually practiced carpooling to those who did not, in terms of beliefs and perceived control and reservations. By analyzing decisional processes of carpoolers, results showed that the motivation for carpooling before and after having adopted the practice is not the same and reveals an internalization of carpooling behavior. We also note that

website members who do not carpool mostly explain this behavior in functional terms (no matches found with other carpoolers etc.) rather than psychological factors (lack of motivation etc.). Finally, we note significant differences between gender for the carpooler group on several variables like beliefs or motivation. Results of this study enable us to get a better understanding of explaining factors set in classical carpooling. More recently, a new type of carpooling has appeared, known as dynamic carpooling. Dynamic or real time carpooling aimed at providing more flexibility to rideshare arrangements, reducing the time needed to organize the trip. This innovation may offer new opportunities but may also raise new challenges. (Amey, 2011). As a discussion, we will examine to what extent factors and behaviors can be similar or not in both types of carpooling.

#### **Supporting the implementation of a university carpooling program through transport psychology research**

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The National Technical University of Athens decided to implement a car-pooling system. Our research team was asked to evaluate the university members' intention to participate and make proposals for improving its efficiency. We applied the theory of planned behavior in a sample of 1004 university members, divided in two groups: public transport and car users. We assumed that the necessary adjustments in travel behavior will be different in the two groups (respective costs and benefits) and therefore the intention will vary between them. Thus, we incorporated as background factors the following variables: "Trust" in the cooperative intention of others, "Sense of security" emerged by the participation to the program, psycho-social benefits from their current travel behavior ("Protection", "Prestige", "Autonomy") and "environmental beliefs". The results revealed a high intention (nearly 75%) to participate in the program for both groups, which is mainly affected by PBC and Attitude. Although background models are quite different, "Trust", "Sense of security" and "Protection" have a common and important predictive power. Our results have accelerated the implementation of the program in June 2011, proposing specific tools regarding participant's sense of security (personal cards, id database, signing, detailed information about the program, web contact etc.).

#### **The Role of the Built Environment and Psychology on Bicycling and Walking Behavior: What Matters? What Comes First?**

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Urban Studies & Planning, Portland State University, United States<sup>1</sup>

A considerable volume of research links the built environment with travel behavior. One recent thread of that research focuses on the role of attitudes, with several researchers finding that attitudes may be as or more important than the built environment. These findings point to the need to incorporate psychological theories, such as the Theory of Planned Behavior, when trying to explain travel decisions. Much of the research using these models treat the built environment as an exogenous variable. However, attitudes may be influencing both the environment (in the housing location choice) and travel behavior (once the person has chosen their home). This complexity raises questions about the correct model structure for explaining these relationships and is often referred to as the issue of "self-selection." This research analyzes the relative roles of demographics, the built environment (objectively measured), attitudes, social norms, and perceived behavioral control (PBC) on walking and bicycling activity among adults. The data come from a random phone survey of 853 adults in Portland, Oregon. Two forms of structural equation models were tested. The first form treats the built environment as an exogenous variable influencing attitudes, norms, and PBC. The second form attempts to account for location choice as such: attitudes -> built

environment -> PBC -> walk/bike travel. Separate models are estimated for bicycling and walking. The analysis confirms the important roles that both attitudes and the built environment play in active transportation, though the effects differ for walking and bicycling.

#### **An extended trial of ecodrive training in a commercial fleet**

Symmons, M.<sup>1</sup> & Rose, G.

Monash University, Australia<sup>1</sup>

Ecodriving involves monitoring engine revolutions to make timely gear changes, traveling at an optimum speed for the gear and engine's torque curve, and anticipating traffic conditions. Thus ecodriving emphasises a smooth driving style. Drivers are encouraged to "flow" the vehicle, anticipating potential interactions by looking further down the traffic stream in order to brake less forcefully and less often and avoid unnecessary acceleration – maximally conserving momentum. An ecodrive training program involving a classroom session with on-road tutoring was trialed in a light commercial fleet for comparison with a matched control group. Data collected over a twelve month period indicated that the trained drivers reduced their fuel consumption by a statistically significant 5.6%. Interestingly, the non-trained control drivers reduced their fuel consumption by 3.8%. Though small, the change for the ecodrivers was statistically larger than that obtained for the control drivers. However, given the conditions and the extent of training, it is difficult to imagine how commercial ecodrive training providers can promise substantially higher savings in fuel, and these results call into question whether it is a cost-effective intervention.

#### **The effect of information provision under non-recurrent traffic congestion on driver route choice**

Nathanail, E.<sup>1</sup> & Adamos, G.

University of Thessaly, Department of Civil Engineering, Greece<sup>1</sup>

"Congestion problems in large urban agglomerations seem to increase as travel demand and private vehicle utilization increase. Normal traffic flow deteriorates more under non-recurrent congestion conditions owing to incidents that occur randomly on the road network in terms of type (traffic accidents, flat tire orbits etc.), time, location and severity. The need to provide to the travelers accurate and timeliness information about traffic conditions and incident occurrences, as a proactive measure to prevent or as a response measure to alleviate mobility problems is imperative. Advanced Traveler Information Systems (ATIS) provide real time information and advise about smoother and safer alternative routes to be taken by the drivers in order to avoid excess delays. Predicting the way drivers behave or react to the provided information and adjust their choices, accordingly, are critical issues when assessing the impact of ATIS on driver behavior.

The purpose of this paper is to examine and analyze the effect of providing information to drivers through ATIS, focusing the research on non-recurrent traffic conditions owing to road incidents. In this direction, a laboratory experiment has been conducted on a driver simulator and data have been collected investigating the choices that drivers make under alternative scenarios, such as ATIS existence or not, and incident occurrences. Sub-scenarios have been further formulated assuming different prevailing traffic conditions, i.e. peak versus non-peak hours, and type of information provided, i.e., descriptive, where ATIS may just inform the drivers about the existing traffic conditions on the network, predictive, where ATIS may inform the drivers about the anticipated traffic conditions and the estimated travel time on certain routes, and advisory, when ATIS suggests alternative routes to be taken.

Data collection during the experimental phase follows a well-structured framework, which enables

further processing in such a way so that to lead to the formulation of conclusions about the impact on route choice by the drivers, under each scenario. Data analysis provides estimation of the probabilities of choosing alternative routes on the tested network and examines the parameters that finally affect the choices.

### **The use of Smartphones in the collection of travel behavior data**

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Department of Telecommunications and Information Processing/ Ghent University, Belgium<sup>1</sup>

In Ghent, the MOVE project started in the collection and analysis of crowd behaviour data. The two main goals of the project are first, the collection of data through the use of mobile phones. The second goal is to develop new technologies to process and mine the collected data for crowd behaviour analysis. The technology will allow to make advanced interpretations of historic and dynamic mobile crowd data coming from GSM/GPS and from different classes of users (vehicle, pedestrian, indoor/outdoor). Fusion will be made between data coming from different sources (smartphone, navigation device) and external map data. The interpretation will allow the mining of advanced features/geometry from the crowd data as well as the dynamic (travel) behaviour of the population.

### **Substance impaired driving**

Thursday 30th of August, 10:30 - 12:30 - Room 16

### **Neurocognitive bases of sex differences in DWI behaviour**

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Psychiatry, McGill University, Canada<sup>1</sup>

Similar to the substance misuse and risk taking fields, both gender and sex differences likely contribute to distinct pathways to persistent driving while impaired (DWI). To date, studies of gender/sex differences among DWI offenders have focussed on psychosocial correlates of gender, revealing an important role for social dysfunction and alcohol use in females DWI. The present study investigates sex differences on multidimensional factors, including neuropsychological mediators of decision-making and self-regulation that may contribute to risky behaviour as well as DWI. Specifically, we hypothesize that male DWI behaviour is linked to prefrontal cortex-linked self-regulatory dysfunction, while female DWI is linked to alcohol and psychosocial dysfunction. Method: A community sample of first time (male = 121, female = 100; 18-40 years old) offenders and controls are recruited. Intake sociodemographic, substance use, personality, psychiatric characteristics, functional testing of executive, attention, memory, inhibition capacities, alcohol biomarkers and structural MRI data are collected.

Results: A preliminary analysis based on partial assessment and sampling provided provisional support for our hypotheses. This presentation reports on the full sample of 100 female first-time DWI offenders along with non-offender controls and the full battery of tests and measures.

Discussion: The study is the first to clarify sex differences in explanatory pathways to persistent DWI behaviour.

### **Do students plan their drinking behavior?**

Kemel, E.<sup>1</sup> & Nebout, A.

CETE de l'Ouest & University Paris 1, France<sup>1</sup>

Alcohol consumption is the main factor of road fatalities in France and in 2009, 26% of the drivers involved in alcohol related fatal accidents were under 25. Most of the existing prevention programs invite students to designate a non drinking driver, before a party, when they plan to drink more than allowed. This approach assumes students plan they alcohol consumption accurately. This study aims at measuring and explaining the differences between planned and observed drinking behavior among students.

40 university students reported the BAC they planned to reach during a party, a week before, as well as the confidence they had about their forecast. In addition, they filled an electronic survey, containing items meant to explain discrepancies between planned and observed drinking behavior. The latter was measured during the party, with breathalyzers.

Comparing estimated to measured BAC, we observed significant differences between intentions and observed behaviors. Several items of the survey are found to account for these differences. Among others, mood state and peer influence are significant factors of « unplanned » drinking behavior. Our approach illustrates the complementarity of field measures and intention based behavioral models. The results are discussed from a public policy perspective.

### **Will they really never ever drink and drive in the future? A preliminary result from interviews with disqualified drink drivers in Japan**

Okamura, K.<sup>1</sup>, Kosuge, K., Kihira, M., & Fujita, G.

Department of Traffic Science, National Research Institute of Police Science, Japan<sup>1</sup>

Japan has achieved a remarkable reduction in the number of both alcohol-related road casualties and drivers detected by the police to be under the influence of alcohol, due to legal revisions to toughen punishment against drink driving. A series of legislative measures took place between 2001 and 2009, aiming at deterring general public by severer criminal penalties, lowering the legal limit from BAC 0.05 % to 0.03, immediate license revocation at BAC 0.05 followed by 2 - 10 years of retention period. The effects have been reinforced by collective, social pressure to act accordingly and also by a range of voluntary interventions. However, only a few efforts have been made to understand background and mechanisms of drink driving behaviour and to offer diagnostic and rehabilitative options.

This presentation reports on on-going result from interviews with drink drivers who have been disqualified from driving. Empirical data include personality, social/familial/healthy states, indicators of drinking problems, readiness to change drinking behaviour, attitudes towards drink driving, reflection on their past behaviour and finally, their determination and strategies to avoid drink driving in the future. Additionally, driving history and biomarkers of excessive alcohol use are being collected. Based on the final evidence we will propose a diagnostic and rehabilitative framework to prevent reoffending.



## Medicinal drug use and driving: The effects of benzodiazepines and opioids on simulated driver performance.

Leung, S.<sup>1</sup>, Chapman, R., Bruno, R., Lenne M., Haber, P., & Lintzeris, N.  
Addiction Medicine, The University of Sydney, Australia<sup>1</sup>

### Introduction

In recent years, there has been increasing evidence pointing to a relationship between medicinal drug use and crash culpability. In particular, benzodiazepines and opioid analgesic are implicated in a considerable proportion of road crashes in Australia. There is also mounting concern about the potentially devastating effects of medicinal drug use in combination with an otherwise low-risk level of alcohol consumption.

### Methods

15 healthy volunteers were recruited to this randomised double-blind placebo-controlled crossover study. Participants attended 8 sessions each in which they were administered three study drugs in unique combinations: (1) alcohol (BAC=0.05g/100ml); (2) oxazepam 30mg; and (3) codeine 60mg. Driver performance was measured on a STISIM driving simulator both before and after drug administration.

### Results

Mixed-model analysis with repeated effects revealed significant impairment of driving performance after administration of codeine and oxazepam, with the impairment being more pronounced in the poly-drug conditions.

### Discussion

Acute therapeutic doses of oxazepam and codeine, alone and in combination with a social dose of alcohol, significantly impaired performance on a number of salient driving tasks. That is, poly-medicinal drug use, even in the absence of alcohol, has the potential to cause deleterious effects on driver performance. These findings highlight the need for strategic educational campaigns regarding the risks of driving whilst taking prescribed medicines.

## Alcohol ignition interlocks in all new vehicles? Disagreement between general public and criminal justice professionals.

Radun, I.<sup>1</sup>, Rajalin, S., Ohisalo, J., Radun, J., & Lajunen, T.

Human Factors and Safety Behavior Group, Institute of Behavioral Sciences, University of Helsinki, Finland<sup>1</sup>

Alcohol ignition interlock (alcolock) has become a promising tool in reducing drunken driving. However, the level of mandatory use for only convicted drunk drivers varies greatly between different countries. Finland has recently adopted a new law that requires the installation of alcolock in all vehicles used in school or daycare transport. Along with that law, several high ranked traffic safety workers, parliamentarians, and ministers called for making an alcolock as standard equipment in all new cars. Before making “tough” decisions, lawmakers usually like to “feel the pulse” of the public regarding whatever issue is in question. On the other hand, surveys on those who are implementing the law, such as police officers, prosecutors, and judges, are much less common than on general public. Two type of data were collected in this study: (i) an online questionnaire data on 325 criminal justice professionals (96 prosecutors, 129 traffic and 100 local police officers), and (ii) a questionnaire on a representative of Finnish adult population (15 years old and above; N=1293). Compared to criminal justice professionals, general public seems to agree better with several high ranked traffic safety workers, parliamentarians, and ministers. The implications to traffic policy will be discussed.

## Symposium - Quality improvement in road safety education

Thursday 30th of August, 10:30 - 12:30 - Ronde zaal

### Adherence to and efficacy of the Checkpoints program implemented in driver licensing agencies

Ouimet, M.C.<sup>1</sup>, Simons-Morton, B.G., Leaf, W.A., Casanova-Powell, T., Wang, J., Li, K., & Preusser, D.F.  
University of Sherbrooke, Faculty of Medicine and Health Sciences, Canada<sup>1</sup>

Introduction: Of the few promising interventions, other than graduated licensing programs, the Checkpoints program (a parent-adolescent intervention) has been demonstrated to reduce risky behavior in young drivers when implemented at permit or at licensing. This study examined the effect of the Checkpoints program when implemented at both permit and licensing. Methods: Participants were recruited in driver licensing agencies in Rhode Island, United States and randomized to the Checkpoints program (which encourages parents to provide gradual access to some drivers' privileges) or the control group (which focused on some aspects of the law and vehicle maintenance). Surveys were administered at baseline (T0), permit (T1) and at 1 and 6 months after licensure (T2, T3). Results: About 900 young novice drivers (M = 16.27; SD = 0.34 years) and one of their parents were involved in the study. Follow-up rates ranged from 78% at T1 to 47% at T3. Group differences in driving agreement adoption and restrictions on driving with passengers and at night will be presented. Conclusion: The promise and challenges related to implementation of parents' intervention within the graduated licensing programs will be discussed.

### Understanding parents' attitudes to and knowledge of their role in road safety education

Oxley, J.<sup>1</sup>, Muir, C., Devlin, A., Kopinathan, C., Charlton, J., & Koppel, S.  
Monash University Accident Research Centre, Australia<sup>1</sup>

Parents can play an important role in enhancing road safety education for children as road safety role models and trainers. However, it is unclear how parents understand the importance of their influence in their childrens' behaviour, and the strategies they adopt to teach/model safe traffic participation.

A survey of 273 parents of young children (aged 3 - 10 years) provided some insight into parents' overall attitudes to/knowledge of road safety, knowledge of their role in the development of their child's road skills, and strategies they have adopted to teach road skills. The findings revealed that attitudes to road safety in general were fairly positive and the majority of parents reported an awareness of their role in teaching their children road safety skills and thought their behaviour would influence their children's behaviour. While there was a high level of supervision and teaching of pedestrian and cycling skills, there were some concerning results regarding knowledge of child restraint in vehicles. Moreover, there was an association between parenting style and attitude towards teaching road safety skills. The impact of these findings on developing initiatives to enhance parents' roles as primary trainers of traffic skills and modellers of good road behaviour is discussed.

### The role of parents in informal traffic education; Questionnaire study of parents' knowledge, needs and motivation

Mesken, J.<sup>1</sup> & Hoekstra, A.T.G.  
SWOV Institute for Road Safety Research, Netherlands<sup>1</sup>

Informal traffic education refers to the informal learning process in which road users continuously

learn of their own experiences and the examples set by others in real life. To learn more on how to make better use of the informal learning process, a questionnaire study was carried out among 585 parents who had at least one child in the primary school age (four to twelve years old). The study included questions about the nature of the child's traffic participation and the ways in which parents actively offer their child guidance in traffic. The results of the study indicate, firstly, that a child's age is an important factor in the way children participate in traffic, as well as in the way parents supervise their child in traffic. The study also indicates that physical exercise is associated with children's traffic participation. Parents seem to be aware that they are important role models, as they positively adapt their behaviour when they participate in traffic in the company of their child. When supervising a child in traffic, parents mainly keep a close watch and correct their child when he or she makes a mistake. Parents spend less time on more proactive ways of guidance, like giving unprompted explanations, demonstrating how something must be done, and rewarding good behaviour. These results will be discussed and recommendations will be formulated in terms of how to motivate and assist parents to take a more proactive role in their child's traffic education.

#### **Development of an educational checklist for road safety education**

Visser, J.<sup>1</sup> & Slinger, W.

DHV Mobility, the Netherlands<sup>1</sup>

In the field of road safety education a vast amount of educational products and projects are available. On a continuous basis new educational initiatives are being developed and implemented. Since 1998 there have been moves in the Netherlands to give more structure to the abundance of ongoing road safety activities within the framework known as Lifelong Road Safety Education. As a first step in this process for each target group of road safety education learning goals have been developed. The Goals for Driver Education-matrix was used a theoretical framework for all age groups. This resulted in learning goals with built-in criteria to determine what themes (knowledge, ability and motivation) and what levels (personal, strategic, tactical and operational) the educational packets should be related to. Existing educational packets have been tested against the learning goal criteria. The information is available in a web-based toolkit within which all relevant data is described. The toolkit does not yet give an indication of the didactical quality of the educational packets. This is why recently an educational checklist has been developed which provides a step-by-step plan, inspired by the Intervention Mapping methodology, for the design as well as for the evaluation of educational road safety education measures. The educational checklist should motivate designers and funding organizations to develop evidence based programs and to spend more attention to quality improvement and evaluation.

#### **Intervention Mapping: evidence-based intervention design as the standard approach in traffic safety education**

Ruiter, R.<sup>1</sup>

Work and Social Psychology, the Netherlands<sup>1</sup>

This contribution starts from the perspective that traffic safety education programmes – despite good intentions – show only little effects on indices of behavior change. It is argued that the limited effectiveness of traffic safety programmes can be mainly attributed to the fact that interventions are based on intuitive assumptions about possible causes of risky behavior without taking note of pre-existing empirical findings and scientifically tested theoretical models. This lack of an evidence-based approach is clearly found in the use of fear-arousing messages to motivate safer traffic behaviour. In general, these campaigns fail to be effective because of a poor translation of theoretical insights. To counter this lack of evidence-based intervention design I will introduce Intervention Mapping, which

provides programme planners with a framework for effective and evidence-based decision making in each step in intervention planning, implementation, and evaluation. I will present the general principles and six steps of Intervention Mapping and illustrate its use in the systematic development of traffic safety interventions.

### **Symposium - Factors influencing interactions between car drivers and two wheelers**

Thursday 30th of August, 10:30 - 12:30 - Room 10

#### **Bicyclists Visual Search Behavior**

Shinar, D.<sup>1</sup>

Ben Gurion University of the Negev, Israel<sup>1</sup>

This presentation will focus on the visual search of bicyclists in situations where they might conflict with other road users: car drivers, pedestrians, and cyclists. A miniature camera installed in sun-glasses will be used to record gross directions in glance behaviours when changing lanes, approaching and entering a traffic circle, and approaching and entering intersections. The analyses will compare the glance behaviours with and without helmets to determine if the latter affect the extent of the visual search.

#### **Improving car drivers' detection of motorcyclists in a car DRL environment**

Cavallo, V.<sup>1</sup> & Pinto, M.

Isttar-LPC, France<sup>1</sup>

The question of visual conspicuity has long been considered decisive to improve motorcyclists' safety. The main safety measure in the past has been the use of daytime running lights (DRLs) by motorcycles, which became compulsory in the seventies in many countries. This conspicuity advantage of motorcycles as the only vehicles with DRLs has been questioned by the growing use of DRLs by cars as well. In two experiments, participants were briefly presented with photographs of real-world traffic scenes. A complex urban environment containing motorcyclists, cyclists and pedestrians as visual targets was used. The findings of the first study indicate that car DRLs created visual noise that decreased the detectability of motorcycles, but also hampered the detection of cyclists and pedestrians. The second study explored ways of defining a new, unique visual signature for motorcycles that makes them again easier to detect and identify in a car DRL environment. Color coding (i.e., a yellow motorcycle headlight) proved most effective, and an additional light on the motorcyclist's helmet also improved motorcycle detectability. The studies as a whole suggest that more attention should be paid to motorcyclists and other vulnerable road users when introducing car DRLs.

#### **An Investigation of Powered-Two-Wheelers' Acceptability towards Conspicuity Treatments and influencing factors**

Rößger, L.<sup>1</sup>, Mühlbauer, F., Krzywinski, J., & Schlag, B.

Technische Universität Dresden, Germany<sup>1</sup>

Compared to other motorised road users, Powered Two-wheelers (PTWs) bear a relatively high accident risk. Analyses of multiple party accidents indicated that one major contributing factor is that PTWs are less conspicuous than other vehicles. Conspicuity aids are treatments considered to counteract the poor conspicuity of PTWs and several treatments were previously found to enhance road users' visual attention for PTWs. However, regardless of the effectiveness, the preparedness

of PTW riders to use conspicuity treatments will finally decide about their wide spreading among the rider community, and thus, about their success in terms of safety benefits. We conducted a study focussing on riders' acceptability towards new concepts of conspicuity treatments (dynamic helmet lights, specific frontal light configurations) and already known treatments (warning vests). N = 66 motorcycle riders were invited to demonstrations of treatments and were asked about their views by a standardised questionnaire. Beyond measuring of riders' acceptability, a screening of underpinning criteria for acceptability judgements was conducted. Moreover, information about personality traits, risk attitudes and riders' behaviour was obtained. This approach enabled us to gain deeper insight into weakness and strength of treatments from riders' perspective and to investigate effects of rider's profile and evaluation criteria on acceptability.

#### **Exploring cyclists' experiences of aggressive behaviour while sharing roads and paths**

Poulos, R.<sup>1</sup>, Hatfield, J., Rissel, C., & McIntosh, A.

School of Public Health and Community Medicine, University of New South Wales, Australia<sup>1</sup>

The issue of aggression between cyclists and other road users has been the subject of considerable media attention in recent years, yet there is very little data in the literature on the experience of aggression from the perspective of the cyclist. Further, hostile road behaviour towards cyclists is a frequently cited deterrent to cycling, and an understanding of the underlying causes will help to inform interventions aimed at improving the way people (motor vehicle drivers, cyclists and pedestrians) share space.

Drawing on findings from the Safer Cycling Study, a large cohort study of cyclists in the state of New South Wales, Australia, this paper provides exposure-based rates of incident aggressive events reported by cyclists, and describes the form, the infrastructure location, and the perceived underlying factors leading to aggressive behaviour. With reference to published research which largely concentrates on aggressive behaviour among motor vehicle drivers, this paper will discuss implications for road safety and potential avenues for prevention.

#### **Does experience of one type of two-wheeler affect behaviours and attitudes to other types of two-wheelers?**

Haworth, N.<sup>1</sup> & Rakotonirainy, A.

CARRS-Q, Queensland University of Technology, Australia<sup>1</sup>

Failure to give way by motor vehicles is a factor in many collisions with both powered and unpowered two wheelers (TWs). Motor vehicle drivers often report that they did not see the TW, but research has shown that motor vehicle drivers who have experience riding a motorcycle are less likely to fail to detect motorcycles. The research reported here examines whether this phenomenon extends to detection of bicycles and whether car drivers who have experience with one mode of TW show improved detection of the other mode. A driving simulator study was conducted in an Australian urban setting which incorporated some of the most common car-TW crash scenarios. Participants with car-only, car plus motorcycle, car plus bicycle, and car plus bicycle plus motorcycle experience operated a car simulator. Their interactions with both types of TWs were measured in terms of visual detection, lateral distance and speed when approaching and passing. The effects of different levels of colour and lighting of the TWs on driver responses were also examined. The attitudes of participants towards TWs were measured in a questionnaire.

### **Symposium - Auditory Distraction**

Thursday 30th of August, 10:30 - 12:30 - Room 9

#### **The Disparate Signatures of Cognitive and Visual Distraction on Driving Performance**

Cooper, J.<sup>1</sup> & Strayer, D.L.

University of Utah, United States<sup>1</sup>

Over the last decade, a growing body of research is beginning to outline the risks associated with performing a variety of secondary tasks while driving. Increasingly, however, researchers using naturalistic and experimentally controlled methodologies are coming to different conclusions regarding the risks associated with cognitive distractions such as cell phone conversation. However, with the gentrification of driver distraction research, it has also become evident that predominately cognitive or visual tasks may each give rise to somewhat distinct patterns of driving interference. As an example, one now common finding is that visual distraction often leads to degraded lateral control, whereas cognitive distraction has been shown to increase lateral control. That is, cognitive distraction often results in virtually no loss of automatic, low-level, vehicle control; whereas visual distraction nearly always does. However, cognitive distraction is often found to negatively affect controlled, attention reliant, performance measures. We propose that the disparate signatures of cognitive and visual distraction on driving performance may account for many of the apparently contradictory findings between naturalistic and experimentally controlled driving research, especially as it relates to the calculation of crash odds ratios arising from surrogate crash measures.

#### **"Sing, sing a song..." Is singing while driving more dangerous than listening to music?**

Rudin-Brown, C. (Missy).<sup>1</sup>, Hughes, G., & Young, K.L.

Monash University Accident Research Centre, Australia<sup>1</sup>

Two common activities performed while driving include listening to music and singing along to music. It is not known whether either activity is associated with decrements in driving performance. This study aimed to investigate the effects of both activities on driving performance. Twenty-one participants completed three trials of a simulated drive concurrently with a peripheral detection task. The trials included a baseline (no music) condition, a condition in which participants listened to music, and a condition in which participants sang along to music. Singing to music was associated with slower and more variable speeds than driving with no music; however, listening to music was associated with the slowest speeds overall. Unexpectedly, singing and listening to music were associated with better lane keeping performance than the no music condition. Nonetheless, participants reported higher subjective mental workload and feelings of distraction when they were singing to music while driving than when they were either listening to music or driving in silence.

#### **Strategies to deal with the auditory distraction induced by radio-listening while driving**

Undal, A.B.<sup>1</sup>, Platteel, S., Steg, L., & Epstude, K.

University of Groningen, the Netherlands<sup>1</sup>

The current study investigated how drivers handle auditory distractions induced by listening to the radio while driving in complex versus simple traffic environments. We propose blocking out the audio-stimuli to be an effective strategy, especially when the traffic complexity is higher. The experimental group (radio) drove in the simulator while listening to a radio-program consisting of music, talk-radio and commercial excerpts. After the simulated drive, they were given a recall task about the content of the radio-program. In addition, a control group (no-radio) was employed to compare the driving performances of drivers in the presence and absence of radio-listening. Results revealed that both groups performed equally well in the majority of the performance

indicators. However, participants who listened to the radio adopted a more cautious driving style. Importantly, drivers in the radio condition recalled less talk-radio excerpts from the drive that was high in traffic complexity compared to the drive low in traffic complexity. We concluded that drivers do not necessarily attend to the content of radio programs, and they actively block out the audio- stimuli particularly when the driving task is more demanding.

#### **A Viable Alternative Music Background As Mediated Intervention For Increased Driver Safety** Brodsky, W.<sup>1</sup> & Kizner, M.

Music Science Lab, Department of the Arts, Ben-Gurion University of the Negev, Israel<sup>1</sup>

In-car music listening requires drivers to process sounds and words, and many drivers sing the melody and/or tap along to the rhythm. While it may difficult to assess music as a risk-factor for distraction, studies have reported: momentary peak levels in loud-music disrupts vestibulo-ocular control; loud music causes a decrease in response time; arousing music impairs driving performance; and quick-paced music increases cruising speed and traffic violations. It is indeed worrying that drivers underestimate the effects of music, and do not perceive decreased ability due to music-generated distraction. In the current study we produced a music background program designed as an optimal listening environment for driver safety, and conducted two field-tests. Study I compared music CDs brought from home to the experimental music; the results indicated that preferred-driving-music was rated higher in enjoyment but also caused greater levels of mental involvement. Study II explored repeated exposure of the experimental program; the results indicated that drivers remained moderately aware of the music background, and consistently reported high-levels of perceived driving safety with positive mood states. We recognize that in-car listening will forever be part of vehicular performance, and future research should invest in exploring music backgrounds that offer increased safety.

#### **Infrastructure and road safety**

Thursday 30th of August, 10:30 - 12:30 - Room 4

#### **Driving behaviour and experience of two types of road works**

Vrieling, J.<sup>1</sup>, Brookhuis, K.A., de Waard, D.

Royal Haskoning, the Netherlands<sup>1</sup>

Drivers are confronted with a changed road environment when driving at road works: compared to a normal road situation the lanes are smaller, the color of the delineation has been changed to yellow and maximum speed is reduced to 70 or 90 km/h. In the Netherlands a new type of road works has been introduced in which the maximum speed is 100 km/h, lanes are almost as wide as normal and the delineation is white. 25 drivers were asked to drive at the normal and new type of road works and a control road. Cameras both recorded the road and the driver and after each road subjects were asked to rate their mental effort and complete questionnaires. The lateral position of the subjects is determined, as well as the percentage of overtaking, hand positions on the steering wheel and their gesture. First results show that drivers have similar mental effort at both types of road works; compared to normal road works subjects drove more frequent on the left side of the lane probably because of the presence of barriers at the new type of road works.

#### **Differences in driving behaviour at a signalised intersection between the green and yellow phase.**

Duivenvoorden, C.W.A.E. (Kirsten).<sup>1</sup>, van der Horst, A.R.A. (Richard), Wegman, F.C.M. (Fred)  
SWOV Institute for road safety research, the Netherlands<sup>1</sup>

Various studies are conducted focusing on driving behaviour of drivers at the onset of yellow and eventually red light running. Although these studies address the safety issues of the yellow and red light running, little attention is paid to how this behaviour relates to the situation when the traffic lights are green. Therefore, little information is available on driving behaviour of drivers passing through an intersection during the green phase. This study examines driving behaviour (e.g. driving speeds) of vehicles passing through a signalised intersection when the light is green. The purpose of this study is to describe how motorised traffic passing through a signalised intersection during the green phase and at the onset of yellow.

In the present study, a signalised rural intersection was equipped with two cameras to unobtrusively study driving behaviour of vehicles passing through the intersection. Two weeks of video recordings were collected. Preliminary results show that driving speeds differ significantly between the green and yellow phase. The results provide useful insights for a driving simulator study on improving intersection safety to be performed. More results will be presented in the paper.

#### **Effects of visual design in tunnels in a simulator study - Why were there gender differences?**

Patten, C.<sup>1</sup>

VTI, Sweden<sup>1</sup>

Driving in tunnels is generally considered to be more dangerous than other type of road because, in the event of an accident in the tunnel, emergency and rescue teams are hampered by the tunnel environment. Moreover, a relatively minor incident such as a vehicle fire on the hard shoulder of an open-air motorway can have devastating consequences for everyone in the tunnel such as the Mont Blanc tunnel fire in 1999 where 39 people died (Luchian, 1999). Tunnels can, however, solve a number of traffic management problems in cities such as Stockholm. The main purpose of this study is to test the hypothesis that enhanced optical cues increase lateral control and reduce driver workload in tunnel driving. In addition, it is suggested that tunnel driving in general requires more mental effort than driving on an open road; that drowsiness leads to impaired lateral control performance. Participants (n = 24) drove in four different scenarios. A Highway, a tunnel with minimal lighting and design characteristics (T1), a tunnel with supporting ceiling lights (T2) which is similar to a modern tunnel where the lights follow the road geometry, and a tunnel that had misleading ceiling lights (T3). The order for the driver's state and the scenarios was balanced. The tunnels were 17 km long. Effects of different visual design of this study suggest that 1) the mental workload was higher towards the end of the tunnel compared to the beginning. Women exhibited higher mental load (peripheral detection task (PDT) and the category ratio scale 10 (CR10)) than men, and especially for tunnel 3 (with misleading visual cues), and 2) lateral control generally increased between the highway and tunnel scenarios. The biggest difference was between the sexes, where women would appear to be affected more by changes in the visual design than the men who appeared to be relatively detached.

#### **Variable message signs design as a case for visuospatial cognition**

Lucas-Alba, A.<sup>1</sup>, Blanch, M.T., & Cabrejas, A.B.

Departamento de Psicología y Sociología/University of Zaragoza, Spain<sup>1</sup>

Since 2007 the European Commission co-funds the EasyWay program, focused on telematics



applications for road transport. Efforts made by Europeans to increase their commonalities also affect road signs, and particularly Variable Message Signs. VMS combine different types of informative elements (pictograms, alphanumeric, words) that then should be perceived, understood and followed by road users. This brings many complexities to VMS design. The contribution of Traffic Psychologists to improve road signs perception has given many of the expected fruits (Wogalter, 2006). But our current understanding of road signs comprehension, particularly international ones, is not so mature in practical terms. This gap could be reduced by bringing the theoretical frame concerning the generation of mental models derived from visuospatial reasoning (Tversky, 2005; de Vega, 1996; Johnson-Laird, 2006) to the case of VMS design. Road Administrations are committed to a communication chain made by a spatial road context (e.g., right lane closed due to road works, congestion length of 4 km) that must be somehow described to (international) drivers via VMS, so they generate certain mental models and take decisions accordingly. Dragging on recent European studies on VMS comprehension (Lucas et al., 2011), this paper bring some data in favor of that approach.

#### **The effects of combinations of road features in Europe - results of ERASER**

Houtenbos, M.<sup>1</sup>, Aarts, L.T., & Weller, G.

SWOV Road Safety Research Institute, the Netherlands<sup>1</sup>

Road safety can benefit from roads that are designed in a way that is self-explanatory for drivers. Indicating an appropriate driving speed is a main issue in self-explaining road design. Previous research has focused on the impact of different design elements on speeding behaviour, but it is less clear how universal these effects are. This was the focus of an online questionnaire study for the ERASER European project on self-explaining roads. It was conducted simultaneously in 6 European counties (N=307): Austria, Germany, the Netherlands, Great Britain, Ireland and Sweden. In total, 24 pictures of rural roads were presented; each a different combination of road width, separation of driving direction, vegetation of the roadside environment and the number of lanes per direction. Participants indicated their own driving speed and a safe speed limit on these roads. Results indicated that there are particular road features whose effects could be considered relatively self-explaining in the purest sense as they are similar for all countries (road width and vegetation). Effects of other road features, (lanes and type of separation) differ per country. This implies that extra communication or complementing roads with more self-explaining features might enhance desired speed behaviour.

attempts to apply this theory to what is already known about behavioural adaptation, and to predicting when behavioural adaptation might, or might not, occur.

In addition to discussing RAT as a model of driver behaviour the presentation will discuss the non-trivial issue of how to determine whether or not drivers are aware of changes in driving task difficulty (or demand, or feelings of risk), and whether their behaviour can be influenced even in the absence of such awareness. The concept of Bayesian Decision Theory will also be introduced and discussed; it will be shown that this approach is a sensible addition to RAT in that it helps to explain how expectation can play a role in driver decision making and processing, and our understanding of behavioural adaptation.

#### **Potential negative behavioural adaption by young novice drivers to in-vehicle technologies, training programs and licensing policies**

Senserrick, T.<sup>1</sup> & Mitsopoulos-Rubens

Transport and Road Safety Research, Australia<sup>1</sup>

We review the potential for young novice driver negative behavioural adaptation to three main crash countermeasures: in-vehicle technologies, driver training programs, and graduated driver licensing policies. "Novice drivers" are defined as those in the early years of independent licensed driving, that is, those on a first driver licence allowing them to drive unsupervised. "Young drivers" are defined as those under the age of 25 years. In general, we argue that novice drivers may be more prone to negative behavioural adaptation due to their driving inexperience and therefore under-developed cognitive-perceptual skills important for safe driving. We also argue that young novices in particular are susceptible due to developmental changes that occur during the adolescent years. We conclude with suggestions on how to avoid, or at least minimise, negative behavioural adaptation by young novice drivers in relation to the countermeasure examples explored. In essence, we propose that the key to avoiding or minimising negative behavioural adaptation among young novice drivers is a greater awareness and a more thorough and accurate understanding of young novice issues by all concerned (e.g., system and program designers, training providers, policy makers, young novice drivers and their parents), that is translated into action.

#### **Is there a biological basis for road safety-related behavioural adaptation?**

Rudin-Brown, C. (Missy)<sup>1</sup> & Fletcher, P.J.

Monash University Accident Research Centre, Australia<sup>1</sup>

'Behavioural adaptation' in the road safety context can be defined as 'the collection of unintended behaviours that occurs following a change to the road traffic system'. Typically, researchers are most interested in those adaptations that negatively impact aggregate road safety. In the disciplines of biology and animal behaviourism, 'adaptation' refers to 'the process of change by which an organism or species becomes better suited to its environment'. In this sense, a vast range of behavioural adaptations has been documented in the scientific literature, from chimpanzees modifying their diet to include leaf varieties that combat disease to domestic horses changing their behaviour in efforts to cope with captivity. It is likely that there is a biological basis for behavioural adaptation that is common across mammalian species. As an evolutionarily innate response, behavioural adaptation would therefore be expected to be expressed differently amongst different groups of people and across individuals. Evidence from the neuropsychological and driver behaviour literature in support of a biological basis for five basic cognitive processes that underpin behavioural adaptation (attention, instrumental [operant] learning, decision-making, memory, and planning) will be presented and discussed in terms of implications for traffic psychology.

### **Symposium - Behavioural Adaptation: Translating theory into action 2**

Thursday 30th of August, 13:30 - 15:30 - Blauwe zaal

#### **Updating Risk Allostasis Theory to better understand Behavioural Adaptation**

Kinncar, N.<sup>1</sup> & Helman, S.

TRL, United Kingdom<sup>1</sup>

That behavioural adaptation occurs only sometimes suggests that certain conditions must be met before a behavioural response that was not desired takes place. The challenge to researchers is to explain why it occurs only sometimes and to offer a predictive model to assist designers and practitioners in managing unwanted behavioural responses to changes in the vehicle or road system.

Broadly, this presentation discusses and updates Risk Allostasis Theory (RAT; Fuller, 2011) and then

### Before the behaviour: considering behavioural adaptation as part of the design process

Carsten, O.<sup>1</sup>

Institute for Transport Studies, University of Leeds, United Kingdom<sup>1</sup>

As driver assistance and support systems become more complex and more varied, the potential for unanticipated behavioural response increases. One solution is to conduct extensive real-world trials of such systems in the form of so-called Field Operational Tests (FOTs). But these trials are very costly and it is not practical to conduct them for every system, function and variant of a function. As an alternative to the FOT, we may use driver behavioural modelling in an effort to understand and anticipate potential adaptations to advanced driver assistance systems. This presentation discusses such modelling approaches and explores design solutions for handling behavioural adaptation. Not all of these design solutions are necessarily aimed at minimising BA: it is important to exploit situations in which adaptation might be positive.

### Acceptance of new technology and policies

Thursday 30th of August, 13:30 - 15:30 - Rode zaal

### Trusting and accepting automation technology in cars

Verberne, F.<sup>1</sup>, Ham, J.R.C., & Midden, C.J.H.

Eindhoven University of Technology, the Netherlands<sup>1</sup>

To persuade people to accept and use smart systems in cars, trust in these smart systems is crucial. The media equation suggests that trust in technology (system trust) could be treated analogously to trust in humans (social trust). Because sharing goals leads to social trust, we expected that sharing driving goals could also lead to trust in and acceptance of Adaptive Cruise Control systems (ACCs). In an experiment, participants (N = 57) were presented three ACCs that differed in their automation type. Furthermore, the ACCs either shared the driving goals of the participants or not. For each ACC system, trust and acceptance were measured. Results suggest that ACCs sharing the driving goals of the user were trusted and accepted more than ACCs not sharing the driving goals of the user. Furthermore, ACCs that took over driving tasks while providing information were trusted and accepted more than ACCs that took over driving tasks without providing information. Trust almost fully mediated the effect of shared driving goals on the acceptance of ACCs. As when trusting other humans, trusting smart systems in cars depends on those systems sharing the user's goals.

### Determinants of hydrogen refueling facility acceptance: a model based on the technology acceptance framework

Huijts, N.<sup>1</sup>, Molin, E.J.E., & van Wee, B.

Transport and Logistics/TU Delft, the Netherlands<sup>1</sup>

In this paper, the technology acceptance framework described by Huijts et al. (2011) is applied to understand Dutch citizens' intention to act in favor of or against the opening of a local hydrogen refueling facility. Separate structural equation models are estimated for those in favor (supporters, N=69) and those against (opponents, N=137). The results show that personal norm is the strongest and attitude towards acting the second strongest direct predictor for intention to act in both models. In addition, in the supporters model perceived behavioral control and social norm were also found to have direct effects. The factor perceived effects of the technology has the strongest indirect effect in both models. In the supporters model, this factor is mainly influenced by trust in

the refueling station owner, whereas in the opponents model, this is mainly influenced by trust in the municipality. Other indirect effects on intention to act are found for outcome efficacy and affect related to the technology. Furthermore, the paper discusses alternative model specifications and policy implications of the results. Overall, it can be concluded that the technology acceptance framework is a useful framework for understanding intention to act with respect to hydrogen facilities.

### Acceptability determinants of advanced driver assistance systems

Schade, J.<sup>1</sup>, Rößger, L., & Schlag, B.

Technische Universität Dresden, Germany<sup>1</sup>

We adopted and extended the theoretical acceptability model developed by Schade & Schlag to investigate and to explain the acceptability of three advanced driver assistance systems (Lane departure warning, Collision Warning with Brake Support, blind spot monitor). Thereby, we tested the predictive power of classic model variables like problem perception, knowledge, perceived effectiveness and social norms with additional variables like image, comfort, safety and experience to explain the acceptability and intention to buy and use these systems. Standardized, scenario-based interviews were conducted during a representative computer assisted web survey (N = 2001). Results show that in particular social norms, image and comfort contribute to the explained variance of acceptability (in total 66-68 %). By applying a SEM approach we further clarify the causal structure of the underlying independent variables. Finally, we discuss the usefulness of the adoption of the acceptability model to other domains.

### Drivers' choice in speed support. Defining the acceptability of Intelligent Speed Assistance.

Vlassenroot, S.<sup>1</sup>

Institute for Sustainable Mobility / Ghent University, Belgium<sup>1</sup>

To have knowledge about the acceptability of Intelligent Transport systems (ITS) is most beneficial for the development of supported implementation strategies. So far, different theories and methods, also stemming from other domains, have been used to define and conceptualize the notion of acceptability. In our research we first developed a theoretical concept to define acceptability of ISA based on different theories and methods used in ITS & ISA research. Secondly we tried to find out which predefined indicators were relevant to define the acceptability of ISA. Background factors, contextual issues and ISA-device related factors were used as indicators to predict the level of acceptability. The effectiveness of ISA (1), equity (2), effectiveness of ITS (3) and personal and social aims (4), were the four variables that had the largest total effect on the acceptability of ISA.

### Consumer perceptions of innovative cars

Pol, M.<sup>1</sup> & Brunsting, S.

ECN, Energy research Centre of The Netherlands, Policy Studies, the Netherlands<sup>1</sup>

A successful transition from the conventional fossil cars to energy-sustainable cars requires a major behavioral change of car-consumers who need to make choices about new options for transport with uncertain costs and benefits compared to their current car.

This paper examines consumers' perceptions about innovative cars and considerations for buying or not buying innovative cars (hybrid, electric, plug-in electric, hydrogen, flexifuel). In this study an on-line questionnaire on attitudes, interests and social norms regarding innovative cars was conducted among 339 Dutch respondents who recently bought a new car. To obtain in-depth understanding of the answers, a follow-up study was conducted consisting of two focus

groups with a sample of survey participants. These focus groups respectively concentrated on respondents' perceptions of innovative cars, and on the personality traits of the 'typical' innovative car driver.

The results of the survey show that perceptions of innovative cars are strongly influenced by affective aspects and to a much smaller extent by environmental impacts. The results of the focus groups indicate that people hold several (negative) misperceptions about innovative cars. The findings indicate that besides the instrumental aspects of cars, affective aspects of car use will be a major predictor of innovative car uptake.

#### Dealing with Parking Pricing - User Reactions towards differentiated Pricing Structures

Francke, A.<sup>1</sup> & Schweigler, D.

Technische Universität Dresden, Germany<sup>1</sup>

If free parking exists, everyone pays for it, except the motorist. In this context, pricing policies such as (dynamic) parking pricing appear to be a very effective tool. The economic best pricing model would be if parking lots in every street are priced different at every hour depending on the demand situation. But this would result in high differentiated pricing systems which are probably too difficult to understand and to predict and therefore do not achieve the desired sustainable mobility behaviour.

The aim of a laboratory study is to investigate to what degree of complexity users are actually able and motivated to deal with differentiated parking prices. The study analyses the cognitive complexity of a pricing system as well as perceived price complexity, travel behaviour and personal involvement. Varied differentiated parking pricing scenarios are presented which participants have to calculate. It is also examined how participants evaluate these schemes in terms of acceptability, intelligibility and price fairness.

Based on these findings, it will be inferred to what degree users understand and are motivated to utilize a parking pricing system in order to adapt their mobility behaviour. Recommendations for the implementation of differentiated parking pricing will also be made.

#### Older road users 2

Thursday 30th of August, 13:30 - 15:30 - Room 16

#### Mandatory screening of older drivers and population-based road accident risk: a critical review

Summala, H.<sup>1</sup>, Lappi, O., & Pekkanen, J.

Traffic Research Unit, Institute of Behavioural Sciences, University of Helsinki, Finland<sup>1</sup>

The European Union, the United States and Australia, among others, widely apply mandatory screening of older drivers in order to stop or restrict driving of those individuals who are assumed be no longer fit to drive safely. The methods may include medical, vision, or cognitive screening, in some cases also a mandatory road driving test. We review research on the effects of such mandatory age-based screening on accident risk.

Practically all relevant research on the safety effects of the mandatory screening is based on comparisons between jurisdictions with different policies, only two reviewed studies analyzed the effects of a change in the policy. All studies used population-based risk measures as the output,

mostly without an individual level analysis. We find that there is to date no reliable evidence of either positive or negative effect of mandatory screening on population accident risk. Moreover, the inferences based on population level risks in the reviewed settings do not allow firm conclusions on causal effects. Randomized controlled trials or, at least, carefully controlled before and after studies with a detailed analysis of participants at the individual level are needed to support evidence-based administrative decisions on the issue.

#### Older drivers' perceptual sensitivity to vehicle approach

Poulter, D.<sup>1</sup> & Wann, J.P.

Department of Psychology & Counselling, University of Greenwich, United Kingdom<sup>1</sup>

Accurately gauging vehicle approach speed is critical for judging when it is safe to pull out of a junction in front of oncoming traffic. Older drivers are more vulnerable on the road, and in particular are more involved in right-of-way collisions and crashes at junctions than younger drivers (Clarke et al, 2010; Preusser et al, 1998). One of the key contributors to crash involvement is the misperception of vehicle approach (DfT, 2010). Participants aged 21 to 83 years (n = 59) took part in a series of psychophysical tasks to measure perceptual sensitivity to different rates of computer simulated vehicle approach. Results showed older drivers were less sensitive to approach speeds than younger drivers, which could lead to a reduction in time available to perform traffic manoeuvres for drivers over 75 years old. This perceptual degradation may in part explain older drivers' overrepresentation in casualty statistics at junctions. Given that the number of drivers over 70 years old is predicted to double in the next 20 years (IAM, 2010), the decline in perceptual acuity with advancing age presents a serious challenge for risk management on the road.

#### Self regulation of driving among older adults (65+): Relation with driving style, subjective health and capability and accident involvement

Diamant, I.<sup>1</sup>, Mey-Tal, M., & Reich Z.

Mediton-Adam- Medical and Psychological Institut & Tel Aviv University, Israel<sup>1</sup>

Decline in skills and health conditions in older drivers may influence their driving. On the other hand, older drivers tend to self regulate their driving and avoid demanding driving conditions, as part of an adaptive process.

The present study analyses 324 self- report questionnaires of older (65+) Israeli drivers, involved and not involved in driving accidents during the past two years. The questionnaire included demographic details, accident characteristics, subjective health condition and functional deficiency, quality of sleep, driving habits, driving confidence (today and compared to 15 years ago), self regulation and avoidance of driving (today and compared to 15 years ago), driving style (DBQ) and involvement in 'failure incidents' in general.

The results reflect a major pattern of self regulation among older drivers. This pattern was found to be statistically predicted by subjective health, subjective cognitive state and driving confidence, conforming with the conception that negative experience of capability, health and driving is a major basis for adaptive behavior among older drivers.

It was also found that reports on driving violations in recent years and the driving 'violations' factor in driving style (based on DBQ), were predictive of driving self regulation. This result may be unique to Israeli older drivers, since it is not consistent with previous studies which mainly found correlation between ' lapses' (of the DBQ) and self regulation in older age.

'Violations' (DBQ) was also found as a predictor of accident involvement (together with subjective functional deficiency). It was also found that reported violations in the past distinguish between drivers involved and not involved in accidents. This pattern may indicate that compliance to the law in older age plays an important role in safe driving.

The results were reviewed with regard to application possibilities and further research.

#### **Baby boomers' mobility patterns and preferences. What are the implications for future transport?**

Siren, A.<sup>1</sup> & Haustein, S.

Department of Transport, Technical University of Denmark, Denmark<sup>1</sup>

The demographic grand challenge of population ageing will be reflected on most of the areas of society, and to a great extent also on the area of transportation. The large post-II world war cohorts, the so called baby boomers, will comprise a large share of tomorrows older population, and it is expected that they will differ from their parents' generation when growing old. In order to understand how the aging boomers may impact the future travel demand, their travel behaviour and expectations were analysed based on 1772 standardized telephone interviews. Baby boomers reported in general being healthy, independent and highly (auto)mobile. They also showed optimism regarding the level of mobility, use of different transport modes, and leading an independent life in the future. However, there were significant gender differences in terms of present and expected car use in old age somewhat similar to those observed in the older cohorts. In addition, using cluster analysis, three segments of baby boomers could be differentiated. The segments showed significant differences in current travel behaviour and living circumstances and some similarities to former segmentations of older road users. Results indicate that the differences between boomers and their parents might be smaller than expected.

#### **Experienced cognitive problems, self-rated changes in driving skills, driving-related discomfort and self-regulation of driving in old drivers**

Meng, A.<sup>1</sup> & Siren, A.

University of Copenhagen, Department of Psychology, Denmark<sup>1</sup>

Many older drivers self-regulate their driving, which may enable them to continue driving safely despite functional decline. The process of self-monitoring of driving ability and awareness of functional decline, and its association with self-regulation of driving is, however, not fully understood. The aim of the study was to examine perceived changes in driving skills, driving-related discomfort, and self-regulation of driving by older drivers with different levels of self-rated cognitive problems. 840 Danish drivers aged 75–95 completed a structured telephone interview. The results showed that the experience of cognitive problems were associated with perceived improvement in higher level driving skills but also decline in lower level driving skills. Moreover, cognitive problems were associated with discomfort in, and avoidance of, driving situations. Finally, a linear relationship between discomfort in driving and avoidance was found and this tended to be stronger for drivers experiencing cognitive problems. The results indicate that older drivers who experience problems with cognitive functions display good self-assessment of changes in their driving skills; that driving-related discomfort is an important factor affecting self-regulation of driving; that driving-related discomfort functions as an indirect self-monitoring of driving ability and may contribute to the safe driving performance of older drivers.

### **Symposium - Driver attention and distraction: Eyes on the road**

Thursday 30th of August, 13:30 - 15:30 - Ronde zaal

#### **Eyes wide shut: Distraction having the eyes on the road**

Martens, M.<sup>1</sup>

TNO, the Netherlands<sup>1</sup>

Since the 100-car study, it has been generally recognized that a driver, having the eyes-off-the-road for 2 seconds or more is unacceptable in terms of traffic safety. Since driving is primarily a visual task, having no relevant driving information fall on the driver's retina is a safety factor with high face validity since it disables a driver to respond to visual cues of running off the road or a lead vehicle braking. However, the opposite is not true either: A driver having his eyes on the road does not mean that all relevant information falling on the retina will actually be processed. In this process, selection and attention play an important role. What safety consequences does it have when a driver is looking outside, but is focussing on distracting elements along the side of the road (e.g. billboards), or maybe even looking on the road but not paying much attention to the driving task. What sort of risk do we run when we are daydreaming, talking on the phone, looking at our HUD or looking for 2 seconds to a billboard that still allows us to see the onset of braking lights of or lead vehicle?

#### **Seven Myths about Cognitive Distraction and Driving**

Young, R.<sup>1</sup>

Wayne State University School of Medicine, United States<sup>1</sup>

Little published research has considered how human cognition relates to driver performance. Indeed, while it is generally recognized that the human mind can only focus on so many tasks at one time, there is no empirical data that clearly connects "cognitive distraction" to crash events. As a result, many myths about cognitive distraction have arisen in the driving safety literature and popular media. We here provide a critical analysis of seven such myths:

- 1) Cell phone conversations increase crash risk four times relative to baseline driving.
- 2) Cell phone conversations decrease crash risk relative to baseline driving.
- 3) Emotional conversations always produce more cognitive distraction than neutral conversations.
- 4) Cognitive distraction from cell phone conversations is a property of the mind, and cannot be directly measured in the brain.
- 5) Cognitive distraction increases response time to visual events in the periphery more than in central vision, thereby reducing the "useful field of view."
- 6) Drivers with increased gaze time to the forward roadway during a cognitively loading task are engaged in unsafe driving behavior.
- 7) Short visual-manual tasks do not have as much cognitive distraction as long visual-manual tasks with high subjective workload and lane and speed deviations.

#### **Enhanced Lane Keeping during Verbal Distraction: the Effect of Lead Car Presence**

Merat, N.<sup>1</sup> & Boer, E.

Institute for Transport Studies, United Kingdom<sup>1</sup>

Previous simulator studies on driver distraction suggest that the effect of distracting in-vehicle tasks on driver performance may depend on the nature of the task itself. Whilst tasks that divert drivers' visual attention away from the road impair lateral control of the car and may increase reaction time to a sudden event in the road, non-visual tasks which allow drivers' eyes to remain on



the road seem to 'improve' lateral performance, with less deviation in the lane and better steering control (Jamson & Merat, 2005; Merat & Jamson, 2008). Drivers' eye movements are also shown to be more focused towards the road centre, when they perform a demanding non-visual task, with the pattern more 'spread' during baseline driving (Victor, Harbluk & Engström). A recent study by Mühlbacher & Krüger (2012) suggests that such improvements in lateral control may be due to the presence of a lead vehicle in such studies. In this paper we provide a more detailed model-based analysis by introducing perceptual-motor-control mechanisms that predict the experimentally observed differences in lane keeping performance as a function of driving condition (presence of a lead car) and in-vehicle task condition (verbal or visual).

#### How distracting and how dangerous are roadside billboards?

Shinar, D.<sup>1</sup>

Ben Gurion University of the Negev, Israel<sup>1</sup>

This presentation will briefly describe three studies that focused on the effects of visual distraction from roadside signs on drivers' visual search, driving behavior, and crashes. The first study – conducted in a naturalistic driving situation measured the glance behavior of drivers as they approached a roadside billboard and as they drove on the same road from the other direction with no billboard in sight. The results showed that billboards do attract driver's glances, but not necessarily from the road ahead. The second study observed drivers as they approached and waited at a signalized intersection with an electronic billboard in sight and from another direction without a billboard in sight. The results showed that the billboards are distracting, but the primary effect was to miss the change of the signal light when it turned green. The third study evaluated a section of an urban freeway before and after the removal of roadside signs. The results indicated that the presence of the billboards is associated with an increase in crashes. The implications of the three studies will be discussed.

#### Effects of billboards on drivers' hazard anticipation and vehicle management behaviors: Study on a driving simulator

Fisher, D.<sup>1</sup>, Divekar, G., Pollatsek, A., & Fisher, D.L.

Mechanical and Industrial Engineering, University of Massachusetts Amherst, United States<sup>1</sup>

Digital billboards are increasingly part of the built environment. Previous studies on a driving simulator have shown that both novice and experienced drivers are willing to look away from the forward roadway for dangerously long periods of time. For example, in one recent study novice and experienced drivers were asked to perform a task which required glances to the side of the road at a billboard. Surprisingly, both novice and experienced drivers glanced longer than 4 s in some 30% of the tasks. We asked whether such long glances would affect drivers' vehicle management and hazard anticipation skills among experienced drivers. Lane exceedances and speed variability were used to index vehicle management. Glances towards active and passive hazards were used to index hazard anticipation. Compared to drivers not engaged in the secondary billboard tasks, drivers engaged in the secondary task had markedly poorer vehicle management and hazard anticipation behaviors.

#### Visual Clutter and Roadside Distractions: The challenge to good traffic engineering and human factors practice

Wachtel, J.<sup>1</sup>

The Veridian Group, United States<sup>1</sup>

Human factors specialists and traffic engineers invest considerable effort to develop the most

effective roadway design and traffic control devices to ensure safe, efficient and pleasurable travel. Road signs, for example, are designed in accordance with high human factors standards of legibility, consistency, and clarity. Yet road authorities continue to permit roadside development in the form of commercial signage visible to motorists that undermines their own efforts to improve traffic safety and maintain flow. Such signs are becoming larger, brighter, interactive, personalized, and closer to the road and increase the driver's task difficulty, compromise visual attention and hamper visual search, and raise the driver's stress level, all of which are counter to the goals of the human factors and traffic engineering community. Because such signage is commonly placed at roadway locations where the driver's task demands are already great (for example interchanges, horizontal and vertical curves), these safety concerns are elevated. As newer research is reported, it becomes clearer that roadside visual clutter and distraction in the form of digital and video signage is not "safety-neutral" as its supporters claim. This presentation will discuss this inherent conflict, identify good practices currently in use, and offer potential solutions to roadway authorities.

#### Potentially distracting objects along freeways: A policy perspective

Schepers, P.<sup>1</sup> & Merckx-Groenewoud, C.

MuConsult, the Netherlands<sup>1</sup>

The Dutch road authority and municipalities often receive permit requests for potentially distracting objects along freeways such as billboards, information boards, works of art or constructions with an exceptional design. For this end, permit policies are needed, based on human factors expertise. But how can this issue be tackled?

Using crash data for linking visual distraction outside the vehicle to what is acceptable in terms of road safety is methodologically hardly possible and results are therefore not usable for policy development. Knowledge is growing gradually with the emergence of new techniques such as eye trackers but research results are still insufficient for comprehensive permit policies. In order to achieve a feasible permit policy, a team of human factors experts created a list of potential criteria. The experts subsequently arranged them in order of deemed importance for road safety. The new policy comprises three criteria that have to be met under all circumstances and five criteria on which objects should be judged according to the site-specific conditions. Problems that will be addressed in the presentation are the lack of knowledge on the relationship between visual distraction and road safety and ambiguity, e.g. when will an expression be experienced as offensive?

#### Mode choice 1

Thursday 30th of August, 13:30 - 15:30 - Room 10

#### Investigating interrelations among personal psychological factors and their influence on mode choice: Empirical evidence from a medium income area in Concepcion, Chile

Tudela, A.<sup>1</sup>, Sichel, V., & Carrasco, J. A.

Civil Engineering Department, Universidad de Concepcion, Chile<sup>1</sup>

Several studies show that mode choice does not only depend on contextual factors, but also on psychological ones. In fact, although transport modes attributes as well as individual socioeconomic characteristics do indeed affect people's decisions, there are psychological features which might be conditioning behaviour under certain scenarios.

The goal of this work is to study the relationship among personal psychological factors and the chosen transport mode, using revealed information. A survey was designed and applied in a medium income area in the city of Concepcion, Chile, seizing contextual and psychological aspects which might affect mode choice. The survey design was based upon Triandis' Interpersonal Behaviour Theory, which considers attitudinal, affective, social and habitual factors as precursors of intention, which is mediated by situational conditions to generate behaviour. The neighbourhood was chosen because people in the area have access to both motorised (public and private) and no motorised transport means.

Factorial analysis and structural equation modelling were used to test the original Triandis framework, as well as to find out new relationships among factors, based upon the collected data.

### **Commuter's Travel Behavior: A Study of Behavioral Intention to Use Bus Rapid Transit in Jakarta**

Hafiyah, N.<sup>1</sup> & Soesetio, S.R

Faculty of Psychology, University of Indonesia, Indonesia<sup>1</sup>

These studies tried to explain the using of bus rapid transit (BRT) in Jakarta, named Transjakarta. Using, the first corridor of busway, the first study explored the characteristics of Transjakarta 's user (N=748). The second study elicited free responses of commuters who usually use cars to travel to their workplace destination, through interview technique (N= 32). The third study predicted commuters' travel behavior change using behavioral intention model of planned behavior theory (N= 493). It explained how their attitudes toward Transjakarta, the difficulties and easiness for car owner to change to Transjakarta using, how they subjectively perceived the norms of using Transjakarta. Furthermore, the study also explored the relative importance of related variables to public transportation in the mind of car owners using the extension of TPB. The results showed interesting findings. The majority of current Transjakarta users did not contributed from car owners. Only small number of its users came from car users. The modal salient beliefs of commuters using private car implied more negative beliefs. Interestingly, majority of car users tended to have positive attitude toward Transjakarta using, weak subjective norms, but strong behavioral intentions to use Transjakarta. Their intentions were even stronger if Transjakarta was totally convenient. Further results were also discussed.

### **Psychology and voluntary travel behavior change: is research guiding practice?**

Adkins, A.<sup>1</sup> & Goddard, T.

Portland State University, United States<sup>1</sup>

The potential for psychology-based theories of behavior change to aid in promoting active travel modes (e.g. walking, cycling, and transit) is widely recognized among travel behavior researchers. But to what extent is this growing body of research making its way into practice? We investigate this question by evaluating materials from voluntary travel behavior change programs in the United States to determine the extent to which five strategies, identified from the psychology of behavior change literature, are used. These strategies are: increasing personal agency and awareness; targeting of new decision contexts (i.e. recent movers); utilizing injunctive & descriptive social norms; eliciting participant intention and planning (i.e. travel feedback programs); and facilitation of behavior change in the form of incentives. These strategies are identified from previous empirical work incorporating the Theory of Planned Behavior (TPB), including supplemental model components such as habit, the Transtheoretical Model (TTM), and Social Cognitive Theory (SCT). Evidence from a preliminary review of program materials suggests that the biggest areas for improvement in voluntary travel behavior change programs are in the areas of social norms,

intention and planning, and new decision contexts. In closing, suggestions are made for better incorporating these strategies into existing programs.

### **Considering personal factors into demand discrete choice models. A critical review on tools and measurements**

Tudela, A.<sup>1</sup>, Domarchi, C., & González, A.

Civil Engineering Dept. Universidad de Concepcion, Chile<sup>1</sup>

Since the development of new demand discrete choice models, many studies and research projects have attempted to consider explicitly subjective-psychological factors. Attitudinal, affective, social as well as habitual factors have been measured and incorporated into models using the latent variables approach, which suits well since these factors cannot be objectively measured. In many cases, when looking for theoretical frameworks which sustain the considered factors in the reported studies, it has been found that:

- There is no explicit theoretical framework or
- Definitions and tools related to the measurement of constructs do not appropriately match with the stated theoretical framework.

This work is a critical review of the studies carried out so far on the specification and measurement of latent variables, oriented to capture those psychological factors which might be affecting the mode choice process. The focus is upon the literature generated into the transport demand modelling and data collection fields, looking for recurrent flaws and misunderstandings. A better insight about these problems will allow us to improve the data collection and modelling stage, capturing what we really want to, and permitting a better implementation of transport policy strategies.

### **Identification and modelling of travel behaviour determinants in order to find successful interventions**

Jonkers, E.I, Martens, M.H., Van de Lindt, M.C., & Vonk, T.

TNO, the Netherlands<sup>1</sup>

To ease some of the major problems in the field of mobility and transport a change in travel and driving behaviour is needed. At this moment, too many travellers use the car and drive at the same moment in time. In order to change travel behaviour various measures can be taken. However, often one starts with selecting a solution or intervention instead of starting with the traveller and trying to find the best intervention for influencing a specific type of behaviour. If you start with the traveller, it is important to know how he makes his decisions and what sort of underlying mechanisms influence this behaviour. In this paper we will first describe the most important determinants of travel behaviour that came out of a literature review. After this we will describe the implementation of these determinants in a so-called MARVEL model. The working of MARVEL is based on causal relations between system components. With MARVEL the effect of (combinations of) interventions can be shown over time and connections between components will be visible. The paper will end with conclusions on how the work that is described can be used in solving problems in the field of mobility and transport.

**Looking for patterns in self-reported attitudes and speeding behaviours using factor analysis of responses and cluster analysis of respondents**

Stradling, S.<sup>1</sup>

Edinburgh Napier University, United Kingdom<sup>1</sup>

Quantitative analysis searches for patterns in data. Such patterns are necessarily simplifications of the richness of the data set and the infinite variety of persons, but may be useful as guides to policy. Data from a recently published large-scale national GB survey of car drivers' attitudes and self-reported speeding behaviour will be presented to discuss the use of factor analysis to group together situations which elicit similar responses (factors), the use of cluster analysis to group together participants who respond similarly (clusters), and the resulting implications for policy on constraining speeding.

**SARTRE4: Motivations and travelling styles of non motorized road users**

Furian, G.<sup>1</sup>, Brandstaetter, Ch., Britschgi, V., & Drapela, E.

Research & Knowledge Management/KFV/Senior Researcher, Austria<sup>1</sup>

The SARTRE4 (Social Attitudes to Road Traffic Risk in Europe) project deals with European road users attitudes, perceptions, opinions, needs, experiences and expectations with respect to road traffic risk.

The SARTRE4 survey is the fourth in a series (earlier surveys were in 1991/1992, 1996/97, 2002/2003) carried out 2010/2011 with 19 countries participating involving at least 1000 individual interviews of random samples per country, among them 600 active, fully licensed car drivers, 200 motorcyclists and 200 non motorized road users in each country investigated.

The proposed presentation will focus on the motivations and travelling styles of people who use mainly other means of transport than cars and motorcycles.

Results include an overview on the distribution of reasons for walking, cycling or using public transport in the 19 participating European countries. Further analyses show differences regarding motivations and travelling style of this group based on socio-demographic variables and in the context of living area.

In order to obtain meaningful, differing groups of non motorized road users, cluster analysis based on travel behavior was performed. The analysis resulted in five types of road users that can be found in each country.

**SARTRE4: Comparison of different road user groups**

Furian, G.<sup>1</sup>, Sanchez, F., Brandstaetter, Ch., Zaidel, D.

SARTRE4: Comparison of different road user groups, Austria<sup>1</sup>

The SARTRE4 (Social Attitudes to Road Traffic Risk in Europe) project deals with European road users' attitudes, perceptions, opinions, needs, experiences and expectations with respect to road traffic risk.

The SARTRE4 survey is the fourth in a series (earlier surveys were in 1991/1992, 1996/97, 2002/2003)

carried out 2010/ 2011 with 19 countries participating involving at least 1000 individual interviews of random samples per country, among them 600 active, fully licensed car drivers 200 motorcyclists and 200 non motorized road users in each country investigated.

The proposed presentation has its focus on the comparison of attitudes by the three groups of users surveyed in the SARTRE4 study and to evaluate differences and similarities between the 19 participating European countries.

Results provide an overview on group comparisons regarding travel behavior, concerns about various social issues, perception of safety needs, acceptance of safety devices, opinions on road safety, perception of factors that may cause accidents as well as attitudes towards road safety measures and possible new safety measures.

The results should help to assess citizens' acceptance of EU (and national) road safety policies, the limitations or successes of existing road safety measures, or support for new measures and policies.

**Cross cultural adaptation of the Traffic Climate Scale**

Gehlert, T.<sup>1</sup>, Hagemeister, C., Özkan, T.

German Insurers Accident Research Department, Germany<sup>1</sup>

This presentation reports on the cross cultural adaption of the Traffic Climate Scale (TCS) to be included in the German road safety panel. The German road safety panel regularly monitors public attitudes towards road safety and self-reported traffic behaviour. The Traffic Climate Scale will be used as an indicator to monitor changes in traffic culture in the long-term. The scale adaptation consisted of five steps. First, the original scale was translated into German using forward and backwards translation. Second, the scale was applied in the 2010 wave of the German road safety panel. The sample consisted of about 1.600 subjects combining online and personal interviews. The sample was representative for household characteristics and travel mode choice in Germany. Third, the psychometric characteristics of the scale like item difficulty, part whole correlations etc. were analysed. Fourth, the scale was validated using road safety attitudes and self-reported traffic behaviour from the same panel wave. Fifth, the results of the German scale were compared with the original Turkish sample. Preliminary results reveal a three factor structure for the German TCS with the factors 'External affective demands', 'Internal requirements' and 'Functionality'. In contrast to the Turkish sample the fourth factor 'Competitiveness' could not be replicated. Further results will be reported in the presentation.

**Traffic light compliance by civilians, soldiers and military officers**

Rosenbloom, T.<sup>1</sup>

Department of Management, Bar Ilan University, Israel<sup>1</sup>

Military officers, particularly those in the chain of command, are expected to provide "a good example of virtue, honor, patriotism, and subordination" (Snider, 2008). The aim of the present study was to examine the extent to which these values are reflected in the behavior that military officers exhibit crossing roads, as compared with soldiers' and civilians' road-crossing behavior. One thousand two hundred pedestrians were observed while crossing the street at an urban intersection in the center of Israel. Of these pedestrians, 594 (49.5%) were soldiers, 112 (9.33%) were officers and 488 (40.66%) were civilians. An observation grid was constructed to register pedestrians' crossing behavior. The independent variables encoded were gender, military status and military rank. The dependent variables encoded were crossing the road at a red light; crossing a busy road; running across the road; crossing the road diagonally; crossing the road without

looking both ways; and crossing without first stopping at the sidewalk edge. To compare the crossing behaviors of each group of pedestrians, a summation was made for the six parameters of safe crossing. An ANOVA compared the means of unsafe road-crossing behaviors of males and females, on the one hand, and of civilians, soldiers and officers, on the other. A post hoc Scheffe test conducted on the means showed that the mean of the unsafe road-crossing behaviors of the civilians ( $M = 1.55$ ,  $SE = .04$ ) was higher than that of the soldiers ( $M = 1.35$ ,  $SE = .04$ ) and of the officers ( $M = 1.21$ ,  $SE = .08$ )  $p < .05$ . No significant difference was found between the means of the unsafe road-crossing behaviors of soldiers and officers, although the means of the officers' unsafe behaviors was lower than that of the soldiers. That is, both soldiers and officers exhibited road-crossing behavior that was significantly safer than that of civilians. Generally, more females waited for the green light (54.1%) than males (45.9%). No main effect of gender or interaction with belonging to the military was found.

### Fatigue

Thursday 30th of August, 13:30 - 15:30 - Room 4

#### Fatigue: State awareness and self-regulation among car drivers

Davidse, R.<sup>1</sup>, Goldenbeld, Ch., & Mesken, J.  
SWOV Institute for Road Safety Research, the Netherlands<sup>1</sup>

This study was designed to investigate how car drivers handle fatigue. Do they recognize fatigue and the fact that fatigue affects their driving performance, do they consider driver fatigue to be dangerous, and do they take countermeasures to avoid that they will fall asleep behind the wheel? Using a web-based panel survey, 4,900 Dutch car drivers were contacted. The survey consisted of 67 questions covering sleep, health, work, fatigue in everyday life, driving, fatigue while driving, countermeasures, (near-)crashes, and background. The final sample consisted of 2,066 drivers (age: 18-70 years; 51% male).

As in previous studies, it was found that many car drivers report that they had driven while being tired in the past year. About 10% indicated that they had (almost) fallen asleep behind the wheel. Logistic regression analyses indicated the best predictive factor for (almost) falling asleep at the wheel is the score on the Epworth Sleepiness Scale. More than half of the respondents consider fatigued driving as dangerous as driving under the influence of alcohol. Nevertheless, 21% drove a car although being aware that (s)he was too tired. Strategies most often used to stay awake while driving were: opening a window or turning on air conditioning (54%), talking to a passenger (53%), and stopping to eat or relax but without sleeping (51%). Only one quarter used the most effective strategy to stay awake, that is ask a passenger to take over driving. The second best strategy, stop for a nap, was used by 14%.

#### Unaware drowsiness deeply in the pupil

Tetsuro, S.<sup>1</sup>, Tanida, K., Hirata, Y., & Nishiyama, J.  
Honda R&D Co.,Ltd. Automobile R&D Center, Japan<sup>1</sup>

Prediction of drowsiness based on an objective measure is demanded in machine and vehicle operations in which human errors may cause fatal accidents. So it is important to detect drowsiness in early phase. We've found that, using monotonous driving simulator to induce drowsiness, pupil diameter fluctuates with large amplitude at low frequencies when the subjects were aware of his/her drowsiness as reported previously. Furthermore we've found that prior to this fluctuation, pupil

diameter decreases gradually in most subjects, and they were not aware of sleepiness during this period. But the detection accuracy was about 80% at most, so we thought that it is desirable to enhance it with other physiological information. We analyzed the heart rate variability using the popular method of chaos analysis (Lorentz plot) and power spectrum (LF/HF, HF) which many researches have been tried to evaluate drowsiness. Then we have got some results that there were some characteristics of heart rate while subjects felt sleepy but there was no characteristic of heart rate before subjects felt sleepy. Therefore we concluded that pupil-diameter is the most reliable premonitor of drowsiness at presence, although the pupil-diameter is easily affected by brightness.

#### Identification of relevant feedback characteristics for driver fatigue detection systems

Karrer-Gauss, K.<sup>1</sup> & Roetting, M.

Technische Universität Berlin, Chair of Human-Machine Systems, Germany<sup>1</sup>

Systems for fatigue detection are a technical intervention to prevent street accidents due to fatigue. Its feedback should motivate the drowsy driver to stop. It is assumed that a good feedback design can also minimize the motivation for undesired behavioral changes. A computer-assisted questionnaire on 16 feedback variants tested, whether the characteristics of visibility, association with fatigue, acceptance, implied danger, urgency, and importance of feedbacks would show a connection to the expected time of continued driving and to the self-estimated precaution during this driving. A pre-test, involving 19 participants (7 female, 12 male), and a main test, involving 78 participants (27 female, 50 male), did confirm the expected connection (all correlations were significant with  $p < .01$ ). If a driver is expected to rest soon and to drive cautiously until he stops, the feedback must be connected unambiguously with the fatigue of the driver. It must adequately impress the danger of the situation, and the driver must accept the warning. If a behavioral change is necessary, the feedback must impress both the urgency and the importance of it. The results of the study indicate ways of constructing the feedback. Certain feedback qualities help to end driving more quickly.

#### When does an accident happen during a trip?

Matsuura, T.<sup>1</sup>

Jissen Women's University, Japan<sup>1</sup>

The accident time point, a relative time point between the departure and the expected arrival, was examined to determine when accidents are likely to happen in a trip. The Japanese in-depth accident database ITARDA was used for the time-related behaviour of drivers involved in accidents- ( $n = 3,061$ ). The items used included the driving time from origin to the accident ( $= a$ ), the expected driving time from origin to destination ( $= b$ ), accident time point in the trip ( $= a/b \times 100$ ), as well as some typical accident data. Accidents did not happen uniformly during a trip. They were more likely to happen in the middle and end of a trip. The accident time point differed according to the expected trip time. While accidents were more likely to happen in the middle of an expected short trip (i.e., 0 to 30 min.), they tended to happen in the latter half of an expected medium trip (i.e., 31 to 90 min.), and to happen in the last 20% tile of an expected long trip (i.e., more than 90 min.). The results suggested familiarity with the road and fatigue affected the accident risk during a trip.

#### A users' perspective on in-vehicle fatigue warning systems

Platho, C.<sup>1</sup>, Schmidt, E. A., & Kolrep, H.

Human-Factors-Consult GmbH, Germany<sup>1</sup>

Driver fatigue is a contributing factor in an estimated 10–30 % of severe road accidents. Different reasons are discussed why people continue driving despite fatigue: the perceived pressure to reach



their destination, their inability to self-assess fatigue, or the underestimation of fatigue-induced impairments. On the market several in-vehicle fatigue warning systems (FWS) exist that assess fatigue-related changes in driving performance and warn the driver accordingly. Up to today, their effectiveness to reduce fatigue-related accidents has not been subject to evaluation. In order to shed light on the users' perspective of in-vehicle-FWS, semi-structured interviews were conducted with 20 regular users to assess their use patterns, and the FWS's perceived value and overall acceptance. Answers to the following research questions are expected: How often do users subjectively experience false alarms or misses? Do they comply with the systems' warnings? Why? Why not? Do they experience it as a contribution to their own safety? And is there any evidence of behavior adaptations, e.g. continued driving despite subjective fatigue due to overreliance on FWS?

### Symposium - Driver behaviour modelling 2

Thursday 30th of August, 16:00 - 18:00 - Blauwe zaal

#### Why the DBQ Should Return to its Roots

Mattsson, M.<sup>1</sup> & Lappi, O.

Traffic Research Unit, Institute of Behavioral Sciences, University of Helsinki, Finland<sup>1</sup>

The Driver Behaviour Questionnaire (DBQ) was originally based on a cognitive theory (the Generic Error Modeling System, GEMS), which postulates a quadripartite categorization of error. Each of the categories (violations, mistakes, slips and lapses) was presumed to have a specific type of cognitive cause. The first questionnaire study did not, however, result in a principal component (PC) structure that would have neatly fit the classification. Instead, three PC's were identified. The follow-up study by Parker et al. (1995) used this three-component structure as a point of departure, and later developments of DBQ were based on the tripartite typology of violations (PC1), errors (PC2), and lapses (PC3). An important part of GEMS, mistakes, was thereby omitted entirely. This has led to a situation where there is, on the one hand, a theoretically motivated classification of error in terms of cognitive causes and an empirically derived set of latent constructs – but where these two do not match one another. We argue that in order to offer a comprehensive account of errors, the DBQ should be developed to make it sensitive to all latent constructs postulated in GEMS, including mistakes, which are theoretically important and also an important target of safety interventions.

#### The role of anticipation in the causation of accidents

Vollrath, M.<sup>1</sup>, Muhrer, E., & Werneke, J.

Department of Engineering and Traffic Psychology, Germany<sup>1</sup>

The concept of situation awareness stresses the importance of the perception of critical elements, the understanding of their meaning and the anticipation of what will happen next. The focus of accident research has often been on the first two components. For example, distracted drivers do not perceive relevant cues in their environment and are thus not able to react adequately. However, in-depth studies of accident causation imply that anticipation seems to play an at least as important role. This was examined in four driving simulator studies with, on the one hand, rear-end accidents and, on the other hand, accidents when turning right at intersection where one has to yield. By manipulating characteristics of other vehicles and the environment it was shown that accidents are much more likely if drivers do not anticipate that a critical event might occur. From these results, a model is suggested which described how anticipations are formed and how these influence attention and action planning.

#### How the ITERATE driver model can improve micro simulation

Hjälmdahl, M.<sup>1</sup>, Tapani, A., Cacciabue, C., & Cassani, M.

VTI, Sweden<sup>1</sup>

Modelling driver behaviour has been an endeavour developed since a number of years. Several approaches have been generated following different theoretical background with the goal of enabling to predict the activity and response of human beings in control of a vehicle operating in dynamically changing environments.

Based on experimental studies carried out on portable simulators including almost 300 subjects in five different countries, possibly making it the largest controlled experiment in the transport domain, a driver model has been developed, tested and validated. The driver model encompasses numerical expressions that cover differences in driver behaviour depending on driver attitude; state; experience; culture and workload.

In this paper, the simulation tool resulting from the research work and experimental activity is presented. The basic theoretical framework is briefly introduced and the simulation approach is discussed in detail, showing the numerical implementation of driver behaviour. The paper further shows how the model can be used in micro simulation applications to allow for micro simulations of driver support systems that take into account the variety of driver behaviour. Potential benefits of driver support systems are largely dependent on how the drivers make use of the systems. The work presented thereby contributes to increasing the reliability of micro simulation based studies of driver support systems.

#### Does the Driver Behaviour Questionnaire measure the same latent constructs in different respondent groups? An Exploratory Structural Equation Modeling study

Mattsson, M.<sup>1</sup>

Traffic Research Unit, Institute of Behavioral Sciences, University of Helsinki, Finland<sup>1</sup>

In DBQ research, a particularly prominent line of research has involved comparing groups such as men and women or respondents of different ages on the underlying constructs (slips, lapses, ordinary violations, aggressive violations). When a self-report instrument is used for this purpose, it is important to ensure that it functions in the same way in the groups to be compared – in other words, that the construct that is compared has the same structure in all the groups. In the context of (Exploratory) Structural Equation Modeling, this can be rigorously evaluated by testing the factorial invariance of the instrument. In DBQ research, this is especially of concern since the DBQ is not, in fact, a single, standardized instrument; rather, there are variants for different cultures, variants with different numbers of items (from 10 to 112) and with different numbers of factors. The factorial and measurement invariance, across genders and age groups, of the four-factor solution for the 28-item version of the instrument is reported. The results show that factorial invariance does not hold and that the instrument thus measures different latent constructs in the different groups of respondents. The implications for the instrument are discussed.

#### Skin conductance and cognitive estimates while driving through narrow gaps: implications to driver behavior theories

Summala, H.<sup>1</sup>, Lappi, O., Pekkanen, J., Lehtonen, E., & Hietamäki, J.

Traffic Research Unit, Institute of Behavioural Sciences, University of Helsinki, Finland<sup>1</sup>

A key question in driver behavior theorizing has been the role of cognitive risk estimates vs. emotional responses. Most of relevant research comes from the estimates given by participants in

settings that seldom if ever produce measurable emotional responses. On-road research on this issue has been subject to methodological problems. In this study we measured emotional responses (skin conductance, SC) and driver estimates as a function of a safety margin measure. Fifteen participants drove an instrumented car around a track, steering with one hand, the other resting on a support to avoid motor artefacts in the SC signal. After three baseline runs, a gate was placed on track, varying in width at four levels (2.5-5m), in balanced blocks. Participants were instructed to maintain a constant speed. When the first gate appeared, the experimenter simply asked to drive through it at the designated speed. At end of each run participants estimated tension they felt on a scale 0 to 9.

SC approximately followed a power function of the safety margin ( $R^2=0.28$ ), increasing from a flat baseline (including the 5m gate), and correlated with estimates at  $r=0.46$ . Implications to driver behavior theories from this forced-paced setting will be discussed.

#### **Towards an enhanced model of driving behaviour: sketching the road ahead**

Carsten, O.<sup>1</sup>, Cacciabue, C., & Peters, B.

Institute for Transport Studies, University of Leeds, United Kingdom<sup>1</sup>

The ITERATE European project has developed a unified model of driver behaviour and driver interaction with driver support systems. This model focuses more than previous models on long-term factors such as personality, experience and national culture, and also includes medium term factors such as fatigue. The model acknowledges the role of short-term factors in the form of task demand, but in its current form this is limited only to the presence of such environmentally-induced task demands as traffic density or road geometry. Driver activity in the vehicle and interaction with information and assistance systems is not properly considered, nor are the dynamic aspects of workload. Other research projects on operator modelling such as HUMAN in the aviation domain and ISI-PADAS in the car driving domain have focused more on the cognitive and workload aspects of driving. This paper assesses the potential for extending the ITERATE model by including an extended consideration of task demand and driver workload in the form of an enhanced cognitive model of driver performance in real time and proposes a model structure that would combine the best features of the behavioural and cognitive modelling approaches.

### **Electric Vehicles**

Thursday 30th of August, 16:00 - 18:00 - Rode zaal

#### **Drivers' acceptance of limiting vehicle dynamics of electric vehicles**

Schmitz, M.<sup>1</sup>, Jagiellowicz, M., Maag, C., Hanig, M.

WIVW GmbH, Germany<sup>1</sup>

One paramount feature of electric vehicles is that the vehicle dynamics can be easily changed by manipulating torque and power of the electric motor. By limiting these parameters the overall performance is limited in terms of maximum acceleration and maximum speed. These changes are expected to have a positive impact on energy consumption (and thus on the range of the vehicle), but a critical impact on driver's acceptance. In a driving simulator study, 24 drivers drove five vehicles with different motor settings through several traffic situations in rural and urban areas. The situations were critical in terms of safety and efficiency, like passing intersections with crossing traffic, overtaking manoeuvres, different speed sections, and variations in slope). Acceptance and efficiency measures were recorded and analysed. Results show that the vehicle performance was

accepted in most traffic situations, even with the highest limitations. Only within a few situations, the given vehicle was rejected by the drivers. The limitations had a clear impact on consumption (~13%). Interestingly, the influence of the self-selected driving style on the energy consumption was stronger (~20%) than the highest impact coming from technical variations. The results are discussed with special regard to safety issues.

#### **Designing human centered charging technology for electric vehicles by integrating factors from psychological research in the development of future systems**

Hahnel, U.<sup>1</sup>, Götz, S., & Spada, H.

Department of Psychology, Albert-Ludwigs University Freiburg; Department of Intelligent Energy Systems, Fraunhofer Institute for Solar Energy Systems, Germany<sup>1</sup>

Electric vehicles can substantially reduce the overall CO<sub>2</sub>-emissions of the transportation sector when charging the vehicles is based on renewable energies. Intelligent load management systems (ILMS) combine electromobility with renewable energies by charging the vehicles during times when renewable energies are available. To optimize the charging process, ILMS require information from drivers about upcoming departure times and route lengths. Inaccurate estimations may endanger drivers' safety due to insufficient battery levels.

We conducted two studies investigating drivers' abilities to accurately predict their mobility as demanded by ILMS. For two weeks, participants predicted their departure times and route lengths of upcoming trips. Actual mobility behavior was recorded using a logbook and GPS tracking devices. Results show that-although the majority of predictions were fairly accurate-a considerable number of estimations would lead to insufficient charging processes in future scenarios. We identified factors such as trip type which substantially influenced the accuracy of participants' predictions. Based on identified factors, we propose charging algorithms for future ILMS, adapting the systems to drivers' skills. ILMS may facilitate the positive environmental impact of electric vehicles. Our findings improve efficiency as well as market success of the technology by enhancing user acceptance due to a human centered design.

#### **Who adopts electric vehicles? The role of car attributes and identity**

Schuitema, G.<sup>1</sup>, Anable, J., Kinnear, N., Stannard, J, Skippon, S

Aarhus University, Denmark<sup>1</sup>

Currently there is a strong focus on the electrification of Electric Vehicles (EV) in climate change programmes. However, private car drivers tend to be sceptical about the adoption of these cars. This study aims at understanding how the perception of vehicle attributes affects the adoption of these vehicles. A majority of the studies so far focused on the functional aspects of EVs (instrumental attributes). Our study, however, indicates that the pleasure of driving (hedonic attributes) and the symbolic function of EVs (symbolic attributes) are equally important, and sometimes even more important, for the adoption of EVs than the perceived instrumental attributes. Which specific attributes are most important were shown to be depending on the type vehicle (i.e., plug-in hybrid vehicle and fully battery electric vehicle) and their role in the household (i.e. main or second car). Following self-image congruency theory, we expected that people who identify themselves strongly with specific characteristics of EVs focus more on the attributes related to these characteristic. We found that particularly people who identify themselves as pro-environmental focus on the positive attributes of EVs, implying that the 'green' image of EVs is essential for the positive perception and adoption of EVs.

## Drivers' Adaptation to Electric Vehicles in the UK Ultra Low Carbon Vehicle Demonstrator Programme: Facilitators and Challenges.

Burgess, M.<sup>1</sup>, Harris, M., Mansbridge, S., Bunce, L., King, N., Lewis, E., & Everett, A.  
Psychology/Oxford Brooke University, UK, United Kingdom<sup>1</sup>

The UK's Technology Strategy Board has funded the world's largest multi-site, multi-manufacturer trial of ultra-low carbon vehicles. The trial involves 340 cars and focuses on gathering empirical data for the UK government, vehicle manufacturers and energy suppliers to determine how people use these cars in everyday activities and what challenges need to be overcome in order to integrate vehicles with the lowest carbon footprint into the national fleet.

We draw on mixed methods pre- and post-trial data (on-board data logger; questionnaires, interviews) to assess the degree to which drivers adapted to the new psycho-motor skills fundamental to EV driving, adopted a new driving style, learned to power their car differently, learned to assess range and how driving style influences range. We demonstrate how motivations of private, fleet and pooled car drivers influenced their vehicle use; determine how expectations and attitudes change with daily experience of EV driving; and compare anticipated and actual barriers to vehicle use. These data analyses allow a detailed picture of changing experience and evolving expectations to emerge. In conclusion we highlight the major facilitators and challenges facing EVs and the drivers of EVs and explicate the ramifications of these findings for key stakeholders and policy makers.

## Trajectory of adaptation in the BMW MINI E Trial: From prior motivations to habituated familiarity.

Harris, M.<sup>1</sup>, Mansbridge, S., & Burgess, M.

Psychology/Oxford Brooke University, UK, United Kingdom<sup>1</sup>

In this research we outline the behavioural and psychological adaptation of three groups of drivers (private, fleet and pooled) to the BMW MINI E in the UK trial. Questionnaire and interview data were gathered at (i) pre-trial (ii) technical instruction (iii) 1 week post pick-up of the MINI E (iv) 3 months post pick-up and (v) 6 months post pick-up. Drivers report the driving experience to be positive and the immediate transition from ICE to MINI E to be relatively easy in terms of driving mechanics and car performance. The sustained adaptation of drivers is influenced in interesting and differential ways by: prior motivations and knowledge captured at pre-trial, context-free technical instruction of the operation of the car and the charging mechanism, and negotiation of the steep learning curve within the first week of context-rich real world driving. The key factors at each of these initial stages of participation and subsequent critical incidents at 3 and 6 months combine with the institutional support network implemented by the manufacturer to influence long-term psychological and behavioural adaptation to the MINI E in terms of achieving habituated familiarity with the technology and the integration of the vehicle into drivers' everyday lives.

## In car distraction

Thursday 30th of August, 16:00 - 18:00 - Room 16

## A Field Study of Drivers' Handheld Mobile Phone Use: Prevalence and Predictors

Porter, B.<sup>1</sup>, Murphy, E. M., Edwards, A. L., & Ladage, J.

Old Dominion University, United States<sup>1</sup>

Distracted driving remains a critical consideration for reducing risks of roadway crashes. This presentation contributes to the literature a large-scale, population-based estimate of handheld mobile phone use. The work also contributes to individual predictor models of the type of driver most likely to use a handheld phone. The study was conducted in Virginia, U.S.A. Using a population- and region-weighted stratified sample of county areas, the authors and their team collected data from 18,989 drivers along 136 road segments in June 2011. Of these 18,706 had data to contribute to the weighted estimate of observed handheld use which was 7.6% (95% CI: 6.0 – 9.1%; the unweighted estimate was 8.2%). Further, 18,097 had complete data for individual-predictor models tested on cases without population weighting. Overall, the odds of handheld phone use were higher for males (OR = 1.47), belted drivers (OR = 1.45), and drivers with passengers present (OR = 3.53). In addition, drivers of passenger vehicles were also more likely observed using handheld mobile phones than other vehicle drivers, except pickup truck drivers for whom the odds were not significantly different. Implications of these findings are discussed in the context of the risk literature.

## Can the Psychological Refractory Period paradigm be used to reduce distraction-related vehicle crashes?

Hibberd, D.<sup>1</sup>, Jamson, S.L., & Carsten, O.M.J.

Institute for Transport Studies, University of Leeds, United Kingdom<sup>1</sup>

Modern vehicles are equipped with numerous systems that can distract drivers from safe performance of the driving task. In many cases, these distractions involve tasks that are not required for successful performance of the driving task, and thus should not be given such high priority by the drivers. Studies have shown that drivers are unable to adequately manage their interaction with in-vehicle tasks, and as such, require assistance to maintain their safety when distractions are available. This is especially important given the likelihood that in-vehicle distractions will become more advanced and commonplace in the near future. This paper reports on a driving simulator study that considers the impact of a surrogate in-vehicle task on responses to a lead vehicle braking event in a medium density, motorway traffic environment. The time interval between the braking event and a distracter task is manipulated to create a Psychological Refractory Period paradigm. The influence of braking event expectancy on participant reaction times and the existence of the Psychological Refractory Period is investigated. The findings are used to recommend in-vehicle task presentation methods to mitigate the negative effects of these tasks on driving performance. The goal is to provide simple guidelines that can be incorporated into future vehicle design.

## Modelling the visual demand of in-vehicle user-interfaces: A consideration of different task characteristics

Burnett, G.<sup>1</sup>, Donkor, R., Lawson, G., & Kuriyagawa, Y.

Human Factors Research Group, University of Nottingham, United Kingdom<sup>1</sup>

Modern in-vehicle secondary systems (e.g. navigation, entertainment) require drivers to carry out a range of tasks which can require significant visual demand, for instance, reading, alphanumeric data entry, menu navigation and list scrolling. Such demands have implications for driving

performance, notably relating to increased likelihood of lane deviations and slower reaction times. This paper reports on a series of studies aiming to establish fundamental relationships between the characteristics of tasks and the subsequent visual demand. The intention was to develop preliminary equations to support interface design, considering key variables such as the number of words a user has to read, letters to type, menus to navigate through, the length of list to scroll through, and so on. The research used the ISO occlusion protocol, in which drivers carry out tasks statically whilst wearing goggles providing interrupted visual conditions (i.e. 1.5 seconds of vision followed by 1.5 seconds of occlusion). The research highlighted a number of relationships between variables (in linear, logarithmic and quadratic form). In addition, results were linked to JAMA and AAM guidelines in order to establish acceptable/ unacceptable limits for task characteristics.

#### **How do phoning, texting, operating a navigation system, and following route guidance while driving affect experienced drivers' performance?**

Knapper, A.<sup>1</sup>, Hagenzieker, M. P., & Brookhuis, K. A.

Delft University of Technology, TPM, Transport and Logistics, the Netherlands<sup>1</sup>

Distracted driving is considered a major factor influencing road safety. To investigate how experienced driver behavior changes due to using in-vehicle technology, a fixed base driving simulator was used. 20 participants were asked to come to two sessions, to twice drive in a rich environment (resembling an actual field test route), while performing mobile phone and navigation system tasks. Participants met conditions of navigating using either a paper map or a navigation system, entering a destination into an actual navigation system, texting, and hand held phoning. Next to that, participants filled in the Rating Scale Mental Effort for each condition. Some preliminary 3 person results show that for the manual tasks (i.e. paper maps, destination entry, texting, phoning), mean speeds were lower (62 km/h as opposed to 70 km/h in the control and route guidance conditions). Texting turned out to take most of the participants' stated effort (mean RSME 69.7), while destination entry rendered lowest RSMEs (53.3) and control conditions were rated easier (61.8 vs 22.7). The results are discussed in terms of the potential relation between workload, performance, and effort. Possible implications for policy for future policy are discussed.

#### **Exploring the mechanisms of mobile telephone distraction on driving: Self- versus other-oriented speech in a dual task**

Walker, I.<sup>1</sup>

Department of Psychology, University of Bath, United Kingdom<sup>1</sup>

Previous research has suggested that the distracting effects of drivers' mobile telephone conversations arise particularly during the speech production, rather than the speech perception, phases of the call. We identify various mechanisms that might underlie this finding, including the idea that speech production is intrinsically more difficult than perception. We then explore, in a laboratory experiment, the idea that speech production might involve additional mental load because the speaker must empathetically consider the recipient of the message. Participants took part in a dual task: whilst undertaking a demanding visual-motor task they also had verbally to describe a visual display whilst their descriptions were recorded. The counterbalanced repeated-measures experimental manipulation was that half the time the drivers recorded these descriptions for themselves to listen to later and half the time they recorded them for somebody else to listen to later. Despite the task remaining constant, producing speech for somebody else appeared to be more effortful than producing speech for oneself, even though the complexity and information content appeared comparable. These data suggest there might be a social, empathetic component to speech aimed at another person that increases mental workload.

#### **Symposium - Innovations in novice driver training and licensing: An international perspective**

Thursday 30th of August, 16:00 - 18:00 - Ronde zaal

#### **Accompanied Driving From Age 17 in Germany – Interaction between the Novice Drivers And Their Accompanying Adults**

Funk, W.<sup>1</sup>

Institut fuer empirische Soziologie an der Universitaet Erlangen-Nürnberg, Germany<sup>1</sup>

Results from the process evaluation of the German pilot scheme will be presented. 3,780 teenagers were interviewed up to four times throughout the pilot scheme, i.e. from starting accompanied driving to obtaining a regular driving licence at the age of 18. Also 1,735 attendants were questioned once.

The interaction between the novices and their accompanying adults can be tracked in the view of the youth on the level of the whole sample and in a panel perspective. Also assessments of the attendants at an early stage of the accompanying period will be presented.

Specifically accepting the presence of the attendants, their availability during the trip, their attention and support in hazard perception and many more aspects can be tracked.

The longer the novice driver participates in the accompanied driving, the more the acceptance of the attendant decreases. However, attendants are perceived as reliable reference persons throughout the accompanying period with their high level of attention only slightly decreasing over time. Also verbal hazard warnings diminish with increasing driving experience, and comments of the attendants are more rarely perceived as criticism.

The results suggest that participants in the accompanied driving measure build their driving experience in a beneficial and secure setting.

#### **The experiences of novices in an enhanced graduated driver licensing program in Queensland, Australia**

Scott-Parker, B.<sup>1</sup>, Watson, B., King, M.J., & Hyde, M.K.

Centre for Accident Research and Road Safety - Queensland (CARRS-Q), Australia<sup>1</sup>

Young novice drivers experience considerable risk of injury and fatality in a road crash when they first begin driving unsupervised as Provisional (intermediate) drivers. Graduated driver licensing (GDL) allows the novice to gain experience in an environment of reduced driving risk and increasing driving privileges. The GDL program in Queensland, Australia, was considerably enhanced in July 2007, including the introduction of a Learner logbook recording 100 hours of supervised driving practice. This paper explores the behaviours of 17-19 year old Learners in the enhanced GDL program (n = 1032, 609 females). Most Learners report compliance with GDL requirements (eg submitting accurate logbooks) and general road rules (eg obeying speed limits). Experiences and behaviours of a subsample of these Learners (n = 183) were compared to an earlier recruited sample of Learners (n = 149) who progressed through Queensland's former-GDL program. As expected, current-GDL Learners reported obtaining significantly more driving practice, over a longer period. Interestingly, the current-GDL Learners appeared to find it easier to gain supervised practice, and this was more likely to be provided by mothers. Study findings of study have important implications for those jurisdictions considering enhancements to GDL, particularly in terms of encouraging greater practice in the Learner phase.



### The experience of parents and other supervisors in a graduated driver licensing program in Queensland, Australia

Watson, B.<sup>1</sup> & King, M.J.

Centre for Accident Research and Road Safety - Queensland (CARRS-Q), Queensland University of Technology, Australia<sup>1</sup>

Queensland's graduated driver licensing system was enhanced in mid-2007 with changes including additional requirements in the learner period and the introduction of a two-stage provisional licence. One of the major new requirements was for learner drivers to record 100 hours of supervised driving practice in a logbook, before they could undertake the test to obtain their provisional licence. This requirement appears to implicitly encourage the involvement of parents and other private supervisors (for instance siblings, partners and friends) in the learning to drive process. This presentation will describe how parents and other private supervisors have responded to the changes made to Queensland's graduated driver licensing system.

Private supervisors of learner drivers (as opposed to professional driving instructors) were recruited using a combination of snowball and convenience sampling techniques (N = 228, 121 females). The average amount of supervision reported by participants was 79.6 hours (sd = 92.4). Parents provided an average of 68.6 hours (sd = 82.4) while non-parents provided an average of 91.1 hours (sd = 96.1). For 59.6 per cent of the sample, this was the first time that they had supervised a learner driver.

Both parental and non-parental supervisors reported that it was important to teach their learner a range of behaviours (such as speed control). There were some differences between parents and non-parents in the extent to which they ensured that their learner engaged in positive driving behaviours (such as assessing the travelling speed of other drivers). There were also differences regarding their endeavours to ensure the learner did not undertake inappropriate driving behaviours (such as drinking alcohol before driving). This study demonstrated that, in addition to parents, non-parental supervisors have an important role to play in assisting learner drivers to obtain significant amounts of practice.

### Feedback interventions for parents and novices during and after accompanied driving

Lotan, T.<sup>1</sup>, Shimshoni, Y., & Omer, H.

OR YAROK / Chief Scientist, Israel<sup>1</sup>

It is well known that young drivers are at their highest risk once they start solo driving. Currently, there is increasing evidence showing significant positive effects of parents' involvements in their young drivers driving behaviour. However, parents, often, for various reasons, tend to neglect their duty and resort to "I trust my kid" justification for not getting involved.

In a recent study we provided personal guidance to parents on how to be present and involved during the time that their young driver starts solo driving. The guidance is constructed within the realm of "The New Authority Approach" and suggests 3 levels of parental vigilant care on teen driving. The first level reacts to safe driving by giving young drivers maximum freedom and responsibility while maintaining constant interest and presence. The second level reacts to dangerous driving with expanding and tightening of parental involvement, putting more limitations on driving and taking away freedom and privileges. Finally level three intensifies parental involvement and presence to its peak, while taking away more driving rights in reaction to very dangerous driving. An In-Vehicle-Data-Recorder is used by parents to assess the suitable level of care. Results show very good potential for increased parents' involvement.

### Evaluating a pre-drivers' training scheme

Glendon, I.<sup>1</sup>, Chalmers, S., Jarvis, A., & Salisbury, R.

School of Applied Psychology/Griffith University, Australia<sup>1</sup>

The 1-day road safety education program is aimed at equipping young people with the knowledge to stay safe on Australian roads before they hold a driver's licence. The program focuses on attitudes and awareness of young people as drivers and passengers. The study was a longitudinal evaluation of the program in a sample of school students (mean age 16.4 years). Attitudes towards risky driving, perceptions of traffic risk, and awareness and knowledge of road safety were measured prior to, immediately after, and six weeks following the program. Survey data were collected from 112 program participants and 127 controls from two schools. Results showed immediate improvements in attitudes towards risky driving, perceptions of traffic risk, and awareness and knowledge of road safety following participation in the program. Improvements were still evident at the 6-week follow-up regarding attitudes towards risky driving. Regardless of group and time, males demonstrated less negative attitudes towards risky driving and poorer perception of traffic risk than females did. Knowledge and awareness of road safety was similar for both genders. Outcomes of the study have both theoretical and practical implications, making a useful contribution to the intervention/evaluation research literature.

### Innovations in graduated driver licensing in the USA

Shope, J.<sup>1</sup>

University of Michigan Transportation Research Institute (UMTRI), United States<sup>1</sup>

As of 2011, all 50 US states had some form of graduated driver licensing (GDL) in place. Several states have recently enhanced their GDL programs, strengthening or adding various components. Some of the changes involved the following: night restrictions have been lengthened; passenger restrictions have been added; cell phone and texting bans have been added; holding periods for learner licenses have been lengthened; requirements for hours of supervised (accompanied) driving have been lengthened; and parent meetings have become required. Other innovations may be added in 2012. The Insurance Institute for Highway Safety maintains a complete file of the US states' current GDL programs. An up-to-date review of the various innovations noted above, and others as introduced, will be presented. Acceptability of the innovations, and evaluation results, if available, will be discussed for the various program components that have been adopted.

### Symposium - Social cognition and driver behaviour

Thursday 30th of August, 16:00 - 18:00 - Room 10

### The Development of Young People's Perceptions of Driving

Tolmie, A.<sup>1</sup> & Durkin, K

Institute of Education, University of London, United Kingdom<sup>1</sup>

Aim: It is well established that novice drivers have elevated levels of involvement in accidents, and this pattern is more pronounced amongst novice drivers aged 17 to 21, especially if they are male. The apparent rapidity with which this above average accident risk is established in this group suggests that its source lies in the pre-driver period. The purpose of this paper is to review what is known from past research on pre-driver influences, integrating this within a perspective informed by developmental psychology more widely, in order to identify potential targets and methods for intervention within the pre-driver period.

**Method:** Structured review. The seven types of factor identified by Strecher et al. (2007) as psychosocial predictors of driver behavior were used as the source for literature search terms in relation to novice drivers and pre-drivers. The findings with regard to the impact of each type of factor were summarised, and developmental issues relating to these influences were then identified, along with their policy implications. Conclusions were informed by both the pre-driver literature and wider research in developmental psychology.

**Results and Conclusions:** The paper will focus on conclusions for the four factors that generate the most important influences: attitudes, norms, identity, and task difficulty. The influence of attitudes has frequently been confused with that of underlying identity, but there is evidence of some more specific effects amongst adolescents, and of ambivalent feelings about the thrills vs the responsibilities of driving that might provide a lever for intervention. Perceived peer norms are a strong influence on personal identity and concomitant behaviour, exacerbating risk-taking among young males. This influence may be counteracted by that of parental norms, however, especially at moments of significant role change, such as (potentially) passing the driving test. Identity is the strongest single influence from the pre-driver period, as the predominant psychological concern in late adolescence, but its effects are compounded by its combination with low skill levels, especially as regards monitoring and adjusting driving behaviour. Greater emphasis on self-regulation in skill development during the pre-driver and novice driver periods may help to offset these effects.

#### **The Social Cognitive Determinants of Offending Drivers' Speeding Behaviour**

Thomson, J.<sup>1</sup> & Elliott, M.A.

School of Psychological Sciences and Health, University of Strathclyde, United Kingdom<sup>1</sup>

**Aim:** Driving faster than the legal speed limit substantially increases the risk of a road traffic crash (Taylor, Lynam, & Baruya, 2000). Official statistics for England and Wales show that around two million speed limit offences are dealt with by the police each year, making speeding the most common of all driving offences (Fiti, Perry, Giraud, & Ayres, 2008). Effective interventions to reduce speeding are likely to target variables that both predict speeding behaviour and are amenable to change. The present research therefore aims to identify such variables, using an extended theory of planned behaviour (TPB; Ajzen, 1985) as a theoretical framework.

**Method:** Prospective design. At Time 1, participants (N=1408 drivers caught by the police or safety camera for speeding) completed postal questionnaires to measure TPB constructs (intention, instrumental and affective attitude, subjective and descriptive norm, and self-efficacy and perceived controllability) and additional variables (moral norm, anticipated regret, self-identity, and past speeding behaviour). At Time 2 (6-months later), subsequent speeding behaviour was measured, again using self-completion, postal questionnaires.

**Results:** The TPB and additional predictors accounted for 66% of the variation in intention and 49% of the variation in subsequent speeding behaviour. The independent predictors of intention were instrumental attitude, affective attitude, self-efficacy, moral norm, anticipated regret and past behaviour. The independent predictors of behaviour were intention, self-efficacy, anticipated regret and past behaviour.

**Conclusions:** Strong evidence for the extended TPB was provided. The cognitive predictors within the model accounted for a substantial proportion of the variance in both intention and subsequent speeding behaviour. From a theoretical perspective, the study demonstrates that the present model provides a more comprehensive account of both intentions and behaviour than does the "standard"

application of the TPB. From an applied perspective, the findings show that the present model provides a good basis for road safety interventions that aim to reduce speeding in a section of the driving population that represent a road safety concern (i.e., speed limit offenders). More specifically, instrumental and affective attitude, self-efficacy, moral norm, and anticipated regret are likely to represent useful intervention targets.

#### **Using an extended theory of planned behaviour to examine the potential within cognition change interventions to reduce the commission of driving violations**

Elliott, M.<sup>1</sup>

School of Psychological Sciences and Health, University of Strathclyde, United Kingdom<sup>1</sup>

**Aim:** Correlational research has demonstrated that the theory of planned behaviour (TPB; Ajzen, 1985) is suitable for predicting drivers' intentions and behaviour. However, to determine whether or not the model provides a suitable basis for road safety interventions, research is needed to examine its potential for changing driver behaviour. Experimental research has difficulty addressing this issue because previous studies have typically achieved, at best, 'small' changes in the model's cognitive predictors. Therefore, the aim of this study was to test the potential within the TPB for changing driver behaviour, using regression-based statistical simulations. Research in other domains was extended by testing the behaviour change capacity of an extended TPB, which included not only intention, attitude, subjective norm and perceived behavioural control, but also moral norm and anticipated regret as additional cognitive antecedents of behaviour.

**Method:** Prospective design (N=198 young drivers aged 18-25 years old). Self-completion questionnaires were used at Time 1 to measure the TPB and additional cognitions with respect to eleven different driving violations. Subsequent performance of those driving violations was measured at Time 2 (one month later), again using self-completion questionnaires.

**Results:** Regression-based simulations showed that changing participants' scores on the cognitive antecedents of driving violations, in isolation, generated significant changes in intentions and reduced the estimated proportion of drivers committing violations by between 1 and 6 percentage points (depending on the cognition that was changed). Significantly larger reductions were estimated following maximum changes to theoretically determined combinations of predictors, to the extent that simultaneously changing participants' scores on all cognitive predictors evoked virtually the maximum amount of intention change possible and reduced the proportion of drivers committing driving violations from 79% to 39%. Sensitivity analyses showed that 'large' (0.8 SD) changes in multiple cognitive predictors were needed to reduce the commission of driving violations. **Conclusions:** There is substantial potential for safety interventions based on the extended TPB to change drivers' intentions and behaviour. However, interventions need to target multiple cognitive antecedents, and achieve 'large' changes in those cognitions, in order to generate meaningful reductions in driving violations. Also, given the notable intention-behaviour 'gap', the present findings imply that cognition change interventions need to be supplemented with strategies that help drivers translate their intentions into action (e.g. implementation intentions).

#### **Did the introduction of the automated speed control system change speeding intention and motivation among young drivers?**

Delhomme, P.<sup>1</sup> & Paran, F.

IFSTTAR, France<sup>1</sup>

In order to know young drivers' motivations to exceed speed limits, we carried out a survey based on extended TPB and at 2 times each separated by about 12 months. At the end of 2002,

the automated speed control system began to be introduced in France. The main aim here was to examine if this new context would modify young drivers' speeding intention and motivations to drive more than 110 km/h on roads where the speed limit is 90 km/h. A sample of 1192 men and women drivers (18-25 yrs) took part in the first phase (2003) and in the second phase (2005) with a within-subject design. We conducted hierarchical regression models to predict intention to drive more than 110 km/h where the speed limit is 90 km/h for the next 12 months and the change in that intention from phase 2 to phase 1. The models to predict the behavioural intention in phase 1 explained 83% of the variance and the reduction of the intent to drive more than 110 km/h explained 59% of the variance. The introduction of the automated speed control system plausibly contributed to reduce the speeding intention, along with a deep modification among the determinants which explained the reduction of that intention.

#### **Evaluation of a mandatory risk-education program for learner drivers in Sweden**

Forward, S.<sup>1</sup>

Swedish Road and Transport Research Institute, Sweden<sup>1</sup>

**Aim.** The aim of this presentation is to present the results from an evaluation of a new training program for learner drivers.

**Method:** A postal survey was used targetting a group of learner drivers aged 18 to 24 years. Results are based on 1403 people.

**Results:** Some mixed results were presented: Attitudes to drink/drug driving had not been affected although their attitude towards driving when tired and using a seat belt had changed in a positive direction. Attitude towards speeding did not change significantly and where changes were noted they were in the wrong direction. Participants' intentions to act in a specific manner changed, but unfortunately not always in the right direction. Two of the safe behaviours (alcohol and seat belt) were more likely to be performed in the after study. However, they were also more inclined to speed and drive when tired.

**Conclusions:** The results show that the participants who completed training expressed a slightly safer attitude, even if this was not always reflected in their intentions. Hence it is suggested that the process of change needs to start earlier with mandatory risk awareness training at school. Another suggestion is to develop new teaching tools for educators.

### **Symposium - Cyclists' behaviour**

Thursday 30th of August, 16:00 - 18:00 - Room 9

#### **Research methods for studying naturalistic bicycling: Practicalities and ethics**

Walker, I.<sup>1</sup>

Department of Psychology, United Kingdom<sup>1</sup>

There is a growing interest in studying bicyclist behaviour, and drivers' behaviour around bicyclists, in both laboratory and real-world settings. In this talk I review some recent studies that have carried out this type of work and then abstract from them the main methods available for studying behaviour of bicyclists and those with whom they share the road. I make particular reference to the quality and form of the data that can be obtained with each method before discussing a framework for considering the ethical aspects of studying real-world traffic behaviour. This framework includes

gradations of privacy and consent, and the legal and behavioural implications of studying road users, particularly when they are naive to the purpose of the study.

#### **Naturalistic cycling studies: understanding how cyclists and drivers interact on the roads**

Johnson, M.<sup>1</sup>, Katz, R., Oxley, J., & Charlton, J.

Monash University Accident Research Centre/Amy Gillett Foundation, Australia<sup>1</sup>

Cyclists' experiences on the road, particularly interactions with vehicles were investigated in two studies using naturalistic methods. The first study was conducted in Melbourne. A compact video camera was mounted to the helmets of commuter cyclists who each filmed 12 hours of their trips to and from work. Analysis of 127 hours of footage identified 54 cyclist-driver interactions, including 2 collisions and 54 near-collisions or incidents. The position of the camera provided important insights into cyclists' experiences on the road; in particular, the moments before an event occurred. This type of information has not been available via traditional post-event (hospital or police) data sources. However, there were limitations to the study, primarily related to the camera. The camera had poor low light sensitivity so footage recorded pre-dawn or post-dusk was primarily black and no details of the trip could be identified. In addition, cyclists' speed was considered to be a contributing factor in the near-collisions, but this could not be confirmed by the camera alone.

The second study is currently being conducted in Canberra. A compact video camera was again mounted to the helmets of commuter cyclists who record 12 hours of their trips to and from work. Limitations identified in the first study were addressed by advancements in the camera technology. Improvements in the aperture of the camera enabled filming in low light conditions and a GPS module that plugged into the camera provided capacity to record speed information within a single unit.

A modified version of the 100-car naturalistic driving study was used to comprehensively analyse all collision and near-collision events. The insights provided by these two studies advance our understanding of cyclists' experiences on the roads and will be used to develop countermeasures that aim to improve safety for Australian cyclists.

#### **The effects of cyclists at rural intersections on driving behaviour: a driving simulator study**

Duivenvoorden, C.W.A.E. (Kirsten).<sup>1</sup>, Hogema, J. (Jeroen), & Wegman, F.C.M. (Fred)

SWOV Institute for road safety research, the Netherlands<sup>1</sup>

Crash statistics show that approximately 30% of fatalities occurring at Dutch rural intersections with a speed limit of 80 km/h are cyclists (2006-2008). To further study the type of crashes and the role of speed, a driving simulator study is conducted. Although driving simulators are commonly used in road safety research, they are rarely used to study cycling safety. Therefore, in the present study cyclists are simulated at intersections to measure the effects on driving behaviour of motorised traffic. For example, do cyclists intending to cross over affect driving speeds of motorised traffic?

In the present study two types of intersection speed-reducing measures are applied aiming for motorised traffic to pass through intersections with a speed substantially lower than the speed limit of 80 km/h. Thirty subjects will participate by each completing three drives on a rural road with both signalised and priority intersections. At each intersection, the amount and manoeuvre (e.g. intending to cross) of cyclists are varied. Cyclists are modelled in such a way that they behave naturally. Results gain insight in the interaction between cyclists and motorised traffic at intersection which can be used to improve cycling safety. Preliminary results will be presented in the paper.

### **Bicyclists' behaviour in two-way bicycle lanes in one-way city streets**

Bjørnskau, T.<sup>1</sup>

Institute of Transport Economics (TØI), Norway<sup>1</sup>

There is little factual knowledge about how two-way bicycle lanes in one-way city streets work. Do new and unexpected conflicts emerge? Does it increase the number of cyclists? If so, do road users in general feel more (or less) safe when there are more cyclists in the street? Do cyclists become more rule-abiding if they are given better road facilities like this? What are the different road users' opinions?

The present study is a quasi-experimental study of cyclists, pedestrians and car drivers' behavioural response to the implementation of two-way bicycle lanes in two one-way city streets in Oslo. Cyclists' behaviour was registered before and after two-way bicycle lanes were implemented in two streets and in comparable control streets. Type of cyclists, cycle behaviour, like riding against red lights, cycling on the pavement and conflicts with parked cars etc. were registered. In addition car drivers, pedestrians and cyclists were interviewed about their opinions about the measure, about conflicts with other road users etc. Conflicts were registered by use of video camera recordings. Before-data was collected in May 2011, after-data will be collected in May/June 2012.

### **A survey of safety-relevant motives, attitudes and behaviors of German cyclists**

von Below, A.<sup>1</sup> & Schmidt, E.A.

Federal Highway Research Institute (BASt), Germany<sup>1</sup>

Between 2000 and 2010 in Germany the number of fatally injured cyclists (-42 %) was not reduced by the same amount as the number of killed car occupants (-58 %). Thus, the knowledge about psychological factors such as safety relevant motives, attitudes and behaviors of this vulnerable road user group and about the potential change of these factors is of high importance. Next to the increase in exposition, the increased proportion of elderly cyclists, the growing use of pedelecs (pedal electric cycles) that enable higher travelling speeds and the relatively low number of cyclists using helmets are topics that might potentially lead to a critical development of cyclist safety in the future.

In order to gain information about psychological as well as sociodemographic characteristics of German cyclists 1,500 face-to-face interviews were conducted with a representative sample of cyclists with widely varying use patterns. A core goal of this questionnaire was to identify user groups with an increased risk of accidents and near accidents. Factors that might contribute to this increased risk are analyzed. At the conference first results will be presented and discussed in relation to the design of adequate road safety measures.

### **A case-control study of cyclists' crash risk**

Huemer, A.<sup>1</sup>, Rapior, M., Gebhard, A., & Vollrath, M.

Department of Engineering and Traffic Psychology, Germany<sup>1</sup>

The crash risk of cyclists is still poorly understood. It is assumed that incorrect behavior of the cyclists (e.g., riding at the wrong side of the road, riding without light during the night) contributes to a high accident risk. However, empirical data supporting this assumption are few. In order to gather this kind of information, a case-control study was conducted in the city of Braunschweig, Germany. In 2009, 613 accidents involving cyclists were reported by the police. From these, seven typical crash-situations were identified. Additionally, at some places in the city there was a clustering of cyclists' accidents. These typical crash-situations at typical locations served as cases in the study.

In 2011, more than 800 cyclists were observed at these locations at comparable times as the accidents (controls). The comparison of cases and controls enables to assess the influence of the situation (e.g. weather conditions), environmental characteristics (e.g. number of lanes), individual differences (e.g. age, gender) and behavioral factors (e.g. incorrect road use, wearing a helmet). Thus, an assessment of crash risk of cyclists is possible.

### **Road safety education 2**

Thursday 30th of August, 16:00 - 18:00 - Room 4

### **Retuning the crash magnets: diversion from prosecution courses for skill and attitude deficit**

Stradling, S.<sup>1</sup>, Broughton, P., Burgess, C., Fylan, F., & Scott, H.

Edinburgh Napier University, United Kingdom<sup>1</sup>

This presentation describes the development and evaluation of diversion from prosecution courses for low level moving traffic offenders in the UK. Bad drivers, whether suffering skill-deficit, attitude-deficit or both, pose more risk on the road and need help. They come to the attention of the authorities through committing traffic offences. Speed cameras and traffic police act as roadside diagnostic agents, spotting the crash magnets and diverting them to appropriate remediation, for which the offender pays. The nature and severity of the offence gives clues as to the type of retraining course needed.

In the UK around 750,000 low level speeding offenders a year are currently being diverted to half-day Speed Awareness courses. This presentation will look at recent evaluation data for the Speed Awareness Course, the updated Driver Improvement (now Driver Alertness) Course, and the RIDE course for errant P2W riders; and at the design, development and evaluation of two new courses, one addressing bad driving habits drivers may have fallen into (skill deficit: Driving 4 Change) and the other disrespect for other road users with whom the driver is sharing the public highway (attitude deficit: What's Driving Us?).

### **The effect of commentary driver training on hazard perception and performance in a driving simulator**

Young, A.<sup>1</sup>, Konstantopoulos, P., & Crundall, D.

University of Nottingham, United Kingdom<sup>1</sup>

Commentary driving involves providing a verbal running commentary while driving; including what the driver can see, what they are thinking and what action they intend to take. Evidence suggests that commentary driver training can lead driver behaviour, though studies have never recorded both the performance in providing a commentary and the subsequent impact on driving behaviour. The current study assessed driving behaviour in a simulator after commentary training via a bespoke video package including example commentaries and hazard perception clips. Simulated behaviour was analysed to detect improvements in driver behaviour, and also possible decrements due to the secondary load of the commentary task. Furthermore, commentary performance was also analysed by comparing the verbal reports of participants in the simulator with the verbal report of an expert driving instructor who drove the real route around Nottingham that the simulated route was based upon. The results are discussed in relation to the causal link between providing a commentary and the subsequent impact on behaviour.



## Young military learner drivers: The benefit of e-training on driving test performance

Dorn, L.<sup>1</sup>

Cranfield University, United Kingdom<sup>1</sup>

For maximum efficiency in the use of UK military resources, driving licence acquisition training takes only 2/3 weeks but this approach may lead to poor hazard awareness and affect practical driving test performance. To supplement training, an experimental group (n=128; 88.3% male) of learner drivers at military camp were given access to an e-training platform with ten hours of online modules including hazard perception training. The platform was accessed for at least an hour a day for 2/3 weeks and driving test performance was compared with a control group (n=92; 98.9% male) at another military camp with no supplementary e-training. The mean age for the experimental group was 19.82 (SD=3.20) and 20.02 (SD=3.50) for the control group. Both groups were comparable for previous learner driving experience and riding experience. The experimental group had a significantly improved pass rate by the third attempt for the practical driving test compared with the control group (91.3% Vs 72.4%). The implication for these findings will be discussed with respect to the training efficiency and safety benefit of e-training for learner drivers.

## A visual scanning task for learning to drive: a driving simulator study

van Leeuwen, P.<sup>1</sup>, De Winter, J.C.F., Damveld, H.J., & Happee, R.

Biomechanical Engineering, Faculty of Mechanical, Maritime and Materials Engineering, Delft University of Technology, the Netherlands<sup>1</sup>

Novice drivers have a smaller functional field of view than experienced drivers. This study investigated the training effectiveness of a visual search task in a driving simulator, aimed at increasing young drivers' functional field of view. Two groups of novice drivers (total of 30 participants, mean age = 19.1 years) were instructed to drive as accurately as possible in the center of the right lane in a self-paced driving task during four 8-min sessions in a rural environment. One group conducted a secondary visual search task, consisting of detecting and fixating on visual stimuli in the foveal and peripheral area. The visual stimuli consisted of purple dots which faded in slowly and disappeared when fixated by the participant. After training, both groups drove a retention session in an urban environment, in which various hazardous situations occurred. Results showed that the participants became more proficient at the lane keeping and the visual search task during training. Although the visual search group had increased functional field of view during the training sessions, no group differences in looking and driving behaviour were detected during the retention session. These results have various implications for young driver training.

## Symposium - Behavioural adaptation of drivers in response to ADAS use

Friday 31st of August, 10:30 - 12:30 - Blauwe zaal

## Which solutions for negative behavioural adaptations to Advanced Driver Assistance Systems?

Piccinini, G.F.<sup>1</sup>, Simões, A., & Rodrigues, C.M.

UNIVERSITAS, Portugal<sup>1</sup>

Advanced Driver Assistance Systems (ADAS) are expected to make the driving task more comfortable and safer. However, previous studies already uncovered some negative short-term effects on drivers' behaviour, induced by ADAS. On the other hand, road safety research still lacks in similar results about the long-term effects.

In order to fill this research gap, this study aims at investigating the negative behavioural

adaptations (BA) to Adaptive Cruise Control (ACC) and Blind Spot Information System (BLIS), considering a small sample of systems' users.

Two focus groups, involving 13 participants, were performed. During the sessions, some erroneous usages of ACC and BLIS were described by the participants, such as driving without hands on the steering wheel (with ACC) or overtaking without checking the side mirrors (with BLIS). A Field Operational Test (FOT) is planned for next January to ascertain the evidence found during the focus groups: 9 ACC and BLIS users will drive an instrumented car for 10 days, with an overall experimental duration of 3 months.

After the FOT, it will be analyzed the significance of personality traits such as Sensation Seeking or Locus of Control for the occurrence of negative BA to ADAS in order to plan adequate training actions.

## How safe do drivers who are familiar with using ADAS feel & how does it affect their behaviour?

Haupt, J.<sup>1</sup>

Research, Austria<sup>1</sup>

Advanced Driver Assistance Systems are one measure aiming at improving traffic safety. Measures introduced to enhance road safety may lead to the converse effect since road users may adapt their behaviour to these negatively<sup>1,2</sup>. Any changes in motivational processes due to the level of experience in using ADAS may also lead to changes in drivers actual behaviour while driving<sup>3</sup>. In a survey drivers that build up a continuum from having 'almost no' to having 'much' experience in using ADAS are asked how safe they feel on the road, how they estimate the likelihood of having an accident and being injured in case they are involved and how much control they perceive while driving. Further on, these drivers are asked to fill in a travel diary for a period of 5 days asking for actions they perform parallel to the driving task like calling, speaking to passengers etc. Results that are going to be presented will indicate whether drivers who are familiar with using ADAS feel more or less safe on the road than inexperienced ADAS users and whether this is reflected in their conscious decision to perform or not to perform actions concurrently to driving.

<sup>1</sup>Näätänen, R. and Summala, H.(1974). A model for the role of motivational factors in drivers' decision-making. *Accident Analysis and Prevention* 6, pp. 243–261.

<sup>2</sup>Carroll, J., Howard, S., Peck, J., Murphy, J.(2002). A field study of perceptions and use of mobile telephones by 16–22 year olds. *Journal of Information Technology Theory and Practice* 4, 49–61.

<sup>3</sup>Hatakka, M.(2000). What makes a good driver? – The hierarchical approach. In: Bartl, G.(Ed.), *DAN-Report. Results of EU-Project: Description and analysis of post licensing measures for novices drivers*. Austrian Road Safety Board (KfV), Vienna, Austria.

The research leading to these results has received funding from the [European Community's] Seventh Framework Programme ([FP7/2007-2013] under grant agreement n°238833.

## Behavioural adaptation of older drivers in response to Advanced Driver Assistance Systems (ADAS)

Dotzauer, M.<sup>1</sup>, van Wolffelaar, P.C., & Brouwer, W.H.

Department of Neuropsychology, University Medical Center Groningen, The Netherlands<sup>1</sup>

The number of older drivers operating a vehicle increases rapidly and driving is a very important aspect of independent living and subjective wellbeing. With ageing, the prevalence

of neurodegenerative disorders such as Parkinson's disease (PD) and Alzheimer's disease (AD) increases. Even in mild forms, these disorders can interfere with driving, particularly in situations involving divided attention and time pressure. Therefore, methods to support older drivers in maintaining safe mobility are needed.

In an advanced driving simulator, we investigate in how far driving performance of older drivers with mild cognitive and visual-motor impairments improves when using an Advanced Driver Assistance System (ADAS) advising on priority and speed. Thirty-six older drivers (n=36) with and without cognitive and visual-motor impairments will be assessed in 14 experimental trials. Until now, ten non-demented subjects with PD (MMSE: M=28.5) and ten healthy older persons (MMSE: M=29) were included. Using average speed and time spent on intersections as global performance characteristics, preliminary results suggest four sessions are needed to reach stable performance levels and small effects of ADAS occur. The time course of performance appears to be different for subjects with PD compared to healthy older drivers, but individual differences are large. Implications of the results and possibilities for more detailed analysis are discussed.

#### **Behavioural adaptation of the unequipped driver to small time headways held by automated vehicles in the traffic**

Gouy, M.<sup>1</sup>, Diels, C., Reed, N., Stevens, A., & Burnett, G.  
TRL, United Kingdom<sup>1</sup>

Platoon driving refers to the electronic coupling of vehicles whereby the first vehicle is driven manually and the others follow automatically with short time headways (THW) as it has beneficial effects on both energy consumption and traffic flow. However, since platoons are expected to operate on normal motorways, it is important to assess how they affect other drivers' behaviour. In particular, this study investigated possible contagion effects whereby the short THW within platoons lead non-platoon drivers to adopt shorter THW too. Using TRL's mid-level driving simulator, 30 participants were asked to follow a lead vehicle. Following the 15 minutes baseline period during which no platoons were present, participants drove adjacent to platoons with large (1.4 seconds) and short (0.3 seconds) THW for 15 minutes each, the order of which was counterbalanced across participants. Results showed a significant main effect of THW: when driving adjacent to the platoon with a short THW, participants' average, minimum and maximum THW was significantly smaller and they spent more time under the critical threshold of 1 second. It is concluded that short THWs in platoons may affect the THW adopted by other traffic which, in turn, may negatively affect road safety.

#### **Young and novice drivers**

Friday 31st of August, 10:30 - 12:30 - Rode zaal

#### **Perceptual Learning of Hazards by Novice Drivers: Theory and Longitudinal Data**

Caird, J.<sup>1</sup>, Johnston, K., Pearson, A., Milloy, S., & Ohlhauser, A.  
Department of Psychology/University of Calgary, Canada<sup>1</sup>

During the first six months after licensure, novice drivers crash risk declines significantly. One of the hypothesized mechanisms for this decline is that hazard perception improves with driving experience. However, this particular learning process is not well understood. A theory of perceptual learning originally proposed by Eleanor Gibson is adapted to provide conceptual and predictive insight

into hazard perception in novice drivers. The central tenants of the theory, such as the necessity of perception and action coupling, are illustrated using novice driver eye movements and hazard responses from a longitudinal simulator study with novice drivers. Specifically the performance of 16 novice teenage drivers (M = 16.2 years of age) was compared to a group of 15 experienced adult drivers (M = 32.9) when a variety of hazards were encountered over the span of six months of testing. A number of events including late yellow lights, the sudden appearance of pedestrians, hard braking by lead vehicles, bicycle path encroachments among others were quasi-randomly dispersed throughout several drives within each monthly simulator session and over the six monthly sessions. Eye movement and response data from these events over time and across group are interpreted using the adapted perceptual learning theory.

#### **Exploring the role of dorsolateral prefrontal cortex in the processing of hazardous driving situations.**

Chapman, P.<sup>1</sup>, Runham, P., & Crundall, D.  
University of Nottingham, United Kingdom<sup>1</sup>

It has been suggested that one possible cause of road accidents in young novice drivers is insufficient development of prefrontal brain regions, however, relatively little research has been conducted that directly explores the involvement of prefrontal cortex in driving. The current study compares a series of classic frontal tasks with driving in the degree to which they evoke activation of dorsolateral prefrontal cortex. We have used functional near-infra red spectroscopy (fNIR) to assess activation during a computerized version of the Corsi block tapping task, the Wisconsin card sorting task, and the Controlled Oral Word Association task. We then contrast these findings with measured activation in dorsolateral prefrontal cortex while participants are driving a high fidelity driving simulator (NITES 2) in conditions of relatively low workload and while participants are attempting to successfully navigate through a series of scripted hazardous scenarios. The results are discussed in terms of the degree to which a fully developed dorsolateral prefrontal cortex is essential in allowing drivers to safely navigate potentially hazardous situations.

#### **Who intends to take post-test driver training? A segmentation of novice drivers in Great Britain**

Helman, S.<sup>1</sup>, Kinnear, N., & Lloyd, L.  
TRL, United Kingdom<sup>1</sup>

Previous research has shown that novice drivers feel unprepared for driving after passing their practical driving test, and can find the transition to solo driving stressful. This suggests a role for post-test training to ease the transition from accompanied to unaccompanied driving. However, very little is known about the underlying motivating factors and needs that novice drivers have towards further training. Specifically, we do not know which underlying variables (attitudes, demographics etc.) best predict how likely novice drivers are to take further training. This means that training providers do not know how best to design and market their range of products. Against this context, the IAM commissioned TRL to carry out a segmentation of novice drivers to understand what motivates their intentions to engage with different types of driver training. One thousand and seven novice drivers (stratified to match the population of practical test passers in GB aged between 17 and 30) were surveyed. Discriminant analyses were used to establish those sets of variables that best discriminated between novice drivers who intended to take future training, and those who did not. The results identify the key underlying attitudinal and behavioural factors that training providers should provide and market.

## Laboratory Based Hazard Perception and Speed Choice Tests Help Identify Young Drivers at Risk

Starkey, N.<sup>1</sup>, Isler, R.B., & Cantwell, S.  
School of Psychology, New Zealand<sup>1</sup>

Young drivers show high levels of risky driving and are over-represented in motor vehicle crash statistics world-wide. Factors contributing to this include inappropriate speed choice and lack of road surveillance skills (visual search, situation awareness and hazard perception). This study was conducted to investigate this further by examining the interactions between speed adaptation, hazard perception skills, personality and driving attitudes in younger and more mature drivers. Ninety-six drivers (48 males, 48 females) with different levels of driving experience (learner, restricted, full licence <25 years of age, and full licence >25 years of age) completed a laboratory video-based speed choice task, a hazard perception dual task and a series of questionnaire measures. Preliminary analyses indicated that male drivers selected significantly higher speeds than female drivers on the speed choice task. On the hazard perception dual task, younger drivers detected significantly fewer hazards and made fewer tracking errors on the secondary task compared to older drivers. In addition, the questionnaire measures on attitudes to speeding and driver confidence identified drivers who chose consistently higher speeds. These preliminary findings indicate that laboratory based tasks could reliably complement questionnaires in identifying risky drivers who may benefit from additional insight training or psychological interventions.

## The importance of aggressiveness and attitudes towards traffic safety for risky driving of Lithuanian young drivers

Seibokaite, L.<sup>1</sup>, Endriulaitiene, A., Marksaityte, R., Zardeckaite-Matulaitiene, K., & Pranckeviciene, A.  
Vytautas Magnus University, Kaunas, Lithuania, Lithuania<sup>1</sup>

Background. Both personality and attitudinal factors are found to be related to risky behaviour. Still, comparative importance of personality traits (which are usually perceived as stable) and attitudes towards safety (which are relatively easily changeable) for risky driving remain unclear.

Method. 226 young drivers (aged 18-29) volunteered to participate in this study. Self-reported questionnaire (consisting of Driver Behaviour Questionnaire and scales of Attitudes towards Traffic Safety and Aggressiveness; information about involvement and being at fault in car accident) and driving in virtual reality simulator were employed.

Results. Multiple regression analysis revealed that aggressiveness has stronger explanatory value for self-reported driving errors and violations than traffic safety attitudes. Indicators of risky driving style in virtual reality simulator (lane crossings, crashes) were mainly explained by aggressiveness; only speed average was predicted by traffic safety attitudes. Involvement or being at fault in car accident was related neither to aggressiveness nor to attitudes.

Conclusions. Personality (measured here as a trait of aggressiveness) contributes stronger for risky driving of young drivers than attitudinal characteristics, which might be influenced in learning process. It is reasonable to expect safety promotion implementation would be more effective in early human developmental stages when personality formation proceed.

## Effects of driving experience depending on cognitive tasks demands

Freydier, C.<sup>1</sup>, Berthelon, C., Bastien-Toniazzo, M., & Aillerie, I.  
IFSTTAR, France<sup>1</sup>

Lack of attention is becoming a public concern with for example use of mobile phone when driving, widely widespread in population of young drivers. Given that young drivers are over-represented in terms of crash frequency, the objective of this research is to determine how the division of attention induced by dual task impacts driving behavior depending on experience.

A dual task paradigm was used to investigate the divided attention on the driving behavior depending on driving experience ( three groups : less than 8 months ; three years and nine years after obtaining license). A car-following task and a number identification task were used. In the main task, drivers had to maintain a predetermined distance from a leading vehicle which speed varied. Two levels of workload were examined by manipulating the amplitude of the leading vehicle speed variations. The secondary task consists in identification of even or odd numbers. The performance in the car-following task was assessed by using objective measures (inter-vehicular distance, standard deviation of inter- vehicular distance, etc). The performance in the number identification was measured by using accuracy and response time.

First results will be presented and will be discussed depending of task difficulties and driving experience.

## Symposium - Identity and car use

Friday 31st of August, 10:30 - 12:30 - Room 16

## Green identity, green travel? The role of pro-environmental self-identity in predicting travel behaviour

Whitmarsh, L.<sup>1</sup>

School of Psychology, Cardiff University, United Kingdom<sup>1</sup>

Transport choices contribute to a range of societal problems, such as climate change, accidents, air pollution, and inaccessibility. Many interventions to change travel behaviour focus on the psychological determinants of transport choices, such as attitudes or identity. This presentation reports on a postal survey (N=551) of pro-environmental behaviours amongst the UK public and assesses the influence of pro-environmental identity, values, perceived behavioural control, subjective norm, attitudes, and demographic factors. Findings show self-identity to be a significant behavioural determinant for certain pro-environmental behaviours (waste reduction, water/energy conservation, eco-shopping and eating) but not for travel behaviours, which was better predicted by structural factors (e.g., location). This finding reflects the important structural constraints and drivers of environmentally-significant behaviours, particularly travel behaviours, and highlights the need for appropriate planning and transport policies to address these. In addition, the lack of influence of pro-environmental self-identity on travel behaviours may suggest competing identities, such as strong social identities associated with car ownership and taking foreign holidays.

## The relationship between values and self-identity in transport behaviour

Van der Werff, E.<sup>1</sup>, Steg, L., & Keizer, K.

University of Groningen, The Netherlands<sup>1</sup>

Both values and self-identity have been found to be important predictors of behaviour (e.g. Sparks

& Shepherd, 1992; Steg et al., 2011). Values are defined by Schwartz (1992) as guiding principles in one's life. They are abstract and general and maintain stable over time (Feather, 1995). Self-identity on the other hand is influenced by past behaviour and can change over time (e.g. Cornelissen et al., 2008). Various scholars have suggested a relationship between values and self-identity (Crompton & Kasser, 2009; Verplanken & Holland, 2002; Sparks & Shepherd, 1992). However, the relationship between values and identity has hardly been studied empirically. Also, little is known about how values and self-identity affect preferences, intentions and behaviours when both are considered simultaneously.

Values reflect what people find important and how they want to see themselves, we therefore hypothesized that values should influence self-identity. Moreover, we expected that identity makes people evaluate the consequences of value-congruent behaviour. We thus hypothesized that the relationship between values and behaviour is mediated by self-identity.

We tested our hypotheses in a representative sample (N = 468) on transport behaviour. As expected, we found that values influence self-identity, suggesting that identity is indeed rooted in values. Moreover, we found that the relationship between values and behaviour is mediated by self-identity. Our results suggest that values influence behaviour via one's self-identity, and that this is more likely to be the case when the particular values are strongly endorsed.

#### **'When it comes to how I travel, who am I?'**

Murtagh, N.<sup>1</sup>, Gatersleben, B., & Uzzell, D.

Dept of Psychology, University of Surrey, United Kingdom<sup>1</sup>

Working parents in England (N=267) were asked to describe how they saw themselves in relation to their regular modes of travel, using a variant on the well-used Twenty Statement Test (Kuhn & McPartland, 1954). In response to the question "When it comes to how I travel, who am I?", the participants provided up to 20 responses starting 'I am...'. Instrumental, affective and symbolic motives emerged (Gatersleben, 2007; Steg et al., 2001). In contrast to expectation, negative emotions emerged, as well as positive, in relation to driving. Some responses expressed anger with other road users. This contrasted a number of responses (39%) in which the participants described themselves as "tolerant" or "considerate". The study was designed to elicit identity statements, and these allowed a variety of symbolic needs to be seen. In some cases, the symbolic importance of a car was explicit: "I am trying to impress with my car". Multiple identities emerged from the participants' responses. Some identities were transport-related but social identities were also apparent, including spouse, worker and man/woman. The findings suggest that how people travel may be part of how they construct and manage multiple identities, and that negative emotions around driving merit further investigation.

#### **My car is a reflection of me; does identification affect driver attitudes and behaviours?**

Gatersleben, B.<sup>1</sup>, Stasiuk, G., & Gwam, M.

University of Surrey, United Kingdom<sup>1</sup>

Territoriality involves using and controlling places and objects in ways that support and contribute to several psychological functions (Altman, 1975). Primary territories function to express and communicate identity and regulate social interactions. Invasions of primary territories can lead to severe emotional and behavioural reactions. This paper looks at the car as a primary territory focusing specifically on the role of identity. In 1890 William James wrote 'It is clear that between what a man calls me and what he simply calls mine the line is difficult to draw'. Cars in particular can become significant symbols of social and personal identities both as material objects (Belk, 1988,

Dittmar, 1994) and as primary territories (Altman, 1975). Data from three studies demonstrated that the more people identify with their car the more they personalise their car, feel in control in and over their car, and the more severely they react to invasion of their car space. Identification with the car was not related to demographic variables but stronger identification was found among those who drive bigger cars. The findings suggest that cars can form important primary territories and this may have implications for driver behaviour.

### **Symposium - Cyclists - Mobility and Health**

Friday 31st of August, 10:30 - 12:30 - Ronde zaal

#### **Is cycling healthy?**

Nijland, H.<sup>1</sup>, de Hartog, J., Hoek, G., & Boogaard, H.

PBL, The Netherlands<sup>1</sup>

Recently, policy interest in promoting cycling as a mode of urban transport has increased substantially within Europe. Motive for this interest is more often the reduction of traffic congestion than promotion of health.

Promoting cycling for health reasons implies that the health benefits of cycling, such as increased physical activity, should outweigh the risks of cycling, such as increased risk of accidents and increased inhalation of air pollution.

The aim of this presentation is to assess quantitatively whether the health benefits of the use of a bicycle instead of a private car for short urban trips outweigh the health risks. The risks and benefits are evaluated both for the individuals who shift from car driving to cycling and for society as a whole. On average, the estimated health benefits of cycling were substantially larger than the risks of cycling relative to car driving. Policies stimulating cycling are likely to have net beneficial effects on public health, especially if accompanied by suitable transport planning and safety measures

#### **Electrical assisted cycling: a new mode for meeting the physical activity guidelines?**

Hendriksen, I.<sup>1</sup>, Engbers L.H., & Simons M.

TNO Expert Center Life Style, Leiden, the Netherlands<sup>1</sup>

To assess the health potential of the electrical assisted bicycle, two studies were performed focusing on the intensity of electrical assisted cycling and the extend that the growing use of electric bicycles can contribute to an increased number of subjects meeting the physical activity guidelines in the Netherlands.

12 habitually active adults were requested to cycle a track of 4.3 km at an intensity they would normally choose for commuter cycling, using three different support settings: no support, light support and power support. Energy expenditure (EE) was estimated using a portable gas analyzing system and heart rate was simultaneously measured. Results showed that EE during cycling on an electric bicycle, in all three measured conditions, is sufficiently high to contribute to the physical activity guidelines for moderate intensity health-enhancing physical activity for adults. Data of an online survey (n=1400) focusing on (electric) bicycle use and Dutch physical activity behavior data showed that the potential gain in meeting the physical activity guidelines can be about 1% as a result of increased electric bicycle use.



Both studies show that promotion of electric bicycle use in the Netherlands can have a positive effect on the amount of subjects meeting the physical activity guidelines.

**The application of an extended theory of planned behaviour to understand cycling intentions: The UK iConnect study.**

Jones, T.<sup>1</sup>, Bird, E., Mutrie, N., & Baker, G. (on behalf of the iConnect team [www.iconnect.ac.uk/](http://www.iconnect.ac.uk/))  
Transport Studies Unit, School of Geography and the Environment, University of Oxford, United Kingdom<sup>1</sup>

Encouraging the uptake of cycling as part of regular daily routines could lead to positive travel and health outcomes but further evidence is required on the efficacy of specific large scale infrastructure projects targeted at increasing its practice. Connect2 is a national infrastructure project to build or improve 79 sites across the UK for cycling and walking and to 'transform travel for local people' ([www.sustransconnect2.org.uk](http://www.sustransconnect2.org.uk)). The iConnect study aims to investigate the effects of Connect2 in 'transforming travel' and will do this by detecting changes in physical activity and travel behaviour and associated carbon emissions. An extended version of Ajzen's theory of planned behaviour was used as one component of a broader ecological framework underpinning the design of a survey instrument administered to populations surrounding Connect2 schemes both prior to and after intervention. This paper provides an overview of the iConnect study approach and the results of analysis from the extended theory of planned behaviour component of the survey. It reveals the ability of the extended model to predict cycling for travel and for recreation amongst populations exposed to this type of intervention and provides a summary of the possible implications for encouraging sustainable travel and physical activity.

**Does improved objective safety indirectly affect bicycle use via improved subjective safety?**

Schepers, P.<sup>1</sup> & Heinen, E.  
Ministry of Infrastructure and the Environment/ Centre for Transport and Navigation, The Netherlands<sup>1</sup>

Past research has shown that objective road safety positively correlates with subjective safety to a small extend. However, this relationship has not yet been studied on the level of municipalities. Also, the interdependence between objective safety, subjective safety and bicycle use was never researched integrally. We hypothesize that objective safety positively influences bicycle use via the perception of road safety, i.e. that subjective safety partially mediates the relationship between objective safety and bicycle use. Especially for cyclists this issue is essential as, for individual users, the bicycle is one of the least safest transportation modes.

This research addresses the effect of the objective safety— number of deaths, number of severe injured, number of reported damages of car drivers and bicyclists corrected for the length of all driven or cycled kilometers within one municipality— controlled for socio-demographic variables on the subjective traffic safety by conducting a multi-level analysis. Secondly, the effect of subjective and objective safety on bicycle share was tested using SEM.

Results indicate that the subjective safety corresponds positively with objective bicycle safety and negatively with car safety. Moreover, objective safety has an independent effect on the bicycle share, but a mediation effect via subjective safety exists, too.

**Symposium - Needs of road users with special challenges: Requirements for a transport system for all**

Friday 31st of August, 10:30 - 12:30 - Room 10

**Can different features in the pedestrian environment increase accessibility/usability and safety/ security for people with impaired vision when walking outdoors?**

Stahl, A.<sup>1</sup> & Almén, M.  
Department of technology and society, Sweden<sup>1</sup>

People with impaired vision/blindness acquire information about the street environment through a long white cane that allows them to feel different surface structures or being able to see distinct contrasts between different surfaces. Hence important design details in the pedestrian environment must function reliably, i.e. different kinds of passages across streets and bicycle lanes, separation between pedestrian and bicycle lanes and design of bus stops.

Properly designed surfaces satisfy three requirements: guidance, warnings, and choices. Pedestrian pathways must be easy to notice and follow. Gaps in the environment require artificial guiding surfaces, e.g. sinusoidal or rib slabs and must be 60 – 70 cm wide. The slabs of the guiding surfaces are to be placed so that the grooves lie in the direction of the walk and provide a tactile sensation in the hand via the cane. Warning surfaces must consist of chamfered domes. To enable people with minor visual impairments to follow a path, it must have light contrasts with the surroundings, at least .40 according to the NCS system.

At the conference we will show how people with visual impairments experience different design details in the pedestrian environment, and what impact they have on their usability and safety.

**Problems and barriers to urban infrastructure and public transportation for people with mobility impairments: higher education and technological innovation as basis for improvement**

Bell, D.<sup>1</sup>  
FACTUM Chaloupka & Risser OG, Austria<sup>1</sup>

Mobility impaired persons are still facing accessibility problems in urban environments and public transportation systems.

Based on focus groups with persons impaired in mobility and expert interviews with professionals in the fields of spatial planning and urban development, two practical issues were assessed within two Austrian research projects, Traffic Check.at and GABAMO: 1.) What are possibilities to integrate barrier-free mobility and accessibility as potential topics into university studies? and 2.) What are feasibilities of modern information and communication systems to allow citizens to articulate their problems?

In order to evaluate problems encountered by impaired people in specific areas and to provide this vital input for the responsible authorities in TrafficCheck.at a modern Smartphone-based system is developed. The system enables different road user groups to participate in improving traffic signals by using the Smartphone and sending any problems they experience. GABAMO aimed at sensitising future spatial and urban planners for the need and opportunities of accessible public infrastructure in the course of their education. Thereby two main issues are discussed as aspects that belong together: 1.) possibilities on how to implement these aspects in higher education and 2.) utilizing new technologies for developing a sustainable and accessible transport system.

### Drivers with hearing loss and the design of driver support systems ? A simulator study

Thorslund, B.<sup>1</sup>, Peters, B., Lyxell, B., & Lidestam, B.

VTI, Sweden<sup>1</sup>

Hearing loss is not an impediment for obtaining a driving license. Few studies have investigated the importance of auditory information for traffic safety and mobility. However, research has shown that hearing loss is associated with poorer driving performance in the presence of distracters. Hearing loss is frequent in the elderly population and with an increasing number of older individuals, the number of drivers with hearing loss will increase. Furthermore, the market for advanced driver support systems (e.g. parking aid, navigation systems, and lane keeping systems) is expanding rapidly. Existing driver support systems frequently utilize auditory information and may thus exclude drivers with hearing loss. Thus, there is a need to examine other sense modalities, such as visual or tactile, for the design of systems according to users' needs and abilities. A simulator study with a collision warning system was conducted in order to evaluate the effects of cognitive workload and risk awareness in drivers with and without hearing loss. The aim was to examine usefulness of different warning modalities. A total of 48 participants drove 30 km while performing a secondary task, announced by a vibration in the seat, and experiencing light and/or sound warnings from oncoming traffic. The results will give indications on suitable design of driver support systems accessible for drivers with hearing loss.

### How persons with cognitive functional impairments post stroke manage the use of buses in public transport

Risser, R.<sup>1</sup>, Iwarsson S., & Stahl A.

FACTUM Chaloupka & Risser OG, Austria<sup>1</sup>

The mobility situation of people with cognitive functional limitations (CFL) has not been dealt with very intensively, so far. Much more weight was put on persons with physical disabilities. In the study presented here we concentrated on how people with cognitive functional limitations post stroke manage the use of busses operated in local public transport, as this could contribute to maintaining autonomous mobility of individuals belonging to this group. With the help of participant observation in connection with test use of local public bus transport, in connection with preceding and follow-up interviews problems with bus use were analysed, but also opportunities that this form of transport could provide. Based on thorough analysis we could identify problems related to the walk to public transport, like difficult interaction with car traffic when crossing roads, to the difficulties with information intake, related to badly designed or switched-off technical devices, and non-satisfying communication with laconic or impatient drivers. All this meets a low degree of self-confidence and often ends up with the members of the analysed groups blaming themselves for the difficulties they meet in the field. The suggestions for measures resulting out of our research approach encompass better control of vehicle speeds, optimisation of the communication style of bus drivers with their customers, and improvement of customers' access to, or support by, relevant trip-related information. Also training measures to reassure persons with CFL in connection with their use of buses, and generally in connection with their use of the public space are suggested.

### A systems approach to address mobility limitations - walkability as a cornerstone.

Methorst, R.<sup>1</sup>

Rijkswaterstaat Centre for Transport and Navigation, The Netherlands<sup>1</sup>

Solutions for people with limited mobility generally are a reaction to reported problems. In a systems approach a different, pro-active and generative, perspective is taken. This goes beyond solving problems, is aimed at providing the best possible quality and reflects the idea of walkability

is a source of wealth and health. Related to the COST 358 Pedestrians' Quality Needs project, a study was initiated to substantiate this approach. Main features were the Design for All principle, starting from the pedestrian and comprehensive coverage of the issue. As walking is the glue of the transport system, the study started with appraisal of walkability needs on the lifestyle/strategic, tactical and operational activity levels. This was based on literature and interdisciplinary discussions. Next, the actual and future pedestrian's performances with regard to abilities, mobility, sojourning, risks/safety and security and satisfaction were assessed, using modelling and multiple sources to have adequate coverage of the issues. The deduced needs were 'translated' into overall design requirements for the various elements of the system, including the social and physical environments and the transportation system. The study arrived at some general guidelines for improving walkability conditions, supporting all relevant kinds of pedestrians, including those with mobility limitations.

### Symposium - Law and Driver Behaviour: a cross cultural view

Friday 31st of August, 10:30 - 12:30 - Room 9

### What Should Be Next for U.S. Traffic Laws and Enforcement? Moving Forward with One Future Research Agenda

Porter, B.<sup>1</sup>

Old Dominion University, United States<sup>1</sup>

This presentation offers a prospective view toward a needed traffic law and enforcement research agenda for the United States. Existing best practices and their effectiveness (e.g., a primary law for seat belt use and resulting behavioral impacts), macro-level and micro-level predictors of law impacts on traffic behavior, and the important role of American enforcers' own behaviors are discussed as these lead to key research questions worthy of future attention. Furthermore, how these laws and enforcement practices are perceived and accepted by the public and policy makers are just as critical (e.g., the use of automated enforcement has been heavily debated) and lead to important research questions. The author's research efforts with colleagues and the literature at-large provide exemplars leading to the case for this agenda. Ultimately, the proposed research agenda encourages efforts to (1) identify how to bridge gaps between scientific findings and advocated legislation, (2) develop the effectiveness of enforcers as role models and change agents for their communities, and (3) tailor enforcement models to diverse settings (i.e., one law or one enforcement plan does not always work for all settings).

### Good, Bad, and Ugly

Özkan, T.<sup>1</sup> & Lajunen, T.

Psychology, Middle east Technical University, Turkey<sup>1</sup>

The present study focuses on Reason's cognitive models of driving. Examining the performance of a task, Reason made a major division between error-free (correct performance) and erroneous performance. Although correct performance seems to constitute the large portion of driving, Reason concentrated on errors in driving because of the evident error – accident –connection. Errors were taken as a “generic term to encompass all those occasions in which a planned sequence of mental or physical activities fails to achieve its intended outcome, and when these failures cannot be attributed to the intervention of some chance agency”. It seems that error-free (correct performance) is basically defined as the opposite pole of errors. Reason classified rule-based behaviours into six categories by the interaction between two performance dimensions (i.e.,

correct performance and erroneous performance) and three rule dimensions (i.e., Good Rules, Bad Rules, and No Rule). The classifications of the rule-based behaviours, its theoretical framework and influence in different traffic context will be discussed.

#### **Traffic violations and enforcement in Germany**

Gehlert, T.<sup>1</sup>, Hautzinger, H., Manssen, G., & Rößger, L.  
German Insurers Accident Research Department, Germany<sup>1</sup>

This presentation reports the results of an interdisciplinary research programme where different aspects of traffic violations have been investigated and set in relation to each other. The aim was to assess the potential of the current traffic law and enforcement system for preventing traffic violations and enhancing road safety. Four aspects were analysed: i) the frequency of traffic violations using Federal accident statistics, ii) the severity of traffic violations using the Central register of traffic offenders, iii) the current traffic law and enforcement system and iv) the public perception of traffic violations and enforcement using a representative survey of German car drivers. The analyses show that right of way violations, speeding, violations while turning off and tailgating were responsible for 89% of severe accidents. But only 21% of traffic violations recorded in the central traffic register of traffic offenders were relate to these causes of accidents. The current legal system does not correspond with the frequency and severity of accidents, especially speeding needs to be treated differently. In contrast to social and personal norms enforcement does not play a significant role for explaining car driver's traffic violations. These results suggest adjusting the current traffic law and enforcement system to correspond with the frequency and severity of accidents and to complement it with prevention measures focusing on psychological determinants of traffic violations.

#### **Law and Behavior in Brazil: the challenge of putting David and Goliath in the same room!**

Bianchi, A.<sup>1</sup>  
Department of Psychology, Federal University of Paraná, Brazil<sup>1</sup>

In Brazil the current Traffic Legislation dates from 1997. At that time, the point used in the drivers' license permission, the mandatory use of seat belt and limited blood alcohol concentration were considered big advances. In 2008 a complementary law "zero alcohol" decreased to near of zero the blood alcohol concentration permitted. Both times the impact in reduction of traffic crashes resulting in deaths and severe injuries was important in the subsequent years, but restart to increase. The problem is related with other laws and their impact on drivers' perceptions and, consequently, behaviors. In Brazil, the driver can refuse to undergo the alcohol concentration test citing the Costa Rica agreement. It is also mandatory for the government to inform the speed control check points, in some departments a sign must stay 300, 200 and 100 meters ahead. In this sense Brazil needs urgently to bring traffic law and driver behavior together. It is necessary to proof to the politicians that the impact of the law about driver behavior is very important and it is not possible to approve laws in order to diminish the chance of punishment to traffic offenders.

#### **Motorcyclists**

Friday 31st of August, 10:30 - 12:30 - Room 4

#### **Powered two-wheeler riders' acceptability and acceptance of advanced rider assistive systems and on-bike information systems**

Lenné, M.<sup>1</sup>, Beanland, V., Fuessl, E., Oberlader, M., Joshi, S., Rößger, L., Bellet, T., Banet, A., Leden, L., Spyropoulou, I., Roebroek, H., Carvalhais, J., & Underwood, G.  
Monash University Accident Research Centre, Australia<sup>1</sup>

There has been limited development of Advanced Rider Assistance Systems and On-Bike Information Systems for powered two-wheelers (PTWs), even though research suggests population-wide deployment of assistive systems could significantly reduce PTW crashes. We conducted a large-scale international survey to determine the factors that influence PTW riders' acceptance of assistive systems, including barriers that may prevent uptake and proper use of systems. The survey was available in seven languages and attracted 6297 respondents, mostly from Europe. Respondents were frequent riders, who rode primarily for leisure purposes and had good awareness of assistive systems. Cluster analysis revealed two groups based on overall acceptance of assistive systems. The high and low acceptance clusters differed in terms of riding practices, risk perception, attitudes towards rule breaking, and some personality traits. Overall acceptance was low, but riders who perceive greater risk in riding display higher acceptance. Acceptance was higher for systems that do not interfere with the riding task and for systems that are well-known and/or considered reliable (e.g., ABS, airbags). Although levels of acceptance for PTW assistive systems are much lower than for equivalent systems in passenger cars, the study suggests riders will accept systems that they perceive to be useful and effective.

#### **A different perspective on the role of conspicuity in motorcycle crashes**

de Craen, S.<sup>1</sup>, Doumen, M., & Bos, N.M.  
SWOV Institute for Road Safety Research, The Netherlands<sup>1</sup>

The most common type of conflict in which a motorcyclist is injured or killed is a collision between a motorcycle and a car. Many studies on motorcycle safety focus on the question why car drivers fail to give priority, on their poor conspicuity of motorcycles, or so-called 'looked-but-failed-to-see' crashes.

But it is not entirely unexpected that motorcycles have many conflicts with cars; there simply are so many cars on the road. This study attempts to unravel if – adjusted for exposure - motorcycles indeed have relatively more conflicts with cars. For this purpose Dutch crash and exposure data in the period 1993-2009 were analysed.

The crash data indicate that motorcyclists are vulnerable in traffic, having a relatively high crash risk. However, corrected for exposure, they are not more often in conflict with cars than with other traffic. Analyses of crashes on intersections suggest that motorcyclists are 'overlooked' almost as often as cars when they approach the intersections from a perpendicular angle from the car driver. Only when a car driver is turning left on the same road, an oncoming motorcycle is overlooked more often than an oncoming car. These results are discussed within the context of perception and conspicuity of motorcycles.

### **When disobedience becomes habit: Effects of travel behaviours of motorcyclist on repetitive traffic violations in three Indonesian cities**

Joewono, T.B.<sup>1</sup>, Tarigan, A.K.M., & Susilo, Y.O.

Graduate Program, Parahyangan Catholic University, Indonesia<sup>1</sup>

Recent studies suggest that traffic violations have certain relationships with personal travel behaviours and increase the risk of accidents as well. While explorations of traffic violations and travel behaviours were extensively reported from developed countries' experience, little is understood about the implications of travel behaviours to traffic violations in the developing world's setting where motorcycle's users are growing very rapidly and well known as aberrant road users. This study has an aim to explore the effects of travel behaviour on traffic violations utilising datasets from three metropolitan cities in Indonesia (Bandung, Yogyakarta and Surabaya). Based on questionnaire surveys among Indonesian motorcyclists with sample size of a thousand in each city, an analysis was completed using structural equation modelling methodology. This study reports that the way people travel for their everyday mobility with motorcycle has positive and significant influence on the construct of repetitive traffic violations. Analysis shows that motorcyclists who commute for longer trips are more frequent to violence against over speeding. On the other hand, repetitive helmet use's violations are statistically influenced by shorter trip patterns. Study also classified several actions of disobedience that are very frequent as a habit of motorcyclist.

### **Judging the approach speed of motorcycles and cars under different lighting conditions**

Gould, M.<sup>1</sup>, Poulter, D. R., Helman, S. & Wann, J. P.

Royal Holloway, University of London, United Kingdom<sup>1</sup>

The ability to accurately judge the approach speed of a motorcycle is critical in order to avoid right of way collisions at junctions. Research has shown that individuals consistently judge the time to contact (ttc) of a motorcycle to be later than that of a car (Horswill et al., 2005). Furthermore, individuals are extremely poor at judging the speed of solo headlight motorcycles in night-time conditions, but a tri-headlight configuration on a standard motorcycle frame can improve the accuracy of speed judgements (Gould et al., 2011). We measured the accuracy of adult drivers' judgements of simulated vehicle approach in a virtual city environment across a range of ambient lighting conditions. An adaptive (best-PEST) psychophysical procedure was used to determine threshold for discrimination between two vehicles approaching at different speeds. Stimuli were presented sequentially, with observers asked to judge which vehicle was travelling faster. Results demonstrated that individuals were significantly more accurate when judging the speed of the car compared to the solo headlight and tri-headlight motorcycles across all lighting levels. However, participants were significantly more accurate at judging the speed of the tri-headlight motorcycle compared with the solo headlight motorcycle in the lower lighting levels (early night and night). Research supported by the UK EPSRC.

### **Motorcyclists' intention to exceed the speed limit on roads limited to 90 km/h: mediating and moderating factors of the behavioural intention**

Eyssartier, C.<sup>1</sup>

CETE de l'Ouest-DES, France<sup>1</sup>

Sarthe is one of the French departments most concerned by motorcycle accidents and it seems that speeding, mainly on roads limited to 90 km/h, is one of the main causes.

The model generally used to understand risk-taking is that of planned behaviour (Ajzen, 1985). In addition, factors such as the group norm (Elliott, 2010), sensation seeking (Jonah, 1997), self-identity

(Watson, Tunnicliff, White, Schonfeld and Wishart, 2007) and group identification (Elliott, 2010) seem to have an influence on the motorcyclist's intention to carry out this behaviour. The aim of this study was to propose an extended planned behaviour model concerning the motorcyclist's intention to exceed the speed limit on a road limited to 90 km/h.

305 motorcyclists in Sarthe answered a questionnaire distributed on the web. The tested model explains 42% of their behavioural intention to exceed the speed limit. The results show that the group norm and sensation seeking mediate the attitude-behavioural intention relation. On the other hand, driving experience does not moderate the relation between the mediating factors and the behavioural intention. In conclusion, strategies for action and the limitations of this research will be presented.

### **Symposium - Highly Automated Driving**

Friday 31st of August, 13:30 - 15:30 - Blauwe zaal

### **Who Guides Who in Haptic Guidance?**

Boer, E.R.<sup>1</sup>, Della Penna, M., Abbink, D., Mulder, M., & van Paassen, M.M.

Entropy Control Inc, United States<sup>1</sup>

Lateral haptic guidance is a form of driver support in which torques on the steering wheel communicate the direction of control the system deems optimal based on a controller-model of the individual driver. These systems are grounded in the principle that the driver adopts a high admittance that amplifies these guidance torques such that the human-system combination controls the car accurately and effortlessly. In addition to the guidance torques, these systems often add asymmetric stiffness around the desired steering angle to inform and protect the driver from deviations relative to the system's ideal control. While this guidance plus stiffness approach yields highly encouraging results, one drawback is that drivers have no clear means to communicate that their intent conflicts with the system's intent. Currently, most systems simply limit the strength of their forces such that the driver can always override them by either adopting a high stiffness to block system guidance or by pushing against the system guidance and through the system's stiffness. In this paper, we provide theoretical and experimental support for an algorithm that utilizes the contact torque profile between system and driver generate torques to enable fluid intent communication between driver and system.

### **Driver assistance and cognitive processes – Are they always positively linked?**

Muhrer, E.<sup>1</sup>, Reinprecht, K.R., & Vollrath, M.V.

Technical University Braunschweig, Germany<sup>1</sup>

Nowadays, nearly every modern car is equipped with several driver assistance systems. Despite this extensive technical support of the driver, an adequate perception and processing of relevant information is required for safe driving. To examine the corresponding impact of assistance systems, 30 subjects (15 male, 15 female, age: M = 28.0, SD = 11.9) were investigated in a fixed based driving simulator. The drivers completed a one-hour route in an urban scenario, while half of them were supported by an ACC Stop & Go. Additionally, all drivers had to perform a visually distraction task. This was to examine if assisted drivers tend to engage more in secondary tasks than unassisted drivers, which is often mentioned as an automation effect in the literature. Driving and gaze behavior and the engagement in the distraction task were analyzed. Results show that drivers did not engage more in the distraction task when driving with system. However, it was found that



driving with system led to a significantly poorer responsiveness in critical situations. Furthermore, supported drivers did not perceive traffic-related elements as well as drivers who drove without a system. This indicates that several components of the information processing can be negatively affected by assistance systems.

#### **The effect of automation level on situation awareness: A Driving-simulator study of advanced driver assistance system**

Baumann, M.<sup>1</sup> & Kassner, A.

Institute of Transportation Systems/ German Aerospace Center, Germany<sup>1</sup>

The driver's mental representation of the current traffic situation is affected by different factors, such as driver's experience, distraction, workload, but also by the driver's task. The task defines the goals to achieve and the relevant elements of the situation. Introducing automation/assistance in the driving task probably changes the driver's mental task representation. In case of a transition between levels of automation the task representation has to be adapted. The greater the difference between the two representations the longer this adaptation should take as more elements of the representation need to be activated in driver's memory.

This hypothesis was tested in a driving simulator experiment where participants had to take over control from an automation system in a car-following situation. Three different levels of automation were realized: manual driving, driving with an extended FCW supporting driver's longitudinal control (FCW+), and driving with a system completely controlling the longitudinal control (ACC+). We expected that the reaction time for taking over control would be longest with the highest level of automation (ACC+), medium with the intermediate level (FCW+) and lowest with manual driving. The results confirm this prediction and are discussed within the framework of a comprehension based model of situation awareness.

#### **Transitions between different levels of automation in a highly automated vehicle: Study results of the project HAVEit**

Schieben, A.<sup>1</sup>

DLR e.V., Institute of Transport Systems, Germany<sup>1</sup>

Four different prototypes of highly automated driving applications were tested in an evaluation study. The focus of the evaluation was on transitions between different levels of automation in these prototypes (Driver without automation, Semi-Automated/ACC and Highly Automated). The study was conducted in the EU-project HAVEit to influence the transitions design of the demonstrator vehicles build up in this project.

Thirty-two participants drove one of the four prototypes in a motion-based driving simulator (eight drivers per group). Expectations and mental models of the transitions were assessed by interviews. In addition, driving data, thinking-aloud protocols and subjective evaluation ratings were recorded during resp. after the 15 minute test drive. Results show that the expectations were influenced by the transition design that the participants experienced in a lower level of automation (Semi-Automated/ACC) and were not in all cases consistent with the actual prototype design. The subjective evaluation did not reveal systematic and significant differences between the prototypes. However, design suggestions were derived from the detailed analysis of the driving data and interviews and were used for the improvement of the transition design of the demonstrator vehicles.

#### **Mitigation strategy for driver out-of-the-loop due to highly automated driving**

Lai, F.<sup>1</sup>, Carsten, O., Merat, N., & Jamson, H.

Institute for Transport Studies, University of Leeds, United Kingdom<sup>1</sup>

Driver error is a factor in over 90% of road accidents. Automated driving could mitigate some of the driver errors and deliver great potential for road safety as well as for road capacity. Adaptive Cruise Control automates the task of car following while Lane Keeping System helps drivers return the vehicle to its travelling lane when an unintentional lane departure is likely. The combination of the two technologies delivers a highly automated scenario for keeping the vehicle progressing on the road, especially motorways, without any driver input. However this leads to concerns over the driver being left out of the loop. This study examines two mitigation strategies to maintain driver attention to the road scene in automated driving. Drivers were required to take control of the vehicle either based on fixed time periods or on dynamic intervals. The approach of using fixed time intervals was based on a review of the literature on adaptive automation. The dynamic intervals were based on drivers' attention allocation - when the driver was detected as being below a threshold of attention to the forward view, the system would then trigger a switch from automated to manual control of the vehicle. The dynamic intervals had a more pronounced effect on keeping drivers 'in-the-loop'. However, both mitigation strategies were equally popular among drivers.

#### **Social Cognition**

Friday 31st of August, 13:30 - 15:30 - Rode zaal

#### **The role of mindfulness in an extended TPB framework to understand drivers' speeding intentions in school zones.**

Abdul Hanan, S.<sup>1</sup>, King, M., & Lewis, I.

Centre of Accident Research & Road Safety- Queensland (CARRS-Q), Australia<sup>1</sup>

Many researchers have demonstrated the applicability of the Theory of Planned Behaviour (TPB) in predicting both intention to speed and actual speeding behaviour. However, there remain shortcomings in the explanatory power of the TPB, with research suggesting that even when drivers had reported an intention to not speed approximately 25% of drivers report behaviour that does not align with their intentions (i.e., they engaged in speeding; Elliott & Armitage, 2006). This research explores the role of a novel and promising construct, mindfulness, in enhancing the explanatory utility of the TPB for the understanding of drivers' speeding behaviour in school zones. Mindfulness is a concept which has been widely used in studies of consciousness, but has recently been applied to the understanding of behaviour in other areas, including clinical psychology, physical activity, education and business. It has been suggested that mindfulness can also be applied to road safety, though its application within this context currently remains limited. This study was based on an e-survey of the general driving public (N=240). Overall, the results identified mindfulness as a construct which may aid understanding of the relationship between drivers' intentions and behaviour. Theoretically, the findings may have implications in terms of identifying mindfulness as an additional explanatory construct within a TPB framework. In road safety practice, the findings suggest that efficacious countermeasures around school zones may be those that function to heighten drivers' mindfulness, such as flashing lights and physical speed reduction measures.

### Representation of traffic and social perception of risk factors for drivers in accidents

Lagares, R.<sup>1</sup> & Campos, P.H.F.

Pontifical Catholic University of Goiás, Brazil<sup>1</sup>

Recent research on traffic psychology recognize the influence of cultural factors in driver's behavior, stimulating research into the socio-cognitive aspects involved. In this sense, a social representation can be defined as an organized set of beliefs or cognitions (Philogenes, 2002) or a set of behavioral prescriptions (Flament, 2000). Thus, this study aimed to identify the social representation of drivers in a large Brazilian city. The sampling was random (N = 1490), including drivers of the national license holders to drive in both sexes and aged between 21 and 65. The instruments were a matter of free recall from word inducing (traffic), scales of perception of the relationship between risk and driving style (straight and self-perception), and a scale with risk factors of an accident. The results show that traffic is generally depicted as chaotic, and the main risk factors are in the driver's behavior. The results also indicate that drivers evaluate their way of conduct as little or no, while the driving style of the other drivers is perceived as a producer of high risk.

### The social dilemma of traffic flow improvement: using the example of Connected Cruise Control

Risto, M.<sup>1</sup> & Martens, M.H.

Centre for Transport Studies, University of Twente, The Netherlands<sup>1</sup>

Connected Cruise Control (CCC) is an in-car driver support systems that aims to improve throughput in dense motorway traffic by advising drivers how to drive. The system is currently under development within a HTAS project. It will integrate lane advice, headway advice and speed advice. The advice that drivers receive does not always work in their individual benefit. However, collective action by a greater amount of CCC users can improve the traffic situation as a whole, resulting in reduced overall travel time. Therefore CCC runs the risk of creating a social dilemma (a give-some dilemma). A situation where individual road users contribute to a common good (that is traffic flow) while refraining from actions that would work in their individual benefit, but that on the other hand could pose a harm to traffic flow. We will present the social dilemma underlying traffic flow improvement using the example of CCC. An emphasis is put on (1) benefit perception, (2) individual differences in the evaluation of individual and collective benefits and (3) the perceived inequality of efforts in the creation of a collective benefit. Finally, we will discuss how CCC design can mitigate the dilemma character inherent in traffic flow improvement.

### How to foster a low-noise and environmentally friendly driving style

Fischer, M.<sup>1</sup>, Moser, S., Lauper, E., & Schlachter, I.

Interdisciplinary Centre for General Ecology, University of Bern, Switzerland<sup>1</sup>

Although it is widely known that eco-driving reduces noise and CO<sub>2</sub> emissions, little is as yet understood about the psychological factors that make car users adopt eco-driving. Therefore, this study was set up to gain insight into the possible psychological factors that explain an individual's willingness for eco-driving. The starting point of the study was a theory-based stage model. By means of qualitative interviews, stage-specific predictors of the model were identified that could predict whether or not individuals would change their driving style. Currently, an online survey that quantitatively tests this model is being conducted (N > 800). Results from that survey will be presented and discussed. Questions that will be addressed are whether the data support the hypothesized model, and which psychological factors best explain the intention for and the self-reported application of eco-driving. In a subsequent step we will use the results from the survey to design interventions that foster eco-driving. These interventions will be fine-tuned and evaluated in

focus groups with the relevant stakeholders (e.g., noise abatement experts, car drivers).

### Introducing "social forgivingness": how the traffic setting influences the extent to which car drivers are inclined to compensate for potentially unsafe acts of other road users at intersections.

Houtenbos, M.<sup>1</sup> & Hoekstra, A.T.G.

SWOV Institute for Road Safety Research, The Netherlands<sup>1</sup>

This presentation will present the results of two online questionnaire studies (N=269 and N=710) on the way that car drivers interact with vulnerable road users (in this case moped riders and bicyclists respectively). The studies focused on the extent to which car drivers are inclined to compensate for potentially unsafe acts of other road users (i.e. act "socially forgiving") and how this is influenced by the level of formal regulation of the traffic setting (e.g., traffic signs and road markings can be present or absent). Results of the first study showed that less explicitly regulated intersections gave more rise to socially forgiving responses towards the moped rider than intersections explicitly regulated by traffic signs and road markings. The results also suggest that in traffic situations where people feel less safe, drivers show more socially forgiving behaviours. To further elaborate upon these results, the second questionnaire study was conducted. This study incorporated some additional traffic settings and made use of different types of stimuli in the form of animations followed by animation stills. It also employed a different answering protocol that allowed respondents to bring more nuance into their responses. The results of the latter study will be analysed and reported at the time of the conference.

## Cycling 2

Friday 31st of August, 13:30 - 15:30 - Room 16

### Policy advice to promote cycling to work in the Netherlands

Hendriksen, I.<sup>1</sup>, Butter, M., Fekkes, M., & Hildebrandt, V.H.

TNO Expert Center Life Style, Leiden, the Netherlands<sup>1</sup>

Daily cycling is very common in the Netherlands. The most recent data show that one quarter of commuting journeys are by bicycle. However, about 30% of commuter journeys up to five kilometres are still by car, despite campaign-efforts to promote commuter cycling.

In order to advice the Dutch authorities on how to promote commuter cycling more effectively, the (scientific) literature was studied and quantitative research was performed. Determinants of commuter cycling behavior were identified and a behavioral model for cycling to work was constructed using international studies. A policy framework was developed, combining determinants of commuter cycling and typologies of policy. 30 specific policy measures were defined and evaluated on their effectiveness, and gaps in policy attention were identified.

Based on these findings, the government is advised to target their policy on a combination of push measures, i.e. parking policy and car mileage charge, and pull measures such as a bicycle mileage credit. Besides, the importance of an infrastructure where a maximal time advantage can be achieved when changing from car to bicycle is emphasized. Some additional measures need to be developed covering determinants of behavior that need more attention, such as social influence and cultural aspects.

### Key events and their effects on cycling behaviour in Dar-es-Salaam

Nkurunziza, A.<sup>1</sup>, Zuidgeest, M., Brussel, M., & Van Maarseveen, M.

Urban and Regional Planning and Geo-information Management, ITC, University of Twente, The Netherlands<sup>1</sup>

The paper explores key events and investigates their effects on cycling behaviour in the city of Dar-es-Salaam, Tanzania. The objective of the study is to identify specific key events during a person's life course with a significant effect on change of travel behaviour towards cycling in relation to stage of change. Stage of change is a key construct of the transtheoretical model of behaviour change that defines behavioural readiness (intentions and actions) into six distinct categories (i.e. pre-contemplation, contemplation, prepared for action, action, maintenance, and relapse). By using a binary logistic regression model, it was possible to identify the key events that influenced change of travel behaviour among 450 daily commuters in different stages of change of cycling behaviour. Model results have shown that income generation, poor daladala (public transport) service, and harsh behaviour of daladala operators have a significant impact on changing to maintenance stage. After marriage, after child birth, past incidence of car accident on bicycle, feel shame on bicycle, fear of losing virginity among girls and shifting from small towns to Dar-es-Salaam where cars are the common mode of travel, have a significant impact on cycling especially moving from maintenance to relapse stage of cycling behaviour.

### Fast Feelings - An experimental study of cycle helmets' effect on cycling pace and emotional reactions

Fyhri, A.<sup>1</sup> & Phillips Ross, O.

Institute of Transport Economics, Norway<sup>1</sup>

It has been suggested that risk compensation reduces the effect of bicycle helmets. The current article tests the hypothesis that risk compensation does not occur among cyclists unaccustomed to wearing a helmet. This was investigated in a field experiment where pace and psychophysiological load was measured. The results show that routine helmet users cycle slower when the helmet is taken away, and that the change in speed was accompanied by an altered emotional state. Non-users did not change their behaviour. The results are interpreted as inconsistent with a risk compensation theory of bicycle helmets, since the observed behavioural change among routine helmet users is probably of a transient nature. The value of using HRV measures has been substantiated by introducing better control of amount of physical load.

### A Study about Factors of Side Crash between Bicycle from Sidewalk with Vehicle

Suzuki, M.<sup>1</sup>, Miyanoue, K., & Yai, T.

Department of Built Environment, Tokyo Institute of Technology, Japan<sup>1</sup>

In Japan, around 50% of accidents between bicycles and vehicles occur at non-signalized intersections, and around 80% of accidents at small, non-signalized intersections are side crashes, with the most hazardous case being an accident between a vehicle on a narrow side road and a bicycle on the sidewalk of a wider road. Moreover, another factor in collisions is that people are allowed to cycle on sidewalks with two-way traffic; for this reason, cycling on sidewalks is more dangerous than cycling on roads. In fact, the bicycle accident rate in Japan is higher than in the United States and EU countries.

To investigate vehicle driver maneuvering and visual behavior at small, non-signalized intersections

with a narrow field of view, laboratory experiments were conducted using a MOVIC-T4 driving simulation system. We observed differences in driving characteristics caused by structural design, road infrastructure, and traffic situations at such intersections. As a result, we indicated the factor of design or situation (especially bushes side of sidewalks and a leading vehicle) which leads up to accidents at intersections.

### Symposium - Driver experience, awareness and (change) detection

Friday 31st of August, 13:30 - 15:30 - Ronde zaal

#### Change detection and driving performance on familiar roads

Charlton, S.<sup>1</sup>

University of Waikato, New Zealand<sup>1</sup>

This paper describes our thoughts on the nature of everyday driving, with a particular emphasis on the processes that govern driver behaviour in familiar, well-practiced situations. This research examined the development and maintenance of proceduralised driving habits in a high-fidelity driving simulator by paying 29 participants to drive a simulated road regularly over 10 weeks of testing. A range of measures, including detection task performance and driving performance were collected over the course of 20 sessions. Performance from a yoked control group who experienced the same road scenarios in a single session was also measured.

The data showed the development of stereotyped driving patterns and declines in change detection performance indicative of attentional blindness and "driving without awareness". Extended practice also resulted in increased sensitivity for detecting changes to foveal road features associated with vehicle guidance and performance on an embedded vehicle detection task (detection of a specific vehicle type). The changes in attentional focus and driving performance over time provide new light on a range of previous research findings and led to the development of a "Tandem Model" that includes both explicit and implicit processes involved in driving performance.

#### Drivers' ability to detect changes in timing at signalized intersections

Vreeswijk, J.<sup>1</sup>, Van Berkum, E., & Van Arem, B.

Peek Traffic bv / University of Twente, The Netherlands<sup>1</sup>

Drivers have limited awareness of changes in trip attributes or the performance of the traffic system. Due to non-utilitarian behavior and perceptual biases a distinctive amount of changes go unnoticed or are valued incorrectly, which makes drivers indifferent to changing traffic conditions to a certain extent. Defining the indifference band and understanding the probability of behavioral response to changes is valuable input for road operators and traffic engineers designing traffic management measures.

To explore the thresholds of the indifference band, a field study was conducted. The study focused on the ability of drivers to observe and rightly value differences in the timing of traffic lights, in particular where the length of the red phase is concerned. Results confirm that drivers have limited awareness of differences in the length of the red phase of traffic lights, both in absolute and relative sense. Moreover, a large range of waiting times are perceived by drivers as being close to the average waiting time, which offers some insight in the indifference band. However, if the reason for waiting is not intuitive the perception of drivers becomes more accurate and their awareness increases (indifference band narrows).

### Change detection in variable speed limits: failed to look or looked but failed to see?

Harms, I.<sup>1</sup>

Rijkswaterstaat, Ministry of Infrastructure and the Environment, The Netherlands<sup>1</sup>

Variable speed limits (VSL) are used to adjust real-time driver speed to the circumstances of the road condition. Based on theoretical research it has been proposed that change blindness - the failure to detect, identify and localise changes - might play a role in the effectiveness of VSL in terms of perception. To examine whether change detection errors actually affect the perception of changes in VSL under natural circumstances, participants needed to be familiar with the road. To achieve this, twenty-four participants drove the same route nineteen times in a driving simulator on five separate days. Part of the route consisted of a motorway where VSL signs were regularly displayed above each driving lane. In drive nineteen the VSL were changed from 80 km/h to 100 km/h. Driver speed, verbal reports, glance frequency and glance duration while driving showed if drivers who did not notice the changed speed limits failed to look at the speed limits or looked at them but just failed to notice they changed. These results are discussed in relation to speed limit recollection, meaningfulness and expectations. This research gives more insight in the extent of change detection errors for VSL and its underlying factors.

### Predicting change: a more robust measure of hazard perception?

Grundall, D.<sup>1</sup>

University of Nottingham, United Kingdom<sup>1</sup>

Hazard perception (HP) tests typically assess response times to hazardous events in driving videos. Studies suggest, though not unanimously, that safer and more experienced drivers respond quicker. However these tests confound individual differences in hazard sensitivity, and lack a measure of accuracy. The 'What Happens Next?' test of hazard prediction offers an alternative methodology which removes these problems. In this test, a video clip stops immediately prior to hazard onset and the screen turns black. Participants then predict the subsequent event. Three experiments investigated different aspects of hazard prediction with this methodology. It was found that a greater number of potential hazards preceding the final occlusion decreased overall prediction rates, though the advantage shown by experienced drivers over novices increased. Secondly, lengthening the temporal gap between occlusion and hazard onset also decreased prediction rates, but again lead to greater benefits for experienced drivers compared to novices. Finally, this test was found to be sensitive to hazard type. When hazards were obscured by environmental features (e.g. parked vehicles), novice performance declined, whereas experienced drivers maintained performance levels seen with more obvious hazards. The results provide insight into hazard perception and also provide a potentially more robust measure of HP skill.

### Drivers' ability to respond to traffic conflicts using Adaptive Cruise Control

Boyle, L.<sup>1</sup> & Xiong, H.

University of Washington, United States<sup>1</sup>

Many technological innovations are designed to increase driver safety by simplifying tasks and user demands in safety-critical situations. An effect that is not anticipated by system designers is that driver's behavior may change, adapting in unforeseen ways that may either enhance or compromise the potential benefits of the ACC system. We present a statistical model developed based on data from a field operational test that quantifies drivers' initial exposure to Adaptive Cruise Control (ACC). A sample of "closing" events to lead vehicles was extracted from a subset of this ACC data.

The results indicate that several factors influence drivers' initial response including the environment, the selected gap setting, driving speed, and drivers' age. These factors provide insight on drivers' ability to respond to changes in their surroundings.

### Road safety in developing nations

Friday 31st of August, 13:30 - 15:30 - Room 10

### Cross-cultural comparison of attitudes towards traffic law and traffic officials - South Africa and Sweden as case studies

Sindair, M.<sup>1</sup>

Stellenbosch University, South Africa<sup>1</sup>

One challenging fact about global traffic injuries and fatalities is the persistent difference in injury levels between the developed world and the developing world. Does this disparity imply that casualty levels are largely a consequence of available local resources and political interests, or are other factors at play? This paper explores differences in experience, attitude and behaviour between young drivers in South Africa and Sweden, two countries with vastly different traffic injury levels. The objective of the research was to investigate whether responses from the two countries reflected distinct cultural and historical experiences, or whether cultural background appeared a negligible factor in how participants reflected on their engagement with road traffic.

Clear differences were identified, specifically around the use of alcohol, seatbelts and attitudes towards pedestrians. The most significant differences, however, emerged around attitudes to traffic officials – although both groups articulated similar levels of respect for law itself, South African respondents communicated an overwhelming contempt for traffic authorities. This attitude appears to have its roots in the mistrust of state authorities under apartheid, and to be fed now by the current culture of government corruption and incompetence. As such differences between the groups appear to have evolved largely in response to specific legal and social contexts, suggesting that cultural context does indeed play some role in driver behaviour and hence in collisions.

### Psychometric Parameters: Drinking and Driving Behavior and Perception of Risk Scale – Brazilian Population

Cuffa, M.<sup>1</sup> & Bianchi, A. S.

Department of Psychology / Federal University of Paraná / Master Student, Brazil<sup>1</sup>

In recent decades rates of Brazilian traffic accident have become a public health problem. According to the Ministry of Health, until September 2011 were 110,806 hospitalizations due to this cause, and alcohol consumption appears as a major cause of these statistics. For efficient public policies can be created, it is necessary to understand how risk perception influences human behavior in traffic. The aim of this study was to develop and to validate the Drinking and Driving Behavior and Perception of Risk Scale for the Brazilian population. The items were created and selected according to previous studies regarding drink and drive behavior and perception of risk in Brazil. 386 college students participated by filling in the questionnaire in class with professor's previous authorization. 55,7% were male and 73,5% were until 25 years old. With a Cronbach's alpha of 0.88, the Risk Perception Scale contains 26 items divided into 5 factors. The Behavior Scale, with Cronbach's alpha 0.88, contains 12 items divided into 2 factors. The results provide an instrument to evaluate perception of risk in traffic context regarding drink and drive behavior validated to a Brazilian population.



### **Traffic Psychology in Brazil: From the road safety to sustainable mobility**

Silva, F.H.V.C.<sup>1</sup> & Hartmut, G.

University of Brasilia, Brazil<sup>1</sup>

In the last century, the first cars and trucks began to circulate in Brazil, outlining a new model of transportation that would become hegemonic in cities, based on road transport. Here, we address the historical aspects of traffic psychology in Brazil: the development of the first psychometric studies with drivers to promote traffic safety, the role of the Traffic Departments in the institutionalization and expansion of Brazilian psychology, and the forms of contribution of psychologists in the public policy of traffic. Today, several changes are taking place in the national scene with potential impacts on the future of the area, for instance, as of 2013, it was established by the government that all psychologists should have the title of specialist in traffic psychology. This requirement has now contributed to the qualification of psychologists and has opened new areas of work regarding the teaching of psychology. In addition, other traffic problems were intensified with the massive use of the automobile, e.g. congestion and air pollution, which the authorities should address more systematically by means of travel demand management measures. Thus, it is proposed that the researches and the work of the psychologist should be expanded to work with sustainable mobility.

### **The relationship Between Driver's Background and Traffic Accident (Case Study in Yogyakarta, Indonesia)**

Munawar, A.<sup>1</sup>

Department of Civil and Environmental Engineering, Gadjah Mada University, Indonesia<sup>1</sup>

Driver performance relates to the driver's knowledge, skill, perceptual and cognitive abilities. Driver behaviour is what the driver chooses to do with these attributes. It depends on the driver's background. The traffic accident rate in the city of Yogyakarta is very high. It is found that more than 80 % of the traffic accident because of the driver behaviour. The following study, therefore, investigates driver's background in the city of Yogyakarta (Indonesia) involved in traffic accident. Home interview surveys were carried out in Yogyakarta, by choosing around 5000 households to be interviewed about educational background, age, family background, transport mode to be used and whether they have been involved in the traffic accident or not. The persons who have been involved in the traffic accident and who have broken the traffic regulation were sorted out. The correlations between the driver's background and the traffic accident have been analysed. It is found that there is a strong correlation between driver's background and traffic accident. An action plan has been suggested to improve driver behaviour in order to reduce the traffic accident.

### **Driver observations contrasted with self-reported driving behaviours: a case study from Pakistan**

Batool, Z.<sup>1</sup> & Carsten, O.

Institute for transport studies, University of Leeds, United Kingdom<sup>1</sup>

Road safety research establishes a causal link between attitudes and behaviours. This paper considers the self-reported and observed driving behaviours of drivers in Pakistan grouped into four distinct attitudinal clusters, namely autonomous; opportunists, regulators and risk-averse. Self reports were obtained using a modified Driver Behaviour Questionnaire (DBQ). Observations were carried out using the Wiener Fahrprobe (WF). This paper will provide only a short summary of the process used to group drivers into attitudinal clusters. Data was analysed using factor analysis and post-hoc multiple ANOVAs. The overall results of DBQ and WF were in agreement such that opportunists were identified as the most dangerous group and regulators as the safest.

However, the results show that all the groups reported low aberrant behaviours on the DBQ, and did not load significantly on any of its extracted factors. By contrast, the WF observations found significant mean differences between the groups and demonstrated distinctive dimensions of drivers' behaviours. Furthermore, the results indicate that regulators, who claimed to be the safest, did not emerge significantly different from fellow drivers in terms of on-road behaviour. Significant relationships between aberrant behaviours and crash involvement are also noted. This paper concludes that self-reports are open to optimism and self-desirability biases and provides support for objectively assessing drivers' behaviours.

### **Cross-cultural hazard perception: Comparing the UK and Malaysia**

Lim, P.C.<sup>1</sup>, Crundall, D.E., Sheppard, E.B.

University of Nottingham, Malaysia Campus, Malaysia<sup>1</sup>

Hazard perception tests are used in several developed countries as part of the driver licensing curriculum, where performance on these tests has been associated with crash involvement. We conducted two cross-cultural studies with different diagnostic tools to examine transferability and utility of hazard perception skills between the UK and Malaysia. In Study 1, novice and experienced drivers from both the UK and Malaysia participated in a traditional reaction time hazard perception test, using video clips of driving scenarios filmed in both countries. In Study 2, the same video clips were shown but cut off just prior to hazard onset, and participants were given four options describing what might happen next in the clip and asked to select the correct one (the 'What Happens Next?' test). A free response version of the latter paradigm has been found to differentiate between novice and experienced drivers in the UK. Participants' eye movements were tracked in both studies to determine whether the different tasks necessitate different visual strategies. The results will be discussed in relation to how drivers view hazards in their own and other countries, and whether cultural differences pose a barrier to the export of hazard perception methodologies.

### **Symposium - Fitness to drive in (older) drivers with brain disorders**

Friday 31st of August, 13:30 - 15:30 - Room 9

#### **Fitness to drive: skill or ability?**

Brouwer, W.<sup>1</sup>

University of Groningen, The Netherlands<sup>1</sup>

No Abstract received.

#### **Can neuropsychological testing predict crash involvement for older drivers?**

Lundberg, C.<sup>1</sup> & Johansson, K.

Traffic Medicine Center, Karolinska University Hospital, Sweden<sup>1</sup>

Crashes involving older drivers are more seldom than crashes of younger drivers related to adverse circumstances such as slippery roads, bad weather or bad visibility, or the influence of alcohol. There is, however, reason to believe that older driver crashes are often caused by impairments of cognitive functions that are important for safe driving, for example attention and mental speed. This has also been shown in different studies.

In a prospective study participants were 493 active older drivers and insurance holders. They were

tested with a short neuropsychological test battery and were then followed up with respect to crash involvement for a mean period of six years. The neuropsychological examination consisted of tests of speed, attention, visuospatial functioning and memory. The participants' insurance company supplied information about the crashes and adverse events that had resulted in insurance claims during the observation period.

Attention, psychomotor speed, and memory were some of the cognitive functions related to the outcome variables and tests of complex functions (as opposed to more basic ones) had a certain potential to predict at-fault crashes. The potential of different tests to predict future crash involvement was low (less than 50 %), which seriously limits their clinical usefulness.

#### **Predictors of fitness to drive in people with Parkinson disease: a confirmation study**

De Vos, H.<sup>1</sup>, Vandenberghe, W., De Weerd, W., Tant, M., & Nieuwboer, A.

Department of Rehabilitation Sciences, Katholieke Universiteit Leuven, Belgium<sup>1</sup>

#### **Background and aims**

In previous work, we found 4 clinical variables (disease duration, contrast sensitivity, Unified Parkinson's Disease Rating Scale motor part, and Clinical Dementia Rating) to predict fitness to drive in Parkinson's disease (PD) with an accuracy of 90%. This study aimed to verify the predictive accuracy of the screening battery in a new sample of drivers with PD.

#### **Method**

Forty-seven PD drivers were enrolled. They were on average (standard deviation) 66 (10) years old. Six patients were in Hoehn and Yahr ON stage I, 23 in stage II, 16 in stage III and 2 in stage IV. They completed a clinical screening and an official driving assessment, encompassing visual, neuropsychological, and on-road tests. The outcome on the screening battery was compared with the fitness to drive decision.

#### **Results**

Twenty-eight (60%) passed the fitness to drive evaluation. Subjects in the current study were significantly older and more severely disabled than those in the previous study. When the discriminant equation from the previous study was applied, 36 (77%) out of 47 participants were correctly predicted to either pass or fail the driving assessment. The sensitivity and specificity were 95% and 64%, respectively.

#### **Conclusions**

The predictive accuracy of the screening battery is lower than previously found, possibly due to the differences in clinical characteristics between the two groups. Yet, the screening battery remains accurate in detecting potentially unsafe drivers

#### **Lateral deviations on a driving simulation task in stroke patients with and without neglect**

Van Kessel, M.E.<sup>1</sup>, Huitema, R.B., & Brouwer, W.H.

Sint Maartenskliniek Research, Development and Education, The Netherlands<sup>1</sup>

Patients with neglect after right hemisphere (RH) stroke tend to show a rightward shift of their subjective midline. Also, lateral deviations have been found in RH neglect patients when walking or driving a wheelchair. However, contradictory results as to direction of these deviations have been reported till now.

Here, lateral deviations of stroke patients with and without neglect (21 RH; 22 LH) and 20 healthy controls performing an ecologically valid computerized dual task (CVRT-D; Van Kessel et

al., submitted) will be presented. The 'tracking' subtest of this task consisted of a simple driving simulation task, projected on a large screen. Participants were instructed to maintain a starting position on a road using a steering wheel, while their position was continuously disturbed by a "side wind" signal, simulating a lateral movement of the car.

Previously, Huitema et al. (2006) found that RH neglect patients with good walking ability showed a deviation to the contralesional side when performing a straight ahead walking task, whilst deviations shifted to the ipsilesional side in patients with more impaired walking ability. The authors suggest that patients without walking difficulties may compensate for a rightward subjective midline displacement by veering to the left, whilst patients with walking difficulties give task priority to walking, resulting in rightward deviation.

Since in the present study patients were seated and no motor activity was required in the maintenance of position, based on the ideas of Huitema et al. (2006), it was predicted that leftward deviations in simulated driving would be observed in the RH patient group. Indeed, tracking results showed clear leftward deviations in RH patients and highly significant differences in lateral position scores between the RH patient group as compared to the healthy controls as well as the LH patients. Furthermore, tracking deviances seemed to be related to asymmetrical performance on other neglect tasks.

Some important features of the tracking task in terms of spatial references will be discussed, together with possible conclusions that can be drawn on spatial attentional and compensation behaviour in neglect patients.

#### **Neuropsychological evaluation of fitness to drive in Huntington disease**

De Vos, H.<sup>1</sup>, De Weerd, W., Tant, M., Nieuwboer, A., & Vandenberghe, W.

Department of Rehabilitation Sciences, Belgium<sup>1</sup>

#### **Aim**

The aim of this study was to determine the neuropsychological functions that are associated with impaired fitness to drive in Huntington disease (HD).

#### **Method**

This study involved 26 patients with manifest HD (6 women). Mean (standard deviation) age was 50 (13) years, mean disease duration was 40 (33) months, and mean Total Functional Capacity score was 10 (2). Patients underwent an official fitness to drive evaluation, which included visual, neuropsychological and on-road tests. The neuropsychological assessment comprised tests of visual scanning, visuospatial abilities, attention, choice response capability, executive control, and cognitive flexibility. Following evaluation, subjects were categorized into fit to drive without restrictions; fit to drive with restrictions; or unfit to drive. Differences in neuropsychological performance between groups were investigated via Kruskal-Wallis statistics.

#### **Results**

Twelve (46%) HD patients were judged as fit to drive without restrictions; 9 (35%) fit to drive with restrictions; and 5 (19%) unfit to drive. Significant differences between groups were found for Useful Field Of View; divided attention, and executive control. No differences were observed for visual scanning, Figure of Rey copy, 4-choice response times and incompatibility.

#### **Conclusions**

Drivers with HD pose a risk of being unsafe on the road. The preliminary results indicate that

neuropsychological assessment in drivers with HD should focus on attention and executive functions rather than on visual scanning and visuospatial abilities.

#### **Lateral position control in nystagmus patients: A driving simulator study of initial performance and effects of training**

Metting, E.<sup>1</sup>, Melis-Dankers, B.J.M., Dr. Brouwer, W.H.  
University of Groningen, department of Psychology, The Netherlands<sup>1</sup>

In the Netherlands, nystagmus patients were excluded from bioptic driver training because in the experience of driving instructors and examiners they often have problems with lateral position control (LPC). The aim of this study was to determine in how far the LPC of nystagmus patients (visual acuity between 20/100 and 20/40) is poorer than persons with unimpaired vision and whether it can be improved by training.

In a driving simulator LPC of 12 nystagmus patients without driving experience and 12 inexperienced healthy was assessed. In a second stage, the six candidates of each group with the poorest LPC were trained in the simulator in four additional sessions on separate days with visual feedback about their performance.

Initial LPC was poorer in the nystagmus group than in the control group but in some patients it fell in the range of performances in the control group. After the training sessions, differences in LPC between both groups disappeared in most conditions.

Based on these outcomes, the Netherlands Bureau of Driving Skills Certificates has adapted their regulations so that nystagmus patients with visual acuity < 0.4 can follow the regular bioptic driving procedure after a positive advice from a driving school about their performances.

### **Symposium - Sanctions and incentives** Friday 31st of August, 13:30 - 15:30 - Room 4

#### **The unwanted effect of making rules salient**

Keizer, K.<sup>1</sup>, Lindenberg, S.M., & Steg, E.M.  
Department of Social Psychology, Faculty of behavioural and social Sciences, University of Groningen, The Netherlands<sup>1</sup>

In traffic and other public spaces you encounter many prohibition signs, as well as signs of the norm-violating behavior they are expected to reduce, like people speeding, graffiti or litter. Based on goal framing theory and previous research, we argue that signs of (dis)respect of others for norms serve as norm-support cues which can weaken or strengthen the influence of norms. This norm-support mechanism implies that (cues of) norm-violating behavior by others (i.e. disrespect-cues) inhibit the influence of norms in general. We also hypothesize that making a known norm salient by means of a prohibition sign will not only focus people on this norm, but also on the (dis)respect-cues in that particular situation, thereby enhancing the influence of these cues. Therefore, we expected that a prohibition sign placed in a setting with corresponding disrespect-cues induces (rather than reduces) violations of the very same norm (i.e. same-norm inhibition effect) and other norms (i.e. cross-norm inhibition effect). We report results of two field experiments that support the negative norm-support mechanism as well as the reversal effect of prohibition signs when cues show

noncompliance. These findings are not only intriguing but they have important and clear practical implications.

#### **Where's the fun in driving? Hedonic and normative determinants of sustainable driving behavior**

Bolderdijk, J.W.<sup>1</sup> & Steg, L.  
Department of Social Psychology, Faculty of behavioural and social Sciences, University of Groningen, The Netherlands<sup>1</sup>

Interventions aimed at changing driving behavior (e.g. speed cameras, kilometer charges) are typically built on the assumption that people are concerned about financial outcomes (cf. pricing measures). Empirical research, however, suggests that such interventions have been less effective than anticipated.

Our research offers a potential explanation for this. Following goal framing theory (Lindenberg & Steg, 2007), we examined to what extent hedonic, gain and normative considerations are associated with driving behavior. In collaboration with five Dutch car insurance companies, we equipped cars of 150 young drivers with GPS devices. Analyses suggest that hedonic (affect) and normative considerations (personal norm) are strongly associated with driving behavior.

These results may help explaining why pricing measures and awareness campaigns have been less successful in changing behavior: financial considerations appear to be less predictive of driving behaviour than hedonic and normative considerations. In order to effectively promote sustainable driving behavior, interventions could focus more on hedonic consideration (e.g., by making sustainable driving behavior fun and convenient) and normative considerations (e.g. by appealing to people's sense of responsibility).

#### **Making small numbers count: environmental and financial feedback to promote eco-driving**

Dogan, E.<sup>1</sup>, Bolderdijk, J.W., & Steg, L.  
University of Groningen, Groningen, the Netherlands<sup>1</sup>

An eco-driving style aims to reduce fuel consumption, which has both environmental and financial benefits. Early campaigns and eco-driving training programs mostly focused on the financial consequences of eco-driving by presenting it as the "economical" driving. In the current research we examined whether emphasizing the financial benefits of eco-driving was indeed a good strategy to promote this driving style.

We manipulated the feedback content to present consequences of specific eco-driving behaviors. More specifically, the amount of fuel saved was presented to drivers either in terms of environmental savings (i.e. CO<sub>2</sub> emission reductions) or financial savings (i.e. monetary savings). Our results indicate that drivers perceived the environmental savings as a result of eco-driving behaviors to be more worth the effort than the financial savings. Furthermore, there was a trend indicating that drivers were more willing to adopt eco-driving behaviors for its environmental benefits.

The current results suggest that financial feedback, reflecting one's self-interest, may not be as motivating for drivers as it is considered by the policy makers and marketers. Environmental feedback, reflecting collective benefits, could be a more effective motivator to promote eco-driving style.

### What might hazard perception contribute to road safety?

McKenna, Frank P.<sup>1</sup>

Department of Psychology, University of Reading, United Kingdom<sup>1</sup>

In historical terms hazard perception is a relative newcomer and hence does not have an extensive research base. Different constructs have been used under the umbrella term of hazard perception so generalization across studies should be done with care. Relatively few large scale studies have been carried out so it is difficult to make unambiguous conclusions about its contribution to road safety. Despite the absence of compelling epidemiological evidence the features that make hazard perception appealing will be considered.

### Drivers' hazard perception ability: new evidence for the validity of tests and training.

Horswill, M.<sup>1</sup>

School of Psychology, The University of Queensland, Australia<sup>1</sup>

Drivers' hazard perception ability is of interest to road safety researchers as it is arguably the only driving-specific skill that has been associated with crash risk across multiple studies. It is typically measured using video-based tests, involving drivers viewing traffic situations and anticipating when a potentially dangerous event will occur. Response times to hazards have been found (1) to be associated with crash risk, (2) to be associated with on-road older driver evaluations, (3) to discriminate between learner, novice, experienced, and expert drivers, and (4) to be associated with performance-reducing circumstances that have also found to impact road safety, such as distraction, fatigue, brain injury, and visual and cognitive deficits. In this talk, I will present data from recent work in our laboratory. This includes findings indicating that relatively simple training leads to drivers fixating hazards earlier and is effective at reducing response times in hazard perception tests for highly experienced drivers (both mid-age and over 65 year olds), as well as novices. Also, the effects of this training appear to be somewhat robust over time. I will also present data describing drivers' insight into their own hazard perception ability (they appear to have none) and I will discuss the key elements that may be necessary to construct a valid hazard perception test. Finally I will discuss current limitations of the research evidence and how hazard perception testing and training could potentially be used in the future to improve road safety.

### Comparing measures of Hazard Perception and Hazard Reactions

Madigan, R.<sup>1</sup> & Groeger, J.A.

School of Applied Psychology, University College Cork, Ireland<sup>1</sup>

The most commonly used method for measuring hazard perception based upon the perception-reaction time to filmed traffic events. We argue that this method lacks ecological validity and may be of limited value in predicting drivers' actual behaviour, and particularly the actions they may take to hazards they encounter. Here we report a number of driving simulator-based studies in which we compare novice and experienced drivers' hazard reaction performance on a discrete button press test with their behaviour in a more dynamic driving environment. Novice (<2 years experience) and experienced drivers (>5 years experience) completed a button-press test which involved watching a simulated drive in UCC's driving simulator and sounding the horn every time a potential hazard was perceived. In order to assess whether discernable changes occurred in actual driving behaviour when encountering these hazards, the groups also completed a behavioural test whereby they drove the same route in the driving simulator. Results indicated that the behavioural hazard

reaction test was more successful than the button-press test in identifying experience-related differences in reaction time to hazards. This suggests that traditional hazard perception tests may be understating experience-related differences when drivers actually are in control of their vehicle.

### The advantage and use of Survival Analysis in analyzing response times in driving related hazard perception paradigms

Parmet, Y., Avinoam, B., Tal, O-G., Yael, F., & Lital, A.

Department of Industrial Engineering and Management, Ben-Gurion University of the Negev, Israel<sup>1</sup>

Typically, exploring differences in experience-based hazard perception involves a paradigm in which drivers observe short traffic-scene video clips and press a response button each time they identify a hazard. While several studies revealed differences in experience-based Response Time (RT) other studies did not report such differences. This study aspires to resolve this apparent contradiction by showing that the common methods used to analyze RTs fail to handle cases where no response is made in the time allowed at all (i.e., a driver did not respond to a hazard). In addition, we propose survival analysis methodology as a more suitable way of analyzing RTs. RT values were generated by sampling observations from pre-defined simulated distributions. Then, each method was evaluated on the basis of its ability to accurately estimate the actual distribution from which the data was generated. The findings show that all commonly used methods underestimate the real distribution whereas the proposed survival analysis method accurately estimates its values. Thus, the use of the common methods is likely to lead to erroneous conclusions. We therefore recommend using more suitable statistical methodologies such as survival analysis that can handle missing responses in a logically-sound and sophisticated manner.

### A robust theory of hazard anticipation and driving safety: Effects of Experience, Age, Cognitive Load, and Eccentricity

Fisher, D.L.<sup>1</sup> & Pollatsek, A.

Mechanical and Industrial Engineering, University of Massachusetts Amherst, United States<sup>1</sup>

The ability to anticipate latent hazards is known to vary as a function of experience: novice drivers can be up to five times less likely than middle-aged drivers to anticipate latent hazards, hazards which could potentially materialize and are either visible, but not moving, or obstructed by the built or natural environment. Recent studies in our lab indicate that older drivers (75 years old and older) are much less likely to anticipate hazards than middle-aged drivers, that drivers whose eyes are on the forward roadway are much less likely to anticipate hazards if they are cognitively loaded than they are if they are not so loaded, and that drivers glancing at a roadside distraction are much less likely to miss both latent and active hazards than are drivers who are not glancing to the side. One can reasonably ask why older drivers should lose a skill which they have previously learned so well. One can ask why the crash rates of drivers who are cognitively loaded and fail to anticipate latent hazards are not much higher. One can ask why electronic billboards have not produced a spate of crashes. A theory will be detailed which can explain not only the effects of experience, age, cognitive load and eccentricity on hazard anticipation, but can also predict quantitatively the relation between these effects and crash rates.

### Assessing the role of the precursor in hazardous events in a driving simulator

Crundall, D.<sup>1</sup>, Konstantopoulos, P., & Chapman, P.

School of Psychology, University of Nottingham, United Kingdom<sup>1</sup>

Recent research suggests that the relationship between the precursor to a hazard and the hazard itself impacts on the ability to spot and predict upcoming dangers on the road. We



were particularly interested in the difference between Behavioural Prediction hazards (BP) and Environmental Prediction hazards (EP). BP hazards occur when the precursor to the hazard (e.g. a child visible on the pavement) is the same object as the actual hazard (the same child running into the road). EP hazards however have an indirect relationship between precursor and hazard, such as a parked van hiding a pedestrian hazard. Evidence suggests that EP hazards should be more difficult to avoid than BP hazards, though the question remains whether driving experience allows one to overcome the difficulties in predicting EP compared to BP hazards. A simulator study was conducted with novice and experienced drivers who encountered both types of hazards in a carefully controlled yet immersive environment. The results are discussed with reference to which aspects of hazard perception can be improved with increased driving experience and why.

### Assistance and warning systems

Friday 31st of August, 16:00 - 18:00 - Rode zaal

#### The multi-driver simulation as a tool for the evaluation of traffic efficiency-orientated driver-assistance systems

Mühlbacher, D.<sup>1</sup>, Fischer, F., Buld, S., Totzke, I., & Krüger, H.-P.

Center for Traffic Sciences, University of Würzburg, Germany<sup>1</sup>

Recently, advanced driver assistance systems (ADAS) using car2X-technology have been developed to increase traffic efficiency. Until now, the evaluation of these ADAS mostly occurs in traffic flow simulation or in driving simulation. The use of several human drivers in the same simulated environment combines the advantages of these methods and is realised in the multi-driver simulation. The aim of the present study is to assess if the multi-driver simulation is suitable for the evaluation of ADAS which aim at traffic efficiency using the example of a traffic light assistant. While approaching a traffic light, this system informs the driver about the optimal speed to pass while the lights are green or about how long the red light will remain.

In each session, n=4 drivers (total N=60) took part. They had to absolve a course with 22 traffic lights at intersections in platoon formation. The traffic light assistant was realised as between-factor (with/without system). Additionally, the system's penetration rate within the platoon (0%/25%/50%/75%/100%) was varied between the sessions.

Various objective (e.g. travel time) and subjective data were collected to assess the potential of the multi-driver simulation. Since the study is currently running, the results will be provided in the final presentation.

#### Associating brainwaves and lateral driving control in a simulator; developing criteria for an brain-based adaptive cruise control.

Dijksterhuis, C.<sup>1</sup>, de Waard, D., & Brookhuis, K.A.

University of Groningen / Traffic psychology group, The Netherlands<sup>1</sup>

Finding appropriate measures to trigger machine changes remains a huge challenge in the field of adaptive automation. Trigger candidates include ECG measures and EEG frequencies, which have been linked to various mental states. The aim of such a system would be to avoid both underload and overload situations; which may both be viewed as a predictor of unsafe driving. When driving, task demands and mental effort investment may be regulated by changing driving speed. This could be handled by a biocybernetic system monitoring mental effort investments. To explore which EEG

frequencies and locations are most promising to serve as input for such a system, an experiment was conducted (n=34) in which participants were exposed to a range of driving speeds, relative to the driver's preferred speeds in a rural environment. To increase lateral demand even further, participants were required to stay below several target levels of swerving behavior (standard deviation of the lateral position). These targets were set, relative to the participants normal swerving behaviour. It will be discussed to what extent an EEG based adaptive cruise control is feasible.

#### Likelihood alarms in highly automated vehicles: Strategies to prepare the driver for erratic automation behaviour

Heesen, M.<sup>1</sup> & Baumann, M.

Institute of Transportation Systems / German Aerospace Center - DLR, Germany<sup>1</sup>

In highly automated driving, erratic automation behaviour could lead to problems in controllability if the driver does not expect such erratic behaviour, e.g. when he is complacent or has no adequate implicit or explicit understanding of the system.

Alerting the driver before the automation shows erratic behaviour would be one approach to improve the controllability.

However, erratic behaviour is not reliably predictable, so that there is a high probability of false alarms leading to low compliance in the alarm.

The likelihood alarm approach respects the unreliable nature of this kind of driver information and might improve compliance in the alarm. A likelihood alarm in form of feedback of automation uncertainty about erratic behaviour was tested with 40 participants in a between-subject study in a fixed-base driving simulator. Type (conventional vs. likelihood) and reliability of the alarm (medium vs. low) was varied. Participants drove with a combined longitudinal and lateral assistance system on a highway. During 40 of 41 situations with a second vehicle drivers experienced 4 respectively 12 false alarms. In the 41st situation the automation did not react to a slower lead vehicle. Driver reaction and trust in automation was measured.

#### An auditory-visual display for supporting drivers on unsignalised intersections

De Winter, J.<sup>1</sup>, Houtenbos, M., de Winter, J.C.F.

SWOV, The Netherlands<sup>1</sup>

A considerable portion of car crashes occur on unsignalised intersections, with poor visibility and unexpected maneuvers playing an important role. We investigated the effects of an auditory-visual display that informed participants about the speed and direction of another car approaching the intersection from the left or right. A flashing red light on the left or right of the speedometer indicated the other car's approaching direction, with the flashing rate corresponding to its speed. Simultaneously, beeps were presented to the left or right ear through headphones, with duration and pitch

corresponding to speed. Twenty-six participants (mean age = 53 years, 8 men) completed two sessions with and two sessions without the display (a total of 160 intersections) in a driving simulator. Using a second driving simulator, an experimenter controlled the 'other car' and encountered the participant in the same virtual environment.

Results showed that the display resulted in increased mean speed while safety (expressed by

time difference to a virtual collision point) improved, especially at intersections where visibility was compromised by buildings blocking the line of sight. Questionnaire results indicated that participants rated the beeps as more useful than the light.

Note. The full paper will contain new results describing between- and within-participant variability, conflict negotiation techniques, and correlations between metrics.

#### **What is more effective in critical intersection situations? – A comparison of different warning strategies**

Werneke, J.<sup>1</sup> & Vollrath, M.

Department of Traffic and Engineering Psychology, TU Braunschweig, Germany<sup>1</sup>

One main reason for intersection accidents are improper visual scanning strategies of drivers which contribute to overlooking other road users with the right of way. Appropriate warning signals which re-allocate drivers' attention towards the appropriate intersection areas could be helpful. In a driving simulator study, the effectiveness of two approaches of visual warning strategies varied in their warning time (1. while approaching the intersection, 2. near a critical incident) were investigated at a give way T-intersection with a critical event (Werneke & Vollrath, 2011). Additionally, the later warning signal was varied in its design. 48 subjects (M = 27.3 years, SD = 7.4) participated in the study. Driving and gaze data as well as subjective evaluations of the three warnings were analyzed. The results showed that the early warning which was given while approaching the intersection showed a positive effect. Here, most collisions could be avoided due to drivers' adaptation of their driving behavior to safer driving. They waited longer at the intersection and finally turned right with a lower velocity. Drivers evaluated this early warning as being most useful in this situation. From these results, requirements are derived for the design of effective warning strategies when driving at intersections.

#### **Acceptance of a new driver assistance system for merging into motorway traffic**

Schwarze, A.<sup>1</sup>, Leske, K., & Eggert, F.

TU Braunschweig Institute of Psychology, Department of Research Methods and Biopsychology, Germany<sup>1</sup>

In the research project FAMOS – Galileo for Future AutoMOtive Systems a new driver assistance system for merging into motorway traffic was developed. The Human Machine Interface (HMI) of this assistant was developed according to principles of behavioral psychology. In such a complex situation assistance systems should present signals whose processing does not require many cognitive resources or time. Thus stimuli that control behavior most easily need to be identified. In such situations signals that allow for a direct coupling of behavior are more appropriate than conveying status information. The developed HMI is comprised of a visual display completed by acoustic signals in specific situations.

The HMI was evaluated in driving simulator studies. Objective data show that the system supports the tendency to drive safer. Subjective data from questionnaires showed that the concept of the HMI and its functionality were rated as being easily to understand and helpful in this specific driving task. Most participants stated that the signals in the display helped them to find the right moment to merge into motorway traffic.

#### **Symposium - The role of feedback technology in reducing novice driving risk**

Friday 31st of August, 16:00 - 18:00 - Room 16

#### **Experimental evaluation of event-based feedback on novice teenagers' driving**

Bingham, C. R.<sup>1</sup>, Simons-Morton, B.G., Shope, J.T., & Ouimet, M.C.

University of Michigan Transportation Research Institute, United States<sup>1</sup>

Teenage drivers have higher motor vehicle crash rates than other drivers. Elevated g-force events resulting from acceleration, turning, and braking can increase crash risk; therefore, event feedback could reduce crash risk among teenage drivers. Studies using event feedback technologies in the form of a light, sound, and/or information (risk level, video footage, and coaching) provided to teenagers and their parents have reported declines in teenage drivers' events; however, no previous study employed a well-controlled experimental design. We report the results of an experiment evaluating the effectiveness of two forms of feedback in reducing newly licensed teenage drivers' event rates. Ninety parent-teen dyads were randomly assigned to either a lights-only group (LO) that received feedback as a blinking light when events occurred, or a lights-plus group (L+) that received a blinking light plus a risk score, event video footage, and coaching. Weeks 1-2 were baseline (no feedback) and weeks 3-15 included condition-appropriate feedback. Growth curve analysis showed significant slope differences ( $p=0.037$ ), with events in L+ decreasing significantly ( $B=-0.11$ ,  $p=0.004$ ), while no change was found for LO ( $B=0.08$ ,  $p=0.61$ ). These results indicate that technologies providing appropriate feedback may be useful in limiting risky driving and reducing crash risk among new teenage drivers.

#### **The impact of video-based feedback among learner drivers on post-license solo driving behaviour. A small scale ND pilot study**

Gatscha, M.<sup>1</sup> & Brandstätter, C.G.

Test & Training International/Head of Research, Austria<sup>1</sup>

The Austrian small-scale field trial of the EU-funded PROLOGUE project sought to assess the impact of video-based feedback provided during and after driving lessons by means of a simulated practical driving test and Naturalistic Driving (ND) data collected up to two months after the driving test. Two groups of learner drivers were randomly assigned to an intervention and a control group. The intervention group received video-based feedback additional to the standard driving education during and/or immediately after driving lessons by the driving teacher. After subjects of both groups received their driving license, an in-vehicle data and video acquisition system was installed in novice drivers' vehicles, capturing video, GPS information, speed and acceleration forces. Based on collected driving parameters, risk scales were developed which are a measure of safety relevant events per hour driven.

Performance differences of both groups in the simulated practical driving test suggest a positive impact of video-based feedback during or after driving lessons. Additionally, some significant differences on the risk scales occurred between the intervention and control group showing more risk events for the control group after receiving their drivers licence compared to the intervention group. However, bigger sample sizes would be needed for more reliable results.

## How to increase young drivers' acceptance to install in-vehicle monitoring systems and use it effectively

Lotan, T.<sup>1</sup> & Grimberg, E.

OR YAROK / Chief Scientist, Israel<sup>1</sup>

In-vehicle monitoring systems are becoming increasingly available. They have been proven to have great potential if administered correctly. A key issue to a successful implementation of those systems is young drivers' acceptance.

Naturally, young drivers do not approve of their driving behaviour being monitored, and will probably never initiate it themselves.

Several approaches to increase young drivers' acceptance are surveyed. These include:

- a personal feedback
- a community model
- monetary incentives
- incentives related to the licensing process
- accompanying benefits

It is imperative that all approaches respect the privacy of the young drivers, provide feedback which the young drivers consider being important or relevant, provide positive feedback (when possible) and are not used by parents to "spy" on their teens. Other factors that contribute to a successful implementation relate to parents' persistence, timing of the installation as well as to parents' willingness to have their own driving monitored as well.

Still, despite its ease of instalment, low cost and wide availability – in-vehicle monitoring systems are not yet widely accepted by young drivers and are far from being an integral part of their driving.

## Strengths and limitations of technology-based feedback to reduce young driver risk

Foss, R.<sup>1</sup>

University of North Carolina at Chapel Hill, United States<sup>1</sup>

Technologic approaches to influence human behavior virtually always promise more in principle than they are able to deliver in practice. This talk outlines both current and potential strengths and limitations of technology-based feedback to improve young driver safety. A distinct advantage of technology-based feedback is the specificity, of actions and their context, that can be addressed with feedback either to facilitate learning or to discourage risky behaviors. The potential for delivering this context-specific feedback immediately, or nearly so, is an additional strong point. A limitation on the performance of most technologic interventions – the need to embed them in a well-designed, carefully maintained human system, both to maximize their use and to ensure appropriate use – characterizes systems to provide technology-based feedback to young drivers as well. Another limitation at present is that not a great deal is known about what feedback should be based upon (e.g., violation of driving laws, erratic or rough driving), or the most effective mechanism for delivering feedback. In sum, much is yet to be learned before the benefits of feedback systems can be extended beyond individual drivers to influence the driving of large young driver populations. Important research questions, whose answers will help shape future feedback systems, will be summarized.

## Symposium - History of road safety research

Friday 31st of August, 16:00 - 18:00 - Ronde zaal

## A quantitative approach to study the history of road safety research

Hagenzieker, M.P.<sup>1</sup>, Bijleveld, F.D., & Commandeur, J.J.F.

SWOV Institute for Road Safety Research, The Netherlands<sup>1</sup>

One way of finding fruitful new ways of tackling the "unsafety" of the road transport system is systematically looking back into what has been done so far. In this pilot study a quantitative approach is taken to study developments in the field of road safety research. This quantitative approach, also called scientometrics, refers to the study of quantitative aspects of information and scientific publications. This approach has not been applied previously to the field of road safety. A global description will be provided of the developments in road safety research from the early days (1920-1930) until recently (2010). To this end, electronic databases have been searched and papers matching search criteria indicating 'road safety research' were selected for analysis. The dataset contains over 25,000 records. Co-word frequencies (or variants thereof) of key-words and their use in the titles and abstracts of these publications are analysed. In this explorative study, we attempt to establish whether important paradigms presented in the literature concerning the history of road safety research can be confirmed on quantitative grounds. The study is in progress; results will be presented at the conference.

## From Gibson and Crooks to Damasio: The role of psychology in the development of driver behaviour

Vaa, T.<sup>1</sup>

Institute of Transport Economics, Norway<sup>1</sup>

The first scientific attempt to deal with the issue of compensation was the classic field-theoretical study of Gibson and Crooks (1938). One theoretical concept was the "Field of safe travel. Nearly 50 years later, the launch of the Risk Homeostasis Theory gave rise to a profound debate about risk, risk homeostasis, and risk compensation. The core issue of the debate was Wilde's fixated assertion that all individuals, not only car-drivers, carry an inherent target level of risk that they are seeking to maintain. Gibson and Crooks fell well within psychological theories of the time, while Wilde's RHT emerged more from control theory and economic utility theory. In the 1990s neuroscience emerges especially with Damasio who introduced a paradigm that has proven fruitful as a framework of more recent driver behaviour models. Näätänen and Summala's "Zero-Risk"-theory integrated Taylor in their "zero-risk" theory which has persisted as a solid and accepted model. Psychological learning theory has, however, not been adequately dealt with which is odd given the prevalence of speeding and risk compensation which cannot escape explanations based on learning theory. The paper will present and discuss the role of psychology and psychological concepts that has been proposed in models since 1938.

## The combat against drug effects on traffic safety

Brookhuis, K.<sup>1</sup>

University of Groningen, Dept. of Psychology, The Netherlands<sup>1</sup>

After the definite breakthrough of the awakening to the negative effects of alcohol on traffic safety in the sixties of the past century (Borkenstein et al., 1964), authorities began to worry about drugs, initially medicinal drugs. After World War II, the prescription (and taking) of medicinal drugs expanded enormously. Pharmaceutical research was booming, for instance leading to the extremely successful introduction of Benzodiazepines, administered for various symptoms. Laboratory studies

gave strong indications that at least some medicinal drugs were likely to affect traffic safety. However, contrary to alcohol, no unambiguous effect with respect to traffic safety could be assessed easily by standard methodology, i.e. epidemiological research. Thereupon a new line of experimental research was developed, in the field itself, by means of instrumented vehicles. People were administered medicinal drugs, and placebo in double-blind within-subjects cross-over designs, driving on closed circuits or in some countries even out on the public road under strict surveillance. Several performance measures were registered, of which "swerving" or "weaving", i.e. the standard deviation of lateral position (SDLP) came forth as the most promising. To date SDLP proved itself as the most valid and reliable indicator of performance deterioration, and is at the basis of recently developed categorization systems of (medicinal) drugs.

#### **The history of road safety policy and knowledge in an institutional context**

Bax, C.<sup>1</sup>, Hagenzieker, M.P., Leroy, P.

SWOV Institute for Road Safety Research, The Netherlands<sup>1</sup>

This paper explores the institutional development of the road safety field over the last century. Institutionalization is the development of more or less stable patterns of acts and behavior which often take place over a time span of decades. The paper reveals changes in patterns of relevant road safety actors, resources, interaction rules and dominant discourses over road safety topics. It focuses on actors in the road safety policy and knowledge world and uses the Netherlands as an exemplary case.

After a theoretical exploration of the concept of institutionalization, an overview of the institutionalization in the Netherlands between 1900 and 2010 is sketched. The research shows the rise of knowledge organizations and national policy departments, especially since 1960. Furthermore, it demonstrates an increasing importance of the regional and local policy level since 1990, and an almost total lack of regional and local knowledge organizations. Analyses suggest that this mismatch between knowledge and policy may cause barriers in the use of scientific knowledge in road safety policy.

The Dutch findings are put into an international perspective and the relevance of the findings for other countries as well as future lessons about the connection between knowledge and policy are discussed.

#### **Road safety and road safety research in the past and future challenges**

Hakkert, A.S.<sup>1</sup>

Ran Naor road safety centre, Israel<sup>1</sup>

This presentation will review road safety developments since the beginning of the 20th century. During the first half of the century focus was mainly on the driver as held responsible for crashes, on developing safer roads and to a lesser extent on producing safer vehicles. Each of these components was generally viewed independently. Much attention was paid to the notion of accident proneness. During the second half of the 20th century slowly, a systems' approach evolved, especially in road safety research since the 1970's. The focus, both in road safety research and in road safety improvements, shifted from a main focus on the driver as the culprit towards measures to create safer driving conditions, regarding driver behaviour, vehicle design and road design jointly. Since the late 20th century, this approach was further developed towards the creation of a "safe system's" approach. In each of these phases, research shifted, in order to provide the evidence base on which these changes could take place. Lately the notion of road safety management is receiving a lot of attention, both in research and in practice.

After defining a vision of the near future, i.e the next 30 years, the presentation will describe some major developments to be expected over these years and the challenges these pose for future road safety research. Changes in the modal split, the age composition of the population, the advances in technology, both in vehicles and on the road and a changing focus on health and environmental issues will all affect road safety research in the future. Finally, expected changes in the sophistication of data bases and research methods will be discussed.

#### **Emotion and driving**

Friday 31st of August, 16:00 - 18:00 - Room 10

#### **Drivers' emotional responses to an emergency braking event within a medium-fidelity simulator**

Donkor, R.<sup>1</sup>, Burnett, G.E. & Sharples, S.

University of Nottingham, United Kingdom<sup>1</sup>

Modern driving simulators provide safe, controlled and cost-effective environments in which many different risk and safety-critical issues can be investigated. Nevertheless, simulators vary considerably as to whether they replicate the relevant emotional and cognitive factors. A study conducted within a medium-fidelity simulator investigated whether drivers behave and emotionally express themselves in response to perceived hazards as would be expected in the real world. Twenty participants drove a series of routes within the simulator and encountered an emergency braking event towards the end of the drive (due to another vehicle pulling out from a parked position). Subjective measures included responses to a variant of the Differential Emotional Scale (DES) and self-reported risk perception. Objective measures included reaction times to the hazard event, and facial expressions recorded on video. Data is still being analysed, although initial results indicate that participants as a whole exhibited realistic reactions and emotional gestures such as raising of arms, reaching for the car horn etc. Moreover, ratings on the individual DES dimensions for anger, fear, scared and upset were significantly higher after the braking event, compared to pre-study values. Further analysis will focus on self-reported feeling of risk and facial expressions using the Facial Action Coding System.

#### **The role of positive and negative affect in influencing drivers' feelings of risk and visual search in hazardous situations.**

Chapman, P.<sup>1</sup> & Jones, M.

University of Nottingham, United Kingdom<sup>1</sup>

Trick, Brandigampola and Enns (2011) have recently reported that presenting emotional images on an in-car display can effect drivers' hazard perception and steering while driving. These are important results and are consistent with the idea that positive emotion broadens the spread of search while negative emotion narrows it. However, there are alternative explanations for these results in the Trick et al. study. In the current study we use a similar design but with participants watching hazard perception videos with emotional images briefly superimposed on them either before a hazardous section, or a matched safer section of driving. This has the advantage that participants are not required to actually look away from the road at any time. Consequently any influences of picture valence can be interpreted directly in terms emotional effects on subsequent driving, rather than distraction from the current task by spatially separated emotional events. Participants' eye-movements and physiological reactions were recorded throughout the task and the results are discussed in terms of the degree to which influences of emotion on driving can be



directly associated with changed patterns of visual search.

#### **Anger and visual attention while driving**

Stephens, A.<sup>1</sup>, Trawley, S.L., Madigan, R., & Groeger, J.A.

University College Cork, Ireland<sup>1</sup>

Mood congruent theories suggest that individuals often evaluate situations according to their current mood rather than the situation itself. Stephens & Groeger (2011) have found the same is true in simulated driving situations, with angry drivers appearing to make more stereotypical judgments of traffic scenes and seeming to underestimate the risks inherent in hazardous situations. The current study aimed to further understand the influence of angry mood on attention to driving hazards. With the use of a state-of-the-art driving simulator, 24 participants drove either an anger-provoking manipulation drive or a control drive, then after a short break, performed a subsequent general drive. In the general drive, participants encountered jaywalking pedestrians and vehicles emerging from driveways from the left road-side. Subjective mood (POMS) was assessed before and after each drive and driving behaviour (speed and reaction times) and eye-behaviour measured simultaneously while drivers drove. Results showed that drivers provoked by slower lead vehicles reported reliably higher increases in angry mood when compared to the control group. These drivers also had reliably slower reactions to jaywalking pedestrians and cars emerging from side-roads. Eye-behaviour data revealed no differences during general driving and few group differences specific to the hazards were observed.

#### **Effects of movement artefacts on validity of skin conductance measures**

Pekkanen, J.<sup>1</sup>, Lappi, O., Lehtonen, E., & Summala, H.

Traffic Research Unit and Cognitive Science, Institute of Behavioural Sciences, University of Helsinki, Finland<sup>1</sup>

Skin conductance (SC) measures are widely considered as proxies to autonomous nervous system (ANS) activation that covaries with certain emotional states. These have also been applied to driving settings in which the subjects are demanded by the task to perform extensive motor tasks. Yet, to our knowledge, there have been no studies trying to quantify the effects of these movements on SC measures. We present results from an experiment where SC was measured from steering and resting hands simultaneously while driving. Our results indicate that the motor tasks cause non-negligible artefacts in the SC signal, which are carried over to measures usually taken as indexing ANS activation. With non-responders removed, the median Spearman correlation between the SC signals was 0.63 while driving. This contrasts with 0.95 in an essentially movement-free control situation. The artefacts also seemed to affect the often used Area Under Curve (AOC) measure: median Spearman correlation between the AOC-values of different hands was 0.44. For interpreting these values, the statistically somewhat difficult nature of SC signals and artefacts are discussed. Based on these results we urge caution in using and interpreting SC measures in settings involving significant motor tasks until effects of these artefacts are better understood.

### **Symposium - Traffic Psychology in Latin-America countries: ways to a traffic safety culture**

Friday 31st of August, 16:00 - 18:00 - Room 9

#### **On psychological issues in traffic engineering. A review of the state of the practice in the Chilean context**

Tudela, A.<sup>1</sup>, Echaveguren, T., & Woywood, M.

Civil Engineering Dept. Universidad de Concepcion, Chile<sup>1</sup>

It has been recognized in the literature that traffic analysis requires the incorporation of the psychological dimension when dealing with, for instance, road safety issues.

This paper is a critical study upon the state of practice of the subjective aspects consideration into traffic engineering issues in the Chilean context, from an engineering standpoint.

An examination of current practices in Chile, related to road design and traffic management, is carried out. Norms and design manuals are revised, looking for the detection of situations where the consideration of subjective aspects deserves to be taken into account. For instance, consistency analysis of road design requires bearing in mind people's perception when dealing with geometry-speed modelling but this subjective aspect is poorly considered into the Chilean practice and standards. Simple physical models are used to study driver/vehicle performance on roads, something which certainly affects safety levels for road users and non users. Currently, incipient research about speed negotiation on roads is conducted to improve the state of knowledge.

Recommendations about traffic analysis and developments where subjective aspects require an urgent consideration are discussed. Progress paths are suggested and envisaged, pointing out situations where a quicker advance can be achieved.

#### **Social Perception of Car Verification and No-car-day Programs in Mexico City**

Urbina-Soria, J.<sup>1</sup> & Andrade-Ríos, J.

National University of Mexico, Mexico<sup>1</sup>

The metropolitan area of Mexico City is the second biggest settlement of the world. With more than 20 million dwellers, it has 4 million vehicles circulating every day. This people and car buildup has an important negative effect on air quality and traffic accidents involving around 22,000 injured people and 1,400 deaths per year (SSP, 2006).

To face these situations, the "No-car-day" was established 22 years ago. It compels cars older than seven years to stop circulating once a week. And furthermore, a Vehicle Verification Program was initiated, which included a vehicle revision with a six-month periodicity.

To evaluate social perception and attitude toward these programs, 600 interviews were made: 300 among private car users, 200 among public transport users, 50 among taxi drivers and 50 among engine mechanics. Results show people perceive high corruption in the vehicle verification and government profit motive. No positive issues are brought spontaneously. Air pollution is perceived as a serious problem, especially related to the large number of cars. People think that air pollution has become higher in recent years, nevertheless it is not true; the objective assessments show that the quality of air is much better than one decade ago.

### Traffic Psychology Research in Argentina

Ledesma, R.D.<sup>1</sup>, Poó, F.M., & Montes, S.A.

CONICET / Universidad Nacional de Mar del Plata, Argentina<sup>1</sup>

Traffic psychology is not a well developed field in Argentina, neither professionally nor scientifically. This situation can be explained by contextual factors, such as the preponderance of clinical psychology and a weak research tradition. Nonetheless, at present there is a great need for research in this area, and scientific developments are emerging. This presentation describes some of the research that is being undertaken by our team in Argentina, and analyzes the challenges and problems confronting this field of research. We believe more and better quality psychological research is needed to respond to the specific demands that arise from our cultural context.

### Environmental psychology on the Move: Aims and Creation of the Mobility Psychology Research Group at the University of Brasília

Günther, H.<sup>1</sup>, Neto, I. L., Cristo e Silva, F. H. V., & Oliveira, Z. F.

Institute of Psychology / University of Brasília, Brazil<sup>1</sup>

The Environmental Psychology Research Group at UnB conducts transportation research since 1990. Two kinds of studies are conducted. Driver behavior: offenses, lapses, errors and workload; mobility: bicycle as mean of transport, influence of road design on behavior, acceptability of traffic demand management measures, instrumental, symbolic and affective aspects of car use, habitual car use. In 2009, students members of EPRG participated in FirstSTEP at Groningen University, which stimulated interest in car use reduction issues and the creation of the Mobility Psychology Research Group. Currently, 7 researchers from Psychology, Engineering and Architecture participate, studying theoretical and methodological issues of research and practice of psychologists dealing with mobility and environmental issues. The Group's experience allows for a fresh perspective for investigations in an field that is not usually studied in Brazil: rather than look at driver aptitude and behavior as an isolated psychological processes, the group's perspective is ecological, in the sense that we consider the multiple interactions between all road users and their physical and social environments. Furthermore, the Group represents the beginning of a movement where psychologists and other professionals maintain a network to contribute to transportation psychology research in Brazil.

### Traffic Psychology in south Brazil: the Sustainable Traffic and Transportation Research Group.

Bianchi, A.<sup>1</sup>

Department of Psychology, Federal University of Paraná, Brazil<sup>1</sup>

This group was created in 2009 with the objective of improve research in Traffic Psychology and related areas. In Brazil a psychological evaluation is mandatory to start the driver licensing process. However, there is not much research in traffic psychology. Then the main objectives in this two first years of the group was to create the conditions to start the discussion about research in traffic psychology and invite undergraduate and graduate students to become involved in this area. In 2010, the group organized the Interamerican Traffic Psychology Conference and in 2011 the two first students completed a master's thesis researching about pedestrians' risk perception and behavior, as well as bicycle model choice. Next year, three more theses about campaigns' evaluation, risk perception and drunk and drive and locus of control and driver's behavior will be defended. The first papers were submitted this year in Brazilian and international journals. The main results point to singularities of Brazilian drivers' general risk perception and in the spectrum of drinking and driving in the Country. Another important aspect was the development and adaptation of research instruments in traffic psychology in Brazil.

### Mode choice 2

Friday 31st of August, 16:00 - 18:00 - Room 4

### Theory of planned behaviour and travel mode choice: Role of attitude, subjective and descriptive norm, perceived control, and self efficacy

Brechán, I.<sup>1</sup>

Institute of Transport Economics, Norway<sup>1</sup>

The theory of planned behaviour has been used to explain travel mode choice. Based on theories of social influence and self efficacy, it has been suggested to include descriptive as well as subjective norm, and self efficacy as well as perceived control. However, the factors may not be independent of each other. Attribution theory suggests we infer people's attitudes from their behaviour. Self efficacy theory suggests perceptions of control influence self efficacy beliefs. Conceptualizing attitude as an overall evaluation implies that attitude could be based, to some degree, on beliefs about consequences of conforming to norms and the cost or difficulty of actions.

In a survey among 229 employees, we measured the factors in the theory of planned behaviour, including descriptive norm and self efficacy, in relation to potential travel modes (car, public transport, and bicycle) on the journey between home and work. All factors were significantly correlated with behavioural intention, but regression analyses showed that only some factors had a direct effect. The effect of descriptive norm was completely mediated through subjective norm and attitude, for all travel modes. The effect of perceived control was completely (public transport and bicycle) or partly (car) mediated through self efficacy and attitude.

### Who are those multi-modal commuters?

Bohte, W.<sup>1</sup> & Heinen, E.

Faculty of Technology, Policy and Management/ TU Delft/ researcher, the Netherlands<sup>1</sup>

In the Netherlands 40 percent of all trips to the railway station are made by bicycle. This large percentage can partly be explained by the high level of bicycle facilities in this country. Bicycle parking is widely available and 45% of all Dutch people live within three kilometers of a railway station. However, less is known about who these bicycle-train travellers are. Are these travellers cyclists for whom the distance is too large to cycle or are they train travellers, who simply need a way to reach the railway station?

This paper analyses attitudes towards the use of the different transport modes and underlying beliefs in relation to mode choice to work. The analyses are based on two large datasets both collected in multiple municipalities in the Netherlands. The results show that bicycle-public transport commuters share their positive beliefs on public transport with commuters who only travel by public transport and their positive beliefs on cycling with bicycle commuters. Remarkably, bicycle-public transport commuters have more positive attitudes towards the use of public transport than commuters who only travel by public transport. Among others they have more positive beliefs about how time saving and pleasant the use of public transport is.

## Investigation of behavioral stage for change as a stratification parameter for mode choice interpretation

Politis, I.<sup>1</sup>

Department of Civil Engineering/Aristotle University of Thessaloniki/Associate Researcher, Greece<sup>1</sup>

Behavioral stage for change is used by traffic psychologists in order to describe the endogenous intention (readiness) of individual to change travel behavior and adopt alternative ways of travelling. It is well known that the mode choice procedure cannot be fully interpreted by taking into consideration only observed differences in time and cost between the modes, since other, unobserved, parameters which are highly related with the personality of the traveler, affect the mode selection and result the exogenous habit.

In this paper, the role of behavioral stage in changing the current travel habits and select alternative to the car modes, is analyzed and discussed. The analysis is divided into two parts; at the first part the importance of behavioral stage itself in mode choice interpretation is tested through a hybrid binary probit model. At the second part, three different models for each of the three behavioral stages tested (pre-contemplation, contemplation, preparation) are developed and the observed differences among them are presented and commented.

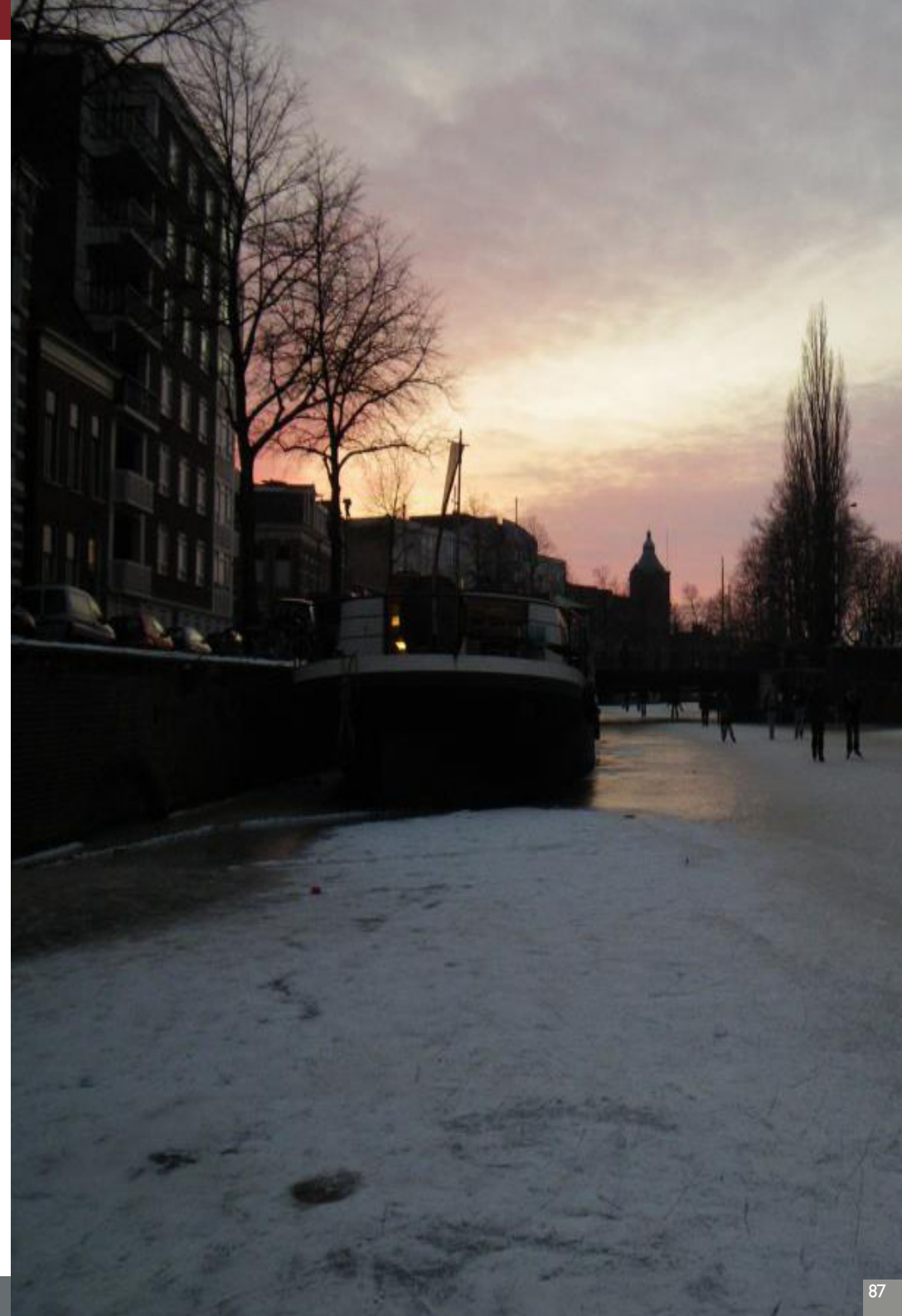
The data sets of the analysis derived from a RP and SP survey, conducted amongst commuters of the largest University in Greece and the binary models are being developed through the usage of Structural Equation Modeling techniques.

## A mixed-methods approach exploring active and non-active travel modes: Enjoyment, Environmental Attitudes and Habit

Thomas, G.<sup>1</sup>, Walker, I., & Musselwhite, C.

Department of Psychology, University of Bath, United Kingdom<sup>1</sup>

In 2011, focus groups held with regular commuters using cars, motorcycles, bicycles, walking and buses discussed the values and problems faced with using their mode, environmental emission targets and changing behaviour. Using a Grounded Theory approach an emergent theory framed travel mode choice as reflective of individual's desire for personal autonomy in their commute. Differences between users of active (bicycle, walking) and non-active (car, motorcycle, bus) modes were apparent, with differing views on their interpretation of control and autonomy, environmental challenges and the possibility of travel mode behaviour change. The findings of the qualitative research were then expanded upon using a large-scale quantitative survey (N=1,457) examining journey satisfaction, habit strength and environmental views (using the New Ecological Paradigm). Results from the survey highlight the increased satisfaction experienced by users of active modes, and varying responses in habit strength and environmental views. A comparison of the results from the two methodologies is used to present a rounded view of affective and implicit motivations of travel mode, highlighting similarities within active mode user groups for future provision, and avenues for behaviour change for non-active mode users.













## Poster Session 1

Wednesday 29th of August, 18:00 - 19:00 - Fontein Patio

### Background Music As A Risk Factor For Distraction Among Young Drivers: And IVDR Study Brodsky, W.<sup>1</sup> & Slor, Z.

Music Science Lab, Department of the Arts, Ben-Gurion University of the Negev, Israel<sup>1</sup>

Statistical data on road safety for Israel indicates that drivers between ages 16-24 account for the highest level of accidents and fatalities; 25% severe accidents and 5% fatalities occur during the first two years of driving, and young novice drivers are 10-times more likely to be in an accident during their first 500 miles. Ironically, the most common violations for this group are speeding (37%) and lane weaving (20%) – both of which were found to correlate with in-cabin music behavior (Brodsky, 2002). Youngsters regularly drive with highly energetic aggressive music consisting of a fast-tempo and accentuated beat, played at strong intensity levels of elevated frequencies and volumes. While music might not be the primary risk factor for driver distraction, it may be more of a contributing factor than currently acknowledged. This paper will present preliminary data from a study funded by the State of Israel National Road Safety Authority. Seventy young drivers with licenses for less than 8-months drove six trips in a “Learners” automobile installed with an in-vehicle data recorder (IVDR); in 2-trips music CDs brought from home was heard, in 2-trips with experimental music custom-tailored for drivers safety was heard, and in two trips no music was heard.

### Driving stereotype change: A tipping point in the public perceptions of electric vehicles?

Burgess, M.<sup>1</sup>, King, N., & Harris, M.

Psychology/Oxford Brooke University, UK, United Kingdom<sup>1</sup>

Image and symbolic attributes of cars play a key role in their desirability and in consumers' purchasing behaviour. Drivers in the UK's Technology Strategy Board funded ultra-low carbon vehicle trial were interviewed regarding their interactions with the general (non-EV driving) public. EV drivers' accounts suggest that EVs are particularly susceptible to stereotyping, but that the stereotyping is in a state of flux. The Traditional, negative stereotype still prevails, despite being based on outdated associations with milk floats and older EV models. Drivers who encounter people holding the traditional stereotype are informed that EVs are strange, slow, absurd, and unviable transportation options. However, the current period of widespread EV trialling in the UK sees the emergence of additional EV stereotypes. Drivers encountered stereotypes that were Ambivalent, with the 'green' image of EVs linked positively to environmental concern but also linked negatively to pretentiousness and radicalism. More Positive stereotypes are in the emergent stage of development, fostered by greater contact with drivers of contemporary EVs, increased availability of performance statistics, and recognition of the future-oriented technological nature of EVs. We discuss the factors underpinning the transition from Traditional to Positive stereotypes indicating the temporal, experiential, and attitudinal dimensions of that path.

### Altering speed perception through the spatial adaptation of music within a vehicle

Burnett, G.<sup>1</sup>, Hazzard, A., & Crundall, D.

Human Factors Research Group, University of Nottingham, United Kingdom<sup>1</sup>

The choice of an inappropriate speed for the current driving context is a common phenomenon. In

this respect, researchers have investigated whether perceptual distortion effects can “trick” drivers into thinking they are travelling faster than reality, for instance by using specific road markings on the approach to a key junction. In this paper, we consider the potential for altering speed perception through the spatial adaption of music within a vehicle. In a fixed-base simulator, sixteen participants drove with no other traffic and were asked to maintain a speed of 70mph. At specific points, the speedometer was turned off. Music at a constant tempo was played throughout varying in the balance between front and rear speakers. Without the speedometer, participants drove significantly slower after the music faded from the front to rear speakers (mean speed 72mph) compared to when no change occurred (mean speed 73.2mph). Post study interviews revealed that participants were not aware of alterations in the spatial positioning of the music. Such results suggest drivers naturally slowed when the music faded from front to rear speakers in an unconscious attempt to re-envelope themselves within the sound bubble. Further work will consider other variables with a larger sample.

### The Difference in the Hazard Perception Ability Between Accident-Involved and Accident-Free Motorcycle Riders

Cheng, S.K.<sup>1</sup>, Ng, C.K., & Hoe, L.

Ergonomics and Human Performance Laboratory, Department of Rehabilitation Sciences, The Hong Kong Polytechnic University, Hung Hom, Kowloon, Hong Kong., China<sup>1</sup>

Motorcycle riders are the most vulnerable types of road user. The primary purpose of this study was to deepen our understanding of the correlation of different subtypes of visual attention and driving violation behaviors and their effect on hazard perception between accident-free and accident-involved motorcycle riders. 63 accident-free and 46 accident-involved motorcycle riders undertook four neuropsychological tests of attention (Digit Vigilance Test, Color Trails Test-1, Color Trails Test-2, and Symbol Digit Modalities Test), filled out the Chinese Motorcycle Rider Driving Violation (CMRDV) Questionnaire, and viewed a road-user-based hazard situation with an eye-tracking system to record the response latencies to potentially dangerous traffic situations. The results showed that both the divided and selective attention of accident-involved motorcycle riders were significantly inferior to those of accident-free motorcycle riders, and that accident-involved riders exhibited significantly higher driving violation behaviors and took longer to identify hazardous situations compared to their accident-free counterparts. However, the results of the regression analysis showed that aggressive driving violation CMRDV score significantly predicted hazard perception and accident involvement of motorcycle riders. Given that all participants were mature and experienced motorcycle riders, the most plausible explanation for the differences between them is their driving style (influenced by an undesirable driving attitude), rather than skill deficits per se.

### The contribution of safe driving training in educating drivers to risk perception

Ciceri, R.<sup>1</sup>, Biassoni, F., & Perego, P.

Department of Psychology, Università Cattolica, Milan, Italy, Italy<sup>1</sup>

The influence of safe-driving training on risk perception is not widely investigated actually (Rosenbloom et al., 2007). Aim of the present work is to examine if an increase in self-confidence and perception of ability, resulting from a safe-driving training, is associated to an increase in risk perception and awareness. 228 subjects took part in an eight-hours safe-driving training including

four driving exercises, simulating risk situations in everyday driving contexts, such as someone suddenly crossing the road or driving on slippery road surface. Before and after the training, all the subjects were submitted a questionnaire to test the risk perception in everyday driving environment (RIPAQ, Risk Perception in Action Questionnaire). Repeated measures ANOVA show a significant increase in the estimate of risk incidental to some situations, like "using your mobile while driving" ( $F=26,334$ ,  $df=1$ ,  $p=0$ ), "avoiding using lifebelt" ( $F=13,817$ ,  $df=1$ ,  $p=0$ ) or "driving at a speed of 60km/h in city center" ( $F=62,778$ ,  $df=1$ ,  $p=0$ ), but not to other ones, as "avoiding slowing down next to a cross road". Data are discussed in the light of the dual process theory about risk perception: the emotional component seems to be more aroused by the safe-driving experience than the analytic one (Slovic, 2004).

#### **Testing of Rehabilitation Program for Traffic Violators in Saudi Arabia** Dabil, S.<sup>1</sup>

King Fahad Security Collage, Ministry of Interior, Saudi arabia, Saudi Arabia<sup>1</sup>

The study used pre-post tests for rehabilitation program for traffic violators in Saudi Arabia. This research used experiment research method. Fifteen subjects were interviewed for their willingness to follow the traffic regulations as the pre-test. All subjects are considered as traffic regulation violators who violate the regulation at least 2 times in the past years. This consideration was based on their self-reporting of the act. Four rehabilitation sessions were conducted for those appointed subjects. The duration of each session is three hours. These sessions was distributed over the period of one month. One session every week was scheduled to enable the rehabilitation elements to be absorbed. The sessions include; lectures, discussions, workshops, films, homework, field observation and practices. Three trainers conveyed the materials and lectures. The conveyers are specialists in sociology, psychology and education. At the end of all sessions the post test was conducted. The content of the post test is the same content as the pre-test. Paired- matched T-test was utilized to test the significant of the difference of the two tests. The result showed a significant difference between the two tests in preference to the post test. This result indicates that the rehabilitation program was successful and therefore can be implemented in Saudi Arabia.

#### **The relation of attitudes and time perception to the practicing of eco-driving among French car drivers**

Dogan, E.<sup>1</sup> & Delhomme. P.

University of Groningen, Groningen, The Netherlands<sup>1</sup>

Eco-driving is considered to be a promising behavioral solution to reduce fuel consumption and CO<sub>2</sub> emissions due to road traffic. However, the majority of the current driver population has not been trained for this new driving style. Even among those drivers who received training on eco-driving, the practicing of eco-driving is not common enough to reach the aimed CO<sub>2</sub> reductions. Attempts to promote eco-driving would be more effective when they target specific reasons that underlie practicing eco-driving. Therefore, it is important to understand the behavioral antecedents of practicing eco-driving in order to develop efficient training programs and interventions.

In the current research, we investigated attitudinal and perceived time-related factors that influence the practicing of eco-driving. We applied extended version of theory of planned behavior in the field of eco-driving. Furthermore, we examined whether drivers' time-saving bias (Svenson, 2008), that is, overestimating the time we save by increasing the speed of actions, moderated the relationship between attitudes and practicing of eco-driving.

Thousand drivers representative of the French population took part in this online survey. Findings

will be discussed for their theoretical and practical implications.

#### **Bicycle and university: possible solutions to increase urban mobility among undergraduate students in Curitiba - Brazil**

Franco, C.<sup>1</sup> & Bianchi, A.

Federal University of Parana, Brazil<sup>1</sup>

The increasing vehicle use within cities has led to traffic jams culminating in a mobility crisis in large urban centers. The use of bicycle begins to be perceived by managers as an alternative to urban transport instead of individualized automotive vehicles, despite the absence of urban infrastructure for cycling and cultural resistance to abandon the car. This study aimed to investigate the attitude of university students to include the bicycle as a mean of transportation to the university. 412 undergraduate students at Curitiba city, enrolled in both public and private colleges and universities, answered the questionnaire. The majority used bus (42.1%) to travel to the university. 33,7 % used car and only 2% used bicycle. In respect to the attitude about using the bicycle to travel to the university, women were more positive than men, so were the younger and those who did not owed a car. This research provided data about attitude in respect of bicycle use on commuting to university and about factors that may influence the choice of this modal. These data can base future campaigns to increase bicycle use among university students.

#### **The influence of safety driving public service commercials on drivers' behavior according to their sensation seeking level**

Frolova, D.<sup>1</sup>

University of Latvia, Latvia<sup>1</sup>

In modern society it is common to create public service announcement that produce fright and/ or disgust in viewers. Especially if the public service announcement concerns health, for exapmle, anti-smoking campaigns. The same type of campaigns are made for road safety needs, but the question is: are these emotionally stimulating campaigns really that effective with the risk-group as they should be?

The aim of current study is to divide safety driving video commercials into two groups - highly stimulating and low stimulating and to measure with the Vienna Risk Taking Battery how two different groups of respondents - high and low sensation seekers - react behaviorally to these campaigns.

The idea is as follows: according to the previous work done by M. Zuckerman and T. Rosenbloom it seems, that high sensation seekers are the risk-group, that safety campaigns should be adressed to, but they do not actually change their risky behavior, when exposed to highly stimulating video (the high sensation value safety driving commercials). The hypothesis is: high sensation seekers will take less risk on the road after being exposed to low sensation value safety driving commercials if compared to high sensation value commercials.

The results will be discussed in terms of their relevance to effective safety commercial creation acknowledging the risk-group.

### **Relation between road aggression and locus of control**

Grunt-Mejer, J.<sup>1</sup> & Grunt-Mejer, K.

Faculty of Psychology, Warsaw University, Poland<sup>1</sup>

Some results concerning the relationship between road aggression and locus of control - a psychological concept explaining belief to which extent we control our life - are already known, indicating that people with an internal locus of control (feeling that they have control over their life) are less apt to road aggression than people who ascribe control to external forces or to other people. However there is no data showing how this dimension is related to the choice of the mode of transport. In presented research we explore hypotheses linking these two variables, assuming that higher level of an internal locus will lead to choosing more independent mode of transport. The hypotheses were confirmed showing that the choice of mode of transportation was related to the level of locus of control: respondents who used a bicycle revealed the highest level of internal locus, whilst respondents who used motorbike had the lowest level of internal locus. Having internal locus of control leads to lower level of anger while driving. Additionally, the more external locus of control, the higher level of anger while driving.

### **New Dutch education intervention program alcohol and traffic**

Hegeman, G.<sup>1</sup>, van Beekum, R., & Vissers, J.A.M.M.

DHV, The Netherlands<sup>1</sup>

The new Dutch education intervention program alcohol and traffic (EMA) is developed by means of Intervention Mapping method. This means that the main aim of the EMA, 'after taking part in the EMA course, I will not drive a vehicle after I have drunk more than the legally allowed alcohol limit', is elaborated into six specific behaviour goals. These behavioural goals are in turn elaborated in more than 200 participant change goals. These changes of the participants are required to reach the main goal. Then, the 200 participant change goals are allocated to determinants of driving behaviour. Finally, for each set of change goals per determinant a part of the EMA program is considered.

The motive to change the since 1996 successfully given EMA course, is the introduction of the Alcohol Lock Program by the 1st December 2011. Due to this development, BAC to get an EMA are lowered. This involves that less participants of the EMA will be alcohol addicts and more will be the 'one time to much drinking for driving' participants. This requests another approach during the course. The aim of the development of the new EMA course by means of Intervention Mapping is to focus less on knowledge about the effects of alcohol in traffic and more on the changes and skills needed to really not drink and drive anymore.

### **The DUI offenders profile: the role of personality and antisocial attitudes**

Jornet-Gibert, M.<sup>1</sup>, Holtschlag, C., Suso, C., Gallardo-Pujol, D., & Andrés-Pueyo, A.

Department of Personality, Universitat de Barcelona, Spain<sup>1</sup>

Driving under the influence (DUI) of alcohol is an important problem in many countries, and heavily linked with road accidents. Therefore, in recent years there has been a growing interest in the study of the individual characteristics associated with this type of traffic offenders. Some studies have found an association between some personality variables and DUI, although the predictive ability of personality traits is generally considered to be quite limited and therefore the study of attitudes has been growing, concluding that the relationship between personality and DUI decreases when controlling for unsafe traffic attitudes. The aim of our study is to define a profile of DUI offenders based on personality characteristics and antisocial attitudes. This study involved 98 subjects, 51

of them where following a diversion program after a DUI offense, and 47 were drivers without criminal records. Personality was assessed by the NEO-FFI Inventory, and antisocial attitudes were assessed using the Jesness Inventory Revised. Our results suggest that personality does not directly predict DUI, but that the relationship between personality traits and DUI depends upon the antisocial attitudes. These findings have implications in the design of treatment and educational programs to avoid DUI recidivism.

### **Response of part-time belt users to enhanced seat belt reminder systems of different duty cycles and duration**

Kidd, D.<sup>1</sup>

Insurance Institute for Highway Safety, United States<sup>1</sup>

Enhanced seat belt reminders are an effective means of increasing seat belt use. It is important to optimize the design of these systems so that they increase belt use and are acceptable to vehicle occupants. This study examined the effects of duty cycle and duration on seat belt reminder effectiveness and annoyance. It also evaluated the European New Car Assessment Programme (Euro NCAP) duration requirement. Eighty part-time belt users experienced one of four seat belt reminders during a simulated drive and rated its effectiveness and annoyance every 45 seconds. Overall, enhanced reminders were rated as more effective than a basic reminder that met the minimum United States federal requirements. Ratings of reminder effectiveness did not change significantly over time. Increasing the proportion of time that a chime sounded and icon flashed during a reminder cycle did not influence system effectiveness, but it did make the system more annoying. Reducing the duty cycle of enhanced reminders would be one method of increasing user acceptance while retaining overall system effectiveness. Lastly, the variation in duration and duty cycle permitted under Euro NCAP requirements for seat belt reminders does not appear to affect their effectiveness.

### **The possibility of reducing cyclists' unrealistic optimism by changing the stereotypical image of victims in bicycle-related accident**

Kinosada, Y.<sup>1</sup> & Usui, S.

Osaka university, Japan<sup>1</sup>

While the number of accident fatalities is decreasing in Japan, that of accident involving cyclists is decreasing at a much lower rate, and thus we need to intervene. Unrealistic optimism, a cognitive bias wherein one rates one's own vulnerability lower than that of the average individual, would hinder precautionary actions to accidents. The aim of this study was to reduce optimism by closely associating participants with their images of accident-prone cyclists. A preliminary investigation revealed that more than half the number of participants felt that cyclists who do not pay attention, who cycle while holding umbrellas, and who cycle in the dark without their lights on were likely to be involved in accidents. Compared to these representative images, the characteristics of participants were considered less representative. According to the representative heuristics, it was hypothesized that if the vulnerability data of cyclists who are similar to participants and who fit the representative image are presented together, the participants were able to identify more with their images of accident-prone cyclists and improve the risk perception. We evaluated the differences between the participants' images of accident-prone cyclists and perceived likelihood of accident while cycling before and after the data presentation.



### **TASEVAL: An example of interventional program for traffic penal violators**

Lijarcio, J.I.<sup>1</sup>

INTRAS. Universitat de València (Spain), Spain<sup>1</sup>

In November of 2007 Spanish Penal Code Law was modified including a new type of crime: the traffic criminal violators. The new penal violations are about human factors like high speed, driving under influence of alcohol or drugs, reckless driving, driving without license, etc. These behaviors can be punished in different ways: deprivation of the right to drive, imprisonment, monetary fines or community work.

We have developed an interventional program, called TASEVAL, for the drivers who have to perform community work to repay a debt to society for having committed the traffic violation. Since 2007, more than 180.000 traffic penal violators have participated in the program. TASEVAL is a set of social and educational activities for rehabilitate the traffic penal violators composed by three stages: 1) Welcome, 2) Training and Social Work and 3) Exit. In the first and third stage participants complete a questionnaire about their beliefs and values in road safety (CRV-SV Scale) to evaluate their evolution. In the second stage they develop activities about awareness with traffic accidents, traffic risk factors (alcohol, drugs, speed...), traffic and social values, and self-control strategies.

With the results of program we expect to draw the traffic penal violator profile in Spain.

### **Travel to work. Effects on choice of mode of transport of information on advantages and disadvantages of the car or subway**

Lois García, D.<sup>1</sup> & Lopez-Saez, M.

Social Psychology Department, Universidad Nacional de Educacion a Distancia (UNED), Spain<sup>1</sup>

The goal of the present study is to provide evidence of how one can influence the behavior of choosing a public transportation mode by means of the information provided about the personal or social benefits of this transportation mode. The use of an experimental methodology allowed us to assess the importance of different types of benefits presented. On the other hand, the characteristics of the sample (N=222), people who habitually go to work by car, grant special rigor to the conclusions derived from this investigation. Our results have both theoretical and applied implications. Theoretically, our investigation contributes to the existing literature, unequivocally underlining the causal relation between trip variability and the preference for a public or private transportation mode. At a practical level, in the context of the use of transportation in cities, publicity campaigns aimed at modifying attitudes should underline the instrumental attributes of the public transportation means, as well as the reliability in trip time, compared with the car. Likewise, we note that, in this type of campaign, the personal and environmental benefits of public transportation and the harm caused by car use contribute to modifying attitudes and mobility behaviors.

### **Development and Validation of Aggressive Driving Scale**

Malomo, B.<sup>1</sup>

Psychology, Nigeria<sup>1</sup>

Due to the paucity of psychologically oriented measures for identifying potential aggressive behaviour of automobile drivers in Nigeria, this study embarked on the development and validation of an aggressive driving scale for work-related automobile drivers in Nigeria. Using a cross-sectional research design, the study was carried out in three stages in six local government areas in Lagos

metropolis, the largest city in Nigeria. On the basis of theoretical framework (frustration-aggression model), content-oriented approach, job analysis, existing measures and prior research studies, items were generated based on aggressive driving behaviours. The author established face and content validity using subject matter experts as reviewers and raters. Questionnaires were developed based on items retained from a pilot study. Data retrieved from 555 consented work-related drivers were used for analysis and construct validation study using the correlational method. Initial expert review of face validity had 2 items discarded. A review of content validity using Lynn (1986) method retained only items with I-CVI of 1.00 agreed by 5 experts. Factor analysis revealed 4 items with coefficient alpha of .96. The result indicates the aggressive driving scale is valid, reliable and relevant for use in Nigeria.

### **Reeducation for Spanish recidivist driver offenders. Study about their attitudes towards traffic safety.**

Marti-Belda, A.<sup>1</sup>

INTRAS. Universitat de València, Spain<sup>1</sup>

On 1st July 2006 a Penalty Point System was introduced in Spain. Five years after all signs point to a success. Despite the number of vehicles and drivers increasing, there has been a dramatic reduction in deaths. The Spanish PPS is focused on consolidating a traffic safety culture, beyond the legal aspects, and on reducing rates of recidivism. The main key for achieving that target is the assistance to a compulsory 24 hours course of awareness and re-education to get licence reinstated. More than 200.000 offenders had assisted to these courses yet. Before starting the course, offenders have to complete an extended questionnaire about knowledge and attitudes towards traffic safety and sociological aspects. Depending on the answers, offenders are addressed to a specific training course. The functioning of the courses and the results of the data from the questionnaires are analysed on that study and gives us fundamental information for knowing the profile of Spanish offenders. Furthermore, data collected about attitudes and believes will help us to improve the effectiveness of the recidivist offenders courses and of the training programs for novice drivers.

### **Rest and Accident of Taxi Drivers**

Nakamura, A.<sup>1</sup>, Shimazaki, K., & Ishida, T.

Graduate school of Human sciences, Waseda University, Japan<sup>1</sup>

Appropriate rest is important for reducing accidents involving taxi drivers working long hours. We investigated the relation between the rest of taxi drivers on duty and accidents by analyzing the one-month records of digital tachographs of 21 accident repeaters and 23 safe drivers. They worked for about 20 hours per a shift. We defined inactivity exceeding five minutes as rest. The dependent variables were the total rest time, the number of rest periods, the maxim continual driving time, and the concordant rate of rest. The concordant rate of rest indicates whether the time and length of rest were regular or not and is the average of the similarity ratio of rest. We compared four variables between accident repeaters and safe drivers. The result revealed that the concordant rate of rest of safe drivers was significantly higher than that of accident repeaters. There was no significant difference in the total rest time, the number of rest periods, or the maxim continual driving time. We found that the regular rest was important.

### **A Comparative Experiment on health benefit of Bicycle path conditions using indirect Energy Consumption Estimation Method**

Notake, S.<sup>1</sup>, Yoshida, N., Hino, Y., & Uchida, T.  
Osaka City University, Japan<sup>1</sup>

Recently, several researches showed that riding bicycle has some health benefits in many countries. Riding bicycle in Japan also attracts people who have concerns about their health and environment while bicycle trip statistics showed that the average trip distance was much shorter than other countries. Under these condition, some bicycle transport planners focuses on the engineering property of bicycle network to realize health benefit effectively, but there is few researches describing the health effects on existent bicycle path conditions.

Therefore we conducted the preliminary experiment that 8 students ride on 3 courses representing urban road conditions with approx. 5km length including different types of bicycle path and traffic condition. During the experiment, heart rate was monitored as dependent variable. Before the experiment, expiratory gas analysis was conducted in laboratory which gives an indirect estimation of energy consumption using the relationship between the load strength of physical activity and energy consumption.

This study analyses the relationship between energy consumption rate and bicycle path conditions such as degree of gradient, interval of signals, and accumulation of physical tiredness using indirect energy consumption estimation method. It also investigated the effect of psychological pressures on heart rate caused by road or traffic conditions.

### **A Cross-Cultural Study on Driving Anger with Chinese and Japanese Drivers**

Oehl, M.<sup>1</sup>, Siebert, F.W.S., Rau, P.L.P., Zhuang, C.Z., & Kanno, T.K.  
Institute of Experimental Industrial Psychology, Leuphana University of Lueneburg, Germany<sup>1</sup>

Although general car safety has increased progressively as well as the safety of road environment has been improved, the numbers of traffic accidents in Japan and especially in China are still remaining alarmingly high. Despite traffic psychological research has shown that emotions leading to maladjusted driving behavior are main contributors to traffic accidents, it is currently far from clear to what extent emotions are influencing driving behavior in Asian countries like China and Japan. In many western countries especially anger was found to correlate significantly with risky and aggressive driving behavior leading to a higher probability of getting involved into traffic accidents. So far, extensive and detailed studies on this critical issue are lacking in most Asian countries. Our current study aims to bridge this gap. We examined the reliability and validity of a Chinese and Japanese version of the Driving Anger Scale (Deffenbacher et al., 1994) and of the Driving Anger Expression Inventory (Deffenbacher et al., 2002). Preliminary results point to the tendency that especially Japanese drivers are experiencing less driving anger compared with drivers in the US. Moreover, cross-cultural differences in the expression of driving anger between Chinese, Japanese and drivers from western countries are visible.

### **Temporal stability of self-reported driving behaviors**

Poo, F.<sup>1</sup>, Montes, S.A., & Ledesma, R.D.  
CONICET/Universidad Nacional de Mar del Plata, Argentina<sup>1</sup>

Reliability of driving self-report measures is usually assessed through internal consistence analysis.

Other important and necessary ways of reliability estimate such as test-retest are little used. The present research examined the 6-month test-retest reliability for two self-report driving measures, the MDSI (Multidimensional Driving Style Inventory) and the ARDES (Attention-related Driving Errors Scale). A first study was conducted in order to assess the stability of the MDSI scores. Participants were a sample of 50 drivers drawn from the general population of Mar del Plata (Argentina). Results indicated strong correlation coefficients for the different MDSI scales (Risky:  $r=.93$ ,  $p<.001$ ; Dissociative:  $r=.83$ ,  $p<.001$ ; Anger:  $r=.89$ ,  $p<.001$ ; Anxious:  $r=.79$ ,  $p<.001$ ; and Careful:  $r=.71$ ,  $p<.001$ ). A second study analysed the temporal stability of the ARDES ( $n=65$ ). Results showed high stability in the ARDES scores ( $r=.80$ ,  $p<.001$ ). These findings suggest that drivers scores are highly stable across time, providing additional evidence of reliability for self-reports. Further studies over longer periods of time are needed.

### **Risk perception and traffic mobility of spinal cord injured people**

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The groups at highest risk of road traffic crashes have been widely studied. Their specific characteristics became them more prone to suffer an accident. Despite of road users with special challenges are not usually considered as a common risk group, they are a vulnerable group because their specific characteristics.

Our study is focused on one specific mobility limitation, spinal cord injury, caused or not by a traffic accident. There are a great number of researches about how traffic accidents cause spinal injuries, however there are few studies about the risk perception of people once they are injured. We made a questionnaire to know the risk perception of people with this kind of disability because the use of a wheelchair supposes a problem for their mobility, and their vision of traffic should be particular. Attending to the amount of barriers and problems there are in traffic, we have explored three variables: their mobility limitations and their risk perception both as drivers and as pedestrians, and their perception about the other road users.

### **The relationship between driving behaviours and cognitive functions among elderly drivers**

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In Japan, it has become obligatory for the drivers who are 75 years old or older to take the Cognitive Impairment Screening Test for Senior Drivers prior to the lessons for elderly drivers. The objective of the present study was to investigate the relationship between driving behaviors and cognitive functions. Field experiments were conducted with 35 elderly drivers, ranging in age from 70 to 79 years old ( $M=74.26$ ,  $SD=2.64$ ) and 34 non-elderly drivers, ranging in age from 21 to 49 years old ( $M=35.41$ ,  $SD=9.23$ ). They were required to drive on public roads under real traffic condition, with a driving school instructor. The driving behaviours were evaluated by the instructors. The assessment of cognitive function addresses the need for a brief test that is sensitive to cognitive differences in normal ageing, including speed of processing, episodic memory, working memory span, alternating attention, reasoning, and executive function. The results showed that the relationship between few cognitive functions and driving behaviors on visual searching and speed control among both age groups.

### Driver education using a tablet device and movies of accidents recorded by drive recorders

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In a previous study that used a touch-panel display, accident repeaters exhibited significantly delayed detection of hazards due to insufficient prediction capability, and these results were almost the same as in another previous study that used eye-tracking devices. Early hazard detection requires appropriate prediction, and so the next problem is to instill appropriate prediction capability in accident repeaters. Therefore, we focused on movies of accidents taken by drive-recorder-equipped taxis. We developed driver-training software that runs on a tablet device (iPad). Movies of accidents embedded in this software were played and paused just before the collision. Drivers were asked to identify hazards requiring attention in the paused image by touching them with their finger. The software identifies touched hazards and records touch timing. After the hazards were identified, the movies restarted to show drivers whether there was a collision with the touched object. The software also displays timing to indicate whether their hazard identification was quick enough. We propose a new method of driver education using an iPad and movies of accidents recorded by drive recorders, and report the results of training examination.

### Is it possible to predict traffic infractions from psychological test results?

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This study analyzed the possibility to predict traffic infractions committed by professional drivers from psychological test results (intelligence and attention tests). Data was collected in two moments – the first being in the act of acquisition of the driving license (CNH) and the second being during license renewal. The sample was 68 drivers, all male, with age range between 18 and 41 years old, mean of 21,72 years old (sd = 5,24). Fifty-four drivers were identified without a record of infraction, and 14 with a record. In the group with a record of infractions the number of points ranged between 3 and 35, mean of 10,79 (sd = 7,73), recorded by the Traffic Department. The analysis did not demonstrate meaningful differences in the average test scores between the groups of drivers with and without a record of infraction. Also no meaningful correlations were evidenced between the test scores and the points attributed to the infractions, both in the acquisition of the CNH and in the renewal. It was concluded that neither high nor low scores on the several instruments constitute criteria capable to define whether a driver will commit more or less infractions. Some implications and methodological issues are discussed.

### Will attitudes towards safety improve after the introduction of a new driver licence training for young mopedists?

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#### Background

To improve traffic safety a new driving license category (AM) for mopeds was introduced in October 2009. This means that mopedists have to complete a new form of training including both theory and practice.

#### Aim

This study aims at evaluating drivers' perception of risk before and after the new program was introduced. Furthermore the content of the program, compliance to course curriculum, teachers and pupils' performance and attitudes was investigated.

#### Method

Two studies were performed. The first study was a before and after study including 1861 participants aged 15-18 years old (901 before and 960 after). In this study a web-survey was used including a number of social psychological construct. The second study was a process evaluation of five different driving schools using direct observations, questionnaires and interviews.

#### Results

The results are presently analyzed and will be presented at the conference. So far data indicate that the practical aspect of the training is most appreciated and that the education focuses more on rules and regulations rather than perception of risk.

### So, you think your road is really safe? Effects of different segregated lane types on motorcyclist causality risk in Malaysia

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Past studies suggest that lane segregation for motorcyclists can imply to a decline in traffic conflicts and severe traffic accidents (Hatfield et al. 2008; Van Driel et al. 2004). This issue has become a high-priority concern for traffic engineer professionals and the authorities, particularly from South Asian countries where motorcycle is categorised as the backbone of urban and rural transportation. In Malaysia, the instalment and usage of segregated lanes was introduced in the 1970s and was extended by law for safety purposes in the 1990s to become three types of motorcycle lanes: exclusive, inclusive and paved shoulder lanes. Exclusive lanes totally segregate the motorcyclists from other road users and allow only one-way travel for each lane. Inclusive lanes have similar design and function with exclusive lanes, but motorcyclists are being separated from other motorists only by pavement markings or a physical barrier on the left side of the existing road, instead of being totally segregated in the exclusive lanes. Paved shoulder lanes function as lateral support for the pavement and without designated pavement markings or a barrier to show that it is a motorcycle lane.

While extensive studies have been reported in evaluating current type, design and other engineering aspects of the lanes, little is known with regard to the effects of such motorcycle lanes on driver causality risk. Based on a self-reported survey among Malaysian motorcyclists (n=565), this study examines driver causality risk and investigates the risk contributing factors in the different lane types. The psychology-based factors of risk are tested in the study, including: speed, attitude, perceived behavioural controls, moral obligation, perceptions of danger, fear of being caught and perceptions of others' behaviours. The data indicated that the driver causality risk is statistically different depending on the lane types. Moreover, paved shoulder lanes have the largest driver causality risk, followed by exclusive and inclusive lanes. Three separate logistic regression models are developed to predict driver causality risk for the three motorcycle lane types because of their unique features. Some of interesting results of this study are: 1) tendency to speed was stronger in exclusive lanes, whereas neglecting to wear a helmet was most likely to appear on paved shoulder lanes. Motorcyclists' perceived behaviours of others showed strongest relationship toward both risky behaviours. 2) Low level of danger's perception was likely to relate to paved shoulder lanes. 3) Moral obligation exhibits opposing effects on the driver causality risk in different types of motorcycle lanes. This may largely be due to different lane features and motorcyclists' behaviours towards different types of motorcycle lanes.

### **Time management as a way to change the behavior of drivers, the perpetrators of accidents**

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Haste is one of the main factors causing the errors of drivers and road accidents. Time Management Training has been designed to help organize subject's daily affairs and priorities. By reducing daily haste we planned to minimize speeding and improve the concentration. It was designed as a one-day training (also as a three-hour version) which is not directly alluded to the situation on the road. Training involved a group of 50 people. They were the perpetrators of road traffic collisions, which, however, not stopped driving. Effects was assessed using a questionnaire DBQ developed by Aaberg and Rimmo, measuring errors in terms of violations, mistakes, inattention and inexperience. Subjects rated their behavior in driving situations before training and then during the three weeks after its completion. Results shows a reduction in violations, mistakes and carelessness. Time management training can be considered as an effective method to change the behavior of road traffic offenders.

### **Experimental analysis of drivers' attitudes toward in-vehicle warning system at stop controlled intersections**

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Most encounter accidents at unsignalized intersections occur, mainly due to stop failure of the approaching vehicle on non-priority side. The authors have developed Intelligent Speed Adaptation (ISA) system with GPS/GIS to provide warning to stop failure vehicles at unsignalized intersections. In this study, in order to acquire the evaluation guideline of driver assistance system such as this system, experiments about driver attitudes toward stop sign warning were carried out. At a drivers' training course, drivers' attitudes were tested to using a vehicle equipped with the warning system in order to ascertain appropriate timing of warnings when approaching intersections. The drivers' evaluation and willingness-to-pay for the warning system were also analyzed using an interview survey answered by testers. From results of the analysis of drivers' evaluation towards warning timing and irritability, it is concluded that appropriate warning timing should be 1.5-2.5 seconds in terms of index of Time to Intersection (TTI) which means estimated time to intersection when the vehicle keeps a constant speed. According to responses from the testers of the experiment, the warning system will be acceptable if it will contribute drivers' safety and it is affordable.

### **On the role of personality when assessing the role of transport upon social exclusion**

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Social exclusion (SE) reflects the existence of barriers which make it difficult or impossible for people to participate fully in society. SE would include several dimensions, such as household income, employment status, political activity, social support and activity-travel participation. SE has been measured using a normative approach, based on marks, which are assigned to objective measurements of its different dimensions. Equal weights are allocated to these dimensions, leading to a single aggregated score.

SE explanatory variables previously identified in the literature include age, household income, person's social capital, person's attachment to community, suite of personality and well-being, perception of personal safety, and the person's trip patterns.

In this context, the objective of this paper is to identify and test different methods to measure SE

from a subjective standpoint. The hypothesis is that, if subjective measures of SE are used, then the real importance of SE objective dimensions might be revealed, challenging the equal weight allocation system, and improving our understanding about the role of the person's trip patterns on SE.

### **Linking the visual search skills of safe driving to executive functions among young novice drivers**

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Young drivers are involved in a disproportionate number of car-accidents. Driving is a highly complex task that requires higher behavioral control abilities. Higher cognitive control functions, so-called executive functions (e.g., inhibition, working memory), still develop until age 25-30. Although lack of driving experience certainly helps to explain high accident incidence, immature executive functioning might further explain it. As a first step, this study aimed to investigate whether executive functions are related to the driving skill of hazard perception as hazard perception failure is a common problem of young novices' driving.

Fifty young novice drivers (17-25 years, max. 12 months driving experience) drove a 16 km simulated ride that contained several road hazards, while their eye behavior was registered by means of an eye-tracker. Executive functions were assessed with separate computerized tasks. Using regression analyses, the drivers' hazard perception and overall driving performance were analyzed in function of executive functioning performance scores. The results and implications for future interventions will be discussed.

### **Culture as a new paradigm in traffic safety.**

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Differences between countries in terms of fatal crash rates suggestions the role of cultural factors in traffic safety. Indeed, "traffic safety culture" beginning to be discussed as a significant issue in many countries. However, there remains no standard definition for this term. Without a standard definition that is grounded in psychosocial theories of behavioral change, it will not be possible to develop new strategies for safety that are based on cultural change. This presentation will discuss the definition and theoretical basis of traffic safety culture and give an overview of new traffic safety strategies based on this paradigm. Such strategies include leveraging values, challenging beliefs, calibrating norms, and changing attitudes. This paradigm is fundamentally different than traditional approaches (engineering, enforcement, education) in that its goal is to transform rather than change behavior.



### Acute effects of analgesics on driving performance in a highway surrounding depending on age

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Among drugs, the association of codeine/paracetamol could decrease vigilance and thus impair driving performance. However, few experimental study evaluated codeine effects on driving, and they only tested these effects on young healthy drivers whereas elderly people represent a large part of drivers and are used to consume this type of drugs.

The effects were evaluated in two groups of 16 subjects, young (20-30 years) and aged (55 to 65 years). One hour of monotonous driving performance was evaluated after 1 dose of codeine/paracetamol (20mg/400mg) intake and compared to a placebo in a double blind and balanced design. Pills were taken at 8AM, highway driving task was performed one hour after at the theoretical plasma peak concentration of the drug.

Results showed that the minimal therapeutic dose of codeine/paracetamol differently affect driving performance in function of age. Young subjects performances did not vary after drug intake whereas aged subjects performance were impaired. Moreover, aged subjects seemed to eliminate the drug more slowly than young subjects. These results are in agreement with our past study on the effects of zolpidem revealing that this hypnotic which did not appear at risk for driving in healthy young subjects could be at risk for aged subjects.

### Charging up and charging out? Drivers' experiences of electric vehicles.

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In this paper we present the charging expectations and experiences of private, fleet, and pooled car drivers in the UK's Technology Strategy Board funded ultra-low carbon vehicle trial. Charging forms a pressing concern for drivers as they need to break an existing well-learned habit (filling up at petrol stations) in order to establish a new habit (becoming accustomed to the mechanics of charging, determining when the car needs to be charged, and determining the location/appropriateness of public charging sites). We examined drivers' usage patterns and the challenges and facilitators to charging through the use of questionnaires and interviews before, during and after the trial. Drivers adapt positively to charging once they get the vehicle (notwithstanding improvements that could be made to ease lifting and fitting cables). As the trial progresses drivers more strongly endorse existing charging times as suiting their daily routine and are positive about the time and cost saved through charging a vehicle at home. Yet there are also areas that can be improved upon in order to enhance drivers' experiences of home and public charging and, critically, the likelihood that they will eventually purchase an EV of their own.

### The relationship between driver's behavior and parenting styles

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This article intends to connect two different knowledges, which nowadays are not very explored in the interface: driver behavior and parenting styles. Human behavior in traffic has been studied worldwide, as well as parenting styles. However, these areas of knowledge are not usually studied

together. In order to explore the parenting styles and driver's behavior, 255 students answered two scales of responsiveness and demandingness and Driver Behavior Questionnaire. Statistical analysis showed that young people surveyed commit significant numbers of errors, lapses, aggressive violations and ordinary violations. Children of negligent parents drive even more dangerous, they take more risk in traffic than children of authoritative parents. The young's children of negligent parents are especially connected to ordinary violations. These results indicate the relationship between driver behavior and parenting styles and opens opportunities for a new theoretical discussion, as well as possible to rethink parenting practices and practices of traffic.

### Initial Development of Psychological Road Audits: Combining Human Factors, Safe Design and Traffic Psychology

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Road safety audits are becoming increasingly important around the world. They are often used to assess the safety of a new road before it is opened to the public, or to audit an existing stretch of highway. However, such audits generally focus on technical aspects such as road surface, visibility distances and junction design. Whilst these are of critical importance, it is hypothesized that a driver-centred approach by means of 'psychological safety audits' could be a beneficial addition to the road auditing process. At present, end-user/driver opinion on the design, building and eventual opening of a new road is often not explicitly focused on by highway engineers.

As part of this, a naturalistic study was carried out to psychologically audit the road. The drivers had no additional tasks. The procedure consisted of getting participants to drive along the road and record their verbal impressions as they drove; then they also watched the video of it to note their subsequent thoughts. A group of 16 experience drivers (8 males and 8 females), with more than 8 years of driving experience, and 16 novice drivers (8 males and 8 females) near to get their driving license, took part on this research. To carry out this assessment and develop the general method, the road selected had a good mixture of driving tasks, such as intersections and multi-lanes, plus had a comparatively high accident rate.

In the ongoing analysis we are focusing on several selected driving tasks such as changing lanes, following a route, negotiating a roundabout or stopping when needed.

Finally, a small workshop/focus group with some of these drivers has been carried out, to identify the sub-tasks in the areas focused on, find design deficiencies and develop possible user-centred design improvements. For instance, we have focused on one or two tasks on the route (e.g., approaching an intersection), showed the participants a task analysis of it - and got them to both talk about the cognitive processes involved (e.g, using Critical Decision Method) and identify potential design problems with the roadway and help develop potential solutions.

This ongoing research is still in its early stages. However, the approach used here, of providing a structured means of gathering end-user opinions by combining a safe design methodology with a targeted naturalistic driving study of a newly-opened stretch of road, is producing potentially valuable new results.

### Impact of framed messages on drivers' speed

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Speeding is among the most common road rule violations, and is one of the main factors explaining crashes (Safetynet, 2009). To decrease the rate of this behavior, authorities use sanctioning measures and prevention interventions (Delhomme, Kreel, & Ragot, 2008; Meyer & Delhomme, 2000). However, the efficacy of prevention messages varies according to a number of factors, among which framing (in terms of gain-loss) is primordial (Haddad & Delhomme, 2006; Rothman & Salovey, 1997; Tversky & Kahneman, 1981). We ran a study to test whether the framing effect (gain more efficient than loss) appeared with minimal messages, in a driving context and in a naturalistic environment.

Four anti-speeding short messages were presented on a message board, on a frequented 4-way highway (speed limitation: 130km/h), during weekends. The messages differed in their orientation (gain vs. loss) as well as their topic (crash vs. fuel consumption). The speed of the highway users was recorded 2 km after the board (6486 speeds recorded). Results show that speed was lower when a message was displayed than in control condition, and when the message was gain-framed than loss-framed. These effects were stronger on the left lanes (passing lanes). Implications for prevention campaigns are discussed.

### New drivers and expertise: a study to investigate the relationship between attention and the perception of hazard during the driving experience

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The aim of this study is to investigate the relationship between attention and the perception of hazard during the driving experience in new drivers.

Firstly were administered three test to 80 Italian subjects (19-21 years old, male and female): AISS (Arnett, 1994), D.B.Q. (Reason, 1990; Cicognani e Zani, 2002), Perception of control test, (Montag e Comrey, 1987; Giannini e Lucidi, 2007). 40 of them were submitted to the experimental condition: the eyes movements of the subjects were registered by an eye tracker (TOBII X120) during the vision of three video of a driving experience with growing difficulties (1=rural background, 2=urban background with few car, 3=urban background with a lot of cars). The main results show that don't came out significant differences in the eyes movements between subject with high/low tendency to commit errors during the drive. Furthermore the results show, in all conditions, a significant differences between the fixation length and the fixation count in occasion of a crosswalk (1=F=39,52; sign.=0,000; F=48,26; sign.=0,000; 2=F=36,18; sign.=0,000; F=16,92; sign.=0,000; 3=F=37,73; sign.=0,000 F=64, 16; sign.=0,000): a person on the footpath is less observed by subject than the person is on the centre of the road, they have an inaccurate scan of the scene.

### Implicit vs. Explicit: Safety and perceptual motor skills in driving

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The self-evaluated safety and perceptual motor skills in driving have long been investigated in traffic safety research. However, the self-evaluated safety and perceptual motor skills in driving is influenced not only by drivers' "objective" skills but also third variables like social desirability and the "reference point" (i.e., an average driver) in drivers' self evaluations. In spite of several explicit (i.e.,

self-reported) measures of drivers' skills (i.e., safety and perceptual motor), the implicit measures of drivers' skills have remained mainly unexamined in the literature. The aim of the present study is, therefore, to develop an alternative measure to the explicit self-report measures of safety and perceptual-motor skills in driving, namely the implicit test of drivers' skills. By the implicit social cognition perspective, an implicit measure of safety and perceptual motor skills in driving was developed using the IAT. The procedure, the content, and the basic statistical analyses of the newly developed implicit test of safety and perceptual motor skills in driving and its relationship with the explicit (i.e., self-evaluations of driving skills) measure (i.e., Driver Skill Inventory - DSI) of driving skills will be presented.

### Analysis of causal effects within the theory of planned behaviour as applied to driving

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Explicit causal analyses of the relationships proposed by the theory of planned behaviour (TPB) and extensions of this model were conducted in two studies of driver behaviour. Both studies used a two-wave panel design. Study 1 used a one-month time lag between baseline and follow-up. At both waves, a convenience sample of drivers (N=135) completed measures of all TPB cognitions and behaviour (compliance with speed limits in urban areas). Cross-lagged multiple regressions and bootstrapping procedures for testing multiple mediators supported all of the potential causal relationships proposed by the TPB. These findings were extended in study 2 by using a large representative sample, a six-month time lag between baseline and follow-up, and a larger number of cognitive predictors. Participants (N=1149 speed limit offenders) completed postal questionnaires at both waves to measure all cognitions proposed by the two-component TPB, along with moral norm, anticipated regret, self-identity and speeding behaviour. Instrumental and affective attitude, descriptive norm, self-efficacy, moral norm, anticipated regret and self-identity were causally related to intention. Intention, self-efficacy, affective attitude, descriptive norm and anticipated regret were causally related to behaviour. Theoretical and practical implications will be discussed in relation to the development of effective behaviour-change interventions.

### Effects of Planned Behaviour, Identity and Social Identity on Motorcyclists' Intentions to Speed

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Theoretically derived and potentially modifiable cognitive antecedents of motorcyclists' speeding behaviour were identified using a predictive model that comprised selected constructs from the theory of planned behaviour (affective attitude and perceived controllability), identity theory (self-identity) and social identity theory (perceived in-group norm and group identification). Participants (N=110) were sampled from Scottish motorcycle club websites and they completed online questionnaire measures of all these constructs, operationalised with respect to speeding on 30mph urban roads and 70mph dual carriageways/motorways, separately. The model accounted for more than 44% of the variation in speeding intentions on both road types. The independent predictors of intention to speed on 30mph urban roads were affective attitude and perceived controllability. For 70mph roads, the independent predictors were affective attitude and each identity construct. Additionally, and in line with social identity theory, the effect of perceived in-group norm on intention to speed on 70mph roads increased with group identification. The findings demonstrate that the cognitive variables examined in this study together constitute a useful model for predicting motorcyclists' speeding intentions. They also show that safety interventions need to be carefully targeted (i.e. depending on road type, different cognitive antecedents need changing in order to reduce motorcyclists' speeding behaviour).

### **Evaluation of the impact on driver behaviour of a new warning signage for automatic speed cameras: how drivers respond.**

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The 5th measure of the French Interministerial Committee of Road Safety dated 18th February 2010 aimed to increase the effectiveness of automatic speed cameras, notably by adding "Hidden cameras often operate" to the warning signage. The goal was to combine the advantages of visible cameras (certainty of detection in a specific place) and hidden cameras (uncertainty of the time and place of detection).

The objective of this research was both to evaluate the effectiveness of this new measure on driver speed and to collect road user attitudes to it.

The results showed no effect of this measure on driver speed. However, a third of drivers questioned had noticed the new warning sign, which is similar to the previous one. The credibility that the respondents gave to the new signage (subjective risk) was linked to how often they observed law enforcement patrols on the same road (objective risk). According to other research, subjective risk coupled with frequent and targeted enforcement has a positive impact on speed (Corbett et Simon, 1999; Goldenbeld and Van Schagen, 2005; Keall, Lynley, Povey and Frith, 2001). Other results and the limitations of the research will be presented.

### **Exploratory approach to teenage moped and light motorcycle driving : between risk-taking and safety.**

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The exploratory research presented here is concerned with the field of study of social representations and norms and deals with the social representation of mopeds and light motorcycles by young teenagers. An alternative choices questionnaire (Gaymard, 2003) composed of items in relation to risk or security and items in relation to the lifestyle, filled out in "standard" and "substitution" conditions. In the latter case, the young people were asked to fill it out « as their parents would » or « as their friends would ».

Multiple regression analysis shows the influence of the peer model on the young riders' answers in the standard condition and confirms the importance of risk-taking in their representation. As was expected, the answers attributed to the parents are closer to the safety model.

### **Functional Aspects for a reliable perception of frontal light pattern at Motorcycles**

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A specific frontal light pattern for motorcycles serving a unique visual signature represents a concept that makes motorcycles clearly distinguishable from other vehicles and quickly identifiable by other road users, and thus, might counteract conspicuity problems of motorcycles. In order to convey a reliable distinguishable visual signature with more than one light source, several perceptual aspects need to be considered. Single elements of the light configuration should be separately perceivable in order to preserve the perception of the whole signature as intended by the combination of its single elements. Moreover, the light configuration should not interfere the perception of other light source information (e.g. turn indicators). In an experiment, the luminous intensity of light sources

and degree of lamp separation were varied and tested under different background conditions and observer distances. Results show that surrounding luminance level had a significant effect on the time and the correctness of subjects' response. A greater lamp separation generates faster decision times and a more correct response. With higher luminous intensity, a shorter lamp separation can be adopted. However, results suggest also that additional lights with intensities beyond a certain level will outshine the signal of the turn indicator. Practical implications will be discussed.

### **Towards a Stochastic Model of Driving Behavior in case of Exceptional Events: A Bayesian Network Modeling Approach**

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Exceptional events (e.g. emergency situations, incidents and adverse weather conditions) have a substantial impact on traffic flow operations. Human factors (e.g. perceptual narrowing) influence driving behavior in case of these events through a considerable degree of inter- and intra-driver heterogeneity. In order to predict the effect exceptional events have on traffic flow operations, it is crucial to capture this stochasticity in mathematical models of car-following behavior. However, in the past car-following behavior has predominantly been modeled through deterministic models. In this contribution we take a first step towards modeling of car-following behavior in case of exceptional events through a Bayesian network modeling approach based on psycho-spacing theory. In the contribution we start with setting up a Bayesian network aimed at predicting so-called action points in the relative speed-spacing plane (perceptual thresholds). Conditional probabilities were learned through a MLE approach using empirical data.

In this contribution we show that this Bayesian network yields an adequate prediction of action points, while also accounting for stochasticity. Next, we extended the network with exceptional events. Conditional probabilities were learned to the net using data from three driving simulator experiments containing exceptional events. Again, we show that this approach provides an adequate prediction of car-following behavior. The contribution concludes with a discussion as well as with recommendations for future research.

### **The Effect of Navigation Voice on Trust and Attention during Route-Finding within a Driving Simulator**

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A simulator study investigated if different voices influenced how people engaged with a navigation device (satnav) while driving. Twenty-nine experienced drivers and satnav users drove to a specified destination using a simulated satnav system and road signs to support their route-finding. Either of two navigation voices were used; one considered trustworthy and the other untrustworthy, based on the results of a questionnaire survey. Towards the end of the route, drivers were presented with conflicting information from the road sign and the voice instruction. In this situation, drivers' confidence in their route choice decreased by over 21% compared to previous junctions where road signs and voice instructions agreed. Twenty-two drivers (76%) followed the voice navigation, rather than the road signs. Of these, the majority were using the trustworthy voice. There was evidence from post-study interviews that some of these drivers were complacent (seeing the road signs, but over-trusting the satnav) whereas others claimed to have not noticed the conflicting road sign. The results suggest that the voice used to deliver directions may not only affect drivers' confidence and allocation of trust, but also have deleterious effects on situation awareness and attention. Conclusions are drawn regarding the implications for road-safety and design.

## Task-Driven System Exploration Enhances Subsequent Instruction Effects: Testing the Applied simTD Vehicle-to-x Human Machine Interface

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The simTD project is shaping tomorrow's safe and intelligent mobility through testing vehicle-to-x communication and its applications. Before applying this new system in a large-scale test field, we measured the influence of drivers' interaction with the human machine interface on their driving performance in a safe driving simulation setup. Therefore, we applied the Lane Change Test methodology and additionally measured visual distraction from the driving task to the simTD display by recording participants' eye gazes. Two questions of highly practical relevance should be addressed: First, we wanted to check, whether our HMI fulfills two visual distraction criteria of the Alliance of Automobile Manufacturer's „Statement of Principles, Criteria and Verification Procedures on Driven Interactions with Advanced In-Vehicle Information and Communication Systems“. Second, we investigated, whether an HMI instruction improves task or driving performance. Results show that even without prior system exploration or instruction, average glance duration meets the AAM criterion and is significantly shorter than two seconds. The total glance time to perform a task was shorter than 20 seconds only after participants made some basic experiences with the system. The results imply that instructions could improve participants' performance, and are even more effective after participants explore the system themselves.

## Preventing globe of death effect : validating attention scale for motorcyclist

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In Latinamerican countries the use of motorcycles as a mean of transport is highly increasing. However, except of helmet use, motorcycle driver behavior is under studied. The objective of this paper was validate the Attentional Related Driving Errors Scale for Motorcyclist (ARDES-M) for brazilian motorcyclist drivers. The ARDES-Mis a unidimensional measure that showed good psychometric properties in the Argentine context. The scale was translated to portuguese for three independent researchers from Argentina y Brasil. Translators considered cultural differences in the scale wording. The equivalence of the Spanish and Portuguese versions were evaluated using backtranslation procedure. A questionnaire about sociodemographic variables and history of traffic crashes was also included. Participants were two hundred and twenty motorcyclist above eighteen years with license driver type A. Psychometric properties were adequate, showing that the scale can be useful in brazilian context where the the mototaxi is a reality and motorcyclist deaths is constantly raising. The instrument could be useful in the psychology assessment of drivers which is a requirement to obtain the license driver in Brasil

## Effect of tendency to take risks in daily life on future accident involvement

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Risk-taking, which means daring to take risks, is one of the important causes of major accidents. Although previous studies have suggested that the tendency to engage in risk-taking was related to occurrence of traffic accidents, most of these studies have focused on risky driving and on past accidents. Thus, the aim of this study was to investigate the effects of the tendency to engage in risk-taking in daily life rather than risky driving on future traffic accident involvement. A questionnaire survey was conducted from June 2010 to May 2011. The respondents of this study were bus drivers who worked for an office in Japan. The tendency to engage in risk-taking was evaluated in addition

to their demographic information. Data on whether or not participants were involved in accidents from June 2010 to November 2011 was collected from the objective accident reports procured from their place of employment. The results reported whether or not drivers who tended to engage in risk-taking in daily life as well as risky driving were more likely to be involved in accidents than those who did not. Intervention measures to bring about a decrease in traffic accidents were discussed from the perspective of risk-taking.

## Reducing road traffic noise – how to design effective interventions

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Road traffic noise is a by-product of modern mobility behavior which provokes negative health, social, and economic effects. Apart from technical improvements, targeting the behaviors of individual drivers is a further strategy to reduce noise. However, psychological models explaining noise-producing behavior are rare and a theoretical foundation upon which to design individual-based interventions is needed. The aim of the project presented was therefore to identify benefits and barriers of low road traffic noise behaviors and to implement these findings into propositions for interventions. A three-step procedure was chosen: First, a theory-based stage model framework was worked out, describing behavior change from the first awakening of problem awareness to the implementation and consolidation of the new behavior. With help of qualitative interviews the theoretical framework was concretized, i.e., different low noise behaviors, as well as potential behavioral predictors, were identified. In a second step, the model was tested with an online survey to identify the intervention potential of the different behavioral predictors. Based on these results, in a last step, recommendations for noise-reducing interventions are being developed in workshops with noise-prevention experts and representatives of the target groups. The product of our undertaking will be presented and the procedure chosen discussed.

## A long-term evaluation study on the “Temporary Stop To See”(TSTS) campaign-Effectiveness of the campaign found twenty two years after the first campaign in 1989

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Objectives: In Spring, 2011 after twenty two years break from the systematic campaign in 1989 Nagatsuka resumed “the second TSTS campaign” in the same company. This campaign aims at improving biased Accident Cause Concept (ACC) into factual one. Improvement of ACC is the basic imperative for an advancement of safety behavior because ACC determines behaviour as Koffka (1935) advocated.

Method: Before the campaign Nagatsuka conducted ACC questionnaire to examine the effect of campaign (by before-after design).

Results: “Perceptual failure” was selected as violations of high rank. The systematic campaign in 1989 that it is not speeding but perceptual failures that heads the accident list improved the biased ACC into factual one.

Considerations: It was a surprise that perceptual failure was selected as violations of high rank in the questionnaire conducted before training. Usually improvement of ACC emerges after the campaign as fruits of training. This time, however, improved and factual ACC was found before the training. This is considered hypothetically to have emerged as an effect of high-intensity effort of campaign promoted 22 years ago on the basis of .factual data. This shows that safety endeavor originated in 1989 by whole company was sustained for long periods.



### **A comparison between self-assessed and instructor-assessed driving skills of Japanese licensed drivers**

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The results of previous questionnaire surveys about subjective driving skills have revealed that drivers tend to rate their skills more highly than those of the average driver. Recently, however, research comparing driver and instructor assessments revealed that the majority of drivers were indeed able to make realistic self-assessments. Nevertheless, this kind of study covered only young driver candidates or newly-licensed drivers. In this study, 53 licensed drivers in a wider age range ( $M=48.5$ , range 20–79) were questioned, and the accuracy of their self-evaluation was examined by comparing their self-assessments with assessments made by instructors. We also examined the effects of age on the accuracy of driver self-evaluation. Drivers completed a self-assessment using a 5-point scale applied to 23 items, shortly after performing a driving task alongside an instructor. The comparison between self-assessments and instructor-assessments revealed that over 40% of drivers overestimated their skills for 14 of the 23 rating items. With regard to the age differences, although no correlations between age and self-assessment were found, negative correlations between age and instructor-assessment were significant. According to the results, older drivers displayed higher levels of overconfidence than younger drivers did.

### **A measure of drivers' justifications for traffic violations**

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According to Bandura's model of moral disengagement, individuals can neutralize their moral standards in different types of transgression through eight psychological mechanisms, grouped into four different schemes: reconstruction of conduct, distortion of agent's conduct, distortion of consequences and distortion of victim's conduct. But how do drivers justify their traffic violations? This research describes the development and validation process of a self-report measure of moral disengagement among Brazilian drivers. In Study 1, 100 drivers responded an initial version of the Driver's Justifications Scale and results showed its scores correlated positively with a measure of traffic violations ( $r = 0.53$ ;  $p < 0.01$ ). In Study 2, items were improved, evaluated by experts, and the scale was completed by 547 drivers. Results from factor analyses partially reflected the original model, revealing three sets of mechanisms: Minimizing Guilt ( $\alpha = 0.81$ ) had the higher scores, followed by Distorting Conduct's Agent ( $\alpha = 0.69$ ) and Reconstructing the Conduct ( $\alpha = 0.81$ )  $F(2, 505) = 52.74$ ,  $p < 0.001$ ,  $\eta^2 = 0.17$ . Results from both studies suggest this new measure has semantic, content and construct validity, as well as internal reliability. Applications to road safety and enforcement are discussed.

### **An Experimental Study on the Relationship between Visual Information and Behavior for Bicycle Facility Design**

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Recently some bicycle lanes with regl control have been introduced on carriageway since 2008 as a governmental pilot project in Japan. However, the design standard of bicycle facilities is still uncertain because of the lack of knowledge for cyclists safety and convenience on roadway. Therefore this study focuses on interactions between visual information and behavior of cyclists on the various types of bicycle facilities. An experimental study using an eye-mark tracking system and the "probe-bicycle" system, which equipped with sensors measuring handle angle, pedal rotation speed, and

break operation, was carried out to examine different type of cycleways with pavement markings, signs, and additional warning signboards on existing roads. In addition to the measurement by using the probe-bicycle, an interview survey was carried out to confirm cyclist's cognition. This paper describes results of some comparative analyses for understanding the characteristics of eye tracking and their behavior response to visual information on cycleways. The study showed that the range of eye movement was limited on bicycle lane behind the effect of high speed, but the range of eye movement became much wider at the transition from bicycle lane to other cycleways due to needs for search of surrounding obstacles.

### **Comparing drivers' performance in simulated hazardous situations with the functioning of the three attentional networks.**

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Driver distraction and inattention are among the major contributing causes of road traffic accidents and their negative impact on safety is expected to further increase in the immediate future. The present study analyses the influence of the functioning of the three attentional networks (executive control, attentional orienting, and alerting) when the drivers have to deal with hazardous traffic situations (e.g. when an oncoming car unexpectedly crosses their trajectory). Individual measures of the participants' attentional functioning were obtained using a computer-based neurocognitive test (the Attention Networks Test for Interactions and Vigilance or ANTI-V), and these measures were compared with their performance in a driving simulator where different types of hazardous situations were presented. Results revealed significant associations between attentional measures and driving performance. A higher attentional orienting score on the ANTI-V was associated with safer driving in situations where a single precursor anticipated the hazard source, whereas in situations with multiple potential hazards higher orienting scores were associated with delayed braking. Additionally, evidence of associations between crash occurrence and the functioning of both the executive control and the alerting networks was reported.

### **The relation between executive functioning and risky driving in young novice drivers.**

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Driving is a highly complex task demanding higher behavioral control abilities. Young drivers are involved in a disproportionately large number of crashes. Lack of driving experience certainly helps to explain the high incidence. However, recent research showed that higher cognitive functions, so-called executive functions, still develop until the age of 25-30. Immature executive functioning might further explain the high accident incidence of young drivers. As a first step, this study aimed to investigate whether executive functioning is related to risky driving in young novice drivers.

Thirty-eight drivers (17-25 years, max. 12 months driving experience) completed a 25km-drive. Measures of risky driving were: standard deviation of lateral position, detection time of, reaction time to, and collisions with road hazards, speeding, yellow and red light running, and head distance. Executive functions of inhibitory control and working memory were measured by means of standardized computerized tasks. Correlation and regression analyses were carried out to determine unique predictors (i.e., executive functions, driving experience, gender) of risky simulated driving in young novice drivers.

Lower executive functioning in young novice drivers was related to increased risky driving behavior. These results and implications for the development of future interventions will be discussed.

### **Comfort and Intervention Behavior of Drivers in Highly Automated Vehicles with Headway Control**

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With the first successful tests and the long-term deployment of highly automated vehicles, the role of the driver changes from having an active part in the driving of the vehicle, to a reactive monitoring task. Due to this considerable issue, it is far from clear what effect this change of the driver's task has on the intervention behavior and comfort of the driver when trailing another vehicle. In this experimental study, one crucial aspect of a future automation, the distance kept by the automated car, was examined in a driving simulator. The distance between the automated vehicle and another vehicle driving ahead was varied in different driving situations. The experienced comfort during the automated driving was measured with a newly developed questionnaire. Results of the study suggest that the distance maintained by the automation affects the comfort experience of the driver as a function of the situations. Results also suggest that drivers perceive the distance to a headway vehicle differently when they drive an automated car. In 47 % of all drives participants intervened before falling below the legal following distance. Results will be discussed in terms of their impact on the design of future vehicle automation and headway control.

### **Minimising consumers' psychological distance when assessing potential mass-market uptake of electric vehicles**

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Plug-in electric vehicles (EVs) could contribute substantially to reductions in transport CO<sub>2</sub> emissions without curtailing personal car use, but widespread uptake would require positive responses from mass market consumers. This poses a methodological problem for estimating potential uptake, since most consumer drivers have no experience of EVs; they are "psychologically distant", so construed in more abstract rather than concrete terms. The Energy Technologies Institute study used a novel methodology to overcome this difficulty, including specific features to reduce the psychological distance from EVs of a large mass-market sample. Initially, 40 mass-market households were provided with an EV for one week. Qualitative interviewing identified issues salient to these drivers. The findings were used to design a 2-wave questionnaire and choice experiment, (N= 4,240 for Wave 1, 2,789 for Wave 2), and an information pack on EVs, supplied with Wave 1, to reduce psychological distance. A 2-day interval between waves enabled the information to be processed non-consciously and integrated with car use, lifestyle and other schemata in long-term memory before participants responded to Wave 2. Drawing upon construal level theory and unconscious thought theory, this paper will detail the methodology used, and how it may have influenced the research findings.

### **Traffic control of freight vehicles in Germany: from manual to automatic direction out of the highway**

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Up to now for truck inspections by the Federal Office for Goods Transport (BAG), it is necessary that members of the BAG enter the highway at the inlet area of a motorway rest station and request the traffic participants manually signaling to exit the highway. At this the members of the BAG are exposed to many risks by themselves without being supported or shielded by any other

devices, vessels or methods. A peculiar high risk for the employees of the BAG are accidents with trucks being involved at short-time workplaces. On behalf of the Federal Highway Institute it is therefore currently being investigated whether an automated rejection (eg. LED-Signs) provides a security-enhancing alternative. Within the research project laboratory and driving simulator studies will be investigate experimentally the optimal selection of symbols and systems in terms of perception, acceptance and regulation compliance. Initial results from these studies are presented and the transfer of practice and the portability and benefit to other countries should be critically discussed.

### **Findings and recommendations from the Scottish Young Driver Debate**

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This paper reports a study undertaken to meet a commitment in Scotland's Road Safety Framework to conduct a public debate on young driver issues including graduated licences and additional training. Working with transport consultancy Atkins, the study undertook interviews with stakeholders; focus groups with a range of drivers aged 17-25 and with parents of young drivers; and an online survey with 260 young people and 380 parents and carers.

Almost all respondents wanted cheaper insurance and help with the costs of learning to drive; road safety awareness training for pre-drivers, learner drivers, younger drivers and young driving offenders; a lower drink-driving limit for all drivers; support for the parents and employers of young drivers; and a longer probationary period of training and practice before release on to the road for solo driving. All except young drivers would welcome the restrictions on night time driving and on carrying young passengers associated with a graduated driving licence scheme.

The study recommends that the Scottish Government put in place a raft of measures before, during and after learning to drive informed by an evidence-based, life-long approach to driver education with all components, especially fear appeals, properly evaluated.

### **Methodological guidelines and diagnostics methods for assessment of drivers' psychological eligibility in Czech Republic**

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The assessment of drivers' psychological eligibility is a key facet of traffic psychology. In defining the baseline assumptions for a valid diagnosis, traffic psychology responds to the developments experienced in the traffic environment, as well as in research and the development of assessment tools. As the demands on drivers grow, however, the process of the development initially involves the verification and revision of those factors which are considered crucial in terms of physical and psychological eligibility. In this respect, traffic psychology seeks to explore the issue of what psychological qualities, functions, and processes are present in driving, what status of such factors has a positive impact on driving, and what the borderline levels are which may be used to predict safe and accident-free driving. Our paper addresses the background for assessment in terms of traffic psychology. After raising general questions, we discuss the possibility of assessing drivers by means of assessment tools used to measure performance and personality traits in general and in terms of traffic psychology, as far as both research and practice are concerned. Recent evaluation studies are mentioned and discussed.

### **Are Malaysian's Angry Drivers?**

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Driving angry has been found to be related to more risky driving behaviour and crash involvement. The Driving Anger Scale (DAS - Deffenbacher, Oetting, & Lynch, 1994) is one measure of driving anger that has been well validated in European countries and in other European-based cultures. However, the validity of the DAS in non-European countries is not well researched. The present study investigated the types of situations that cause Malaysian drivers to become angry and examined the underlying factor structure of the 33-item version of the DAS using exploratory factor analysis. Data were collected from a sample of 355 Malaysian drivers using convenience sampling. The average age of the participants was 26.7 years old with 43.4% being male. This paper presents the results of the study and compares these findings with previous research in other countries.

### **Efficacy of motorcycle licensing test to discriminate between new and experienced riders**

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Motorcycle riders attended a rider training venue to undertake a number of performance tests with the aim of exploring differences between newly licensed riders, riders who had been licensed for some time and had long-term experience, and a third group who had been licensed for some time but stopped riding for a period before returning to it more recently. Fifteen riders of each type participated. Amongst other activities, each rider completed a slow ride, a test of braking skill, and a test of swerving performance – three tasks included in the standard licensure test in Victoria, Australia. The tests were administered and scored by experienced, practising riding instructors. These tests are supposed to indicate level of proficiency in riding as well as ability to quickly perceive and evade hazards. As such, it was expected that the most experienced group should fare the best. However, no significant difference was evident between the groups. This may indicate that riders achieve and retain optimum efficiency in these skills soon after licensure, or that they are not a good indicator of proficiency, or that the means of testing (used by the licensing authority) is not an efficient means of determining riding readiness.

### **The Influence of Criticality and Predictability of Surrounding Traffic Lane Change Manoeuvre on Driver's Mental Workload**

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No Abstract received.

### **Drinking & Driving: Perception of Indian truck drivers**

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India holds the dubious distinction of having the highest number of road crash fatalities in the world. India being the developing country has seen an unprecedented rise in the number of vehicles on road and with growing fleet of commercial vehicles driven largely by illiterate and untrained drivers, the risk of road crashes has increased manifold, considering the fact that drunken driving is a common attribute of truck drivers. A questionnaire-based survey of 163 truck drivers (in the age group of 20 to 65) was conducted to ascertain their level of awareness about the law and perception about drinking and driving, as well as assess the law enforcement. A large percentage

of respondents in all age group expressed that it was legal to drive after drinking and nearly 50 percent of the respondents had been driving after drinking. When asked about whether they were ever checked by police for drunken driving, only minuscule number of drivers had encountered such a check that not only proves laxity in enforcement of traffic rules on the part of the police, but more importantly, reflected the fearlessness of the drivers from being punished for errant behavior.

### **An Objective Evaluation of an Education-Based Distracted and Drowsy Driving Intervention for Rural Teen Drivers**

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Teen drivers have an increased crash risk compared to other age groups. Distraction is presumed to be a predominant risk factor for teen and rural drivers. This study used a naturalistic study and online survey methodology with a sample of rural novice teen drivers to evaluate a component of a driver education module that was augmented to incorporate videos of teen drivers having near crashes as a result of distracted and drowsy driving. The results indicate that male drivers report more dangerous behaviors, with perceived driving skills increasing with age and driving exposure. However, behavioral events were most commonly related to speed choice and vehicle control in corners rather than distraction. The limited effect of this education module may be related to the importance of motivational factors in addition to knowledge. Thus, it is possible that the reason teen drivers engage in distracting activities while driving is not because they lack the knowledge that such activity is dangerous. Indeed, even with this knowledge they are motivated to assume such risks while driving within the current traffic safety culture.

### **Assessing the quality of service in public transport**

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Quality of service undoubtedly became a key issue in attracting public transport users and provide massive commuting. The main objective of this paper is to outline the perceived service quality from users' point of view, by making understandable the role of personal beliefs, attributes, social and subjective norms and behavioral control on user behavior. Examining the impact of transit policy on quality of service and the consequent public transport demand, and measuring the offered quality of service, measures and strategies may be developed to affect model shift to public transport modes. Also, by examining the determinants of perceived and desired service quality the present paper aims at developing guidelines needed to increment service quality. Personal needs and characteristics, past experience, trip attributes and transportation system components, construct an interrelation chain of indicators with key role in the quality of service development. Pointing out the overlaps between the customers perceived and desired service quality, and the operators provided and optimum planning we can determine the tolerance area where these expectations meet. The output of the analysis attempts to provide strategies and policies for the public transport system, which accommodate both user and decision maker objective and perceived quality of service.



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