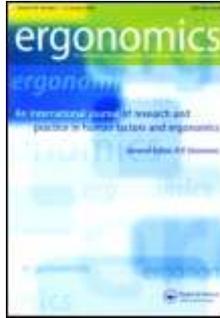


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Číslo 9 - Special Issue Driver Safety



A. Ian Glendon. Driving violations observed: An Australian study. S. 1159–1182.

This study analyses 2765 cases of driving behaviours in three Australian states - New South Wales, Queensland and Victoria. Data were gathered from in-car coordinated video and audio recording sequences in free-flowing traffic along two-, three- and four-lane highways with varying speed limits on all days of the week in daylight and fine weather conditions. Explanatory variables included driver age group and gender, passenger characteristics and vehicle age and type. Response variables included driving violations and other driving behaviours, including lane use, speeding, close following (tailgating), driver's hands position and mobile phone use. Data were analysed qualitatively and quantitatively. By focusing upon vehicle and driver characteristics, and their impact on driving behaviours, including identified violations, this study explores some implications both for future research and for traffic policy makers.

- **Keywords:** Driver behaviours; Driver characteristics; Driving culture; Driving violations; Speeding; Tailgating

M. Brackstone; M. Macdonald. Driver headway: How close is too close on a motorway? S. 1183–1195.

Driver headway has recently become an important question with much attention being given to unsafe headways or 'tailgating'. This paper reviews a series of recent studies undertaken at the University of Southampton, which have sought to measure and model distance keeping, demonstrating how following distance depends on a wide range of factors, some of which are only recently being explored. These include variations in following distance for any particular driver and the relationship with time to collision, variations in following distances of drivers of differing nationalities and the ability of the driver to 'read the road ahead', which may be affected by interaction with different vehicle types. It is demonstrated that providing clear unequivocal statements regarding car following and safety levels, even after such studies, is still far from straightforward.

- **Keywords:** Car following; Close following; Driver behaviour; Headway

S. G. Stradling. Car driver speed choice in Scotland. S. 1196–1208.

Drivers who commit driving violations, such as speeding, crash more. Driving violations reduce safety margins amplifying the impact of driver errors. Speed is placed in the context of car use and its attractions. It is argued that speed choice results from the

interaction of opportunities, obligations and inclinations. Data from large-scale surveys of Scottish car drivers support this and show that many drivers in Scotland prefer to drive at or below the speed limit and that many say they are currently cutting their normal driving speed. Suggestions for promoting safer and more sustainable speed choices are made.

- **Keywords:** Speed; Speeding; Car drivers; Road traffic accident involvement; Driving violations; Driver speed choice

N. A. Stanton; G. H. Walker; M. S. Young; T. Kazi; P. M. Salmon. Changing drivers' minds: the evaluation of an advanced driver coaching system. S. 1209–1234.

This paper reports on the study of an advanced driver coaching system. The study distinguishes between different types of post-licensure programmes in order to explore a system based on a model of identifying and responding to hazards, called 'information, position, speed, gear and acceleration' (IPSGA). Previous literature has been sceptical about the benefits of advanced driver education; thus, the current study was designed to control for the effects of coaching drivers in the 'IPSGA' system (the treatment group) against the effects of being accompanied (control group 1), as well as the mere effects of time (control group 2). Measures were taken before the driver coaching began (as a baseline measure) and again after 8 weeks (to see if any changes had occurred). These measures included driver knowledge via a post-drive interview, observations of driving skill and driver attitude using a locus of control scale. The results suggest that advanced driver coaching using the IPSGA system had a beneficial effect on all of these measures. Drivers in the coaching condition improved their situation awareness, driving skills and reduced attributions of external locus of control. The study lends support to the case for one-to-one individualized driver coaching using a systematic model of driving.

- **Keywords:** Driver education; Advanced driving; Driver skills; Locus of control; Situation awareness

G. Underwood. Visual attention and the transition from novice to advanced driver. S. 1235–1249.

Inexperienced drivers are particularly vulnerable to road traffic accidents, and inattention emerges as a factor in these accidents. What do these drivers attend to and how can their observation skills be developed? When drivers scan the road around them, differences are observed as function of driving experience and training, with experienced drivers increasing their visual scanning on roadways of increasing complexity. Trained police drivers showed this effect of increased scanning even more than experienced drivers. This suggests that the driver's understanding of the task develops with experience, such that roads that demand increased monitoring (e.g. interweaving traffic on a multi-lane highway) receive more extensive scanning than roads that are simpler (e.g. light traffic on a straight rural road). Novice drivers do not show this sensitivity to road complexity, suggesting that they fail to attend to potential dangers involving the behaviour of other road users. Encouragingly, a simple training intervention can increase the visual scanning of novices.

- **Keywords:** Attention; Driving; Road traffic accidents; Hazard perception; Situation awareness; Skill and experience; Driver training

J. A. Groeger; A. P. Banks. Anticipating the content and circumstances of skill transfer: Unrealistic expectations of driver training and graduated licensing? S. 1250–1263.

There is substantial evidence that driving skills improve during driver training, but the long-term safety benefit of such formal training remains unproven. Restricting the exposure of newly licensed drivers to more hazardous driving circumstances, as in graduated driver licensing (GDL) regimes, demonstrably reduces crash risk, but drivers remain at risk after the restrictions are eased. GDL and most other licensing regimes advocate increased basic training and practice, but thereafter require neither advanced training nor systematic increase in exposure to risk. This assumes that basic skills acquired during formal training will transfer positively to new and more demanding traffic circumstances. This paper reviews the theoretical basis for these assumptions and offers a way of systematically identifying the extent of transfer desired. It is concluded that there is little theoretical or empirical foundation for the supposition that what is learned during or after training will have a safety benefit in later driving.

- **Keywords:** Driving; Driver training; Transfer of training; Skill acquisition

M. N. Lees; J. D. Lee. The influence of distraction and driving context on driver response to imperfect collision warning systems. S. 1264–1286.

Automotive collision warning systems (CWS) can enhance hazard identification and management. However, false alarms (FAs), which occur as a random activation of the system not corresponding to a threat and not interpretable by the driver, and unnecessary alarms (UAs), which occur in situations judged hazardous by the algorithm but not by the driver, may limit CWS effectiveness. A driving simulator was used to investigate the influence of CWS (accurate, UA, FA, none) and distraction on driver performance during non-critical and critical events. FAs and UAs differentially influenced trust and compliance. FAs diminished trust and compliance, whereas the context associated with UAs fostered trust and compliance during subsequent events. This study suggests current warning descriptions based on signal detection theory need to be expanded to represent how different types of alarms affect drivers.

- **Keywords:** Collision warning system; Signal detection theory; False alarms; Trust; Driver behaviour

K. Catchpole; D. Mckeown. A framework for the design of ambulance sirens. S. 1287–1301.

Ambulance sirens are essential for assisting the safe and rapid arrival of an ambulance at the scene of an emergency. In this study, the parameters upon which sirens may be designed were examined and a framework for emergency vehicle siren design was proposed. Validity for the framework was supported through acoustic measurements and the evaluation of ambulance transit times over 240 emergency runs using two different siren systems. Modifying existing siren sounds to add high frequency content would improve vehicle penetration, detectability and sound localization cues, and mounting the siren behind the radiator grill, rather than on the light bar or under the wheel arch, would provide less unwanted noise while maintaining or improving the effective distance in front of the vehicle. Ultimately, these considerations will benefit any new attempt to design auditory warnings for the emergency services.

- **Keywords:** Siren; Ambulance; Warning; Alarm; Safety; Design

G. Funke; G. Matthews; J. S. Warm; A. K. Emo. Vehicle automation: A remedy for driver stress? S. 1302–1323.

The present study addressed the effects of stress, vehicle automation and subjective state on driver performance and mood in a simulated driving task. A total of 168 college students participated. Participants in the stress-induction condition completed a 'winter' drive, which included periodic loss of control episodes. Participants in the no-stress-

induction condition were not exposed to loss of control. An additional, independent manipulation of vehicle speed was also conducted, consisting of two control conditions requiring manual speed regulation and a third in which vehicle speed was automatically regulated by the simulation. Stress and automation both influenced subjective distress, but the two factors did not interact. Driver performance data indicated that vehicle automation impacted performance similarly in the stress and no-stress conditions. Individual differences in subjective stress response and performance were also investigated. Resource theory provides a framework that partially but not completely explains the relationship between vehicle automation and driver stress. Implications for driver workload, safety and training are discussed.

- **Keywords:** Stress; Automation; Driving; Safety

M. S. Young; N. A. Stanton. What's skill got to do with it? Vehicle automation and driver mental workload. S. 1324–1339.

Previous research has found that vehicle automation systems can reduce driver mental workload, with implications for attentional resources that can be detrimental to performance. The present paper considers how the development of automaticity within the driving task may influence performance in underload situations. Driver skill and vehicle automation were manipulated in a driving simulator, with four levels of each variable. Mental workload was assessed using a secondary task measure and eye movements were recorded to infer attentional capacity. The effects of automation on driver mental workload were quite robust across skill levels, but the most intriguing findings were from the eye movement data. It was found that, with little exception, attentional capacity and mental workload were directly related at all levels of driver skill, consistent with earlier studies. The results are discussed with reference to applied theories of cognition and the design of automation.

- **Keywords:** Attention; Automaticity; Automation; Driving; Mental workload; Resources

W. J. Horrey; D. J. Simons. Examining cognitive interference and adaptive safety behaviours in tactical vehicle control. S. 1340–1350.

Concurrent mental workload degrades some aspects of driving performance, but drivers might be able to modify their behaviour adaptively to accommodate cognitive impairments. For example, they might maintain longer vehicle headway in dual-task conditions to compensate for slowed response times. Studies documenting such adaptive behaviours typically use steady-state driving scenarios such as car following. Yet, driving often involves tactical control situations in which drivers need to monitor multiple aspects of their traffic environment and to accommodate changing goals. In two simulator experiments, this study examined the impact of mental workload on safety margins (distances) that drivers keep when engaged in a tactical control task: passing other vehicles. Although drivers did increase their headway adaptively when engaged in steady-state car following (experiment 2), they did not adapt their behaviour to accommodate cognitive load when performing tactical control manoeuvres. Implications of this difference between steady-state and tactical control driving contexts, both for driving research and for driving safety, are discussed.

- **Keywords:** Driver distraction; Mental workload; Tactical vehicle control; Adaptive safety behaviours

R. Ma; D. B. Kaber. Situation awareness and driving performance in a simulated navigation task. S. 1351–1364.

The objective of this study was to identify task and vehicle factors that may affect driver situation awareness (SA) and its relationship to performance, particularly in strategic (navigation) tasks. An experiment was conducted to assess the effects of in-vehicle navigation aids and reliability on driver SA and performance in a simulated navigation task. A total of 20 participants drove a virtual car and navigated a large virtual suburb. They were required to follow traffic signs and navigation directions from either a human aid via a mobile phone or an automated aid presented on a laptop. The navigation aids operated under three different levels of information reliability (100%, 80% and 60%). A control condition was used in which each aid presented a telemarketing survey and participants navigated using a map. Results revealed perfect navigation information generally improved driver SA and performance compared to unreliable navigation information and the control condition (task-irrelevant information). In-vehicle automation appears to mediate the relationship of driver SA to performance in terms of operational and strategic (navigation) behaviours. The findings of this work support consideration of driver SA in the design of future vehicle automation for navigation tasks.

- **Keywords:** In-vehicle automation; Automation reliability; Situation awareness; Driving performance; Navigation aiding