Journal of Safety Research – rok 2010, ročník 41

Číslo 5 (October 2010)

Antonio Peña-García, Rocío de Oña Lopez, Antonio Espín Estrella, Fernando Aznar Dols, Franscisco J. Calvo Poyo, Evaristo Molero Mesa, Juan de Oña López. *Influence of daytime running lamps on visual reaction time of pedestrians when detecting turn indicators*. Pages 385-389.

Introduction: This article describes one experiment that studied the influence of Daytime Running Lamps (DRL) on pedestrian detection of turn indicators. **Method:** An experimental device including one DRL and one turn indicator was used in order to determine Visual Reaction Times (VRT) of 148 observers in different situations involving turn indicator activation. Such situations were combinations of three main variables: color of DRL, separation between DRL and Turn Indicator, and observation angle. **Results:** Significant changes in VRT were found depending on the configurations above, especially the observation angle and the color of DRL. This second result demonstrates that amber DRLs inhibit the detection of Turn Indicators. **Impact on industry:** One of the main targets of this paper is to recommend that carmakers introduce only white DRLs on new vehicles. We also intend to advise regulatory bodies working on automotive regulation about the consequences of allowing amber DRLs and also about the danger of introducing constrains on the distance between DRL and Turn Indicator without further experimental evidences.

- **Keywords:** Headlamp; Daytime Running Lamp; Turn Indicator; Visual Reaction Time

Anurag Pande, Mohamed Abdel-Aty, Abhishek Das. *A classification tree based modeling approach for segment related crashes on multilane highways*. Pages 391-397.

Introduction: This study presents a classification tree based alternative to crash frequency analysis for analyzing crashes on mid-block segments of multilane arterials. **Method:** The traditional approach of modeling counts of crashes that occur over a period of time works well for intersection crashes where each intersection itself provides a well-defined unit over which to aggregate the crash data. However, in the case of mid-block segments the crash frequency based approach requires segmentation of the arterial corridor into segments of arbitrary lengths. In this study we have used random samples of time, day of week, and location (i.e., milepost) combinations and compared them with the sample of crashes from the same arterial corridor. For crash and non-crash cases,

geometric design/roadside and traffic characteristics were derived based on their milepost locations. The variables used in the analysis are non-event specific and therefore more relevant for roadway safety feature improvement programs. First classification tree model is a model comparing all crashes with the non-crash data and then four groups of crashes (rear-end, lane-change related, pedestrian, and single-vehicle/off-road crashes) are separately compared to the non-crash cases. The classification tree models provide a list of significant variables as well as a measure to classify crash from non-crash cases. ADT along with time of day/day of week are significantly related to all crash types with different groups of crashes being more likely to occur at different times. **Conclusions:** From the classification performance of different models it was apparent that using non-event specific information may not be suitable for single vehicle/off-road crashes. **Impact on Industry:** The study provides the safety analysis community an additional tool to assess safety without having to aggregate the corridor crash data over arbitrary segment lengths. **Research Highlights:** ► An alternative to crash frequency modeling to assess safety on arterial segments is proposed in this article. ► In addition to the arterial streets the same approach can also be applied to freeway corridors. ► Unlike the more traditional crash frequency analysis the proposed approach does not require defining segments of arbitrary lengths on the corridor. ► Individual events (crashes) are used as the units of analysis and therefore the approach is free of the concerns arising from aggregation of the data.

- **Keywords:** Crash frequency; Arterial safety; Classification trees; Mid-block segment crashes

Pete Kines, Lars P.S. Andersen, Soren Spangenberg, Kim L. Mikkelsen, Johnny Dyreborg, Dov Zohar. *Improving construction site safety through leader-based verbal safety communication*. Pages 399-406.

Background: The construction industry is one of the most injury-prone industries, in which production is usually prioritized over safety in daily on-site communication. Workers have an informal and oral culture of risk, in which safety is rarely openly expressed. This paper tests the effect of increasing leader-based on-site verbal safety communication on the level of safety and safety climate at construction sites. **Method:** A pre-post intervention-control design with five construction work gangs is carried out. Foremen in two intervention groups are coached and given bi-weekly feedback about their daily verbal safety communications with their workers. Foremen-worker verbal safety exchanges (experience sampling method, n = 1,693 interviews), construction site safety level (correct vs. incorrect, n = 22,077 single observations), and safety climate (seven dimensions, n = 105 questionnaires) are measured over a period of up to 42 weeks. **Results:** Baseline measurements in the two intervention and three control groups reveal that foremen speak with their workers several times a day. Workers perceive safety as part of their verbal communication with their foremen in only 6-16% of exchanges, and the levels of safety at the sites range from 70-87% (correct observations). Measurements from baseline to follow-up in the two intervention groups reveal that safety communication between foremen and workers increases significantly in one of the groups (factor 7.1 increase), and a significant yet smaller increase is found when the two intervention groups are combined (factor 4.6). Significant increases in the level of safety are seen in both intervention groups (7% and 12% increases, respectively), particularly in regards to 'access ways' and 'railings and coverings' (39% and 84% increases, respectively). Increases in safety climate are seen in only one of the intervention groups with respect to their 'attention to safety.' No significant trend changes are seen in the three control groups on any of the three measures. **Conclusions:** Coaching construction site foremen to include safety in their daily verbal exchanges with workers has a significantly positive and lasting effect on the level of safety, which is a proximal estimate for work-related accidents. It is recommended that future studies include coaching and feedback at all organizational levels and for all involved parties in the construction process. Building client regulations could assign the

task of coaching to the client appointed safety coordinators or a manager/supervisor, and studies should measure longitudinal effects of coaching by following foremen and their work gangs from site to site. **Research Highlights:** ► Leader-worker daily verbal safety exchanges are rare on construction sites. ► Leader-based safety coaching increases daily verbal safety exchanges. ► Leader-based safety coaching increases level of safety at construction sites.

- **Keywords:** leader-based intervention; coaching; construction foreman; safety level; safety climate; experience sampling method

Thomas R. Cunningham, Neville Galloway-Williams, E. Scott Geller. *Protecting the planet and its people: How do interventions to promote environmental sustainability and occupational safety and health overlap?* Pages 407-416.

Problem: The challenges of both occupational safety and health and environmental sustainability require large-scale behavior change for meaningful improvements to occur. Environmental sustainability, or the 'green movement' has received far more attention recently, and certain strategies and recommendations from interventions designed for promoting pro-environmental behaviors may inform efforts to intervene on critical behaviors for improving occupational safety and health. **Method:** A survey of the literature regarding behavioral interventions for both environmental sustainability and occupational safety and health was conducted. Several theoretical approaches are reviewed, and successful approaches from each domain are identified, as well as parallel challenges and points for crossover. Recommendations are provided for adapting environmental sustainability intervention approaches for occupational safety and health applications. **Impact on Industry:** Safety and health leaders may achieve sustainable improvements in worker safety and health by harnessing the momentum of the green movement and adapting successful intervention approaches from the environmental sustainability domain. **Research highlights:** ► Environmental sustainability and occupational safety and health present parallel challenges for behavior change. ► Many successful approaches to increasing environmentally responsible behaviors have been demonstrated. ► Safety and health improvement efforts may be strengthened by borrowing ideas from the green movement.

- **Keywords:** Environmental sustainability; Behavioral intervention; Occupational safety; Worker health; Translational research

Arnaud Villieux, Patricia Delhomme. *Driving anger and its expressions: Further evidence of validity and reliability for the Driving Anger Expression Inventory French adaptation*. Pages 417-422.

Introduction: The aims of this study were to provide further evidence of validity and reliability for the Driving Anger Expression Inventory (DAX) French adaptation (Villieux & Delhomme, 2008, Le Travail Humain, 71(4), 359–384) and to investigate the relationships between driving anger, how people express their anger while driving, and traffic violations among young drivers in France. **Method:** The French adaptations of the DAX, of the Driving Anger Scale (DAS), and of the Extended Violations Scale were administered to a sample of 314 drivers. **Results:** Confirmatory factor analysis of the French DAX items yielded a three factors solution with 11 items, which obtained better goodness-of-fit to the data. Cronbach α reliabilities for DAX factors ranged from .71 to .79. Aggressive forms of anger expression correlated positively with driving anger and traffic violations whereas the 'Adaptive/Constructive Expression' factor correlated negatively with these variables. **Discussion:** Globally, our results replicated earlier findings and showed that DAX factors are useful predictors of self reported violations and complement established measures like the DAS. **Impact on Industry:** Implications for

driver education and interventions were examined. **Research Highlights:** ► The original DAX (Driving Anger Expression Inventory) factor structure developed in the U.S. does not seem to be entirely applicable to our French sample. ► Aggressive forms of anger expression and traffic violations recorded were strongly and positively correlated together. ► Negative correlations were observed between 'Adaptive/Constructive Expression' factor and traffic violations. ► Using the vehicle as an instrument of anger expression was a major predictor of multiple traffic violations.

- **Keywords:** Driving anger; Expression of driving anger; Violations; Validity; Reliability

Tsung-Chih Wu, Chia-Hung Lin, Sen-Yu Shiau. *Predicting safety culture : the roles of employer, operations manager and safety professional*. Pages 423-431.

Introduction: This study explores predictive factors in safety culture. **Method:** In 2008, a sample 939 employees was drawn from 22 departments of a telecoms firm in five regions in central Taiwan. The sample completed a questionnaire containing four scales: the employer safety leadership scale, the operations manager safety leadership scale, the safety professional safety leadership scale, and the safety culture scale. The sample was then randomly split into two subsamples. One subsample was used for measures development, one for the empirical study. **Results:** A stepwise regression analysis found four factors with a significant impact on safety culture (R^2 = 0.337): safety informing by operations managers; safety caring by employers; and safety coordination and safety regulation by safety professionals. Safety informing by operations managers (ß = 0.213) was by far the most significant predictive factor. **Impact on industry:** The findings of this study provide a framework for promoting a positive safety culture at the group level. **Research Highlights:** ► Four safety leadership factors significantly affect safety culture. ►Safety informing by operations managers was the best predictor of safety culture. ►Developing training programs to help managers to understand safety roles.

- **Keywords:** Safety culture; Safety climate; Safety leadership; Safety performance; Safety role

Daniel W.M. Chan, Albert P.C. Chan, Tracy N.Y. Choi. *An empirical survey of the benefits of implementing pay for safety scheme (PFSS) in the Hong Kong construction industry*. Pages 433-443.

Introduction: The Government of the Hong Kong Special Administrative Region (SAR) has implemented different safety initiatives to improve the safety performance of the construction industry over the past decades. The Pay for Safety Scheme (PFSS), which is one of the effective safety measures launched by the government in 1996, has been widely adopted in the public works contracts. Both the accident rate and fatality rate of public sector projects have decreased noticeably over this period. **Method:** This paper aims to review the current state of application of PFSS in Hong Kong, and attempts to identify and analyze the perceived benefits of PFSS in construction via an industry-wide empirical questionnaire survey. A total of 145 project participants who have gained abundant handson experience with the PFSS construction projects were requested to complete a survey questionnaire to indicate the relative importance of those benefits identified in relation to PFSS. The perceived benefits were measured and ranked from the perspectives of the client and contractor for crosscomparison. **Results:** The survey findings suggested the most significant benefits derived from adopting PFSS were: (a) Increased safety training; (b) Enhanced safety awareness; (c) Encouragement of developing safety management system; and (d) Improved safety commitment. A wider application of PFSS should be advocated so as to achieve better safety performance within the construction industry. **Impact on Industry:** It is recommended that a similar

scheme to the PFSS currently adopted in Hong Kong may be developed for implementation in other regions or countries for international comparisons.

- **Keywords:** Pay for Safety Scheme (PFSS); Safety performance; Benefits; Hong Kong; Construction industry

Robert E. Mann, Gina Stoduto, Jennifer Butters, Anca Ialomiteanu, Paul Boase, Mark Asbridge, Mary Chipman, Christine M. Wickens. *Age group differences in collision risk*. Pages 445-449.

Introduction: The purpose of the current study was to examine differences in factors associated with self-reported collision involvement of three age groups of drivers based on a large representative sample of Ontario adults. **Method:** This study was based on data from the CAMH Monitor, an ongoing cross-sectional telephone survey of Ontario adults 18 years and older from 2002 to 2005. Three age groups were examined: 18-34 (n = 1,294), 35-54 (n = 2,428), and 55+ (n = 1,576). For each age group sample, a logistic regression analysis was conducted of self-reported collision involvement in the last 12 months by risk factor measures of driving exposure (kilometers driven in a typical week, driving is stressful, and driving on busy roads), consuming five or more drinks of alcohol on one occasion (past 12 months), cannabis use (lifetime, and past 12 months), and driving after drinking among drinkers (past 12 months), controlling for demographics (gender, region, income, and marital status). **Results:** The study identified differences in factors associated with self-reported collision involvement of the three age groups of adult drivers. The logistic regression model for the youngest group revealed that drivers who reported that driving was stressful at least some of the time, drank five or more drinks on an occasion, and drove after drinking had an increased risk of collision involvement. For the middle age group, those who reported using cannabis in the last 12 months had significantly increased odds of reporting collision involvement. None of the risk factor measures showed significant associations with collision risk for older drivers (aged 55+). **Impact:** The results suggest potential areas for intervention and new directions for future research. **Research Highlights:** ►We examined self-reported collision involvement as a function of driver age. ►For drivers 18-34 alcohol factors and stressful driving increased collision risk. ►For drivers 35-54 use of cannabis in the past year increased collision risk. ►No risk factors were associated with collision risk for older drivers.

- **Keywords:** Motor vehicle collision; Driver age; Drinking driving; Heavy alcohol use; Cannabis use; Driving exposure; Population survey

Yilmaz Hatipkarasulu. *Project level analysis of special trade contractor fatalities using accident investigation reports*. Pages 451-457.

Introduction: Construction is among the most dangerous industries in the United States accounting for thousands of fatalities every year. Although there is data available on high risk work types and areas, the project-level detail is not readily available. **Method:** This paper uses the accident investigation reports to categorize project types and presents project level analysis of 350 fatal accidents for special trade contractors. **Results:** The results showed that Residential and Commercial projects lead the fatalities where Falls are observed as the leading cause. However, when the fatality causes and project categories are analyzed for each work type, the results showed different fatality cause proportions for each project type. **Impact on Industry:** Project level analysis approach has a direct impact on identifying high risk work types and areas for special trade contractors by making it possible to focus the prevention and intervention efforts more accurately, while highlighting training and education needs. **Research highlights:** ►Similar project settings/environment create similar hazards for construction contractors regardless of the work type. ►Project level analysis is essential in identification of high

risk work areas and types. ►Accident investigation reports can be used for project level analysis of construction fatalities.

- **Keywords:** Construction Safety; Construction Worker Fatalities; Special Trade Contractors; Accident Reports

Douglas R. Roehler, Ann M. Dellinger. *What is the single most important thing you can do to prevent injuries in a crash?* Pages 459-462.

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