# Human Factors – rok 2010, roč. 52

# Číslo 5

## ATTENTIONAL PROCESSES

***Engström, Johan; Aust, Mikael Ljung; Viström, Matias.*** **Effects of Working Memory Load and Repeated Scenario Exposure on Emergency Braking Performance. S. 551-559(9).**

**Objective:** The objective of the present study was to examine the effect of working memory load on drivers' responses to a suddenly braking lead vehicle and whether this effect (if any) is moderated by repeated scenario exposure. **Background:** Several experimental studies have found delayed braking responses to lead vehicle braking events during concurrent performance of nonvisual, working memory-loading tasks, such as hands-free phone conversation. However, the common use of repeated, and hence somewhat expected, braking events may undermine the generalizability of these results to naturalistic, unexpected, emergency braking scenarios. **Method:** A critical lead vehicle braking scenario was implemented in a fixed-based simulator. The effects of working memory load and repeated scenario exposure on braking performance were examined. **Results:** Brake response time was decomposed into accelerator pedal release time and acceleratorto-brake pedal movement time. Accelerator pedal release times were strongly reduced with repeated scenario exposure and were delayed by working memory load with a small but significant amount (178 ms). The two factors did not interact. There were no effects on accelerator-to-brake pedal movement time. **Conclusion:** The results suggest that effects of working memory load on response performance obtained from repeated critical lead vehicle braking scenarios may be validly generalized to real world unexpected events. **Application:** The results have important implications for the interpretation of braking performance in experimental settings, in particular in the context of safety-related evaluation of in-vehicle information and communication technologies.

- **Keywords:** ATTENTIONAL PROCESSES; DUAL-TASK PERFORMANCE; WORKING MEMORY LOAD; REPEATED SCENARIO EXPOSURE; BRAKE RESPONSE TIME; SENSORY AND PERCEPTUAL PROCESSES; PSYCHOMOTOR PROCESSES; HIGHWAY SAFETY; DRIVER BEHAVIOR; EMERGENCY BRAKING PERFORMANCE; SAFETY EVALUATION

## BIOMECHANICS, ANTHROPOMETRY, AND WORK PHYSIOLOGY

**Wade, Chip; Redfern, Mark S.; Andres, Robert O.; Breloff, Scott P.** ***Joint Kinetics and Muscle Activity While Walking on Ballast*****. S. 560-573(14).**

**Objective:** This study examined the impact of two common sizes of ballast on gait biomechanics. The terrain was designed to simulate a railroad work setting to investigate the variation in gait kinetics and muscle activation while walking. **Background:** Research and epidemiology suggest a potential link between walking surface characteristics and injury. However, few studies have investigated the impact of ballast surfaces, which is a surface of interest in the railroad and construction industries, on gait dynamics. **Method:** For this study, 20 healthy adult men walked along three distinct pathways (no ballast [NB], walking ballast [WB], and mainline ballast [MB]). WB and MB consisted of rock with an average size of 0.75 to 1 in. and 1.25 to 1.5 in., respectively. Full-body motion, ground reaction forces, and electromyographic (EMG) signals from lower extremity muscles were collected, and three dimensional joint moments were calculated. Parameters of interest were moment trajectories and ranges, EMG activity, and temporal gait measures. **Results:** Joint-specific differences indicate significant variations between surface conditions. Joint moment ranges were generally smaller for MB and WB compared with NB. EMG activity, in particular, co-contraction levels, was found to be significantly greater on ballast compared with NB. Temporal gait parameters were significantly different for MB than for either WB or NB. **Conclusion:** Walking on ballast increases muscle activation to control the moments of the lower extremity joints. **Application:** The results suggest that ballast has an effect on muscles and joints; thus, the findings provide insight to improve and develop new work practices and methods for injury prevention.

- **Keywords:** KINETICS; EMG; GAIT ANALYSIS; IRREGULAR TERRAIN; WALKING SURFACE CHARACTERISTICS; INJURY PREVENTION; GAIT BIOMECHANICS; JOINT MOMENTS; JOINT KINETICS; MUSCLE ACTIVITY; WALKING ON BALLAST; RAILROAD WORK; GAIT DYNAMICS; BALLAST SURFACES; RAILROAD INDUSTRY; WALKING SURFACES; UNEVEN GROUND

## DISPLAYS AND CONTROLS

### Shin, Gwanseob; Hegde, Sudeep. *User-Preferred Position of Computer Displays : effects of Display Size*. S. 574-585(12).

**Objective:** Effects of display size and dual display setting on preferred display and keyboard positions were evaluated. **Background:** User-preferred display position may vary as its size changes or when multiple displays are used. It is also not known whether the use of larger displays or multiple displays would influence positioning of the keyboard. **Method:** Participants (*N* = 19) who had normal visual acuity (20/30 or better) determined preferred positions of the display and the keyboard during a data entry task in four display setups (19, 24, 27.5, and dual 19 in.). The size of capital characters (3.2 mm high) was kept consistent between setups. **Results:** Preferred viewing distance ranged from 0.68 m (19-in. display) to 0.76 m (27.5-in. display). No significant differences in viewing distance and display height were found between the single 19-in. display and dual 19-in. displays setups. The preferred position of the keyboard was consistent between display setups. **Conclusion:** Participants placed larger displays farther and lower while maintaining the display top at or near eye height. Preferred position of the dual displays in landscape setting did not differ from that of a single display. It appears that the preferred display position varies with the vertical dimension of the overall viewable area of the display. **Application:** The results of this study can be used to determine the dimensions or adjustability of computer workstations for larger displays or multiple displays settings.

- **Keywords:** COMPUTER DISPLAY; DISPLAY SIZE; VIEWING DISTANCE; DISPLAY VIEWING ANGLE; ACUITY RESERVE; DISPLAY HEIGHT; MULTIPLE DISPLAYS; COMPUTER WORKSTATION; VISUAL DISPLAY TERMINAL; PREFERRED DISPLAY POSITION; USER-PREFERRED DISPLAY POSITIONS; USER-PREFERRED KEYBOARD POSITIONS; LARGE DISPLAYS; GUIDELINES

## TRAINING, EDUCATION, INSTRUCTIONAL SYSTEMS

### Jones, Keith S.; Derby, Paul L.; Schmidlin, Elizabeth A. *An Investigation of the Prevalence of Replication Research in Human Factors*. S. 586-595(10).

**Objective:** The present studies investigated the nature of replication research within the human factors literature. **Background:** Many claim that researchers in certain fields do not replicate prior research. This is troubling because replications allow science to self-correct. A successful replication corroborates the original finding, whereas an unsuccessful replication falsifies it. To date, no one has assessed whether this issue affects the field of human factors. **Method:** In the first study, eight articles (parent articles) were selected from the 1991 issues of the journal *Human Factors*. Each article that had referenced one of the eight parent articles between 1991 and September 2006 (child articles) were also retrieved. Two investigators coded and compared each child article against its 1991 parent article to determine whether the child article replicated its parent article. The second study replicated these procedures. **Results:** Half or more of the parent articles in Study 1 and Study 2 (75% and 50%, respectively) were replicated at least once. Furthermore, human factors researchers conducted replications of their own work as well as the work of others. However, many researchers did not state that they replicated previous research. **Conclusion:** Replications seem to be common in the human factors literature. However, readers may not realize that a study replicated prior research. Thus, they may incorrectly assess the evidence concerning a given finding. **Application:** Human factors professionals should be taught how to identify replications and to be cautious of research that has not been replicated.

- **Keywords:** HUMAN FACTORS; PHILOSOPHY OF SCIENCE; FALSIFICATION; REPLICATION RESEARCH; SELF-CORRECTING SCIENCE; SELF-CORRECTION; REPLICATED RESEARCH

### Rosen, Michael A.; Salas, Eduardo; Pavlas, Davin; Jensen, Randy; Fu, Dan; Lampton, Donald. *Demonstration-Based Training : a Review of Instructional Features*. S. 596-609(14).

**Objective:** This article reviews instructional features used in demonstration-based training (DBT). **Background:** The need for fast and effective training and performance support that can be accessed from anywhere is a growing need for organizations. DBT programs are one method to address these needs, but a better understanding of how to maximize the effectiveness of DBT activities is needed. Specifically, beyond the content of the demonstration (i.e., the dynamic example of task performance), what instructional features (i.e., information and activities in addition to the demonstration) can be used to improve the effectiveness of DBT interventions? **Method:** The authors conducted a systematic review of the applied and basic science literatures relevant to DBT. **Results:** Instructional features in DBT can be categorized according to the degree to which they encourage active learner involvement (i.e., active vs. passive), when they occur relative to viewing the demonstration (i.e., pre-, during-, and postdemonstration conditions), and the observational learning process they are intended to augment. Five categories of instructional features are described: passive guidance or support, preparatory activities, concurrent activities, retrospective activities, and prospective activities.

**Conclusion:** There is a wide variety of instructional features used in DBT, but more systematic research is needed to understand the conditions under which each is most effective as well as to outline a method for sequencing of demonstration with other delivery methods, such as practice opportunities. **Application:** The framework presented in this article can help guide the systematic development of training systems incorporating DBT as well as provide a direction for future research.

- **Keywords:** TRAINING; OBSERVATIONAL LEARNING; INSTRUCTIONAL DESIGN; DEMONSTRATION-BASED TRAINING; CROSS-TRAINING; TEAM TRAINING; EDUCATION; INSTRUCTIONAL SYSTEMS; TRAINING TECHNOLOGIES; MULTIMEDIA LEARNING; INSTRUCTIONAL FEATURES; ACTIVE LEARNING; PASSIVE LEARNING; LEARNER ENGAGEMENT; OBSERVATIONAL LEARNING PROCESSES; SOCIAL LEARNING THEORY; MIMICRY; VICARIOUS LEARNING