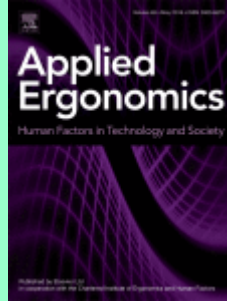


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Luis Lutnyk, David Rudi, Victor R. Schinazi, Peter Kiefer, Martin Raubal. *The effect of flight phase on electrodermal activity and gaze behavior: A simulator study.* 103989.

Current advances in airplane cockpit design and layout are often driven by a need to improve the pilot's awareness of the aircraft's state. This involves an improvement in the flow of information from aircraft to pilot. However, providing the aircraft with information on the pilot's state remains an open challenge. This work takes a first step towards determining the pilot's state based on biosensor data. We conducted a simulator study to record participants' electrodermal activity and gaze behavior, indicating pilot state changes during three distinct flight phases in an instrument failure scenario. The results show a significant difference in these psychophysiological measures between a phase of regular flight, the incident phase, and a phase with an additional troubleshooting task after the failure. The differences in the observed measures suggest great potential for a pilot-aware cockpit that can provide assistance based on the sensed pilot state.

- **Keywords:** Aviation; Eye tracking; Electrodermal activity

Yao Song, Da Tao, Yan Luximon. *In robot we trust? The effect of emotional expressions and contextual cues on anthropomorphic trustworthiness.* 103967.

Following the evolution of technology and its application in various daily contexts, social robots work as an advanced artificial intelligence (AI) system to interact with humans. However, limited research has been done to discuss the role of emotional expressions and contextual cues in influencing anthropomorphic trustworthiness, especially from the design perspective. To address this research gap, the current study designed a specific robot prototype and conducted two lab experiments to explore the effect of emotional expressions and contextual cues on trustworthiness via a combination of subjective ratings and physiological measures. Results showed that: 1) positive (vs. negative) emotional expressions enjoyed a higher level of anthropomorphic trustworthiness and visual attention; 2) regulatory fit was expanded in parasocial interaction and worked as a prime to activate anthropomorphic trustworthiness for social robots. Theoretical contributions and design implications were also discussed in this study.

- **Keywords:** Social robot; Emotional expressions; Anthropomorphic trustworthiness; Eye tracking; Electrodermal activity (EDA)

Daniel Paes, Javier Irizarry, Mark Billingham, Diego Pujoni. *Investigating the relationship between three-dimensional perception and presence in virtual reality-reconstructed architecture. 103953.*

Identifying and characterizing the factors that affect presence in virtual environments has been acknowledged as a critical step to improving Virtual Reality (VR) applications in the built environment domain. In the search to identify those factors, the research objective was to test whether three-dimensional perception affects presence in virtual environments. A controlled within-group experiment utilizing perception and presence questionnaires was conducted, followed by data analysis, to test the hypothesized unidirectional association between three-dimensional perception and presence in two different virtual environments (non-immersive and immersive). Results indicate no association in either of the systems studied, contrary to the assumption of many scholars in the field but in line with recent studies on the topic. Consequently, VR applications in architectural design may not necessarily need to incorporate advanced stereoscopic visualization techniques to deliver highly immersive experiences, which may be achieved by addressing factors other than depth realism. As findings suggest that the levels of presence experienced by users are not subject to the display mode of a 3D model (whether immersive or non-immersive display), it may still be possible for professionals involved in the review of 3D models (e.g., designers, contractors, clients) to experience high levels of presence through non-stereoscopic VR systems provided that other presence-promoting factors are included.

- **Keywords:** Virtual reality; Virtual environments; Human factors; Three-dimensional perception; Presence; Design technology

Anna-Maria Sourelli, Ruth Welsh, Pete Thomas. *User preferences, driving context or manoeuvre characteristics? Exploring parameters affecting the acceptability of automated overtaking. 103959.*

Future user acceptance will be a requirement for the AVs to accomplish their estimated safety benefits, highlighting the importance of acceptable driving behaviour. This study aims to investigate the parameters that affect the acceptability of highly automated overtaking. 237 respondents participated in a video based online survey, rating different motorway flying overtaking scenarios based on their preferences. The scores were analysed using a variety of methods (statistical tests, Principal Component Analysis, Linear Mixed Models). Long pull-out distances and manoeuvre duration values, as well as lower speeds were preferred by the participants, with some limited impact of the driving situation. Overall, behaviour simulating an average, cautious human driver is likely to positively influence acceptability and suggests the value of further research on context-adaptive automated driving to account for subjective risk perception. These findings can contribute towards user-centred systems that assist or autonomously perform overtaking manoeuvres, supporting their uptake and thus the realisation of their safety benefits.

- **Keywords:** Automated driving; Technology acceptance; Overtaking; Driver behavior; Vehicle automation; Perceived safety

Nathan A. Edwards, Maria K. Talarico, Ajit Chaudhari, Cody J. Mansfield, James Oñate. *Use of accelerometers and inertial measurement units to quantify movement of tactical athletes: A systematic review. 103991.*

The dynamic work environments of tactical athletes are difficult to replicate in a laboratory. Accelerometers and inertial measurement units provide a way to characterize movement in the field. This systematic review identified how accelerometers and inertial measurement units are currently being used to quantify movement patterns of tactical athletes. Seven research and military databases were searched, producing 26,228

potential articles with 78 articles included in this review. The articles studied military personnel (73.1%), firefighters (19.2%), paramedics (3.8%), and law enforcement officers (3.8%). Accelerometers were the most used type of sensor, and physical activity was the primarily reported outcome variable. Seventy of the studies had fair or poor quality. Research on firefighters, emergency medical services, and law enforcement officers was limited. Future research should strive to make quantified movement data more accessible and user-friendly for non-research personnel, thereby prompting increased use in tactical athlete groups, especially first responder agencies.

- **Keywords:** Wearable sensors; Biomechanics; Human movement

Siyuan Zhou, Xu Sun, Qingfeng Wang, Bingjian Liu, Gary Burnett. *Examining pedestrians' trust in automated vehicles based on attributes of trust: A qualitative study.* 103997.

Pedestrians' trust in automated vehicles (AVs) needs to be analyzed and deconstructed to update it from its current broad concept into several lower-level attributes for assessment and measurement. In this study, we have employed virtual reality (VR) and scenario-based interviews to examine the trust of pedestrians toward AVs, based on the attributes of trust and trustworthiness. A hybrid approach of inductive and deductive thematic analysis of the responses of 36 participants was undertaken. Eight such attributes emerged from the analysis, including statistical reliability and dependability, competence, predictability, familiarity, authority/subversion, liberty/oppression, care/harm, and sanctity/degradation. The first four are objective attributes concerning automation trustworthiness and human trust in automation, while the remaining four are subjective attributes, analogous to properties of human morality. The findings of this study provide an empirical grounding for trust theories. Specifically, we have highlighted the importance of subjective qualities in constituting pedestrian-AV trust, including "automation morality" and "care/harm".

- **Keywords:** Automated vehicles; Attributes of trust; Qualitative analysis

Parian Haghghat, Toan Nguyen, Mina Valizadeh, Mohammad Arvan, Natalie Parde, Myunghee Kim, Heejin Jeong. *Effects of an intelligent virtual assistant on office task performance and workload in a noisy environment.* 103969.

This study examines the effects of noise and the use of an Intelligent Virtual Assistant (IVA) on the task performance and workload of office workers. Data were collected from forty-eight adults across varied office task scenarios (i.e., sending an email, setting up a timer/reminder, and searching for a phone number/address) and noise types (i.e., silence, non-verbal noise, and verbal noise). The baseline for this study is measured without the use of an IVA. Significant differences in performance and workload were found on both objective and subjective measures. In particular, verbal noise emerged as the primary factor affecting performance using an IVA. Task performance was dependent on the task scenario and noise type. Subjective ratings found that participants preferred to use IVA for less complex tasks. Future work can focus more on the effects of tasks, demographics, and learning curves. Furthermore, this work can help guide IVA system designers by highlighting factors affecting performance.

- **Keywords:** Intelligent virtual assistant; Office work; Background noise; Conversational agents; Digital personal assistants; Human-computer interaction

Danielle M. Arcidiacono, Elizabeth M. Lavoie, Adam W. Potter, Sai V. Vangala, Lucas D. Holden, Hope Y. Soucy, Anthony J. Karis, Karl E. Friedl, William R. Santee, David P. Looney. *Peak performance and*

cardiometabolic responses of modern US army soldiers during heavy, fatiguing vest-borne load carriage. 103985.

Introduction: Physiological limits imposed by vest-borne loads must be defined for optimal performance monitoring of the modern dismounted warfighter. **Purpose:** To evaluate how weighted vests affect locomotion economy and relative cardiometabolic strain during military load carriage while identifying key physiological predictors of exhaustion limits. **Methods:** Fifteen US Army soldiers (4 women, 11 men; age, 26 ± 8 years; height, 173 ± 10 cm; body mass (BM), 79 ± 16 kg) performed four incremental walking tests with different vest loads (0, 22, 44, or 66% BM). We examined the effects of vest-borne loading on peak walking speed, the physiological costs of transport, and relative work intensity. We then sought to determine which of the cardiometabolic indicators (oxygen uptake, heart rate, respiration rate) was most predictive of task failure. **Results:** Peak walking speed significantly decreased with successively heavier vest loads ($p < 0.01$). Physiological costs per kilometer walked were significantly higher with added vest loads for each measure ($p < 0.05$). Relative oxygen uptake and heart rate were significantly higher during the loaded trials than the 0% BM trial ($p < 0.01$) yet not different from one another ($p > 0.07$). Conversely, respiration rate was significantly higher with the heavier load in every comparison ($p < 0.01$). Probability modeling revealed heart rate as the best predictor of task failure (marginal R^2 , 0.587, conditional R^2 , 0.791). **Conclusion:** Heavy vest-borne loads cause exceptional losses in performance capabilities and increased physiological strain during walking. Heart rate provides a useful non-invasive indicator of relative intensity and task failure during military load carriage.

- **Keywords:** Energy expenditure; Exercise metabolism; Fatigue; Movement economy; Oxygen cost

Lingguo Bu, Jing Qu, Lei Zhao, Yanjie Zhang, Yonghui Wang. A neuroergonomic approach to assessing motor performance in stroke patients using fNIRS and behavioral data. 103979.

Stroke is characterized by high morbidity and disability, and proposing effective methods for assessing and designing rehabilitation products is an attractive topic in current research. In this study, a hand function rehabilitation aid was developed for stroke patients. Ten stroke patients and 20 healthy older people as a control group were recruited to perform a 600 s task after a 600 s resting by gripping a stick while clicking on a flashing light in an electronic insert in sequence according to a pattern. The functional near-infrared spectroscopy (fNIRS) and behavioral data were collected during their rehabilitation training. Brain function was analyzed using three indicators, namely brain area activation, functional connectivity and effective connectivity, while behavioral performance was analyzed using ten indicators, such as velocity and acceleration, and correlations were made between both. Followed by proposing a quantitative assessment method based on the fusion of multiple data sources. The results showed that the developed rehabilitation tool could effectively stimulate the patient's brain and help recover their cognitive and behavioral capacities. The scientific validity of the proposed assessment approach was further confirmed by contrasting the data results of the stroke group with those of the healthy elderly group. This study has integrated brain function and behavioral data, providing a practical quantitative evaluation method of product ergonomics and data-driven product design concepts for stroke patients.

- **Keywords:** Neuroergonomic; Stroke; fNIRS; Motor performance; Rehabilitation

Howard Chen, Mark C. Schall, Nathan B. Fethke. Gyroscope vector magnitude: A proposed method for measuring angular velocities. 103981.

High movement velocities are among the primary risk factors for work-related musculoskeletal disorders (MSDs). Ergonomists have commonly used two methods to calculate angular movement velocities of the upper arms using inertial measurement units (accelerometers and gyroscopes). Generalized velocity is the speed of movement traveled on the unit sphere per unit time. Inclination velocity is the derivative of the postural inclination angle relative to gravity with respect to time. Neither method captures the full extent of upper arm angular velocity. We propose a new method, the gyroscope vector magnitude (GVM), and demonstrate how GVM captures angular velocities around all motion axes and more accurately represents the true angular velocities of the upper arm. We use optical motion capture data to demonstrate that the previous methods for calculating angular velocities capture 89% and 77% relative to our proposed method.

Yong-Ku Kong, Jeong Ho Kim, Hyun-Ho Shim, Jin-Woo Shim, Sang-Soo Park, Kyeong-Hee Choi. *Efficacy of passive upper-limb exoskeletons in reducing musculoskeletal load associated with overhead tasks.* 103965.

Overhead work can pose substantial musculoskeletal stress in many industrial settings. This study aimed to evaluate the efficacy of passive upper-limb exoskeletons in reducing muscular activity and subjective discomfort ratings. In a repeated-measures laboratory experiment, 20 healthy male participants performed 10-min drilling tasks with and without two passive upper-limb exoskeletons (VEX and Airframe). During the tasks, muscle activity in eight muscles (upper limb - upper trapezius, middle deltoid, biceps brachii, triceps brachii; low back - erector spinae; lower limb - rectus femoris, biceps femoris, tibialis anterior) was collected using electromyography as a physical exertion measure. Subjective discomfort rating in six body parts was measured using the Borg's CR-10 scale. The results showed that muscle activity (especially in the upper-limb muscles) was significantly decreased by 29.3–58.1% with both exoskeletons compared to no exoskeleton condition. The subjective discomfort ratings showed limited differences between the conditions. These findings indicate that passive upper-limb exoskeletons may have potential as an effective intervention to reduce muscular loading and physical exertion during overhead work.

- **Keywords:** Electromyography; Shoulder assist; Overhead work; Work related musculoskeletal Disorders (WMSDs); Ergonomic intervention

Aditi Gupta, Damian G. Kelty-Stephen, Madhur Mangalam, Ryan J. McKindles, Leia Stirling. *Walking speed and dual task input modality impact performance on a self-paced treadmill.* 103986.

Interference between a walking task (target speeds on a self-paced treadmill) and dual visual and tactile-visual response time task was investigated. Ambulatory dual-task scenarios reveal how attention is divided between walking and additional tasks, but the impact of walking speed and dual-task modality on gait characteristics and dual-task performance is unclear. The purpose of this study was to evaluate the effect of visual and tactile-visual dual-task on gait performance. Participants (n=15) targeted four speeds (0.5, 1.0, 1.3, and 1.5 m/s) on a self-paced treadmill with a visual speed indicator (a green region centered at the target speed). Participants completed the same speed profile on the treadmill without (Self-Paced) and with a response time dual task (Self-Paced with Dual Task) requiring finger-tap responses to go/no-go cues. Six gait characteristics were calculated: proportion of time in the desired speed green region (GTP), speed ratio (ratio of mean to target speed), time to green region after target speed change (NRT), normalized stride width (NSW), normalized stride length (NSL), and stride time (ST). Both stride length and width were normalized by participant leg length. Lower GTP and greater speed ratio at slower speeds during dual tasking indicate speed-dependent changes in gait characteristics. Changes in NSL and ST were more affected by speed than dual task. These findings support that when speed is a parameter that is

tracked, participants do not universally decrease speed in the presence of a dual task. These findings can support the decisions made when designing new wearable technologies that support navigation, communication, and mobility.

- **Keywords:** Attention; Gait; Ambulation; Cognitive resources

Martinique Engelbrecht, Anriëtte Bekker. *A discomfort threshold for impulsive whole-body vibration on a slamming-prone vessel.* 103992.

This study contributes towards a threshold for the onset of discomfort stemming from vibration that is transmitted to the human body by means of impulsive wave slamming in dynamic shipping environments. Wave slamming is a random, violent, non-linear event. Subjective and objective data were collected from two research voyages on a slamming-prone vessel. Full-scale vertical acceleration measurements were conducted near work and accommodation areas on the vessel. A daily diary survey was used to gather human responses among passengers. In addition, instantaneous slamming vibration comfort ratings were obtained by observers on the ship Bridge during a test sequence that purposefully induced slamming. The results indicate that two different approaches converged to the same VDV_{1hr} comfort threshold (0.41 m/s^{1.75} and 0.43 m/s^{1.75}), which corresponds to the limit where 50% of respondents indicated discomfort. A similar analysis using the r.m.s. metric converged to an identical threshold (0.03 m/s²), irrespective of the accumulated time of assessment.

- **Keywords:** Whole-body vibration discomfort threshold; Wave-induced slamming; Receiver operating characteristic analysis

Samuel Lamanuzzi, Geneviève Gill, SangHoon Yoon, Erika Renda, Julie N. Côté. *Effects of anti-fatigue lenses on performance, muscle activity and subjective discomfort responses during a seated computer task.* 103964.

Anti-fatigue lenses (AFL) intend to provide health benefits in association with computer work. Their effects on visual and muscle discomfort mechanisms and task performance remain unclear. Twenty-three computer users (n = 12 males) underwent two 90-min computer sessions with AFL or placebo lenses. Eye strain, body discomfort, typing performance, upper trapezius (UT) activation amplitude and variability, and neck posture were analyzed for time, condition, and sex effects. No significant effects of condition were observed on the dependent measures evaluated. Discomfort increased over time (neck/shoulder: $p < .001$), more so in females (eye strain: $p < .001$). Females' UT activation amplitude was negatively correlated to eye strain in the placebo condition ($p = .05$).

- **Keywords:** Musculoskeletal discomfort; Electromyography; Kinematics

Tim A. Bentley, Carlo Caponecchia, Leigh-ann Onnis, Yvonne Brunetto, Ben Farr-Wharton, Marcus Cattani, Abilio Neto, Alexis Vassiley. *A systems model for the design of occupational health and safety management systems inclusive of work-from-home arrangements.* 103966.

The study addressed an important knowledge gap in the literature by co-designing a model for OHS management systems inclusive of workers who work-from-home, with a focus on psychosocial risks. This qualitative research study utilised a series of co-design focus groups involving Australian regulators, health and safety managers and practitioners, senior managers, middle managers and workers who work-from-home, to better understand the types of measures that organisations can apply to improve their health and safety management systems. Using a systems approach, consideration was

given to the organisation of the remote working system, the home-work interface for remote workers, the competencies of managers and employees in regard to their occupation health and safety (OHS) responsibilities, and the complexity of identifying, reporting and monitoring psychosocial hazards for employees working from home. The study identified a need for tools designed to support both managers and workers in promoting psychologically safe working from home.

- **Keywords:** Work-from-home; Health and safety management systems; Psychosocial hazards

Evismar Andrade, Leo R. Quinlan, Richard Harte, Bronwyn Reid-McDermott, Frank Kirrane, Enda Fallon, Martina Kelly, Tony Hall, Michael Scully, John Laffey, Patrick Pladys, Ethel Ryan, Dara Byrne, Gearóid ÓLaighin. *The development and preliminary evaluation of a clinician e-learning training platform for a neonatal sepsis risk monitor for use in ICU settings.* 103990.

Background: Training clinicians on the use of hospital-based patient monitoring systems (PMS) is vital to mitigate the risk of use errors and of frustration using these devices, especially when used in ICU settings. PMS training is typically delivered through face-to-face training sessions in the hospital. However, it is not always feasible to deliver training in this format to all clinical staff given some constraints (e.g., availability of staff and trainers to attend in-person training sessions and the costs associated with face-to-face training). **Objective:** The literature indicates that E-learning has the potential to mitigate barriers associated with time restrictions for trainers and trainees and evidence shows it to be more flexible, and convenient for learners in healthcare settings. This study aimed to develop and carry out a preliminary evaluation via a case study of an e-learning training platform designed for a novel neonatal sepsis risk monitor system (Digi-NewB). **Methods:** A multi-modal qualitative research case study approach was used, including the analysis of three qualitative data sources: (i) audio/video recordings of simulation sessions in which participants were asked to operate the system as intended (e.g., update the clinical observations and monitor the sepsis risk), (ii) interviews with the simulation participants and an attending key opinion leader (KOL), who observed all simulation sessions, and (iii) post-simulation survey. **Results:** After receiving ethical approval for the study, nine neonatal intensive care unit (NICU) nurses completed the online training and participated in the simulation and follow-up interview sessions. The KOL was also interviewed, and seven out of the nine NICU nurses answered the post-simulation survey. The video/audio analysis of the simulations revealed that participants were able to use and interpret the Digi-NewB interface. Interviews with simulation participants and the KOL, and feedback extracted from the survey, revealed that participants were overall satisfied with the training platform and perceived it as an efficient and effective method to deliver medical device training. **Conclusions:** This study developed an online training platform to train clinicians in the use of a critical care medical device and carried out a preliminary evaluation of the platform via a case study. The e-learning platform was designed to supplement and enhance other training approaches. Further research is required to evaluate the effectiveness of this approach.

- **Keywords:** E-learning; Patient monitoring system; Training; Medical equipment; Human factors; Usability; Sepsis

Hiddadura Isura Malinda Mendis Abeynayake, Ravindra S. Goonetilleke, Albert Wijeweera, Uwe Reischl. *Efficacy of information extraction from bar, line, circular, bubble and radar graphs.* 103996.

With the emergence of enormous amounts of data, numerous ways to visualize such data have been used. Bar, circular, line, radar and bubble graphs that are ubiquitous were

investigated for their effectiveness. Fourteen participants performed four types of evaluations: between categories (cities), within categories (transport modes within a city), all categories, and a direct reading within a category from a graph. The representations were presented in random order and participants were asked to respond to sixteen questions to the best of their ability after visually scanning the related graph. There were two trials on two separate days for each participant. Eye movements were recorded using an eye tracker. Bar and line graphs show superiority over circular and radial graphs in effectiveness, efficiency, and perceived ease of use primarily due to eye saccades. The radar graph had the worst performance. "Vibration-type" fill pattern could be improved by adding colors and symbolic fills. Design guidelines are proposed for the effective representation of data so that the presentation and communication of information are effective.

- **Keywords:** Data representation; Data visualization; Information extraction

Alistair Cooper, Francesco Mazzeo, Patrick Waterson, Mark S. Young, Dominique Louis. *The use of Bayesian Belief Networks (BBNs) to probe deeper into railway safety management systems – Two studies from Great Britain and Italy.* 103968.

The importance of Safety Management Systems (SMS) to the railway industry is underlined by the fact that all organisations operating on UK railways are required by law to have one. Analysing SMSs can provide a reliable systemic tool to identify hazards and weaknesses within complex systems like the railway, making it possible to significantly increase safety, reducing the odds of near misses and accidents. However, there is little empirical research evidence to determine the impact on safety of a structured SMS. The current paper describes two studies which use Bayesian Belief Networks (BBN) to conceptualise SMSs and their impact on front-line performance. The paper presents the usefulness of BBNs to compare complex systems and reconcile cultural differences within the railway industry, identifying factors that are deemed vital within Italy and Britain. The two studies allowed us to identify the most influential factors within a SMS and how they interact with each other, as well as the strength of the identified relationships. A BBN is particularly useful in estimating how changing some of the node states (e.g., by making safety leadership present) affected the other factors. The current study showed that safety leadership has an impact on the SMSs of the British and Italian railway industries.

Yong-Ku Kong, Sang-Soo Park, Jin-Woo Shim, Kyeong-Hee Choi, Hyun-Ho Shim, Kiana Kia, Jeong Ho Kim. *A passive upper-limb exoskeleton reduced muscular loading during augmented reality interactions.* 103982.

The aim of this study was to evaluate a passive upper-limb exoskeleton as an ergonomic control to reduce the musculoskeletal load in the shoulders associated with augmented reality (AR) interactions. In a repeated-measures laboratory study, each of the 20 participants performed a series of AR tasks with and without a commercially-available upper-limb exoskeleton. During the AR tasks, muscle activity (anterior, middle, posterior deltoid, and upper trapezius), shoulder joint postures/moment, and self-reported discomfort were collected. The results showed that the exoskeleton significantly reduced muscle activity in the upper trapezius and deltoid muscle groups and self-reported discomfort. However, the shoulder postures and task performance measures were not affected by the exoskeleton during the AR interactions. Given the significant decrease in muscle activity and discomfort without compromising task performance, a passive exoskeleton can be an effective ergonomic control measure to reduce the risks of developing musculoskeletal discomfort or injuries in the shoulder regions.

- **Keywords:** 3-dimensional motion capture; Computer-human interaction; Passive exoskeletons; Musculoskeletal discomfort

Grégoire S. Larue, Christopher N. Watling, Mahrokh Khakzar, Danielle Villoresi, Sepehr Ghasemi Dehkordi. *Factors reducing the detectability of train horns by road users: A laboratory study.* 103984.

Level crossing safety is a well-researched safety issue worldwide, but little attention has been placed on the safety benefits of using train horns when a train approaches a level crossing. Given train horns' adverse effects on the health and well-being of residents living near rail tracks, the use of train horns must be beneficial to safety. The current study sought to determine in a laboratory environment whether road users (N = 31) can detect the range of train horns observed in Australia in terms of loudness and duration, using high-definition audio recordings from railway crossings. A repeated measures design was used to evaluate the effects of key factors likely to influence the detectability of train horns, including, visual and auditory distractive tasks, hearing loss and environmental noise (crossing bells). Train horn detectability was assessed based on participants' accuracy and reaction times. Results indicated the duration of the train horn had the most influential effect on the detectability of train horns, with short-duration train horns less likely to be detected. The presence of bells at a crossing was the second most important factor that limited train horn detection. Train horn loudness also affected detectability: faint blasts were less likely to be noticed, while loudest blasts were more likely to be noticed. However, loud horns reduced the ability to detect the side from which the train was approaching and may result in longer times to detect the train, in the field. The auditory distractive task reduced the train horn detection accuracy and increased reaction time. However, the visual distractive task and medium to severe hearing loss were not found to affect train horn detection. This laboratory study is the first to provide a broad understanding of the factors that affect the detectability of Australian train horns by road users. The findings from this study provide important insights into ways to reduce the use and modify the practice to mitigate the negative effects of train horns while maintaining the safety of road users.

- **Keywords:** Safety; Railway level crossings; Warning; Distraction; Hearing loss

Yoshitaka Maeda, Hiroshi Kawahira, Yoshikazu Asada, Shinichi Yamamoto, Masahisa Shimpo. *The effect of refresher training on fact description in medical incident report writing in the Japanese language.* 103987.

To maintain the effectiveness of the training (1st-Training Session: 1st-TS) to accurately describe facts in the medical incident reports (IRs) in Japanese, a refresher TS was designed and its effectiveness was examined. First, textual analysis showed that IRs' accuracy significantly decreased six months after the 1st-TS. Based on this result, the refresher TS was designed and conducted with 64 residents. To verify the refresher TS' effectiveness, IRs after the 1st-TS, six months later, and after the refresher TS were compared via text analysis. The results showed that the refresher TS restored the description rate of patient's background, safety check procedures, original work procedures, information on equipment used, reporter's actions, and post-incident response. The questionnaire was also administered and showed that the refresher TS contributed to residents' motivation to learn about IRs. In conclusion, the refresher TS contributed to sustaining the effect of the 1st-TS on accurately describing IRs.

- **Keywords:** Incident reporting; Accurate fact description; Patient safety education design

Nicholas E. Anton, Guoyang Zhou, Tera Hornbeck, Amy M. Nagle, Susan Norman, Anand D. Shroff, Denny Yu. *Detailing experienced nurse decision making during acute patient care simulations.* 103988.

Introduction: Nurse decision making (DM) is critical for patient safety. Eye-tracking methods can effectively assess nurse DM. The purpose of this pilot study was to use eye-tracking methods to assess nurse DM during a clinical simulation. **Materials and methods:** Experienced nurses managed a simulated patient manikin who suffered from a stroke mid-simulation. We assessed nurses' gaze patterns prior to and after the stroke. DM in general was assessed by nursing faculty using a clinical judgement rubric, and dichotomously based on recognition of the stroke or not. **Results:** Data from eight experienced nurses was examined. For the nurses who recognized the stroke, visual attention was focused on the vital sign monitor and patient's head, which suggest those locations were consistently examined for correct decision-makers. **Conclusions:** Dwell time on general AOIs was associated with poorer DM, which may reflect poorer pattern recognition. Eye-tracking metrics may be effective to objectively assess nurse DM.

- **Keywords:** Nursing; Eye-tracking; Simulation; Decision making