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Marek Bekier & Brett R. C Molesworth. *Altering user' acceptance of automation through prior automation exposure*. Pages: 745-753.

Air navigation service providers worldwide see increased use of automation as one solution to overcome the capacity constraints imbedded in the present air traffic management (ATM) system. However, increased use of automation within any system is dependent on user acceptance. The present research sought to determine if the point at which an individual is no longer willing to accept or cooperate with automation can be manipulated. Forty participants underwent training on a computer-based air traffic control programme, followed by two ATM exercises (order counterbalanced), one with and one without the aid of automation. Results revealed after exposure to a task with automation assistance, user acceptance of high(er) levels of automation ('tipping point') decreased; suggesting it is indeed possible to alter automation acceptance. **Practitioner Summary**: This paper investigates whether the point at which a user of automation rejects automation (i.e. 'tipping point') is constant or can be manipulated. The results revealed after exposure to a task with automation assistance, user acceptance of high(er) levels of automation decreased; suggesting it is possible to alter automation acceptance.

- **Keywords:** Automation, automation acceptance, decision-making, tipping point, air traffic management

Rich C. McIlroy & Neville A. Stanton. *What do people know about eco-driving?* Pages: 754-769.

An online survey of 321 respondents revealed that the majority of people are aware of eco-driving and have a positive attitude towards it. Although the types of eco-driving tips offered by respondents, and their potential effect on fuel consumption, were in line with those found in the popular and academic literature, knowledge of specific fuel saving behaviours was generally low. Relationships were found between environmental attitudes and knowledge of, and propensity to perform eco-driving behaviours; however, these relationships were weak, indicating that neither pro-environmental attitudes nor knowledge of eco-driving behaviours is strongly indicative of actual eco-driving performance. Males were found to be more knowledgeable of the means for driving in a

fuel-efficient manner than females; however, no effect was found for either age or level of general education. Results are discussed in terms of the challenges and opportunities for encouraging eco-driving, and the necessity for both governmental and industry involvement. **Practitioner Summary:** To successfully encourage the uptake of eco-driving (e.g. through policy, training and feedback) it is first necessary to understand how the general public perceives it, and what they already know of it. This survey study addresses this by looking at relationships between environmental attitudes and knowledge, and specific eco-driving measures.

- **Keywords:** Eco-driving, environmental attitudes, environmental behaviours, energy use, behaviour change

Paul Matthew Salmon, Natassia Goode, Antje Spiertz, Miles Thomas, Eryn Grant & Amanda Clacy. *Is it really good to talk? Testing the impact of providing concurrent verbal protocols on driving performance*. Pages: 770-779.

Questions have been raised regarding the impact that providing concurrent verbal protocols has on task performance in various settings; however, there has been little empirical testing of this in road transport. The aim of this study was to examine the impact of providing concurrent verbal protocols on driving performance. Participants drove an instrumented vehicle around a set route, twice whilst providing a concurrent verbal protocol, and twice without. A comparison revealed no differences in behaviour related to speed, braking and steering wheel angle when driving mid-block, but a significant difference in aspects of braking and acceleration at roundabouts. When not providing a verbal protocol, participants were found to brake harder on approach to a roundabout and accelerate more heavily coming out of roundabouts. It is concluded that providing verbal protocols may have a positive effect on braking and accelerating. Practical implications related to driver training and future research are discussed. **Practitioner Summary:** Verbal protocol analysis is used by ergonomists to understand aspects of cognition and decision-making during complex tasks such as driving and control room operation. This study examines the impact that it has on driving performance, providing evidence to support its continued use in ergonomics applications.

- **Keywords:** Driver behaviour, verbal protocol analysis, concurrent verbal protocol analysis, on-road studies

Steven L. Trawley, Amanda N. Stephens, Peter G. Rendell & John A. Groeger. *Prospective memory while driving: comparison of time- and event-based intentions*. Pages: 780-790.

Prospective memories can divert attentional resources from ongoing activities. However, it is unclear whether these effects and the theoretical accounts that seek to explain them will generalise to a complex real-world task such as driving. Twenty-four participants drove two simulated routes while maintaining a fixed headway with a lead vehicle. Drivers were given either event-based (e.g. arriving at a filling station) or time-based errands (e.g. on-board clock shows 3:30). In contrast to the predominant view in the literature which suggests time-based tasks are more demanding, drivers given event-based errands showed greater difficulty in mirroring lead vehicle speed changes compared to the time-based group. Results suggest that common everyday secondary tasks, such as scouting the roadside for a bank, may have a detrimental impact on driving performance. The additional finding that this cost was only evident with the event-based task highlights a potential area of both theoretical and practical interest. **Practitioner Summary:** Drivers were given either time- or event-based errands whilst engaged in a simulated drive. We examined the effect of errands on an ongoing vehicle follow task. In contrast to previous non-driving studies, event-based errands are more

disruptive. Common everyday errands may have a detrimental impact on driving performance.

- **Keywords:** Prospective memory, delayed intentions, distractions, virtual environment, driving simulator, driving

Julian Abich IV, Lauren Reinerman-Jones & Gerald Matthews. *Impact of three task demand factors on simulated unmanned system intelligence, surveillance, and reconnaissance operations*. Pages: 791-809.

The present study investigated how three task demand factors influenced performance, subjective workload and stress of novice intelligence, surveillance, and reconnaissance operators within a simulation of an unmanned ground vehicle. Manipulations were task type, dual-tasking and event rate. Participants were required to discriminate human targets within a street scene from a direct video feed (threat detection [TD] task) and detect changes in symbols presented in a map display (change detection [CD] task). Dual-tasking elevated workload and distress, and impaired performance for both tasks. However, with increasing event rate, CD task deteriorated, but TD improved. Thus, standard workload models provide a better guide to evaluating the demands of abstract symbols than to processing realistic human characters. Assessment of stress and workload may be especially important in the design and evaluation of systems in which human character critical signals must be detected in video images. **Practitioner Summary:** This experiment assessed subjective workload and stress during threat and CD tasks performed alone and in combination. Results indicated an increase in event rate led to significant improvements in performance during TD, but decrements during CD, yet both had associated increases in workload and engagement.

- **Keywords:** Workload, stress, unmanned systems, simulation, signal detection, change detection, change blindness

Jérôme Bourbousson & Marina Fortes-Bourbousson. *Fluctuations of the experience of togetherness within the team over time: task-cohesion and shared understanding throughout a sporting regular season*. Pages: 810-823.

Based on a diagnosis action research design, the present study assessed the fluctuations of the team experience of togetherness. Reported experiences of 12 basketball team members playing in the under-18 years old national championship were studied during a four-month training and competitive period. Time series analysis (Auto-Regressive Integrated Moving Average procedures) served to describe temporal properties of the way in which the fluctuations of task-cohesion and shared understanding were step-by-step experienced over time, respectively. Correlations, running-correlations and cross-lagged correlations were used to describe the temporal links that governed the relationships between both phenomena. The results indicated that the task-cohesion dimensions differed mainly for shared understanding dynamics in that their time fluctuations were not embedded in external events, and that the variations in shared understanding tend to precede 'individual attractions to the task' variations with seven team practical sessions. This study argues for further investigation of how 'togetherness' is experienced alternatively as a feeling of cohesion or shared understanding. **Practitioner Summary**: The present action research study investigated the experience that the team members have to share information during practice, and the subsequent benefices on team cohesion. Results call for specific interventions that make team members accept the fluctuating nature of team phenomena, to help them maintaining their daily efforts.

- **Keywords:** Team cognition, longitudinal study, ARIMA, team functioning

Jongil Lim, Christopher J. Palmer, Michael A. Busa, Avelino Amado, Luis D. Rosado, Scott W. Ducharme, Darnell Simon & Richard E. A. Van Emmerik. *Additional helmet and pack loading reduce situational awareness during the establishment of marksmanship posture*. Pages 824-836.

The pickup of visual information is critical for controlling movement and maintaining situational awareness in dangerous situations. Altered coordination while wearing protective equipment may impact the likelihood of injury or death. This investigation examined the consequences of load magnitude and distribution on situational awareness, segmental coordination and head gaze in several protective equipment ensembles. Twelve soldiers stepped down onto force plates and were instructed to quickly and accurately identify visual information while establishing marksmanship posture in protective equipment. Time to discriminate visual information was extended when additional pack and helmet loads were added, with the small increase in helmet load having the largest effect. Greater head-leading and in-phase trunk–head coordination were found with lighter pack loads, while trunk-leading coordination increased and head gaze dynamics were more disrupted in heavier pack loads. Additional armour load in the vest had no consequences for Time to discriminate, coordination or head dynamics. This suggests that the addition of head borne load be carefully considered when integrating new technology and that up-armouring does not necessarily have negative consequences for marksmanship performance. **Practitioner Summary:** Understanding the trade-space between protection and reductions in task performance continue to challenge those developing personal protective equipment. These methods provide an approach that can help optimise equipment design and loading techniques by quantifying changes in task performance and the emergent coordination dynamics that underlie that performance.

- **Keywords:** Coordination, personal protective equipment, situational awareness, task performance, survivability

Etienne Cusin, Manh-C. Do & Patrice R. Rougier. *How does wearing a lumbar orthosis interfere with gait initiation?* Pages: 837-843.

The interaction between medical devices and the human body must be evaluated in standardised laboratory tests. Since wearing a lumbar orthosis is assumed to reduce lower back mobility and reinforce trunk movement control through imposed lordosis, this device is expected to affect gait initiation which requires trunk and pelvic rotations. Thirteen healthy subjects were asked to initiate gait without orthosis (control) and orthosis with or without lordosis constraints. The biomechanical parameters usually reported for gait initiation were studied and no statistically significant effects were found. Indeed, the duration of the anticipation, and execution phases and maximal instantaneous velocity of centre of gravity at the end of the first step were not modified by the experimental conditions. The lack of interference underlines the robustness of the gait initiation parameters, which therefore may lead subjects to adopt adaptive strategies to retain this invariance. Future experiments should be conducted to highlight these strategies. **Practitioner Summary:** The aim of this study was to investigate the effect of various lumbar orthosis characteristics on gait initiation organisation. The results, based on a dynamic analysis of balance strategies, showed that the medical device had no repercussions on movement control. Several explanations are proposed, which should be validated by future studies.

- **Keywords:** Test, medical device, orthosis, gait initiation

Arthur Stewart, Robert Ledingham, Graham Furnace, Hector Williams & Susan Coleshaw. *Survival suit volume reduction associated with*

***immersion: implications for buoyancy estimation in offshore workers of different size*. Pages: 844-850.**

Rationale: It is currently unknown how body size affects buoyancy in submerged helicopter escape. *Method*: Eight healthy males aged 39.6 ± 12.6 year (mean ± SD) with BMI 22.0–40.0 kg m^{-2} wearing a standard survival ('dry') suit undertook a normal venting manoeuvre and underwent 3D scanning to assess body volume (wearing the suit) before and after immersion in a swimming pool. **Results**: Immersion-induced volume loss averaged 14.4 ± 5.4 l, decreased with increasing dry density (mass $volume^{-1}$) and theoretical buoyant force in 588 UK offshore workers was found to be 264 ± 46 and 232 ± 60 N using linear and power functions, respectively. Both approaches revealed heavier workers to have greater buoyant force. **Discussion**: While a larger sample may yield a more accurate buoyancy prediction, this study shows heavier workers are likely to have greater buoyancy. Without free-swimming capability to overcome such buoyancy, some individuals may possibly exceed the safe limit to enable escape from a submerged helicopter. **Practitioner Summary:** Air expulsion reduced total body volume of survival-suited volunteers following immersion by an amount inversely proportional to body size. When applied to 588 offshore workers, the predicted air loss suggested buoyant force to be greatest in the heaviest individuals, which may impede their ability to exit a submerged helicopter.

- **Keywords:** Survival suit, body volume, estimated buoyancy, offshore workers, 3D body scanning

Saad Alabdulkarim, Maury A. Nussbaum, Ehsan Rashedi, Sunwook Kim, Michael Agnew & Richard Gardner. *Impact of task design on task performance and injury risk: case study of a simulated drilling task*. Pages: 851-866.

Existing evidence is limited regarding the influence of task design on performance and ergonomic risk, or the association between these two outcomes. In a controlled experiment, we constructed a mock fuselage to simulate a drilling task common in aircraft manufacturing, and examined the effect of three levels of workstation adjustability on performance as measured by productivity (e.g. fuselage completion time) and quality (e.g. fuselage defective holes), and ergonomic risk as quantified using two common methods (rapid upper limb assessment and the strain index). The primary finding was that both productivity and quality significantly improved with increased adjustability, yet this occurred only when that adjustability succeeded in reducing ergonomic risk. Supporting the inverse association between ergonomic risk and performance, the condition with highest adjustability created the lowest ergonomic risk and the best performance while there was not a substantial difference in ergonomic risk between the other two conditions, in which performance was also comparable. **Practitioner Summary**: Findings of this study supported a causal relationship between task design and both ergonomic risk and performance, and that ergonomic risk and performance are inversely associated. While future work is needed under more realistic conditions and a broader population, these results may be useful for task (re)design and to help cost-justify some ergonomic interventions.

- **Keywords:** Ergonomic risk, performance, quality, adjustability, task design

Helen Cristina Nogueira, Luciana Cristina da Cunha Bueno Silva, Helenice Jane Cote Gil Coury, Dechristian França Barbieri & Ana Beatriz Oliveira. *Can experience modulate handler responses to boxes designed to decrease musculoskeletal load?* Pages: 867-875.

Biomechanical load during the handling of commercial (cardboard box with and without cut out) and non-commercial boxes (cardboard box with a retreat on the bottom edges), on experienced compared to inexperienced subjects was evaluated. Thirty-seven inexperienced and 21 experienced workers handled all boxes at shoulder and ground levels. Biomechanical load on upper limb was investigated through posture and electromyography (EMG) recordings. Comfort and effort were assessed immediately after each handling. In general, experienced workers had low range of motion. On the other hand, EMG was similar between both groups, except when non-commercial boxes were handled in non-favourable heights. Comfort was higher when a non-commercial box was handled versus a commercial one, regardless of the group. Both groups had a lower biomechanical load when handling the non-commercial boxes compared to the commercial ones. However, experienced workers did not have the same advantage as inexperienced subjects when handling those new boxes. **Practitioner Summary**: Box designs favouring intuitive hand coupling and more efficient postures have potential to reduce the risk of upper-limb musculoskeletal disorders in inexperienced subjects. However, ergonomist has to deal with workers on different levels of experience. Results of this study can support the development of effective recommendations for the working context.

- **Keywords:** Manual material handling, handles, experienced and inexperienced workers, biomechanics, occupational health

Derry Law, Mei-chun Cheung, Joanne Yip, Kit-Lun Yick & Christina Wong. *Scoliosis brace design: influence of visual aesthetics on user acceptance and compliance*. Pages: 876-886.

Adolescent idiopathic scoliosis is a common condition found in adolescents. A rigid brace is often prescribed as the treatment for this spinal deformity, which negatively affects user compliance due to the discomfort caused by the brace, and the psychological distress resulting from its appearance. However, the latter, which is the impact of visual aesthetics, has not been thoroughly studied for scoliosis braces. Therefore, a qualitative study with in-depth interviews has been carried out with 10 participants who have a Cobb angle of 20°–30° to determine the impact of visual aesthetics on user acceptance and compliance towards the brace. It is found that co-designing with patients on the aesthetic aspects of the surface design of the brace increases the level of user compliance and induces positive user perception. Therefore, aesthetic preferences need to be taken into consideration in the design process of braces. **Practitioner Summary**: The impact of visual aesthetics on user acceptance and compliance towards a rigid brace for scoliosis is investigated. The findings indicate that an aesthetically pleasing brace and the involvement of patients in the design process of the brace are important for increasing user compliance and addressing psychological issues during treatment.

- **Keywords:** Aesthetics, compliance, scoliosis, design