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Shane M. Dixon, Anna-Carin Nordvall, Wendy Cukier & W. Patrick Neumann. *Young consumers' considerations of healthy working conditions in purchasing decisions: a qualitative examination*. Pages: 601-612.

Research has suggested that products manufactured under healthy work conditions (HWC) may provide a marketing advantage to companies. This paper explores young consumers' considerations of HWC in purchasing decisions using data from qualitative interviews with a sample of 21 university students. The results suggest that interviewees frequently considered the working conditions of those who produced the products they purchased. Participants reported a willingness to pay 17.5% more on a \$100 product if it were produced under HWC compared to not. Their ability and willingness to act on this issue was, however, hampered by a lack of credible information about working conditions in production, the limited availability of HWC goods and a presumed higher price of HWC goods. While caution should be applied when generalising from this targetable market segment to a general population, these results provide actionable direction for companies interested in using a HWC brand image to gain a strategic sales advantage. **Practitioner Summary:** This interview study shows that young consumers are interested in, and willing to pay a premium for, goods made under healthy working conditions (HWC). Reported barriers to acting on this impulse include a lack of credible information on working conditions. Ergonomics can help provide a strategic marketing advantage for companies.

- **Keywords:** Ethical consumption, ergonomics, human factors strategy, Ergo-brand, marketing

Cecilia Berlin, W. Patrick Neumann, Nancy Theberge & Roland Örtengren. *'Power base' tactics for workplace change – an interview study with industrial engineers and ergonomists*. Pages: 613-627.

The work activities of industrial engineers (IEs) and ergonomists drive workplace changes. The purpose of this study is to compare the work practices of the two professions and examine (1) how IEs and ergonomists gain influence over workplace changes and (2) whether there are prevailing types of intentional interaction behaviours

called *Power bases (PB)* present in the interaction tactics they employ. The study identified key behavioural strategies used by the interviewees to successfully influence workplace changes; these were then mapped to their corresponding PB. Results showed that IEs and ergonomists were successfully influencing workplace changes using several tactics across the spectrum of PB, with the exception of *Reward* and *Coercion*. The study concludes with a list of recommended workplace change agent tactics, and proposes that a PB 'analytical lens' can serve to increase the budding ergonomists' critical and analytical skills when considering possible workplace change tactics. **Practitioner Summary:** This interview study examines how workplace ergonomics change agents, represented by the two professions: industrial engineers and ergonomists, perceive and exercise their capacity to influence workplace change. Key behavioural tactics that interviewees have found successful are reported, alongside effects on short- and long-term relations with other workplace-influencing stakeholders.

- **Keywords:** Organisational ergonomics, Organisational Design and Management, power bases, stakeholders, occupational health

Paul Rothmore, Paul Aylward, Jodi Gray & Jonathan Karnon. *A long-term evaluation of the stage of change approach and compensable injury outcomes – a cluster-randomised trial.* Pages: 628-635.

This study investigated the long-term injury outcomes for workers in companies from a range of industries which had been randomly allocated to receive ergonomics interventions tailored according to the stage of change (SOC) approach or standard ergonomics advice. Differences in compensable injury outcomes between the groups were analysed using logistic regression models. Questionnaire results from face-to-face interviews to assess musculoskeletal pain and discomfort (MSPD), job satisfaction and other factors were also analysed. Although not significant at the 0.05 level, after adjusting for workgroup clustering, workers in receipt of tailored advice were 55% (OR = 0.45, 95% CI = 0.19–1.08) less likely to report a compensable injury than those in receipt of standard ergonomics advice. Workload, job satisfaction and MSPD were significantly correlated with injury outcomes. The observed outcomes support the potential value of the SOC approach, as well as highlighting the need to consider workload, job satisfaction and MSPD when planning injury prevention programmes. **Practitioner Summary:** This study investigated compensable injury outcomes for workers who had received ergonomics advice tailored according to the stage of change (SOC) approach compared with standard ergonomics advice. The results support the potential value of the SOC approach and highlight the need to consider workload, job satisfaction and musculoskeletal pain and discomfort when planning injury prevention interventions.

- **Keywords:** Stage of change, ergonomics tools and methods, intervention effectiveness, musculoskeletal disorders

Shasank Nagavarapu, Steven A. Lavender & William S. Marras. *Spine loading during the application and removal of lifting slings: the effects of patient weight, bed height and work method.* Pages: 636-648.

The biomechanical loading on the lumbar spine was assessed as 12 female nurses applied and removed slings under two patients of differing weights (54 and 100 kg), using two work methods, and while working at three bed heights (56, 71, 93 cm). Three-dimensional spine loads at the L2/L3, L3/L4, L4/L5 and L5/S1 disc levels were measured using a validated EMG-assisted biomechanical model. Anterior/posterior (A/P) shear loading at the L5/S1 level consistently exceeded the tolerance threshold limit for disc failure. The peak compression values exceeded the 3400 N tolerance threshold for several participants when placing the sling under the 100-kg patient. In general, working from both sides of the bed generated slightly higher A/P shear loading than the one-sided

method. Raising the bed significantly decreased compression and A/P shear forces. Therefore, raising the bed to at least the nurse's knuckle height is recommended when applying and removing patient slings. **Practitioners Summary:** We investigated the spine loading associated with placing and removing slings used for the mechanised lifting of patients. Peak compression and anterior shear forces exceeded recognised thresholds when placing slings underneath heavier patients. Raising the bed to at least knuckle level helps mitigate these spinal loads.

- **Keywords:** Musculoskeletal disorders, patient handling, patient lifts, lifting sling, bed height

Hannah Rice, Joanne Fallowfield, Adrian Allsopp & Sharon Dixon. *Influence of a 12.8-km military load carriage activity on lower limb gait mechanics and muscle activity.* Pages: 649-656.

The high stress fracture occurrence in military populations has been associated with frequent load carriage activities. This study aimed to assess the influence of load carriage and of completing a load carriage training activity on gait characteristics. Thirty-two Royal Marine recruits completed a 12.8-km load carriage activity as part of their military training. Data were collected during walking in military boots, pre and post-activity, with and without the additional load (35.5 kg). Ground contact time, lower limb sagittal plane kinematics and kinetics, and electromyographic variables were obtained for each condition. When carrying load, there was increased ground contact time, increased joint flexion and joint moments, and increased plantar flexor and knee extensor muscle activity. Post-activity, there were no changes to kinematic variables, knee extensor moments were reduced, and there was evidence of plantar flexor muscle fatigue. The observed gait changes may be associated with stress fracture development. **Practitioner Summary:** This study identified gait changes due to load carriage and after a military load carriage training activity. Such activities are associated with lower limb stress fractures. A pre-post study design was used. Gait mechanics changed to a greater extent when carrying load, than after completion of the activity when assessed without load.

- **Keywords:** Load carriage, EMG, kinetics, kinematics, stress fracture

Ipek Ensari, Robert W. Motl, Rachel E. Klaren, Bo Fernhall, Denise L. Smith & Gavin P. Horn. *Firefighter exercise protocols conducted in an environmental chamber: developing a laboratory-based simulated firefighting protocol.* Pages: 657-668.

A standard exercise protocol that allows comparisons across various ergonomic studies would be of great value for researchers investigating the physical and physiological strains of firefighting and possible interventions for reducing the demands. We compared the pattern of cardiorespiratory changes from 21 firefighters during simulated firefighting activities using a newly developed firefighting activity station (FAS) and treadmill walking both performed within an identical laboratory setting. Data on cardiorespiratory parameters and core temperature were collected continuously using a portable metabolic unit and a wireless ingestible temperature probe. Repeated measures ANOVA indicated distinct patterns of change in cardiorespiratory parameters and heart rate between conditions. The pattern consisted of alternating periods of peaks and nadirs in the FAS that were qualitatively and quantitatively similar to live fire activities, whereas the same parameters increased logarithmically in the treadmill condition. Core temperature increased in a similarly for both conditions, although more rapidly in the FAS. **Practitioner Summary:** The firefighting activity station (FAS) yields a pattern of cardiorespiratory responses qualitatively and quantitatively similar to live fire activities, significantly different than treadmill walking. The FAS can be performed in a

laboratory/clinic, providing a potentially standardised protocol for testing interventions to improve health and safety and conducting return to duty decisions.

- **Keywords:** Firefighting, test protocol, oxygen consumption calorimetry, heart rate, core temperature

Peter G. Renden, Geert J. P. Savelsbergh & Raoul R. D. Oudejans. [Effects of reflex-based self-defence training on police performance in simulated high-pressure arrest situations](#). Pages: 669-679.

We investigated the effects of reflex-based self-defence training on police performance in simulated high-pressure arrest situations. Police officers received this training as well as a regular police arrest and self-defence skills training (control training) in a crossover design. Officers' performance was tested on several variables in six reality-based scenarios before and after each training intervention. Results showed improved performance after the reflex-based training, while there was no such effect of the regular police training. Improved performance could be attributed to better communication, situational awareness (scanning area, alertness), assertiveness, resolution, proportionality, control and converting primary responses into tactical movements. As officers trained complete violent situations (and not just physical skills), they learned to use their actions before physical contact for de-escalation but also for anticipation on possible attacks. Furthermore, they learned to respond against attacks with skills based on their primary reflexes. The results of this study seem to suggest that reflex-based self-defence training better prepares officers for performing in high-pressure arrest situations than the current form of police arrest and self-defence skills training.

Practitioner Summary: Police officers' performance in high-pressure arrest situations improved after a reflex-based self-defence training, while there was no such effect of a regular police training. As officers learned to anticipate on possible attacks and to respond with skills based on their primary reflexes, they were better able to perform effectively.

- **Keywords:** Anxiety, flinch, resilience, stress, threat

Rui-feng Yu, Lin-dong Yang & Xin Wu. *Risk factors and visual fatigue of baggage X-ray security screeners: a structural equation modelling analysis*. Pages: 680-691.

This study identified the risk factors influencing visual fatigue in baggage X-ray security screeners and estimated the strength of correlations between those factors and visual fatigue using structural equation modelling approach. Two hundred and five X-ray security screeners participated in a questionnaire survey. The result showed that satisfaction with the VDT's physical features and the work environment conditions were negatively correlated with the intensity of visual fatigue, whereas job stress and job burnout had direct positive influences. The path coefficient between the image quality of VDT and visual fatigue was not significant. The total effects of job burnout, job stress, the VDT's physical features and the work environment conditions on visual fatigue were 0.471, 0.469, -0.268 and -0.251 respectively. These findings indicated that both extrinsic factors relating to VDT and workplace environment and psychological factors including job burnout and job stress should be considered in the workplace design and work organisation of security screening tasks to reduce screeners' visual fatigue.

Practitioner Summary: This study identified the risk factors influencing visual fatigue in baggage X-ray security screeners and estimated the strength of correlations between those factors and visual fatigue. The findings were of great importance to the workplace design and the work organisation of security screening tasks to reduce screeners' visual fatigue.

- **Keywords:** Visual fatigue, structural equation model, work organisation, security screening

Kevin Hopkins, Steven J. Kass, Lisa Durrance Blalock & J. Christopher Brill. *Effectiveness of auditory and tactile crossmodal cues in a dual-task visual and auditory scenario*. Pages: 692-700.

In this study, we examined how spatially informative auditory and tactile cues affected participants' performance on a visual search task while they simultaneously performed a secondary auditory task. Visual search task performance was assessed via reaction time and accuracy. Tactile and auditory cues provided the approximate location of the visual target within the search display. The inclusion of tactile and auditory cues improved performance in comparison to the no-cue baseline conditions. In comparison to the no-cue conditions, both tactile and auditory cues resulted in faster response times in the visual search only (single task) and visual-auditory (dual-task) conditions. However, the effectiveness of auditory and tactile cueing for visual task accuracy was shown to be dependent on task-type condition. Crossmodal cueing remains a viable strategy for improving task performance without increasing attentional load within a singular sensory modality. **Practitioner Summary:** Crossmodal cueing with dual-task performance has not been widely explored, yet has practical applications. We examined the effects of auditory and tactile crossmodal cues on visual search performance, with and without a secondary auditory task. Tactile cues aided visual search accuracy when also engaged in a secondary auditory task, whereas auditory cues did not.

- **Keywords:** Auditory cueing, dual-task performance, multiple resource theory, tactile cueing, visual search

Caroline Ariën, Kris Brijs, Giovanni Vanroelen, Wesley Ceulemans, Ellen M. M. Jongen, Stijn Daniels, Tom Brijs & Geert Wets. *The effect of pavement markings on driving behaviour in curves: a simulator study*. Pages: 701-713.

This study investigates the effect of two pavement markings (transverse rumble strips (TRS) and a backward pointing herringbone pattern (HP)) on speed and lateral control in and nearby curves. Two real-world curves with strong indications of a safety problem were replicated as realistic as possible in the simulator. Results show that both speed and lateral control differ between the curves. These behavioural differences are probably due to curve-related dissimilarities with respect to geometric alignment, cross-sectional design and speed limit. TRS and HP both influenced mean speed and mean acceleration/deceleration but not lateral control. TRS generated an earlier and more stable speed reduction than HP which induced significant speed reductions along the curve. The TRS gives drivers more time to generate the right expectations about the upcoming curve. When accidents occur primarily near the curve entry, TRS is recommended. The HP has the potential to reduce accidents at the curve end. **Practitioner Summary:** Two pavement markings (transversal rumble strips and HP) nearby dangerous curves were investigated in the driving simulator. TRS generated an earlier and more stable speed reduction than HP which induced speed reductions along the curve. The TRS gives drivers more time to generate right expectations about the upcoming curve.

- **Keywords:** Horizontal curves, pavement markings, driving simulator, road safety engineering

Atsuo Murata, Kensuke Naitoh & Waldemar Karwowski. *A method for predicting the risk of virtual crashes in a simulated driving task using behavioural and subjective drowsiness measures*. Pages: 714-730.

This study proposed a procedure for predicting the point in time with high risk of virtual crash using a control chart methodology for behavioural measures during a simulated driving task. Tracking error, human back pressure, sitting pressure and horizontal and vertical neck bending angles were measured during the simulated driving task. The time with a high risk of a virtual crash occurred in 9 out of 10 participants. The time interval between the successfully detected point in time with high risk of virtual crash and the point in time of virtual crash ranged from 80 to 324 s. The proposed procedure for predicting the point in time with a high risk of a crash is promising for warning drivers of the state of high risk of crash. **Practitioner Summary:** Many fatal crashes occur due to drowsy driving. We proposed a method to predict the point in time with high risk of virtual crash before such a virtual crash occurs. This is done using behavioural measures during a simulated driving task. The effectiveness of the method is also demonstrated.

- **Keywords:** Automotive crash risk, behavioural measures, X-bar control chart, virtual crash, psychological rating of drowsiness

Yihun Jeong & Woojin Park. *Differences between obese and non-obese drivers in preferred vehicle interior components setting and driving posture.* Pages: 731-742.

This study compared obese and non-obese drivers in the preferred seat and steering wheel setting and preferred driving posture. Twenty-one extremely obese and 23 non-obese drivers participated. Each participant determined the most preferred setting of the interior components using an adjustable vehicle mock-up; the preferred components setting and corresponding preferred driving posture were recorded. The participant groups exhibited significant differences in the preferred interior components setting. The obese group created larger steering wheel-seat space than the non-obese, with greater rearward seat displacement, more upright steering wheel angle and smaller steering wheel column displacement. It also exhibited more upright seatback angle deemed necessary for facilitating steering wheel reach with the increased steering wheel-seat distance. The between-group differences in the preferred driving posture were less pronounced: no significant group mean angle differences were found except for the elbow joint angles. Also, the mean hip joint centre positions did not significantly differ. **Practitioner Summary:** To contribute to larger driver packaging, this study compared obese and non-obese drivers in the preferred vehicle interior components setting and driving posture. The obese group created significantly larger space between the steering wheel and seat than the non-obese, through interior components adjustments. The between-group postural differences were less pronounced.

- **Keywords:** Obesity, driving posture, vehicle interior components, occupant packaging