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**W. Patrick Neumann, Shane M. Dixon & Anna-Carin Nordvall. *Consumer demand as a driver of improved working conditions : the 'Ergo-Brand' proposition. pages 1113-1126.***

This article develops and explores the 'Ergo-Brand' proposition, which posits that consumers may prefer to buy goods that are made under good working conditions (GWCs). This preference would enhance a differentiation strategy for companies, thereby fostering the application of ergonomics in production. This proposition is developed in the context of a narrative review of the literature on 'ethical consumerism'. This is supplemented with a survey study, conducted in both Canada and Sweden ( $n = 141$ ) to explore this proposition. Results indicate that consumers would prefer goods made under GWCs, but not unconditionally as quality and price concerns were ranked higher. Access to information on the working conditions in production was seen as a barrier. Nevertheless, the Ergo-Brand concept may be a viable avenue in promoting attention towards ergonomics in companies – particularly if consumer habits are subject to intervention by advertising. Further research on this strategy is warranted. **Practitioner Summary:** The 'Ergo-Brand' proposition suggests that companies can gain competitive advantage because consumers prefer to buy goods made under good working condition – a goal of ergonomics. We relate this to the 'ethical consumer' research, and demonstrate in a survey that consumers report preferring goods made under good conditions.

- **Keywords:** consumer attitudes, ergonomics, human factors, healthy work conditions, ethical consumerism

**N. Keller, U. Czienskowski & M.A. Feufel. *Tying up loose ends : a method for constructing and evaluating decision aids that meet blunt and sharp-end goals. pages 1127-1139.***

We present a methodological framework for constructing and evaluating decision aids – fast and frugal trees (FFT) – ideally suited to the front line of an organisation. Their performance can be analysed in signal detection theory, allowing for transparent selection of FFTs given managerial-level trade-offs among type I and II errors. We extend FFTs from binary classification to selection from multiple actions (FFT multiple) as well as performance analysis to organisational goal states beyond type I and II error reduction. Concepts and framework are introduced and a tutorial-style example application (threat assessment at military checkpoints) is provided. Throughout, we

discuss ways to deal with missing or incomplete data and show that the performance of decision aids may be overestimated if the effectiveness of actions is not heeded. The methodology can be used to construct and evaluate decision aids in any area characterised by dichotomised cues and a one-to-many mapping between categorisation outcomes and actions. **Practitioner Summary:** The paper presents a methodological framework for the construction of decision aids and their evaluation along multiple goal states across institutional levels. We then apply this framework to construct and evaluate decision aids for threat assessment in military operations. Ways to deal with missing and incomplete data are discussed.

- **Keywords:** fast and frugal trees, signal detection theory, decision support, military personnel

**Jenny C.A. Read & Iwo Bohr. *User experience while viewing stereoscopic 3D television.* pages 1140-1153.**

3D display technologies have been linked to visual discomfort and fatigue. In a lab-based study with a between-subjects design, 433 viewers aged from 4 to 82 years watched the same movie in either 2D or stereo 3D (S3D), and subjectively reported on a range of aspects of their viewing experience. Our results suggest that a minority of viewers, around 14%, experience adverse effects due to viewing S3D, mainly headache and eyestrain. A control experiment where participants viewed 2D content through 3D glasses suggests that around 8% may report adverse effects which are not due directly to viewing S3D, but instead are due to the glasses or to negative preconceptions about S3D (the 'nocebo effect'). Women were slightly more likely than men to report adverse effects with S3D. We could not detect any link between pre-existing eye conditions or low stereoacuity and the likelihood of experiencing adverse effects with S3D. **Practitioner Summary:** Stereoscopic 3D (S3D) has been linked to visual discomfort and fatigue. Viewers watched the same movie in either 2D or stereo 3D (between-subjects design). Around 14% reported effects such as headache and eyestrain linked to S3D itself, while 8% report adverse effects attributable to 3D glasses or negative expectations.

- **Keywords:** stereoscopic displays, 3D television, stereo vision, binocular vision, eyestrain, visual fatigue

**Liesbeth Groenesteijn, Suzanne Hiemstra-van Mastrigt, Cedric Gallais, Merle Blok, Lottie Kuijt-Evers & Peter Vink. *Activities, postures and comfort perception of train passengers as input for train seat design.* pages 1154-1165.**

Working in the train is a part of new ways of working. However, the ideal working position is unknown. Moreover, the ideal position for leisure and relaxing is also unknown. This article defines what activities train passengers mainly perform and which corresponding postures are seen. Based on the observations on actual train rides, four main activities could be identified: Reading, Staring/sleeping, Talking and Working on laptop. Working on laptop was the activity with the longest duration and talking had the shortest duration. Associated with these four activities, a top eight of different postures were observed. Except for headrest comfort, comfort scores were not significantly different between activities. The top eight corresponding postures combined with comfort scores showed that per activity different postures were observed and the comfort scores varied in relation to the combination of posture and activity. Nearly for all activities, the majority of passengers preferred adjustability options to fit the seat to the performed activity. **Practitioner Summary:** The article is created for insight into activities, postures and comfort of seated train passengers. The results of this study can be used for designing comfortable seating in the transportation industry (train passengers, bus and aircraft seats) and for semi-public spaces to enable optimal support for the user in its activities.

- **Keywords:** train passenger comfort, activities, postures, seat design

**Vincenzo Occhionero, Leena Korpinen & Fabriziomaria Gobba. *Upper limb musculoskeletal disorders in healthcare personnel. pages 1166-1191.***

The literature on upper limb musculoskeletal disorders (UL-MSD) in different groups of healthcare workers was reviewed: 65 relevant studies were collected. In *dentists*, the neck was the most frequently affected segment, with prevalences up to 73% and exceeding 50% in 7 out of 12 studies. In *dental hygienists* and in *laboratory technicians*, the hand/wrist had the highest prevalence in the majority of the studies. In *nurses*, the most seriously affected anatomic sites were the neck and shoulders. *Physiotherapists* had the lowest prevalence of UL-MSD. A high prevalence of upper limb disease, mainly carpal tunnel syndrome, was reported in *dentists*, *dental hygienists*, *anesthesia nurses* and *endoscopists*. The high prevalence of upper limb disorders/diseases reported in health personnel supports the hypothesis of a significant risk in these workers. However, the possible role of biomechanical overload, as much as that of stress or other personal factors, cannot be currently assessed. **Practitioner Summary:** Published studies support the hypothesis of a significant risk of upper limb musculoskeletal disorders in healthcare activities. The neck was the most frequently affected segment in *dentists*, the hand/wrist in *dental hygienists* and in *laboratory technicians*, and the neck and shoulders in *nurses*. Lower prevalence was reported in *physiotherapists*. A high prevalence of carpal tunnel syndrome was also observed in various healthcare activities.

- **Keywords:** healthcare personnel, work-related disorders and diseases, neck, shoulder, elbow, hand–wrist, CTS

**R. Scott Dainty, Eric Alcorn, Chantelle A. Ferguson & Diane E. Gregory. *Prevalence of occupation-related pain among baristas and an examination of low back and shoulder demand during the preparation of espresso-based beverages. pages 1192-1200.***

Many baristas complain of low back pain (LBP) and upper extremity discomfort while at work. This study documented the prevalence of LBP and shoulder pain, via questionnaire, among a population of baristas to determine whether cumulative low back loads and shoulder moments are associated with pain reporting. Fifty-nine baristas completed the questionnaire; ten were also video-recorded for biomechanical analysis while making espresso beverages and cumulative and peak low back loads and shoulder moments were calculated. Seventy-three percent of those who completed the questionnaire reported having experienced LBP, and half attributed this pain to their job as a barista. Furthermore, 68% reported having experienced shoulder pain and half also attributed this pain to their job. Those who suffered from LBP had higher peak low back compression and those with shoulder pain had, in general, higher moments about their dominant shoulder. **Practitioner Summary:** This study found that, of those surveyed, at least half of baristas who suffer from low back or shoulder pain attributed this pain to their job. Furthermore, these individuals, in general, have higher loads in their low back and higher moments about their shoulders.

- **Keywords:** ergonomics, coffee-making, posture, cumulative loading

**Jin Qin, Jia-Hua Lin, Bryan Buchholz & Xu Xu. *Shoulder muscle fatigue development in young and older female adults during a repetitive manual task. pages 1201-1212.***

Age may modify the association between occupational physical demand and muscle loading, and ultimately increase the risk of musculoskeletal disorders. The goal of this study was to investigate age-related differences in shoulder muscle fatigue development

during a repetitive manual task. Twenty participants in two age groups completed an 80-minute simulated low-intensity assembly task. Electromyographic (EMG) manifestation of muscle fatigue was observed in the upper trapezius, deltoid and infraspinatus muscles in both age groups, and coincided with an increase in the subjective ratings of perceived exertions. Compared with the younger group, older group showed a more monotonic decrease in EMG power frequency in the upper trapezius and deltoid muscles. However, the age-related difference in EMG amplitude was less consistent. Relative rest time of the upper trapezius muscle in the older group was less than the young group throughout the task. The observed patterns of EMG measures suggest that older participants may have disadvantages in fatigue resistance in the upper trapezius and posterior deltoid muscles during the simulated repetitive manual task. **Practitioner Summary:** A rapidly ageing workforce in the USA and other countries poses new challenges for preventing work-related injuries. This study showed that during an 80-minute repetitive light manual work, older adults exhibited more consistent patterns of electromyographic manifestation of shoulder muscle fatigue and less rest in the upper trapezius muscle than young adults.

- **Keywords:** age, shoulder, muscle fatigue, electromyography, repetitive work

**Joo-Young Lee, Yota Yamamoto, Riichi Oe, Su-Young Son, Hitoshi Wakabayashi & Yutaka Tochiara.** *The European, Japanese and US protective helmet, gloves and boots for firefighters: thermoregulatory and psychological evaluations.* pages 1213-1221.

The purpose of this study was to investigate the physiological and subjective responses of the European, Japanese (JPN) and US firefighters' helmet, gloves and boots for international standardisation. Three experimental conditions were evaluated (clothing mass: 9.4, 8.2 and 10.1 kg for the three conditions, respectively) at the air temperature of 32°C and 60% relative humidity. The results showed that there was no significant difference among the three conditions in oxygen consumption, heart rate, total sweat rate, rectal temperature and mean skin temperature, whereas peripheral temperatures and subjective perceptions were lower in the JPN condition than in the other conditions ( $P < 0.05$ ). These results indicate that a 0.5-kg reduction in helmet mass and a 1.1-kg reduction in boot mass during exercise resulted in a significant decrease in head and leg temperatures and subjective perceptions, while a 1.9-kg reduction in total clothing mass had insignificant influences on the metabolic burden and overall body temperature. **Practitioner Summary:** International, European or American standards on firefighters' helmet, boots or gloves stipulate minimum requirements for the protection of firefighters, whereas comfort functions are relatively neglected. The structural differences in the officially approved helmets, gloves and boots can reduce regional thermoregulatory burdens and improve subjective perceptions.

- **Keywords:** firefighter, protective helmet, protective gloves, protective boots, thermoregulation

**Angelique A. Scharine, Mary S. Binseel, Timothy Mermagen & Tomasz R. Letowski.** *Sound localisation ability of soldiers wearing infantry ACH and PASGT helmets.* pages 1222-1243.

Helmets provide soldiers with ballistic and fragmentation protection but impair auditory spatial processing. Missed auditory information can be fatal for a soldier; therefore, helmet design requires compromise between protection and optimal acoustics. Twelve soldiers localised two sound signals presented from six azimuth angles and three levels of elevation presented at two intensity levels and with three background noises. Each participant completed the task while wearing no helmet and with two U.S. Army infantry helmets – the Personnel Armor System for Ground Troops (PASGT) helmet and the Advanced Combat Helmet (ACH). Results showed a significant effect of helmet type on

the size of both azimuth and elevation error. The effects of level, background noise, azimuth and elevation were found to be significant. There was no effect of sound signal type. As hypothesised, localisation accuracy was greatest when soldiers did not wear helmet, followed by the ACH. Performance was worst with the PASGT helmet. **Practitioner Summary:** A soldier's headgear provides ballistic protection but decreases his ability to accurately localise sound sources. Soldiers performed a sound localisation task with no helmet and while wearing each of two Army helmets. The study confirmed that the ACH had less impact on auditory spatial perception than the PASGT helmet.

- **Keywords:** auditory situation awareness, sound localisation, helmets, monaural localisation cues, spatial orientation

**Yu Huang & Michael J. Griffin. *The relative discomfort of noise and vibration : effects of stimulus duration.* pages 1244-1255.**

How noise discomfort and vibration discomfort depend on duration has not previously been compared. For five durations (2, 4, 8, 16 and 32 s), the subjective equivalence of noise and vibration was investigated with all 49 combinations of 7 levels of noise and 7 magnitudes of whole-body vertical vibration. The rates of increase in discomfort with increasing duration were similar for noise and vibration, whereas they are currently assumed to be 3 dB per doubling of noise duration and 1.5 dB per doubling of vibration duration. The discomfort caused by low levels of noise was masked by high magnitudes of vibration, and the discomfort caused by low magnitudes of vibration was masked by high levels of noise. As stimuli durations increased from 2 to 32 s, the influence of vibration on the judgement of noise discomfort decreased, whereas the influence of noise on the judgement of vibration discomfort was unchanged. **Practitioner Summary:** For predicting the relative discomfort caused by steady-state noise and steady-state vibration over durations from 2 to 32 s, the combination of average measures of sound and vibration (e.g. sound pressure level and root-mean-square acceleration) provide more accurate estimates than the combination of the principal standardised 'dose' measures (e.g. sound exposure level and vibration dose value).

- **Keywords:** noise, vibration, discomfort, duration

**H. Lunt, D. White, G. Long & M. Tipton. *Wearing a crotch strap on a correctly fitted lifejacket improves lifejacket performance.* pages 1256-1264.**

Wearing a lifejacket when immersed in water should support the wearer, maintaining their airway clear of the water. It is proposed that a retention system would improve airway protection by improving retention of the lifejacket around the torso. Study one ( $n = 10$ ) quantified the performance of lifejackets immediately following a step into water from height when a lifejacket was worn with a crotch strap (two different tightness) and without a crotch strap. Airway freeboard was improved when wearing a crotch strap ( $P < 0.05$ ) compared with no crotch strap. Study two used a manikin to examine the performance of lifejackets with and without a crotch strap during 3-h exposures to waves. During exposure to waves, the time taken to aspirate the lethal dose of seawater for drowning was doubled when wearing a crotch strap compared with the no-crotch-strap conditions ( $P < 0.001$ ). Therefore, wearing a crotch strap (functioning retention system) on a correctly fitted lifejacket improves airway protection following accidental immersion and prolonged wave exposure. **Practitioner Summary:** Following a step from height into water, wearing a crotch strap on a correctly fitted lifejacket improved lifejacket performance. Wearing a lifejacket with the crotch strap fitted minimised the reduction in lifejacket performance, compared with the no-crotch-strap condition, when exposed to waves for 3 h.

- **Keywords:** lifejacket retention, airway protection, drowning

**Masanori Ohta, Masaharu Kumashiro, Yasumasa Eguchi, Yusaku Morita, Yoshimasa Konno & Hiroshi Yamato. *The relationship between work ability and oxidative stress in Japanese workers.* pages 1265-1273.**

Work ability is based on the balance between personal resources and work demand. This study focused on the personal resources component of work ability. The aims of this study were to elucidate the association between work ability and cardiovascular (CV) risk factors, particularly oxidative stress, and to estimate the effect of a community-implemented lifestyle modification programme on work ability and CV risk factors. Urinary 8-iso-prostaglandin F<sub>2α</sub> (PGF<sub>2α</sub>), a biomarker of oxidative stress, was negatively correlated with psychological resources, as measured by the Work Ability Index (WAI). Overall WAI score was unchanged following the programme, while CV risk factors and antioxidative activity improved. A reduction in PGF<sub>2α</sub> levels was correlated with an improvement in subjective work ability relative to job demands, as assessed by a WAI item. Taken together, the results suggest that lifestyle modification programmes enhance the personal resources component of work ability and are associated with a reduction in oxidative stress. **Practitioner Summary:** We demonstrated the capacity of a lifestyle modification programme to augment personal resources by reducing CV risk factors such as oxidative stress. In addition, since the community-implemented lifestyle modification programme minimally affected work ability, 'worksites' health promotion programmes might more effectively enhance personal resources.

- **Keywords:** work ability, personal resources, oxidative stress, lifestyle modification, cardiovascular risk factors