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Zara Whysall, James Bowden & Michael Hewitt. *Sickness presenteeism: measurement and management challenges*. Pages: 341-354.

Since work can be restorative to health, attending work when unwell should not be viewed as an inherently negative phenomenon. However, the functional benefits are likely to depend on the health condition, and the psychosocial quality of the work provided. The current study used a workforce survey to explore differences in the pattern of presenteeism and absenteeism by health condition, the association of psychosocial work factors with presenteeism compared to absenteeism, and their interaction to predict health. Findings indicate that instead of substituting absenteeism for presenteeism, the two tend to coincide, but the balance differs by health condition. Presenteeism is more likely to occur in poorer psychosocial environments, reinforcing the importance of ensuring work is designed and managed in ways that are beneficial rather than detrimental to health. The findings also highlight the methodological importance of differentiating between the act and impact of presenteeism in future research and practice. **Practitioner Summary:** Effective management of work-related health requires that practitioners manage both sickness absence and presence together, since employees tend to fluctuate between the two when unwell. Interventions should be tailored to the specific health concern, paying particular attention to the psychosocial environment in enabling employees to continue working without exacerbating health.

- **Keywords:** Health risks, attitudes and behaviour, mental work capacity, musculoskeletal disorders, psychological stress

Nelson Ositadimma Oranye & Jayson Bennett. *Prevalence of work-related musculoskeletal and non-musculoskeletal injuries in health care workers: the implications for work disability management*. Pages: 355-366.

To compare the prevalence of musculoskeletal and non-musculoskeletal injuries in a cohort of workers in Manitoba health care sector, who made injury claims between 2002 and 2012. A retrospective study, using secondary data from WCB Manitoba. Logistic regression was used to determine odds ratios for nature of work-related injuries among different groups of workers. Idiopathic work-related musculoskeletal disorders (WMSD)

constituted 74.6% of all the injury claims. Injury risks varied between worker groups, and a significant difference was found within the female group, $\chi^2 = 13.4$, $p = 0.0094$, but not among the males. Compared to the married, single workers were more likely to experience traumatic than idiopathic injuries (OR = 1.72, CI, 1.28, 2.29), and much higher risk of traumatic injuries than non-WMSD (OR = 1.93, CI, 1.31, 2.84). Work-related injury risks vary significantly across occupations and worker groups, with idiopathic injuries being higher in high physical tasks. **Practitioner Summary:** To compare musculoskeletal and non-musculoskeletal injuries among workers in health care sector, and explore the implications for work disability management. Retrospective study, using workers' compensation claims data. The risk of idiopathic work-related musculoskeletal disorders continue to be high compared to traumatic and non-musculoskeletal disorders, particularly in tasks that involved high physical activities.

- **Keywords:** Idiopathic injuries, traumatic injuries, health care sector, work-related musculoskeletal disorders, workplace injuries

Michelle Cardoso, Colin McKinnon, Dan Viggiani, Michel J. Johnson, Jack P. Callaghan & Wayne J. Albert. *Biomechanical investigation of prolonged driving in an ergonomically designed truck seat prototype*. Pages: 367-380.

A postural evaluation during a prolonged driving task was conducted to determine the ergonomic validity of a new freely adjustable truck seat prototype. Twenty participants were recruited to perform two 2-h simulated driving sessions. Postures were assessed using motion capture, accelerometers and pressure pads. Subjective discomfort was also monitored in 15-min increments using ratings of perceived discomfort (RPD) and the Automotive Seating Discomfort Questionnaire. Participants had a more neutral spine posture during the first hour of the drive and reported lower RPDs while sitting in the prototype. Pairing the gluteal backrest panel with the adjustable seat pan helped reduce the average sitting pressure. The industry-standard truck seat may lead to the development of poor whole body posture, and the proposed ergonomic redesign of a new truck seat helped improve sitting posture and reduce perceived discomfort. **Practitioner Summary:** A new freely adjustable truck seat prototype was compared to an Industry standard seat to assess hypothesised improvements to sitting posture and discomfort for long haul driving. It was found that the adjustable panels in the prototype helped promote spine posture, reduce sitting pressure and improved discomfort ratings.

- **Keywords:** Prolonged sitting, seating, perceived discomfort, posture, ergonomic design

Peter Le, Alexander Aurand, Benjamin A. Walter, Thomas M. Best, Safdar N. Khan, Ehud Mendel & William S. Marras. *Development of a lumbar EMG-based coactivation index for the assessment of complex dynamic tasks*. Pages: 381-389.

The objective of this study was to develop and test an EMG-based coactivation index and compare it to a coactivation index defined by a biologically assisted lumbar spine model to differentiate between tasks. The purpose was to provide a universal approach to assess coactivation of a multi-muscle system when a computational model is not accessible. The EMG-based index developed utilised anthropometric-defined muscle characteristics driven by torso kinematics and EMG. Muscles were classified as agonists/antagonists based upon 'simulated' moments of the muscles relative to the total 'simulated' moment. Different tasks were used to test the range of the index including lifting, pushing and Valsalva. Results showed that the EMG-based index was comparable to the index defined by a biologically assisted model (r2 = 0.78). Overall, the EMG-based index provides a universal, usable method to assess the neuromuscular effort associated

with coactivation for complex dynamic tasks when the benefit of a biomechanical model is not available. **Practitioner Summary:** A universal coactivation index for the lumbar spine was developed to assess complex dynamic tasks. This method was validated relative to a model-based index for use when a high-end computational model is not available. Its simplicity allows for fewer inputs and usability for assessment of task ergonomics and rehabilitation.

- **Keywords:** Co-contraction, neuromuscular, trunk muscles, co-activation

Richard M. Kesler, Ipek Ensari, Rachel E. Bollaert, Robert W. Motl, Elizabeth T. Hsiao-Wecksler, Karl S. Rosengren, Bo Fernhall, Denise L. Smith & Gavin P. Horn. *Physiological response to firefighting activities of various work cycles using extended duration and prototype SCBA*. Pages: 390-403.

Firefighters' self-contained breathing apparatus (SCBA) protects the respiratory system during firefighting but increases the physiological burden. Extended duration SCBA (>30 min) have increased air supply, potentially increasing the duration of firefighting work cycles. To examine the effects of SCBA configuration and work cycle (length and rest), 30 firefighters completed seven trials using different SCBA and one or two bouts of simulated firefighting following work cycles common in the United States. Heart rate, core temperature, oxygen consumption, work output and self-reported perceptions were recorded during all activities. Varying SCBA resulted in few differences in these parameters. However, during a second bout, work output significantly declined while heart rates and core temperatures were elevated relative to a single bout. Thirty seven per cent of the subjects were unable to complete the second bout in at least one of the two-bout conditions. These firefighters had lower fitness and higher body mass than those who completed all assigned tasks. **Practitioner Summary**: The effects of extended duration SCBA and work/rest cycles on physiological parameters and work output have not been examined. Cylinder size had minimal effects, but extended work cycles with no rest resulted in increased physiological strain and decreased work output. This effect was more pronounced in firefighters with lower fitness.

- **Keywords:** Firefighting, heart rate, core temperature, work cycle, self-contained breathing apparatus

Gavin P. Horn, Richard M. Kesler, Steve Kerber, Kenneth W. Fent, Tad J. Schroeder, William S. Scott, Patricia C. Fehling, Bo Fernhall & Denise L. Smith. *Thermal response to firefighting activities in residential structure fires: impact of job assignment and suppression tactic*. Pages: 404-419.

Firefighters' thermal burden is generally attributed to high heat loads from the fire and metabolic heat generation, which may vary between job assignments and suppression tactic employed. Utilising a full-sized residential structure, firefighters were deployed in six job assignments utilising two attack tactics (1. Water applied from the *interior*, or 2. Exterior water application before *transitioning* to the interior). Environmental temperatures decreased after water application, but more rapidly with transitional attack. Local ambient temperatures for inside operation firefighters were higher than other positions (average ~10–30 °C). Rapid elevations in skin temperature were found for all job assignments other than outside command. Neck skin temperatures for inside attack firefighters were ~0.5 °C lower when the transitional tactic was employed. Significantly higher core temperatures were measured for the outside ventilation and overhaul positions than the inside positions (~0.6–0.9 °C). Firefighters working at all fireground positions must be monitored and relieved based on intensity and duration. **Practitioner Summary:** Testing was done to characterise the thermal burden experienced by firefighters in different job assignments who responded to controlled residential fires

(with typical furnishings) using two tactics. Ambient, skin and core temperatures varied based on job assignment and tactic employed, with rapid elevations in core temperature in many roles.

- **Keywords:** Firefighting, core temperature, heat stress, heat strain, body temperature

Yoon Jeong Baek, Dahee Jung, Su-Young Son & Joo-Young Lee. *Comparisons between Shikoro-type helmet with no hood and typical fire protective helmets with hood in a hot and humid environment*. Pages: 420-428.

The purpose of this study was to evaluate physiological and subjective responses while wearing the Shikoro-type helmet for firefighters when compared to typical helmets. Eight firefighters conducted a 30-min exercise at a 5 km h^{-1} in three helmet conditions at an air temperature of 32 °C with 70%RH. The results showed that no significant differences in rectal, mean skin temperature and physiological strain index among the three conditions were found during exercise and recovery. Skin temperatures on the cheek, ear and neck during exercise were significantly lower for the Shikoro-type condition ($p < 0.05$), but forehead temperature was greater for the Shikoro-type helmet when compared to the other conditions ($p < 0.05$). Statistical differences in thermal sensation and thermal comfort for overall and local body regions were not found among the three conditions. These results imply that the Shikoro-type helmet had local advantages in reducing skin temperatures on the face and neck. **Practitioner Summary:** Firefighters wear their helmet with its hood to protect the head and neck but a Shikoro type helmet has no fire protective hood. This study aimed to evaluate the comfort function of Shikoro helmet along with typical helmets. The results demonstrated thermal benefits of the Shikoro helmet on the head.

- **Keywords:** Fire protective helmet, fire protective hood, Shikoro-type helmet, physiological strain index, thermal comfort, evaporative heat loss

Veerle Ross, Alexandra Y. Vossen, Fren T. Y. Smulders, Robert A. C. Ruiter, Tom Brijs, Kris Brijs, Geert Wets & Ellen M. M. Jongen. *Measuring working memory load effects on electrophysiological markers of attention orienting during a simulated drive.* Pages: 429-443.

Intersection accidents result in a significant proportion of road fatalities, and attention allocation likely plays a role. Attention allocation may depend on (limited) working memory (WM) capacity. Driving is often combined with tasks increasing WM load, consequently impairing attention orienting. This study ($n = 22$) investigated WM load effects on event-related potentials (ERPs) related to attention orienting. A simulated driving environment allowed continuous lane-keeping measurement. Participants were asked to orient attention covertly towards the side indicated by an arrow, and to respond only to moving cars appearing on the attended side by pressing a button. WM load was manipulated using a concurrent memory task. ERPs showed typical attentional modulation (cue: contralateral negativity, LDAP; car: N1, P1, SN and P3) under low and high load conditions. With increased WM load, lane-keeping performance improved, while dual task performance degraded (memory task: increased error rate; orienting task: increased false alarms, smaller P3). **Practitioner Summary:** Intersection driver-support systems aim to improve traffic safety and flow. However, in-vehicle systems induce WM load, increasing the tendency to yield. Traffic flow reduces if drivers stop at inappropriate times, reducing the effectiveness of systems. Consequently, driver-support systems could include WM load measurement during driving in the development phase.

- **Keywords:** Attention orienting, working memory load, event-related potentials, driving simulation

Yee Mun Lee & Elizabeth Sheppard. *The effect of lighting conditions and use of headlights on drivers' perception and appraisal of approaching vehicles at junctions*. Pages: 444-455.

Use of Daytime Running Lights (DRL) is mandatory in many countries for motorcycles, and in some for cars. However, in developing countries, DRLs may be optional or compliance low. The effect of car or motorcycle headlights and lighting conditions on Malaysian drivers' ability to perceive and judge the safety of pulling out was investigated. Stimuli were photographs depicting either daytime or nighttime taken at a T-junction with approaching vehicles with headlights on or off. Headlights improved drivers' ability to perceive cars and motorcycles in the nighttime photographs but not the daytime photographs, although this could be due to the bright weather in the photographs. Drivers judged it less safe to pull out when approaching motorcycles had headlights on than off, regardless of the lighting conditions, supporting the utility of DRL for motorcycles. Headlights did not affect judgements for cars, questioning the utility of DRL for cars. **Practitioner Summary:** The effect of headlights and lighting conditions on drivers' ability to perceive and make judgements about the safety of pulling out was investigated. Daytime Running Lights influenced drivers' decision-making about the safety of pulling out in front of motorcycles, illustrating the importance of having automatic headlights equipped.

- **Keywords:** Driving, headlights, lighting conditions, motorcycle, perception

Olga Kombeiz & Anna Steidle. *Facilitation of creative performance by using blue and red accent lighting in work and learning areas*. Pages: 456-463.

Research has shown that colours influence motivation and cognitive performance. In achievement contexts, red evokes avoidance motivation that hinders creativity, while blue elicits an approach motivation that facilitates creativity. However, due to their position and mode of presentation, colours may convey a different message. Red accent lighting creates a cosy, friendly room atmosphere that may, even in an achievement context, elicit an approach rather than an avoidance motivation. Results (N = 146) showed that both blue and red accent light increased strategic approach motivation compared to white accent light. Moreover, through the heightened approach motivation, colourful accent light indirectly improved creative performance. Implications for future research on colour and practical implications for colour usage are discussed. **Practitioner Summary:** Designing work environments for creativity is a new topic in ergonomics research and practice. The present study demonstrates indirect effects of coloured accent light on creativity providing interesting possibilities for the design of workplaces for knowledge workers, classrooms and all other rooms in which people work on new ideas.

- **Keywords:** Coloured light, accent light, colour in context, creativity, approach motivation

Deirdre E. McGhee, Lauren G. Ramsay, Celeste E. Coltman, Sheridan A. Gho & Julie R. Steele. *Bra band size measurements derived from three-dimensional scans are not accurate in women with large, ptotic breasts*. Pages: 464-472.

This study investigated differences in standard measurements used to determine bra size, under-bust chest circumference (UBCC) and over-bust chest circumference (OBCC),

measured from a three-dimensional scan (hand-held scanner) compared to the direct measurement in 111 women (age 21–56 years; right breast volume 57–1672 mL; bra size 10A–18G). Bland–Altman plots of UBCC measurements showed a large positive bias and wide limits of agreement (12 cm; −4.6 to 28 cm), which increased as band size increased but decreased when the breasts were digitally removed from the scan prior to the UBCC measurement. The difference in UBCC measurements determined from scans compared to direct measurement had a strong positive correlation with breast volume and breast ptotis. The OBCC measurements showed a small positive bias (2.4 cm; −3.4 to 8.4), consistent across the range of bra sizes. Bra band size measurements determined from three-dimensional scans can be inaccurate in women with large, ptotic breasts. **Practitioner Summary:** We investigated potential errors in anthropometric data derived from three-dimensional scans used for bra design and fit. Bra band size measurements taken from three-dimensional scans were over-estimated in women with large breasts, whereas bra cup size measurements were accurate to within one-cup size across the entire range of bra sizes.

- **Keywords:** Anthropometry, bra size, three-dimensional scanning, breast, bra design