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Kevin Daniels, Cigdem Gedikli, David Watson, Antonina Semkina & Oluwafunmilayo Vaughn. *Job design, employment practices and well-being: a systematic review of intervention studies*. Pages: 1177-1196.

There is inconsistent evidence that deliberate attempts to improve job design realise improvements in well-being. We investigated the role of other employment practices, either as instruments for job redesign or as instruments that augment job redesign. Our primary outcome was well-being. Where studies also assessed performance, we considered performance as an outcome. We reviewed 33 intervention studies. We found that well-being and performance may be improved by: training workers to improve their own jobs; training coupled with job redesign; and system wide approaches that simultaneously enhance job design and a range of other employment practices. We found insufficient evidence to make any firm conclusions concerning the effects of training managers in job redesign and that participatory approaches to improving job design have mixed effects. Successful implementation of interventions was associated with worker involvement and engagement with interventions, managerial commitment to interventions and integration of interventions with other organisational systems. **Practitioner Summary:** Improvements in well-being and performance may be associated with system-wide approaches that simultaneously enhance job design, introduce a range of other employment practices and focus on worker welfare. Training may have a role in initiating job redesign or augmenting the effects of job design on well-being.

- **Keywords:** Well-being, job design, employment practices, interventions

Evie Michailidis & Mark Cropley. *Exploring predictors and consequences of embitterment in the workplace*. Pages: 1197-1206.

Research on the feeling of embitterment at work is still in its infancy. The present study investigated the predictors and consequences of the feeling of embitterment at work. It was hypothesised that organisational injustice as well as over-controlling supervision would predict embitterment at work and that embitterment would be associated with work-related rumination. Three hundred and thirty-seven employees completed an online survey. Regression analysis revealed that procedural injustice and over-controlling

supervision were significant predictors of embitterment and that embitterment contributed significantly to the prediction of increased affective rumination and reduction in detachment. Mediation analysis indicated that embitterment at work was a significant mechanism through which organisational injustice and over-controlling supervision exerted their effect on affective rumination, which is indicative of insufficient recovery from work. Findings suggest that breaches in organisational justice can generate feelings of embitterment at work, which in turn can interfere with employees' ability to adequately recover from work. **Practitioner Summary:** The purpose of this study was to investigate predictors and consequences of embitterment in the workplace using an online questionnaire. Findings suggest that perceived unfairness, because of structural and organisational aspects, predicts feelings of embitterment and that feeling embittered at work can prevent employees from adequately recovering from work.

- **Keywords:** Post-traumatic embitterment disorder, organisational justice, work-related rumination, recovery

Gitte Sofie Jakobsen, Anne Matilde Timm, Åse Marie Hansen, Anne Helene Garde & Kirsten Nabe-Nielsen. *The association between shift work and treatment-seeking migraine in Denmark*. Pages: 1207-1217.

In Europe, the one-year prevalence of migraine is 14.9% and migraine is on the top-10 list of leading causes of years lost to disability. Sleep disturbances and irregular daily routines are considered triggers of migraine and these factors are well-known consequences of shift work. We studied the association between treatment-seeking migraine and shift work, categorised as fixed evening work, fixed night work and variable working hours with and without night work in a Danish working population of 5872 participants. When compared with fixed day workers, only participants with fixed evening work were found to have significantly increased odds of reporting treatment-seeking migraine after adjustment for socio-demographic and behavioural covariates (OR = 1.56; 95% CI 1.05–2.32). Participants with seniority of 10 years or more notably accounted for this association. Due to the cross-sectional design, selection mechanisms may have biased the results. **Practitioner Summary:** The study showed higher odds of treatment-seeking migraine among evening workers even when taking a range of potential confounders into account. Due to the cross-sectional design, we cannot draw any causal inferences, but potential mechanisms underlying the present study are discussed, with an emphasis on possible selection into evening work.

- **Keywords:** Evening work, night work, headache, selection

Helena Jahncke, Staffan Hygge, Svend Erik Mathiassen, David Hallman, Susanna Mixter & Eugene Lyskov. *Variation at work: alternations between physically and mentally demanding tasks in blue-collar occupations*. Pages: 1218-1227.

The aims of this questionnaire study were to describe the occurrence and desired number of alternations between mental and physical tasks in industrial and non-industrial blue-collar work, and determine to which extent selected personal and occupational factors influence these conditions. On average, the 122 participating workers (55 females) reported to have close to four alternations per day between mental and physical tasks, and to desire more alternations than they actually had. They also expressed a general preference for performing a physical task after a mental task and vice versa. In univariate regression models, the desired change in task alternations was significantly associated with gender, age, occupation, years with current work tasks and perceived job control, while occupation was the only significant determinant in a multiple regression model including all factors. Our results suggest that alternations between productive physical and mental tasks could be a viable option in future job rotation. **Practitioner**

Summary: We addressed attitudes among blue-collar workers to alternations between physically and mentally demanding tasks. More alternations were desired than those occurring in the job, and workers preferred performing a physical task after a mental and vice versa. Alternating physical and mental tasks could, thus, be a viable option in job rotation.

- **Keywords:** Cognitive task, job rotation, pause, physical variation, repetitive work

Nancy St-Onge, Afshin Samani & Pascal Madeleine. *Integration of active pauses and pattern of muscular activity during computer work*. Pages: 1228-1239.

Submaximal isometric muscle contractions have been reported to increase variability of muscle activation during computer work; however, other types of active contractions may be more beneficial. Our objective was to determine which type of active pause vs. rest is more efficient in changing muscle activity pattern during a computer task. Asymptomatic regular computer users performed a standardised 20-min computer task four times, integrating a different type of pause: sub-maximal isometric contraction, dynamic contraction, postural exercise and rest. Surface electromyographic (SEMG) activity was recorded bilaterally from five neck/shoulder muscles. Root-mean-square decreased with isometric pauses in the cervical paraspinals, upper trapezius and middle trapezius, whereas it increased with rest. Variability in the pattern of muscular activity was not affected by any type of pause. Overall, no detrimental effects on the level of SEMG during active pauses were found suggesting that they could be implemented without a cost on activation level or variability. **Practitioner Summary:** We aimed to determine which type of active pause vs. rest is best in changing muscle activity pattern during a computer task. Asymptomatic computer users performed a standardised computer task integrating different types of pauses. Muscle activation decreased with isometric pauses in neck/shoulder muscles, suggesting their implementation during computer work.

- **Keywords:** Computer work interventions, neck/shoulder, electromyography, variability

Benjamin Lee-Bates, Daniel C. Billing, Peter Caputi, Greg L. Carstairs, Denise Linnane & Kane Middleton. *The application of subjective job task analysis techniques in physically demanding occupations: evidence for the presence of self-serving bias*. Pages: 1240-1249.

The aim of this study was to determine if perceptions of physically demanding job tasks are biased by employee demographics and employment profile characteristics including: age, sex, experience, length of tenure, rank and if they completed or supervised a task. Surveys were administered to 427 Royal Australian Navy personnel who characterised 33 tasks in terms of physical effort, importance, frequency, duration and vertical/horizontal distance travelled. Results showed no evidence of bias resulting from participant characteristics, however participants who were actively involved in both task participation and supervision rated these tasks as more important than those involved only in the supervision of that task. This may indicate self-serving bias in which participants that are more actively involved in a task had an inflated perception of that task's importance. These results have important implications for the conduct of job task analyses, especially the use of subjective methodologies in the development of scientifically defensible physical employment standards. **Practitioner Summary:** To examine the presence of systematic bias in subjective job task analysis methodologies, a survey was conducted on a sample of Royal Australian Navy personnel. The relationship between job task descriptions and participant's demographic and job profile characteristics revealed the presence of self-serving bias affecting perceptions of task importance.

- **Keywords:** Survey, employment standards, methodology, physically demanding occupation, bias

Sean Hudson, Carlton Cooke & Ray Lloyd. *The reliability of the Extra Load Index as a measure of relative load carriage economy*. Pages: 1250-1254.

The aim of this study was to measure the reliability of the extra load index (ELI) as a method for assessing relative load carriage economy. Seventeen volunteers (12 males, 5 females) performed walking trials at 3 km·h−1, 6 km·h−1 and a self-selected speed. Trial conditions were repeated 7 days later to assess test–retest reliability. Trials involved four 4-minute periods of walking, each separated by 5 min of rest. The initial stage was performed unloaded followed in a randomised order by a second unloaded period and walking with backpacks of 7 and 20 kg. Results show ELI values did not differ significantly between trials for any of the speeds ($p = 0.46$) with either of the additional loads ($p = 0.297$). The systematic bias, limits of agreement and coefficients of variation were small in all trial conditions. We conclude the ELI appears to be a reliable measure of relative load carriage economy. **Practitioner Summary:** This paper demonstrates that the ELI is a reliable measure of load carriage economy at a range of walking speeds with both a light and heavy load. The ELI, therefore, represents a useful tool for comparing the relative economy associated with different load carriage systems.

- **Keywords:** Load carriage, economy, reliability, physiology, ergonomics tools and methods

Vuk Ekmecic, Ning Jia, Thomas G. Cleveland, Maya Saulino, Jeff A. Nessler, George H. Crocker & Sean C. Newcomer. *Increasing surfboard volume reduces energy expenditure during paddling*. Pages: 1255-1260.

The purpose of this study was to investigate how altering surfboard volume (BV) affects energy expenditure during paddling. Twenty surfers paddled in a swim flume on five surfboards in random order twice. All surfboards varied only in thickness and ranged in BV from 28.4 to 37.4 L. Measurements of heart rate (HR), oxygen consumption (VO_2), pitch angle, roll angle and paddling cadence were measured. VO_2 and HR significantly decreased on thicker boards [VO_2: $r = -0.984$, $p = 0.003$; HR: $r = -0.972$, $p = 0.006$]. There was also a significant decrease in pitch and roll angles on thicker boards [Pitch: $r = -0.995$, $p < 0.001$; Roll: $r = -0.911$, $p = 0.031$]. Results from this study suggest that increasing BV reduces the metabolic cost of paddling as a result of lower pitch and roll angles, thus providing mechanical evidence for increased paddling efficiency on surfboards with more volume. **Practioner Summary:** This study investigated the impact of surfboard volume on energy expenditure during paddling. Results from this study suggest that increasing surfboard volume reduces the metabolic cost of paddling as a result of lower pitch and roll angles, thus providing mechanical evidence for increased paddling efficiency on surfboards with more volume.

- **Keywords:** Surfing, oxygen consumption, heart rate, paddling

Alain Chavaillaz & Juergen Sauer. *Operator adaptation to changes in system reliability under adaptable automation*. Pages: 1261-1272.

This experiment examined how operators coped with a change in system reliability between training and testing. Forty participants were trained for 3 h on a complex process control simulation modelling six levels of automation (LOA). In training, participants either experienced a high- (100%) or low-reliability system (50%). The impact of training experience on operator behaviour was examined during a 2.5 h testing session, in which participants either experienced a high- (100%) or low-reliability system

(60%). The results showed that most operators did not often switch between LOA. Most chose an LOA that relieved them of most tasks but maintained their decision authority. Training experience did not have a strong impact on the outcome measures (e.g. performance, complacency). Low system reliability led to decreased performance and self-confidence. Furthermore, complacency was observed under high system reliability. Overall, the findings suggest benefits of adaptable automation because it accommodates different operator preferences for LOA. **Practitioner Summary:** The present research shows that operators can adapt to changes in system reliability between training and testing sessions. Furthermore, it provides evidence that each operator has his/her preferred automation level. Since this preference varies strongly between operators, adaptable automation seems to be suitable to accommodate these large differences.

- **Keywords:** Automation, reliability, trust, training, complacency

Robert Ngueutsa & Dongo Rémi Kouabenan. *Accident history, risk perception and traffic safe behaviour*. Pages: 1273-1282.

This study clarifies the associations between accident history, perception of the riskiness of road travel and traffic safety behaviours by taking into account the number and severity of accidents experienced. A sample of 525 road users in Cameroon answered a questionnaire comprising items on perception of risk, safe behaviour and personal accident history. Participants who reported involvement in more than three accidents or involvement in a severe accident perceived road travel as less risky and also reported behaving less safely compared with those involved in fewer, or less severe accidents. The results have practical implications for the prevention of traffic accidents. **Practitioner Summary:** The associations between accident history, perceived risk of road travel and safe behaviour were investigated using self-report questionnaire data. Participants involved in more than three accidents, or in severe accidents, perceived road travel as less risky and also reported more unsafe behaviour compared with those involved in fewer, or less severe accidents. Campaigns targeting people with a less serious, less extensive accident history should aim to increase awareness of hazards and the potential severity of their consequences, as well as emphasising how easy it is to take the recommended preventive actions. Campaigns targeting those involved in more frequent accidents, and survivors of serious accidents, should address feelings of invulnerability and helplessness.

- **Keywords:** Accident history, prevention, risk perception, safe behaviour, road safety

Dick de Waard, Frank Westerhuis, Danielle Joling, Stella Weiland, Ronja Stadtbäumer & Leonie Kaltofen. *Visual map and instruction-based bicycle navigation: a comparison of effects on behaviour*. Pages: 1283-1296.

Cycling with a classic paper map was compared with navigating with a moving map displayed on a smartphone, and with auditory, and visual turn-by-turn route guidance. Spatial skills were found to be related to navigation performance, however only when navigating from a paper or electronic map, not with turn-by-turn (instruction based) navigation. While navigating, 25% of the time cyclists fixated at the devices that present visual information. Navigating from a paper map required most mental effort and both young and older cyclists preferred electronic over paper map navigation. In particular a turn-by-turn dedicated guidance device was favoured. Visual maps are in particular useful for cyclists with higher spatial skills. Turn-by-turn information is used by all cyclists, and it is useful to make these directions available in all devices. **Practitioner Summary:** Electronic navigation devices are preferred over a paper map. People with lower spatial skills benefit most from turn-by-turn guidance information, presented either auditory or on a dedicated device. People with higher spatial skills perform well with all

devices. It is advised to keep in mind that all users benefit from turn-by-turn information when developing a navigation device for cyclists.

- **Keywords:** Navigation, spatial ability, map, ageing, cycling

P. Ella Braat-Eggen, Anne van Heijst, Maarten Hornikx & Armin Kohlrausch. *Noise disturbance in open-plan study environments: a field study on noise sources, student tasks and room acoustic parameters*. Pages: 1297-1314.

The aim of this study is to gain more insight in the assessment of noise in open-plan study environments and to reveal correlations between noise disturbance experienced by students and the noise sources they perceive, the tasks they perform and the acoustic parameters of the open-plan study environment they work in. Data were collected in five open-plan study environments at universities in the Netherlands. A questionnaire was used to investigate student tasks, perceived sound sources and their perceived disturbance, and sound measurements were performed to determine the room acoustic parameters. This study shows that 38% of the surveyed students are disturbed by background noise in an open-plan study environment. Students are mostly disturbed by speech when performing complex cognitive tasks like studying for an exam, reading and writing. Significant but weak correlations were found between the room acoustic parameters and noise disturbance of students. **Practitioner Summary:** A field study was conducted to gain more insight in the assessment of noise in open-plan study environments at universities in the Netherlands. More than one third of the students was disturbed by noise. An interaction effect was found for task type, source type and room acoustic parameters.

- **Keywords:** Open-plan study environment, noise, higher education, tasks, acoustics