



Emerging Evidence Alert September 2019

This Emerging Evidence Alert includes the latest peer-reviewed articles, reports and evidence on a range of workplace health and safety, prevention, recovery at work and return to work topics. It presents a review of recent journal articles or relevant content related to the five Comcare research themes of: enabling healthy and safe workplaces; enhancing employer capability; guiding and supporting mental health; fostering work participation; and the future of work. Articles are collated articles published in August 2019 only.

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1. Level of Evidence – certain study designs are scientifically stronger at answering a question. The scoring hierarchy we provided is presented below

Level of Evidence	Description
Level 1	Evidence from a systematic review or meta-analysis of relevant studies.
Level 2	Evidence from a randomised controlled trial
Level 3	Evidence from a controlled intervention trial without randomisation (i.e. quasi-experimental).
Level 4	Evidence from a case-control or cohort study.
Level 5	Evidence from a single case study, a case series, or qualitative study.
Level 6	Evidence from opinion pieces, reports of expert committees and/or from literature reviews (scoping or narrative).

2. Relevance – research carried out in Australia or similar countries is most relevant to Australian readers

Level	Description
A	Study conducted in Australia or the study has been conducted outside Australia but confounders unlikely to affect relevance
B	Study conducted outside Australia and confounders likely to affect generalisability

Body stressing in the office and on the road

Body stressing is a serious risk factor for physical and mental health conditions for office workers and transport drivers.

[BeUpstanding](#) is a free, evidence based program that aims to raise awareness about the risks associated with prolonged sitting in the office. The BeUpstanding team are [recruiting workplaces](#) to participate in this world first research project. The program is free and includes an online toolkit, data driven feedback, and a custom Team Performance Report.

A [new survey](#) led by Monash University and the NSW Centre for Work Health & Safety is also focused on body stressing and mental health. Co-funded by the Transport Workers Union and Linfox, the survey is part of a three-phase research program that aims to develop a better understanding of the factors impacting truck driver health.

Fostering Work Participation and Recovery

Work ability

Work ability and job survival: Four-year follow-up.

Background: Employees with impaired work ability might be at higher risk of remaining shorter in the job than those with adequate work ability. The aim of the study was to establish whether work ability plays a role in job survival. Methods: Four-year follow-up (2008-2012) study of 1037 employees of a hospital in São Paulo, Brazil. Work ability was categorized as "adequate" or "impaired". Employment status at the end of follow-up was categorized as active, resignation or dismissal. Survival analysis was performed using the Kaplan-Meier method and the Cox proportional-hazards model. Results: About 78.9% of the participants had adequate and 21.1% impaired work ability. Job survival was longer for the participants with adequate work ability independently from the type of job termination ($p < 0.001$). The odds of job termination were higher for the participants with impaired work ability ($p < 0.001$) who either resigned (hazard ratio-HR = 1.58) or were dismissed (HR = 1.68). Conclusion: Job survival was shorter for the employees with impaired work ability independently from the type of job termination. It was also shorter for the employees who were dismissed compared to those who resigned. Duration in the job might be extended through actions to enhance work ability.

Martinez et al. 2019.

International Journal of Environmental Research and Public Health, vol. 16, no. 17.

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Keywords: Aging; Healthcare worker; Life course; Longitudinal studies; Prolonged work career; Work ability

Evidence Level: 4B

Link: <https://www.mdpi.com/1660-4601/16/17/3143>

Educational differences in duration of working life and loss of paid employment: working life expectancy in the Netherlands.

This study explored the educational differences in duration of working life by working life expectancy (WLE) and working years lost (WYL) through disability benefits and other non-employment states in the Netherlands. The study found that among low-educated workers, more working years are lost due to unemployment, no income, and especially disability benefits. The latter reflects large educational inequalities in health and working conditions.

Robroek et al. 2019.

Scandinavian Journal of Work, Environment and Health, [Epub ahead of print]

Keywords: Working life expectancy; Loss of paid employment; Education; Working years lost

Evidence Level: 4A

Link: http://www.sjweh.fi/show_abstract.php?abstract_id=3843

Determinants of occupational outcome in recent-onset psychosis: The role of cognition.

Working or studying is a common goal among people with recent-onset psychosis. Cognitive deficits have been reported to influence occupational outcome, but to date few studies have evaluated if cognitive deficits independently predict occupational outcome when taking into account other important determinants, such as self-esteem, motivation, length of time absent from employment/school, job/school search behaviours, subjective cognitive complaints and psychotic symptoms. Hence, this longitudinal study aimed to evaluate the role of cognition, as well as other key factors relevant to occupational outcome, to predict occupational status six months after baseline in people with recent-onset psychosis. A total of 27 participants receiving treatment in rehabilitation programs were included in the study. Neuropsychological, psychological, clinical and occupational measures were administered at baseline, and occupational status was collected

six months later. Ordinal regression indicated that working memory and length of time absent from employment/school at baseline predicted 48.1% of the variance of occupational status at six months, with both variables showing a unique significant contribution to the model. These results suggest that working memory could be integrated in comprehensive models of occupational outcome in people with recent-onset psychosis. In addition, supported employment and education programs could target cognitive deficits and length of time absent from employment/school to help these individuals to acquire a job or return to school given their strong predictive value on occupational outcome.

Pothier et al. 2019.

Schizophrenia Research: Cognition, vol. 18.

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Keywords: Cognition; Cognitive remediation; Occupational outcome; Recent-onset psychosis; Recovery; Rehabilitation program

Evidence Level: 4A

Link: <https://www.sciencedirect.com/science/article/pii/S2215001319300113?via%3Dihub>

Early intervention

Early occupational intervention for people with low back pain in physically demanding jobs: A randomized clinical trial.

Background: Occupational medicine seeks to reduce sick leave; however, evidence for an add-on effect to usual care is sparse. The objective of the GOBACK trial was to test whether people with low back pain (LBP) in physically demanding jobs and at risk of sick leave gain additional benefit from a 3-month complex intervention that involves occupational medicine consultations, a work-related evaluation and workplace intervention plan, an optional workplace visit, and a physical activity program, over a single hospital consultation and an MRI. Methods: We enrolled people from the capital region of Denmark to an open-label, parallel-group randomized controlled trial with a superiority design from March 2014 through December 2015. In a hospital setting 305 participants (99 women) with LBP and in physically demanding jobs were randomized to occupational intervention (n = 153) or no additional intervention (control group; n = 152) added to a single hospital consultation giving a thorough explanation of the pain (i.e., clinical examination and MRI) and instructions to stay active and continue working. Primary outcome was accumulated sick leave days due to LBP during 6 months. Secondary outcomes were changes in neuropathic pain (painDETECT questionnaire [PDQ]), pain 0-10 numerical rating scale (NRS), Fear-Avoidance Beliefs Questionnaire (FABQ), Roland-Morris Disability Questionnaire (RMDQ), Short Form Health Survey (SF-36) for physical and mental health-related quality of life (HRQoL), and self-assessed ability to continue working (range 0-10). An intention-to-treat analysis of sick leave at 6 months showed no significant difference between groups (mean difference in days suggestively in favor of no additional intervention: 3.50 [95% CI -5.08 to 12.07], P = 0.42). Both groups showed significant improvements in average pain score (NRS), disability (RMDQ), fear-avoidance beliefs about physical activities and work (FABQ), and physical HRQoL (SF-36 physical component summary); there were no significant differences between the groups in any secondary outcome. There was no statistically significant improvement in neuropathic pain (PDQ score), mental HRQoL (SF-36 mental component summary), and self-assessed ability to stay in job. Four participants could not complete the MRI or the intervention due to a claustrophobic attack or accentuated back pain. Workplace visits may be an important element in the occupational intervention, although not always needed. A per-protocol analysis that included the 40 participants in the intervention arm who received a workplace visit as part of the additional occupational intervention did not show an add-on benefit in terms of sick leave (available cases after 6 months, mean difference: -0.43 days

[95% CI -12.8 to 11.94], P = 0.945). The main limitations were the small number of sick leave days taken and that the comprehensive use of MRI may limit generalization of the findings to other settings, for example, general practice. Conclusions: When given a single hospital consultation and MRI, people in physically demanding jobs at risk of sick leave due to LBP did not benefit from a complex additional occupational intervention. Occupational interventions aimed at limiting biopsychological obstacles (e.g., fear-avoidance beliefs and behaviors), barriers in the workplace, and system barriers seem essential to reduce sick leave in patients with LBP. This study indicates that these obstacles and barriers may be addressed by thorough usual care.

Hansen et al. 2019.

PLoS Med, vol. 16, no. 8.

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Keywords: Early occupational intervention; Low back pain; Physically demanding job; Sick leave; Occupational medicine

Evidence Level: 2A

Link: <https://journals.plos.org/plosmedicine/article?id=10.1371/journal.pmed.1002898>

Disability

Trajectories of future sickness absence and disability pension days among individuals with a new sickness absence spell due to osteoarthritis diagnosis ≥ 21 days: a prospective cohort study with 13-month follow-up.

Introduction: Osteoarthritis is one of the most common types of musculoskeletal diagnoses also among working-age populations, and often leads to long-term sickness absence (SA) spells or even disability pension (DP). Aim: To identify future trajectories of days of SA and/or DP among people with a new SA spell due to osteoarthritis that became ≥ 21 long, and to investigate sociodemographic and morbidity characteristics of individuals in identified trajectories. Methods: This is a prospective population-based cohort study using data from several Swedish registers. We studied future SA/DP among all 4894 individuals aged 16-64 years who, during the first 6 months of 2010, had an incident SA spell due to osteoarthritis (ICD-10 codes M15-19) ≥ 21 days. Using group-based trajectory modelling, we identified trajectories of mean SA/DP net days/month and 95% CIs for the 13 months from the 21st day of the index SA spell. Sociodemographic and morbidity characteristics were compared by χ^2 tests and multinomial logistic regression. Results: We identified five trajectories of SA/DP days: 'fast decrease' (36% of the cohort), 'medium fast decrease' (29%), 'slow decrease' (15%), 'fluctuating' (12%) and 'late decrease' (8%). Individuals in the two trajectories who still had SA/DP days at end of follow-up (late decrease and fluctuating) were more likely to be older, born outside the EU and have indicators of more severe morbidity than those in the other trajectories. Conclusion: Five trajectories of future SA/DP days were identified; 80% of the cohort belonged to trajectories with no SA/DP by the end of follow-up. Identifying trajectories of future SA/DP provides new insights regarding the developments of SA/DP over time among people on SA due to osteoarthritis; not only days in the initial SA spell but also in new spells during follow-up need to be included for a better understanding.

Farrants et al. 2019.

BMJ Open, vol. 9, no. 8.

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Keywords: Disability pension; Osteoarthritis; Return to work; Sick leave

Evidence Level: 4A

Link: <https://bmjopen.bmj.com/content/9/8/e030054.long>

Enhancing Employer Capability

Organisational issues

Organizational culture and job demands and resources: Their impact on employees' wellbeing in a multivariate multilevel model.

(1) The present study aims to explore the impact of job demands and resources (JDR), personal resources, and the organizational culture on workers' wellbeing and health. (2) A cross-sectional survey of Spanish workers in small and medium-sized enterprises (SMEs) was conducted with a sample of 1599 workers from 154 SMEs. A multivariate multilevel analysis was performed to analyze the different relationships. (3) In light of the results obtained, we observed that job demands were negatively associated with workers' health, while job resources were positively correlated to workers' health and wellbeing. Secondly, the different types of identification at work are positively related to job satisfaction and organizational citizenship behaviors (OCBs), but the intensity of this association differs with the form of identification. Finally, at the organization level, the dimensions of organizational culture are related differently to employees' job satisfaction, OCBs, and health; (4) these results confirm the role of organizational culture and its association with desirable outcomes, allowing us to expand the JDR model.

Lopez-Martin et al. 2019.

International Journal of Environmental Research and Public Health, vol. 16, no. 17.

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Keywords: JDR theory; Group and organizational identification; Job satisfaction; Organizational citizenship behavior; Organizational culture; Professional identity

Evidence Level: 4B

Link: <https://www.mdpi.com/1660-4601/16/17/3006>

Examining the association of changes in minimum wage with health across race/ethnicity and gender in the United States.

Background: The minimum wage creates both winners (through wage increases) and-potentially-losers (through job losses). Research on the health effects of minimum wage policies has been sparse, particularly across gender and among racial/ethnic minorities. We test the impact of minimum wage increases on health outcomes, health behaviors and access to healthcare across gender and race/ethnicity. **Methods:** Using 1993-2014 data from the Behavioral Risk Factor Surveillance System, variables for access to healthcare (insurance coverage, missed care due to cost), health behavior (exercise, fruit, vegetable and alcohol consumption) and health outcomes (self-reported fair/poor health, hypertension, poor physical health days, poor mental health days, unhealthy days) were regressed on the product of the ratio of the 1-year lagged minimum wage to the state median wage and the national median wage, using Linear Probability Models and Poisson Regression Models for dichotomous and count outcomes, respectively. Regressions (total population, gender-stratified, race/ethnicity stratified (white, black, Latino), gender/race/ethnicity stratified and total population with interaction terms for race/ethnicity/gender) controlled for state-level ecologic variables, individual-level demographics and fixed-effects (state and year). Results were adjusted for complex survey design and Bonferroni corrections were applied to p-values such that the level of statistical significance for a given outcome category was 0.05 divided by the number of outcomes in that category. **Results:** Minimum wage increases were positively associated with access to care among white men, black women and Latino women but negatively associated with access to care among white women and black men. With respect to dietary quality, minimum wage increases were associated with improvements, mixed results and negative impacts among white, Latino and black men, respectively. With respect to health outcomes, minimum wage increases were associated with positive, negative and mixed impacts among white women, white men and Latino men, respectively. **Conclusions:** While there is enthusiasm for

minimum wage increases in the public health community, such increases may have to be paired with deliberate strategies to protect workers that might be vulnerable to economic dislocation. Such strategies may include more robust unemployment insurance or increased access to job training for displaced workers.

Narain et al. 2019.

BMC Public Health, vol. 19, no. 1.

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Keywords: Health disparities; Minimum wage; Public policy; Race/ethnicity

Evidence Level: 4B

Link: <https://bmcpublichealth.biomedcentral.com/articles/10.1186/s12889-019-7376-y>

Shift work

Effectiveness of an online CBT-I intervention and a face-to-face treatment for shift work sleep disorder: A comparison of sleep diary data.

In western societies, about one in six employees works in shifts. Shiftwork is associated with a number of poor somatic and psychological health outcomes, especially sleep issues. Higher rates of absenteeism and accidents in the workplace are possible consequences. Still, prevention programs and treatment options that are specifically tailored to shift-workers' needs are rare. We devised a 4-week online cognitive behavioral therapy for insomnia (CBT-I) intervention (n = 21) and compared sleep outcomes to a face-to-face outpatient treatment for shift-workers (n = 12) using a sleep diary and the Epworth Sleepiness Scale (ESS). In the online sample, measures also included the World Health Organization wellbeing questionnaire (WHO-5) and the Insomnia Severity Index (ISI). In the outpatient sample, the Beck Depression Inventory (BDI-II), the Montgomery-Åsberg Depression Rating Scale (MADRS), and the Pittsburgh Sleep Quality Index (PSQI) were administered. Results showed significant improvements in sleep efficiency by 7.2% in the online sample and 7.7% in the outpatient sample. However, no significant difference was found in the rate of improvement in sleep efficiency across four weeks of treatment between the samples. In the online sample, the wellbeing (WHO-5) and insomnia symptoms (ISI) scores were significantly improved following the CBT-I intervention ($p < 0.004$ and $p < 0.002$ respectively). In the outpatient sample, symptoms of depression (BDI-II and MADRS scores) and insomnia symptoms (PSQI scores) improved significantly following the CBT-I intervention. In summary, CBT-I significantly improved sleep efficiency in both the online and outpatient samples, in addition to wellbeing, symptoms of insomnia, and depression. The findings of this study demonstrate online CBT-I as a feasible approach for treating insomnia in shift-workers. Future randomized controlled trials are needed.

Peter et al. 2019.

International Journal of Environmental Research and Public Health, vol. 16, no. 17.

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Keywords: Chronobiology; Cognitive behavioral therapy; Insomnia; Occupational health; Shiftwork; Telepsychiatry

Evidence Level: 4B

Link: <https://www.mdpi.com/1660-4601/16/17/3081>

The factors influencing the eating behaviour of shiftworkers: what, when, where and why.

This systematic scoping review examined the evidence on factors influencing the eating behaviors of shift workers. The review found that irregular working hours was the biggest influence on when workers ate on shift, shift-type was the biggest influence on what workers ate, the majority of food was sourced from canteens and cafeterias, and socialising with colleagues was the biggest

reason why workers chose to eat. Future research into shift worker eating should consider the different individual and social contexts that influence eating patterns.

Gupta et al. 2019.

Industrial Health, vol. 57, no. 4.

Keywords: Eating at night; Meal timing; Nightshift; Safety; Shiftwork

Evidence Level: 6A

Link: https://www.jstage.jst.go.jp/article/indhealth/57/4/57_2018-0147/article

Management and leadership

The impact of inclusive leadership on employees' innovative behaviors: The mediation of psychological capital.

Employee innovation is the cornerstone of the organization, and the motivation for employee innovative behavior largely depends on the leadership style of the leader. With the economic development of society, the traditional authoritative style of leadership can no longer adapt to the psychological characteristics of employees, who use new-era work concepts, techniques, and social rules (hereafter, new generation employees). Inclusive leadership is based on the concept of "fully inclusive and equitable" in traditional Chinese culture, and it can adapt to the independent needs of new generation employees. At present, the research on the relationship between the traditional leadership style and employee innovative behavior is relatively extensive, but there is little research on the relationship between inclusive leadership style and employee innovative behavior, and this needs further exploration. This paper takes new generation employees as the sample and uses psychological capital as an intermediary variable to explore the influence of inclusive leadership style on the innovative behaviors of new generation employees. We found that inclusive leadership is significantly and positively related to new generation employees' innovative behavior. Theoretical and practical implications are discussed.

Fang et al. 2019.

Frontiers in Psychology, vol. 10.

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Keywords: China; Inclusive leadership; Innovative behavior; New generation employees; Psychological capital

Evidence Level: 6B

Link: <https://www.frontiersin.org/articles/10.3389/fpsyg.2019.01803/full>

A moderated mediation model of self-concept clarity, transformational leadership, perceived work meaningfulness, and work motivation.

The purpose of this study was to investigate the role of self-concept clarity in predicting employees' perceived work meaningfulness. We proposed a moderated mediation model in which perceived work meaningfulness could mediate the relationship between self-concept clarity and work motivation, and transformational leadership could moderate this mediating relationship. We tested our hypotheses using data collected from 488 employees in various companies. Results showed that individual differences in self-concept clarity were positively related to perceived work meaningfulness, and perceived work meaningfulness mediated the relationship between self-concept clarity and work motivation. Furthermore, the strength of indirect relationship between self-concept clarity and work motivation via perceptions of work meaningfulness was stronger when transformational leadership was low than when it was high. Implications of our findings along with limitations of this study and directions for future research are also discussed.

Oh et al. 2019.

Frontiers in Psychology, vol. 10.

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Keywords: Perceived work meaningfulness; Personality; Self-concept clarity; Transformational leadership; Work motivation

Evidence Level: 5B

Link: <https://www.frontiersin.org/articles/10.3389/fpsyg.2019.01756/full>

Adapting to the Future of Work

Technology

Survey dataset on fusing RFID with mobile technology for efficient safety of construction professionals.

The fourth industrial revolution has encouraged technologies such as the RFID fused with mobile software for monitoring construction workers on site. In this dataset, a structured questionnaire was design directed to thirty-four (34) construction professionals in Gauteng province South Africa through random sampling. The set of descriptive statistics is presented with tables, bar and pie charts. The willingness level of construction professionals to adopt RFID and mobile technology on construction sites was identified. The barriers to the adoption of fusing mobile technology and RFID for construction safety can be determined when the data is analyzed. Moreover, the construction professional's agreement with RFID as a tool for preventing health hazards on construction sites can be obtained from the analysis of the survey data.

Osunsanmi et al. 2019.

Data in Brief, vol. 25.

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Keywords: Fourth industrial revolution; Health hazards; Occupational health and safety; Radio frequency identification (RFID)

Evidence Level: 5B

Link: <https://www.sciencedirect.com/science/article/pii/S2352340919306444?via%3Dihub>

Technostress among university teachers in higher education: A study using multidimensional person-environment misfit theory.

To investigate the phenomenon of technostress among university teachers in higher education, a multidimensional person-environment misfit framework of technostress was proposed and validated by 343 teachers from universities in China. The findings indicate that person-organization (P-O) misfit, person-technology (P-T) misfit, and person-people (P-P) misfit largely captured how university teachers interact with multiple dimensions of the higher education environment in an imbalanced way that causes technostress. P-O misfit predicted P-T misfit and P-P misfit. Relationships between multidimensional technostress and job performance were investigated. It was found that university requirements related to the use of ICT and the suitability of ICT for university teachers' work were critical factors affecting their job performance. In addition, a comparison was made among university teachers from different grade levels, revealing that university management related to ICT use tended to affect university teachers of higher-grade levels more than those of lower-grade levels in generating technostress.

Wang et al. 2019.

Frontiers in Psychology, vol. 10.

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Keywords: Higher education; Information and communication technologies; Multidimensional person-environment misfit; Technostress; University teachers

Evidence Level: 6B

Link: <https://www.frontiersin.org/articles/10.3389/fpsyg.2019.01791/full>

Implementing sensor technology applications for workplace health promotion: a needs assessment among workers with physically demanding work.

Background: Workers with physically demanding work may be at risk for injury, illness or other adverse health outcomes due to exposure to different occupational hazards, especially at higher age. Sensor technology applications may be useful in the workplace to unobtrusively measure and monitor work exposures and provide workers with real-time feedback or access to data on demand. Many aspects might impede the implementation of sensor technology applications in the workplace, which should be taken into consideration for a successful implementation. Moreover, needs and preferences of workers regarding the use of sensor technology applications during work performance need to be identified. Therefore, the aim of this study was to identify worker needs and preferences regarding the use of sensor technology applications in the workplace.

Methods: Four on-site focus group sessions were conducted in four different companies among workers with physically demanding work (n = 30). Semi-structured interview schedules were used to identify which work exposures should be measured, by which kind of sensor technology applications, under which (pre)conditions, how to motivate long-term use of sensor technology applications, and which type of feedback is preferred. For data analysis, a content-analysis with an inductive approach was performed.

Results: Participants mentioned that they want to use wearable sensor technology applications to measure and monitor physical job demands, occupational heat stress, noise and fatigue. Factors associated with quality, comfort and perceived ease of use were identified as potential barriers for implementation in the workplace. Long-term motivation was attributed to the ability to manage and monitor work exposures, positive feedback and data ownership. Participants indicated a need to both receive real-time feedback and access to data on demand.

Conclusions: Sensor technology applications may support workers with physically demanding work to measure and monitor their work exposures. Potential barriers for implementation such as privacy aspects and quality, comfort and perceived ease of use of sensor technology applications need to be well considered to ensure successful implementation of sensor technology applications in the workplace.

Spook et al. 2019.

BMC Public Health, vol. 19, no. 1.

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Keywords: Ageing workforce; Focus groups; Needs assessment; Occupational hazards; Physically demanding work; Sensor technology applications; Sustainable employability; Work exposures; Workplace health promotion

Evidence Level: 5B

Link: <https://bmcpublichealth.biomedcentral.com/articles/10.1186/s12889-019-7364-2>

Evaluation of wearable sensors for physiologic monitoring of individually experienced temperatures in outdoor workers in southeastern U.S.

Climate-related increases in global mean temperature and the intensification of heat waves present a significant threat to outdoor workers. Limited research has been completed to assess the potential differences in heat exposures that exist between individuals within similar microenvironments. Yet, there is a paucity of individual data characterizing patterns of individually experienced temperatures in workers and the associated physiologic heat strain response. The objective of this study was to apply a wearable sensor-based approach to examine the occupational, environmental, and behavioral factors that contribute to individual-level variations in heat strain in grounds maintenance workers. Outdoor workers from three diverse climatic locations in the southeastern United States - high temperature, high temperature + high humidity, and moderate temperature environments - participated in personal heat exposure monitoring during a 5-day work period in the summer. We performed Cox proportional hazards modeling to

estimate associations between multiple heat strain events per worker and changes in individually experienced temperatures. Heat strain risk was higher among workers with a place to cool-off, higher education, and who worked in hotter temperatures. A mismatch was observed between workers' perceptions of heat strain and actual heat strain prevalence across exposure groups. We also used a quasi-Poisson regression with distributed lag non-linear function to estimate the non-linear and lag effects of individually experienced temperatures on risk of heat strain. The association between increasing temperature and heat strain was nonlinear and exhibited an U-shaped relationship. Heat strain was less common during issued heat warnings demonstrating behavioral adaptive actions taken by workers. This study is one of the first temperature monitoring studies to quantify the individual-level exposure-response function in this vulnerable population and highlights the elevated risk of heat strain both immediately and several days after worker exposure to high temperatures.

Runkle et al. 2019.

Environment International, vol. 129.

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Keywords: Climate change risk assessment; Distributed lag nonlinear models; Individually experienced temperatures; Outdoor workers; Physiologic heat strain; Wearable sensors

Evidence Level: 5A

Link: <https://www.sciencedirect.com/science/article/pii/S0160412018329799?via%3Dihub>

Ageing workforce

Interpreting subjective and objective measures of job resources: The importance of sociodemographic context.

Salutary retirement policy depends on a clear understanding of factors in the workplace that contribute to work ability at older ages. Research in occupational health typically uses either self-reported or objective ratings of the work environment to assess workplace determinants of health and work ability. This study assessed whether individual characteristics and work-related demands were differentially associated with (1) self-reported ratings of job resources from older workers in the Health and Retirement Study, and (2) corresponding objective ratings of job resources from the Occupational Information Network (O*NET). Results from regression and relative weights analyses showed that self-reported ratings were associated with self-reported job demands and personal resources, whereas corresponding O*NET ratings were associated with differences in gender, race, or socioeconomic standing. As a result, subjective ratings may not capture important aspects of aging workers' sociodemographic background that influence work ability, occupational sorting, opportunities for advancement, and ultimately the job resources available to them. Future studies should consider including both subjective and objective measures to capture individual and societal level processes that drive the relationship between work, health, and aging.

Schmitz et al. 2019.

International Journal of Environmental Research and Public Health, vol. 16, no. 17.

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Keywords: Data accuracy; Demography; Healthy aging; Occupational health; Occupational stress; Socioeconomic factors; Work

Evidence Level: 4A

Link: <https://www.mdpi.com/1660-4601/16/17/3058>

From work ability research to implementation.

Work ability research started in Finland in the 1990s due to the challenges of work force aging. The employment rates of older workers (55+) were below 40% and early retirement and work disability rates were rather common in many European countries. The work ability concept and methods were developed and broad international research activities started in the 1990s. A comprehensive promotion model for work ability was created aiming to prevent work ability from declining during aging. However, to be able to impact the work ability is a complicated and difficult task, and requires effects on human resources, work arrangements, and management. Therefore, only a limited number of intervention studies have shown an improvement of work ability during aging. This article introduces some possibilities regarding how to make work ability interventions more successful.

Ilmarinen et al. 2019.

International Journal of Environmental Research and Public Health, vol. 16, no. 16.

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Keywords: Implementation; Intervention research; Knowing–doing gap; Work ability index (WAI), Work ability concept

Evidence Level: 6B

Link: <https://www.mdpi.com/1660-4601/16/16/2882>

Educational inequalities in the impact of chronic diseases on exit from paid employment among older workers: a 7-year prospective study in the Netherlands.

Objectives: The study aimed to investigate the relative and absolute risks of early exit from paid employment among older workers with a chronic disease, and to assess whether these risks differ across educational groups. **Methods:** Data on chronic diseases and demographics from 9160 Dutch workers aged 45–64 years were enriched with monthly information on employment status from Statistics Netherlands. Subdistribution hazard ratios (SHR) and 7-year probabilities among workers with a chronic disease of exit from paid employment through disability benefits, unemployment benefits, early retirement benefits or economic inactivity were estimated using competing risks regression analyses based on Fine and Gray's models. **Results:** Workers with one chronic disease had a higher risk to exit paid employment through disability benefits (SHR 4.48 (95%CI 3.22 to 6.25)) compared with workers without chronic disease, and this risk further increased for multiple chronic diseases (SHR 8.91 (95%CI 6.33 to 12.55)). As occurrence of chronic diseases was highest among low educated workers, the 7-year probabilities to exit paid employment through disability benefits were highest among this group. Cardiovascular, musculoskeletal, psychological and respiratory diseases were associated with disability benefits (SHRs ranging from 2.11 (95%CI 1.45 to 3.07) to 3.26 (95%CI 2.08 to 5.12)), whereas psychological diseases were also related to unemployment (SHR 1.78 (95%CI 1.33 to 2.38)). **Conclusions:** Older workers with a chronic disease have a higher risk to exit paid employment through disability benefits. As multimorbidity has an additive effect, addressing multimorbidity as a risk factor for sustainable employment is needed.

Hengel et al. 2019.

Occupational & Environmental Medicine, [Epub ahead of print]

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Keywords: Chronic disease; Disability benefits; Educational inequalities; Employment

Evidence Level: 4B

Link: <https://oem.bmj.com/content/76/10/718.long>

Interventions to Reduce Ageism Against Older Adults: A Systematic Review and Meta-Analysis.

This systematic review and meta-analysis explored the evidence related to the effectiveness of strategies to reduce ageism. Eligible studies were those that (1) evaluated an intervention

designed to reduce ageism, (2) examined at least 1 ageism outcome in relation to older adults, (3) used a design with a comparison group (randomized or nonrandomized), and (4) were published after 1970. The review found that ageism interventions had an effect on attitudes, knowledge, and comfort but no effect on anxiety or working with older adults. Combined interventions with education and intergenerational contact showed the largest effects on attitudes, with greatest effects for females and for adolescent and young adult groups. The authors concluded that strategies involving education and intergenerational contact can serve as the basis of effective interventions to reduce ageism.

Burnes et al. 2019.

American Journal of Public Health, vol. 109, no. 8.

Keywords: Ageism; Older adults; Physical health; Mental health; Interventions

Evidence Level: 1A

Link: <https://ajph.aphapublications.org/doi/pdfplus/10.2105/AJPH.2019.305123>

Guiding and Supporting Mental Health and Wellbeing

Mental health

Comparable risk of suicidal ideation between workers at precarious employment and unemployment: Data from the Korean welfare panel study, 2012-2017.

Precarious employment and unemployment are important factors that impact suicidal behavior. This study investigated (1) how employment transitions among permanent employment, precarious employment, and unemployment are associated with suicidal ideation in working employees and compared (2) whether individuals transitioning among these three states were more vulnerable than those remaining. Using nationally representative longitudinal data between 2012-2017, a total of 25,862 adults aged 25 to 59 years old without a record of suicidal ideation were included at baseline. Transitions in employment status (permanent work, precarious work, or unemployment) and suicidal ideation were analyzed using hierarchical logistic regression models. Compared to the "permanent to permanent" group, individuals in the "permanent to precarious" (odds ratio (OR) 1.74, 95% confidence interval (95% CI) 1.29-2.35), "permanent to unemployment" (OR 1.97, 95% CI 1.32-2.96), "precarious to precarious" (OR 1.86, 95% CI 1.21-2.85), and the "precarious to unemployment" (OR 1.43, 95% CI 1.05-1.95) groups had higher odds of suicidal ideation. The magnitude of such odds was generally higher than that of individuals at annual unemployment or precarious states. The results show that adults moving in and out of different employment states have higher odds of suicidal ideation than individuals at annually static precarious or unemployment status.

Kim et al. 2019.

International Journal of Environmental Research and Public Health, vol. 16, no. 16.

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Keywords: Employment status; Employment transition; Precarious employment; Suicide ideation

Evidence Level: 4B

Link: <https://www.mdpi.com/1660-4601/16/16/2811>

Common mental disorders through the eyes of German employees: attributed relevance of work-related causes and prevention measures assessed by a standardised survey.

Purpose: Common mental disorders (CMDs) are becoming increasingly relevant in the working world. Numbers of risk factors have been confirmed by mostly correlative cross-sectional studies. Comprehensive and effective prevention is urgently needed. There is little knowledge about employees' own perceptions on causes of CMDs and prevention measures. Therefore, a survey

was conducted in 2016. Methods: A standardised instrument was developed for an online survey in a commercial access panel, targeted employees in different job types. We assessed two outcomes: perceived relevance of (1) work-related demands to the development of CMDs, and (2) prevention approaches in the workplace and on individual and societal levels. Possible predictive aspects were analysed exploratively by multivariate linear regression analysis. Results: The response rate was 75% (n = 610). Job types were categorised as "blue", "grey" and "white-collar" workers (n = 193, 169, 248). The majority of respondents rated both outcomes consistently as "quite" or "very relevant"; societal prevention strategies were more relevant for non-white-collar workers. Perceived relevance of individual predisposition to develop a CMD was the strongest predictor for both outcomes, indicating the perception that people with higher personal vulnerability might suffer a higher strain from work-related risk factors than others. Conclusion: We assume that participants in our survey judged the relevance of work-related causes of CMDs independently of their own workload. The perceived relevance of prevention measures in different areas is consistent with official guidelines. A possible selection bias due to characteristics of access panel collectives and own direct or indirect experiences with CMD should be critically questioned.

Burgess et al. 2019.

International Archives of Occupational and Environmental Health, vol. 92, no. 6.

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Keywords: Common mental disorders; Cross-sectional survey; Employee perceptions; Prevention measures; Work-related risk

Evidence Level: 5B

Link: <https://link.springer.com/article/10.1007%2Fs00420-019-01414-7>

Effort-reward imbalance, over-commitment and depressive episodes at work: evidence from the ELSA-Brasil cohort study.

A growing burden of mental illness, and in particular depression, among workers is a concern of occupational public health. Scientific evidence has revealed consistent associations of work-related stress, as measured by theoretical models, with depression, but mostly so in developed countries. This contribution explores these associations in a developing Latin American country, Brazil, by applying an internationally established work stress model, the effort-reward imbalance (ERI). This model focuses on the work contract where unjust exchange between high efforts spent and low rewards received in turn contributes to stress-related disorders. The model's extrinsic ('effort', 'reward') and intrinsic components ('over-commitment'), as well as their combination, are hypothesized to be related to a higher risk of depressive episodes (DE). Using cross-sectional data from the ELSA-Brasil study, including 10,034 workers from the public sector, we observed increased prevalence ratio (PR) of DE according to ERI scales. The quartiles of highest 'effort' (PR = 1.85; 1.44-2.37), highest 'over-commitment' (PR = 3.62; 2.80-4.70) and lowest 'reward' (PR = 3.44; 2.55-4.64) were associated with DE, on adjusted models, as well as the E-R ratio (PR = 2.47; 1.92-3.17). An additive interaction was identified between the E-R ratio and 'over-commitment'. The results support the use of ERI as a screening tool for work stress in the Brazilian context and will offer guidance for worksite health promotion programs.

De Araujo et al. 2019.

International Journal of Environmental Research and Public Health, vol. 16, no. 17.

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Keywords: Brazil; ELSA-Brasil; Depressive episodes; Effort-reward imbalance; Over-commitment; Work stress

Evidence Level: 4B

Link: <https://www.mdpi.com/1660-4601/16/17/3025>

What makes a good work break? Off-job and on-job recovery as predictors of employee health.

This study explored the association between detachment after work and during work breaks and individual health among health care employees in the Netherlands. The study showed that when health care employees experienced more cognitive detachment after work, they reported less concentration problems, and when employees experienced more emotional detachment after work, they reported less feelings of emotional exhaustion, less depressive feelings, and less sleep problems. Where employees experienced more physical detachment after work, they reported less concentration problems, less feelings of emotional exhaustion, less sleep problems and less physical health problems. No significant associations were found for detachment during work breaks.

De Jonge et al. 2019.

Industrial Health, [Epub ahead of print]

Keywords: Fatigue; Psychosocial stress; Sleep; Work hours; Workload

Evidence Level: 4B

Link: https://www.istage.ist.go.jp/article/indhealth/advpub/0/advpub_2019-0097/article

Bullying and harassment

Fighting incivility in the workplace for women and for all workers: The challenge of primary prevention.

This article discusses the role of several constructs, such as workplace relational civility (WRC), positive relational management (PRM), and emotional intelligence (EI), as possible primary preventive resources to effectively deal with interpersonal mistreatment in the workplace (i.e., incivility). Since women endure workplace incivility more frequently than men, their well-being is particularly at risk. Thus, the possibilities for further research and primary prevention interventions in line with the achievement of the fifth Sustainable Development Goal (SDG 5) are discussed.

Di Fabio et al. 2019.

Frontiers in Psychology, vol. 10.

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Keywords: Emotional intelligence; Positive relational management; Primary prevention; Well-being; Workplace incivility; Workplace relational civility

Evidence Level: 6B

Link: <https://www.frontiersin.org/articles/10.3389/fpsyg.2019.01805/full>

Prevalence of workplace discrimination and mistreatment in a national sample of older U.S. workers: The REGARDS cohort study.

Although workplace discrimination and mistreatment (WDM) has recently drawn widespread media attention, our understanding of the prevalence of these phenomena remains limited. In the current study, we generated national prevalence estimates of WDM from a community-based cohort of employed black and white men and women aged ≥ 48 years. Measures of WDM in the current job were obtained by computer-assisted telephone interview (2011-2013) involving dichotomous responses (yes or no) to five questions and deriving a composite measure of discrimination (yes to at least one). Prevalence estimates and age- and region-adjusted prevalence ratios were derived with use of SUDAAN software to account for the complex sample design. Analyses were stratified by race and sex subgroups. This sample represents over 40 million U.S. workers aged ≥ 48 years. The prevalence of workplace discrimination ranged from a high of 25% for black women to a low of 11% for white men. Blacks reported a 60% higher rate of discrimination compared to whites; women reported a 53% higher prevalence of discrimination, compared with men. The prevalence of workplace mistreatment ranged from 13% for black

women to 8% for white men. Women reported a 52% higher prevalence of mistreatment compared to men, while differences by race were not significant. Mistreatment was 4-8 times more prevalent among those reporting discrimination than among those reporting none. Subgroup differences in mistreatment were confined to the wage-employed. Findings suggest that middle age and older wage-employed blacks and women experience the highest prevalence of WDM; moreover, discrimination is strongly associated with mistreatment. This study contributes to our understanding of at-risk segments of the U.S. labor market and the need for targeted interventions to reduce WDM.

Fekedulegn et al. 2019.

SSM Population Health, vol. 8.

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Keywords: Ageism; Harassment; Mistreatment; Racism; Sexism; Workplace discrimination

Evidence Level: 4B

Link: <https://www.sciencedirect.com/science/article/pii/S2352827319300588?via%3Dihub>

Workplace stress - risk factors

Is there an optimal autonomic state for enhanced flow and executive task performance?

Introduction: Flow describes a state of optimal experience that can promote a positive adaptation to increasing stress. The aim of the current study is to identify the ideal autonomic state for peak cognitive performance by correlating sympathovagal balance during cognitive stress with (1) perceived flow immersion and (2) executive task performance. Methods: Autonomic states were varied in healthy male participants (n = 48) using combinations of patterned breathing and skeletal muscle contraction that are known to induce differing levels of autonomic response. After autonomic variation, a Stroop test was performed on participants to induce a mild stress response, and autonomic arousal was assessed using heart rate variability. Subjective experience of flow was measured by standardized self-report, and executive task performance was measured by reaction time on the Stroop test. Results: There were significant associations between autonomic state and flow engagement with an inverted U-shaped function for parasympathetic stimulation, sympathetic response, and overall sympathovagal balance. There were also significant associations between autonomic states and reaction times. Combining sympathetic and parasympathetic responses to evaluate overall sympathovagal balance, there was a significant U-shaped relationship with reaction time. Discussion: Our results support the flow theory of human performance in which the ideal autonomic state lies at the peak of an inverted-U function, and extremes at either end lead to both suboptimal flow experience. Similarly, cognitive task performance was maximized at the bottom of the U-function. Our findings suggest that optimal performance may be associated with predominant, but not total, sympathetic response.

Chin et al. 2019.

Frontiers in Psychology, vol. 10.

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Keywords: Cognitive performance; Flow; Heart rate variability; Parasympathetic and sympathetic reactivity; Sympathovagal balance

Evidence Level: 5A

Link: <https://www.frontiersin.org/articles/10.3389/fpsyg.2019.01716/full>

How do coworkers aid in coping with emotional exhaustion? An experience sampling method approach.

The present study emphasizes the indirect influences of coworker helping behavior on emotional exhaustion through psychological availability and the moderating role of perceived task demands

on a daily basis. Using a two-wave experience sampling method with data collected via mobile phones, we collected 345 matched data from 69 samples over five consecutive days in mainland China. We developed a moderated mediation model to test our conceptual model, with the following significant results: (1) Daily coworker helping behavior decreased employee emotional exhaustion; (2) daily psychological availability mediated the influence of coworker helping behavior on employee emotional exhaustion; (3) through psychological availability, perceived task demands moderated the indirect influence of daily coworker helping behavior on emotional exhaustion. The indirect influence of daily coworker helping behavior only emerged with a low perception of job demands. This research explores the mechanism and boundary conditions of the relationship between daily coworker helping behavior and employee emotional exhaustion with the job demands-resources model framework. In practice, leaders should adopt beneficial interventions to enhance team cohesion, to facilitate team members' helping behavior, and to manage task demands.

Xiu et al. 2019.

International Journal of Environmental Research and Public Health, vol. 16, no. 16.

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Keywords: Coworker helping behavior; Emotional exhaustion; Experience sampling method; Psychological availability; Task demands

Evidence Level: 5B

Link: <https://www.mdpi.com/1660-4601/16/16/2919>

Influence of workplace environment, working conditions and health status of taxi drivers on vehicle collisions or near-miss events.

This study explored risk factors causing health-related vehicle collisions among 1,739 taxi drivers in Japan using a self-report questionnaire. The study found that being unable to take vacation time, having chronic diseases, taking insufficient vacation time, and difficulty reporting poor health conditions were associated with an increased risk of an accident.

Baba et al. 2019.

Industrial Health, vol. 57, no. 4.

Keywords: Health management; Health-related vehicle collisions; Prevention; Risk factors; Taxi drivers

Evidence Level: 4B

Link: https://www.istage.ist.go.jp/article/indhealth/57/4/57_2018-0104/article

Psychophysical stress and strain of maritime pilots in Germany. A cross-sectional study.

Maritime pilots work in an irregular deployment system (rotation system) with unpredictable work assignments under high levels of physical and mental stress. Fatigue or chronic diseases, e.g. coronary heart disease, peptic ulcers or gastritis can occur as a consequence. This can lead to long-term limitations of pilots' work ability. The aim of this study is to analyse current stress and strain in maritime pilots. Methods: Initially, all German pilots were interviewed with an online questionnaire about their living and working situation (response rate 43%). Subsequently, a medical and psychological examination of a random sample was carried out with pilots working in a 4-month rotation system compared with those working in a 1-week system. Most of the measurements took place at the beginning and the end of continuous work assignments each lasting several weeks (pre vs post-rotation). The questionnaires RESTQ-work 27, Resilience Scale RS-13 and Berlin Questionnaire were used as well as a sleeping diary. Furthermore, cardiovascular parameters (during rest and under ergometric stress), activity and blood parameters, urine stress hormones, and the pupillary unrest index were surveyed. Results: 60 pilots were recorded with an average age of 48.7 years (SD 8.3 years). Among the parameters collected, there were no

significant differences between pre and post-rotation examinations. Pilots with a 4-month rotation system experienced a much higher subjective strain level in RESTQ work-27 (OR 10.12 (95% CI 1.21-84.59)). According to the sleep diaries of the pilots working in a 4-month rotation system, reduced levels were found concerning the pre and post-rotation subjective performance level ($p = 0.042$ and 0.029), subjective sleep duration ($p = 0.032$) and current subjective feeling post-rotation ($p = 0.036$). Objectively measured arterial hypertension was significantly more frequent among pilots working 4 months at a time (OR 21.41 (95% CI 1.26-364.05)). In addition, elevated levels of total cholesterol, triglycerides and uric acid were more common among this group of pilots ($p = 0.038$, $p = 0.033$ and $p = 0.038$). In particular, the risk of hypertriglyceridemia was increased (OR 4.41 (95% CI 1.15-16.91)). Discussion: Maritime pilotage represents a very straining profession that has been studied very little up to this point. The present results indicate that 4-month rotation systems lead to higher levels of subjective and objective strain than 1-week rotation systems. Interventions are therefore recommended; especially a change in the rotation system should be considered.

Barbarewicz et al. 2019.

PLoS One, vol. 14, no. 8.

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Keywords: Psychosocial stress; Maritime pilots; Physical stress; Mental stress; Work ability

Evidence Level: 4B

Link: <https://journals.plos.org/plosone/article?id=10.1371/journal.pone.0221269>

Mental strain of immigrants in the working context.

Inability to work due to reported mental strain and psychiatric disorders is rising in Germany these days. Meanwhile the country's net migration is positive. While there is empirical evidence for a healthy migrant effect regarding the physical health in the beginning (mostly accompanied by a subsequent convergence effect), the mental health of migrants remains partly understudied. In order to evaluate the migrant's share in the rise of reported mental strain in Germany, 4000 employees were surveyed by means of an online access panel. About 16 percent of them revealed a migration background. Their Copenhagen Burnout Inventory (CBI) score is slightly yet significantly above the German autochthonous' one both using bi- and multivariate analysis, indicating that there is a specific vulnerability rather than a healthy migrant effect regarding mental strain at work.

Claassen et al. 2019.

International Journal of Environmental Research and Public Health, vol. 16, no. 16.

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Keywords: Burnout; Epidemiology; Mental health; Migrant health; Occupational medicine; Public health

Evidence Level: 4B

Link: <https://www.mdpi.com/1660-4601/16/16/2875>

Perceived stress and sickness absence: a prospective study of 17,795 employees in Denmark.

Objectives: The aims were to examine (1) the prospective association between perceived stress and sickness absence, and if this association (2) differed by sex, and (3) was stronger when only long-term sickness absence (≥ 31 days) instead of all-length sickness absence (≥ 1 day) was included. Moreover, different cut-points for the length of the sickness absence periods were applied. **Methods:** We followed respondents (10,634 women and 7161 men) from the 'Work Environment and Health in Denmark' 2014-survey for up to 18 months in the 'Register of Work Absences' from Statistics Denmark. Perceived stress was measured by a single question: "In the last 2 weeks, how often have you felt stressed?" We used Cox-regression with repeated events,

adjusted for age, sector, education, and previous sickness absence. Results: The hazard ratio (HR) for all-length sickness absence (≥ 1 day) for "Often/Always" stress compared to "Seldom/Never" stress was statistically significant among both men (HR = 1.25 [1.13-1.38]) and women (HR = 1.43 [1.34-1.51]). The HR was statistically significant for women (HR = 2.26 [1.89-2.70]), but not for men (HR = 1.22 [0.86-1.73]), when the analyses were restricted to long-term sickness absence (≥ 31 days). The sex-difference was statistically significant. Additional analyses with cut-points at ≥ 2 , ≥ 4 , ≥ 6 , ≥ 8 , ≥ 11 , ≥ 15 , ≥ 20 , and ≥ 25 sickness absence days showed that among women, the HR increased gradually with increasing lengths of the sickness absence periods. Conclusions: The prospective association of perceived stress with risk of sickness absence was stronger among women than men. Among women, perceived stress was more strongly associated with long-term sickness absence than with all-length sickness absence.

Thorsen et al. 2019.

International Archives of Occupational and Environmental Health, vol. 92, no. 6.

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Keywords: Long-term sickness absence; Sex difference; Short-term sickness absence; Stress reaction; Stress symptom

Evidence Level: 4B

Link: <https://link.springer.com/article/10.1007%2Fs00420-019-01420-9>

Workplace stress – assessment and management

An empirical study comparing unobtrusive physiological sensors for stress detection in computer work.

Several unobtrusive sensors have been tested in studies to capture physiological reactions to stress in workplace settings. Lab studies tend to focus on assessing sensors during a specific computer task, while in situ studies tend to offer a generalized view of sensors' efficacy for workplace stress monitoring, without discriminating different tasks. Given the variation in workplace computer activities, this study investigates the efficacy of unobtrusive sensors for stress measurement across a variety of tasks. We present a comparison of five physiological measurements obtained in a lab experiment, where participants completed six different computer tasks, while we measured their stress levels using a chest-band (ECG, respiration), a wristband (PPG and EDA), and an emerging thermal imaging method (perinasal perspiration). We found that thermal imaging can detect increased stress for most participants across all tasks, while wrist and chest sensors were less generalizable across tasks and participants. We summarize the costs and benefits of each sensor stream, and show how some computer use scenarios present usability and reliability challenges for stress monitoring with certain physiological sensors. We provide recommendations for researchers and system builders for measuring stress with physiological sensors during workplace computer use.

Akbar et al. 2019.

Sensors, vol. 19, no. 17.

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Keywords: ECG; EDA; PPG; Human–computer interaction; Physiology; Stress; Thermal imaging; Unobtrusive sensors; Wearables

Evidence Level: 5A

Link: <https://www.mdpi.com/1424-8220/19/17/3766>

Understanding police performance under stress: Insights from the biopsychosocial model of challenge and threat.

We examine when and how police officers may avoid costly errors under stress by leveraging theoretical and empirical work on the biopsychosocial (BPS) model of challenge and threat. According to the BPS model, in motivated performance contexts (e.g., test taking, athletics), the evaluation of situational and task demands in relation to one's perceived resources available to cope with those demands engenders distinct patterns of peripheral physiological responding. Individuals experience more challenge-like states in which blood circulates more efficiently in the periphery when they evaluate their coping resources as meeting or exceeding the task demands. Conversely, individuals experience more threat-like states in which blood circulates less efficiently in the periphery when they view the situation or task demands as exceeding their coping resources. Patterns of response consistent with challenge and threat states have been shown to predict important performance and decision-making outcomes in stressful contexts, and repeated experiences of threat-like patterns of physiological activity are thought to have detrimental effects on long-term cardiovascular health. To date, however, research has not used the biopsychosocial model to understand police decision-making under stress. Here, we review relevant empirical work from the perspective of the BPS model concerning how minority status and power can shape challenge and threat responding and contribute to decision-making under stress. We then detail a research agenda aimed at improving the translational value of research being conducted within the BPS model for understanding complex performance and decision-making in the real world, including among law enforcement personnel.

Kelley et al. 2019.

Frontiers in Psychology, vol. 10.

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Keywords: Biopsychosocial; Challenge; Police; Shootings; Threat

Evidence Level: 6A

Link: <https://www.frontiersin.org/articles/10.3389/fpsyg.2019.01800/full>

Complex motor learning and police training: Applied, cognitive, and clinical perspectives.

The practices surrounding police training of complex motor skills, including the use of force, varies greatly around the world, and even over the course of an officer's career. As the nature of policing changes with society and the advancement of science and technology, so should the training practices that officers undertake at both central (i.e., police academy basic recruit training) and local (i.e., individual agency or precinct) levels. The following review is intended to bridge the gap between scientific knowledge and applied practice to inform best practices for training complex motor skills that are unique and critical to law enforcement, including the use of lethal force. We begin by providing a basic understanding of the fundamental cognitive processes underlying motor learning, from novel skill acquisition to complex behaviors including situational awareness, and decision-making that precede and inform action. Motor learning, memory, and perception are then discussed within the context of occupationally relevant stress, with a review of evidence-based training practices that promote officer performance and physiological responses to stress during high-stakes encounters. A lack of applied research identifying the neurophysiological mechanisms underlying motor learning in police is inferred from a review of evidence from various clinical populations suffering from disorders of cognitive and motor systems, including Alzheimer's and Parkinson's disease and stroke. We conclude this review by identifying practical, organizational, and systemic challenges to implementing evidence-based practices in policing and provide recommendations for best practices that will promote training effectiveness and occupational safety of end-users (i.e., police trainers and officers).

Di Nota et al. 2019.

Frontiers in Psychology, vol. 10.

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Keywords: Motor learning; Occupational health; Physiology; Plasticity; Police; Procedural learning; Stress; Training

Evidence Level: 6A

Link: <https://www.frontiersin.org/articles/10.3389/fpsyg.2019.01797/full>

My mind is working overtime - Towards an integrative perspective of psychological detachment, work-related rumination, and work reflection.

In the literature on occupational stress and recovery from work, several facets of thinking about work during off-job time have been conceptualized. However, research on the focal concepts is currently rather diffuse. In this study we take a closer look at the five most well-established concepts: (1) psychological detachment, (2) affective rumination, (3) problem-solving pondering, (4) positive work reflection, and (5) negative work reflection. More specifically, we scrutinized (1) whether the five facets of work-related rumination are empirically distinct, (2) whether they yield differential associations with different facets of employee well-being (burnout, work engagement, thriving, satisfaction with life, and flourishing), and (3) to what extent the five facets can be distinguished from and relate to conceptually similar constructs, such as irritation, worry, and neuroticism. We applied structural equation modeling techniques to cross-sectional survey data from 474 employees. Our results provide evidence for (1) five correlated, yet empirically distinct facets of work-related rumination. (2) Each facet yields a unique pattern of association with the eight aspects of employee well-being. For instance, detachment is strongly linked to satisfaction with life and flourishing. Affective rumination is linked particularly to burnout. Problem-solving pondering and positive work reflection yield the strongest links to work engagement. (3) The five facets of work-related rumination are distinct from related concepts, although there is a high overlap between (lower levels of) psychological detachment and cognitive irritation. Our study contributes to clarifying the structure of work-related rumination and extends the nomological network around different types of thinking about work during off-job time and employee well-being.

Weigelt et al. 2019.

International Journal of Environmental Research and Public Health, vol. 16, no. 16.

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Keywords: Burnout; Employee well-being; Mental health; Perseverative cognition; Psychological detachment; Rumination; Thriving; Vitality; Work engagement; Work reflection

Evidence Level: 4B

Link: <https://www.mdpi.com/1660-4601/16/16/2987>

Development of an e-learning prototype for assessing occupational stress-related disorders: a qualitative study.

Background: Occupational stress-related disorders are complex to diagnose and prevent, due to their multifactorial origin. We developed an e-learning programme aimed at supporting occupational physicians when diagnosing and preventing occupational stress-related disorders. In order to explore the extent to which a developed e-learning prototype was perceived as useful and feasible by occupational physicians, we executed a qualitative study. Methods: We conducted semi-structured, face-to-face interviews with fifteen occupational physicians, who were recruited using a combination of convenience and purposive sampling. Participants were shown a hard copy prototype of the e-learning programme, on which they were invited to comment in terms of perceived usefulness and feasibility. The interview data was transcribed verbatim and coded by two researchers using a content analysis approach. Results: Occupational physicians perceived e-

learning as useful when it contributed to creating a full clinical picture and supported the diagnosis. Its structure had to support occupational physicians to work systematically. The programme had to be applicable to their daily practice and had to incorporate learning tools in order to increase the competences of occupational physicians. Feasibility was perceived to increase when the e-learning programme took less time to complete, when the quantity of written text was not too high, and when the user was guided and recertification points provided. Conclusions: An e-learning programme can be an asset in continuing medical education for occupational physicians when assessing occupational stress-related disorders. Perceived usefulness depended on the clinical picture, structure, practicality and the increasing of competences. Feasibility depended on text, time, structure and reward.

Omvlee et al. 2019.

BMC Medical Education, vol. 19, no. 1.

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Keywords: E-learning; Feasibility; Mental disorders; Occupational physicians; Occupational stress-related disorders; Qualitative research; Usefulness

Evidence Level: 5B

Link: <https://bmcmmededuc.biomedcentral.com/articles/10.1186/s12909-019-1743-3>

Burnout

A comparative study of burnout, stress, and resilience among emotional workers.

Objective: To investigate associations between stress, resilience, and burnout in three emotional job sectors. **Methods:** We conducted a multi-group comparative study using structural equation modeling and latent mean analysis. In total, 806 participants (403 call center consultants, 270 mental health workers, and 133 school counselors) completed self-administered questionnaires including the Perceived Stress Scale, Korean version of the Connor-Davidson Resilience Scale, and Maslach Burnout Inventory General Survey. **Results:** Stress had significant direct effects on resilience and burnout, and resilience had significant direct effects on burnout in all groups. Resilience partially mediated these relationships among call center consultants and school counselors. Stress and burnout were highest in call center consultants, followed, in order, by mental health workers and school counselors. Resilience was highest in school counselors, followed, in order, by mental health workers and call center consultants. The effect size of the latent mean difference was highest for burnout, followed, in order, by resilience and stress. **Conclusion:** Our findings suggest that stress caused by emotional labor can contribute to burnout. Interventions targeted at different sectors are needed to reduce burnout.

Lee et al. 2019.

Psychiatry Investigation, [Epub ahead of print].

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Keywords: Burnout; Mental health; Resilience; School; Stress

Evidence Level: 4B

Link: <http://psychiatryinvestigation.org/journal/view.php?doi=10.30773/pi.2019.07.10>

Lack of group support and burnout syndrome in workers of the state security forces and corps: Moderating role of neuroticism.

Background and Objectives: This research analyzes the relationship between the lack of group support and burnout syndrome in workers of the State Security Forces and Corps, considering the role of personality traits in this relationship. In particular, it is hypothesized that neuroticism will moderate this relationship. **Materials and Methods:** Participants were 237 workers from the State Security Forces and Corps dedicated to tasks of citizen security. **Results:** The results show that

neuroticism moderates the relationship between lack of group support and the three components of the burnout syndrome: emotional exhaustion, depersonalization, and personal fulfillment. Conclusions: The findings are discussed, suggesting intervention strategies for the improvement of the agents' personal well-being.

Farfan et al. 2019.

Medicina (Kaunas), vol. 55, no. 9.

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Keywords: Burnout; Emotional exhaustion; Group support; Neuroticism; Personality traits

Evidence Level: 5B

Link: <https://www.mdpi.com/1010-660X/55/9/536>

Psychosocial issues

How do family role overload and work interference with family affect the life satisfaction and sleep sufficiency of construction professionals?

Sleep and work-family problems attract a great attention in the construction industry because construction professionals are usually prone to work-family conflicts and sleep problems. The objective of this study was to analyze the effect of Family-Role Overload (FRO) and Work Interference with Family (WIF) on sleep sufficiency. We also included life satisfaction as a mediator and family supportive supervision behaviors (FSSB) as a moderator. Using a sample of 193 Chinese construction professionals, we collected objectively-measured sleep sufficiency data with validated wrist actigraphies and self-reported sleep sufficiency data, FRO, WIF, life satisfaction and FSSB with questionnaires through multiple waves. Results demonstrated that FRO was negatively associated with both objectively-measured and self-reported sleep sufficiency and life satisfaction played an important mediating role in this relationship. The moderating effect of life satisfaction on the path between WIF and sleep sufficiency is trivial. In addition, no significant moderating effects of FSSB were found. More substantial policies should be taken to improve the life satisfaction and sleep sufficiency of construction professionals.

Lu et al. 2019.

International Journal of Environmental Research and Public Health, vol. 16, no. 17.

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Keywords: Construction professional; Family role overload; Family supportive supervision behaviors; Life satisfaction; Sleep; Work interference with family; Work-family conflict

Evidence Level: 4B

Link: <https://www.mdpi.com/1660-4601/16/17/3094>

Psychosocial working conditions across working life may predict late-life physical function: a follow-up cohort study.

Background: Increasing life expectancy has made understanding the mechanisms underlying late-life health and function more important. We set out to investigate whether trajectories of change in psychosocial working conditions are associated with late-life physical function. Methods: Two Swedish surveys, linked at the individual level, were used (n = 803). A psychosocial job exposure matrix was used to measure psychosocial working conditions during people's first occupation, as well as their occupation every five years thereafter until baseline in 1991. Physical function was measured in 2014. Random effects growth curve models were used to calculate intraindividual trajectories of working conditions. Predictors of physical function were assessed with ordered logistic regression. Results: A more active job at baseline was associated with increased odds of late-life physical function (OR 1.15, CI 1.01-1.32). Higher baseline job strain was associated with decreased odds of late-life physical function (OR 0.75, CI 0.59-0.96). A high initial level followed by an upward trajectory of job strain throughout working life was associated with decreased odds of

late-life physical function (OR 0.32, CI 0.17-0.58). Conclusions: Promoting a healthier workplace by reducing chronic stress and inducing intellectual stimulation, control, and personal growth may contribute to better late-life physical function.

Nilsen et al. 2019.

BMC Public Health, vol. 19, no. 1.

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Keywords: Cohort; Job control; Life course; Mobility limitations; Sweden; Work-related stress

Evidence Level: 4A

Link: <https://bmcpublihealth.biomedcentral.com/articles/10.1186/s12889-019-7473-y>

The subjective well-being challenge in the accounting profession: The role of job resources.

The main activity of the accountant is the preparation and audit of the financial information of a company. The subjective well-being of the accountant is important to ensure a balanced professional judgment and to offer a positive image of the profession in the face of the incorporation and retention of talent. However, accountants are subjected to intense pressures that affect their well-being in the performance of their tasks. In this paper, the job demands-resources theoretical framework is adopted to analyze the relationships between job demands, job resources, and the subjective well-being of a large sample of 739 accounting experts at the European level. Applying a structural equations model, the results confirm, on the one hand, the direct effects provided in the theoretical framework and, on the other, a new mediating role of job demands-subjective well-being relationship resources.

Molina-Sanchez et al. 2019.

International Journal of Environmental Research and Public Health, vol. 16, no. 17.

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Keywords: JDCS; Accountants; Auditor strains; Subjective well-being

Evidence Level: 6B

Link: <https://www.mdpi.com/1660-4601/16/17/3073>

iWorkHealth: An instrument to identify workplace psychosocial risk factors for a multi-ethnic Asian working population.

Objective: The current study aimed to develop iWorkHealth, a valid and reliable self-administered instrument which identifies workplace psychosocial risk factors in Singapore. **Methods:** The survey was conducted among 2718 employees who were primarily salaried workers and working in five companies from the healthcare, banking and finance, and legal sectors in Singapore. Factor extraction and item reduction were conducted using exploratory factor analysis (EFA) and Mokken scale analysis (MSA). Construct validity, internal consistency and convergent validity of the final scale were confirmed using confirmatory factor analysis (CFA), Cronbach's alpha and Pearson correlation coefficients, respectively. Multiple Indicators Multiple Causes model was used to detect Differential Item Functioning (DIF). **Results:** EFA and MSA identified a five-factor solution (job demand, job control, employee and management engagement, supervisor support and colleague support) for the 27 items iWorkHealth instrument. CFA demonstrated that the five-factor model fitted the data with high internal consistency (Cronbach's alpha ranged from 0.79 to 0.92). The convergent validity was shown through significant association with existing scales-high job demand was significantly associated with high burnout and depression, while high job control, employee and management engagement, supervisor support and coworker support were significantly associated with low burnout and depression. Ten items were detected with significant DIF, but impact was minimal on the associations between socio-demographics factors and iWorkHealth subscales. **Conclusions:** The findings provided evidence that the iWorkHealth instrument which comprises 27 items in five domains of psychosocial risk at the workplace is a

reliable and valid instrument that could be used to measure and compare the level of psychosocial risk factors across companies and industries in Singapore.

Abdin et al. 2019.

PLoS One, vol. 14, no. 8.

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Keywords: iWorkHealth; Workplace; Psychosocial risk; Working population; Risk factors

Evidence Level: 4B

Link: <https://journals.plos.org/plosone/article?id=10.1371/journal.pone.0220566>

Enabling Healthy and Safe Workplaces

WH&S

Mortality inequalities by occupational class among men in Japan, South Korea and eight European countries: a national register-based study, 1990-2015.

Background: We compared mortality inequalities by occupational class in Japan and South Korea with those in European countries, in order to determine whether patterns are similar. **Methods:** National register-based data from Japan, South Korea and eight European countries (Finland, Denmark, England/Wales, France, Switzerland, Italy (Turin), Estonia, Lithuania) covering the period between 1990 and 2015 were collected and harmonised. We calculated age-standardised all-cause and cause-specific mortality among men aged 35-64 by occupational class and measured the magnitude of inequality with rate differences, rate ratios and the average inter-group difference. **Results:** Clear gradients in mortality were found in all European countries throughout the study period: manual workers had 1.6-2.5 times higher mortality than upper non-manual workers. However, in the most recent time-period, upper non-manual workers had higher mortality than manual workers in Japan and South Korea. This pattern emerged as a result of a rise in mortality among the upper non-manual group in Japan during the late 1990s, and in South Korea during the late 2000s, due to rising mortality from cancer and external causes (including suicide), in addition to strong mortality declines among lower non-manual and manual workers. **Conclusions:** Patterns of mortality by occupational class are remarkably different between European countries and Japan and South Korea. The recently observed patterns in the latter two countries may be related to a larger impact on the higher occupational classes of the economic crisis of the late 1990s and the late 2000s, respectively, and show that a high socioeconomic position does not guarantee better health.

Tanaka et al. 2019.

Journal of Epidemiology and Community Health, vol. 73, no. 8.

Keywords: Cause of death/trends; Epidemiology; Middle aged; Registries; Socioeconomic factors

Evidence Level: 4B

Link: <https://jech.bmj.com/content/73/8/750.long>

Sedentary practices

Breaking barriers: using the behavior change wheel to develop a tailored intervention to overcome workplace inhibitors to breaking up sitting time.

Background: The workplace is a prominent domain for excessive sitting. The consequences of increased sitting time include adverse health outcomes such as cardiovascular disease and poor mental wellbeing. There is evidence that breaking up sitting could improve health, however, any such intervention in the workplace would need to be informed by a theoretical evidence-based framework. The aim of this study was to use the Behaviour Change Wheel (BCW) to develop a tailored intervention to break up and reduce workplace sitting in desk-based workers. **Methods:** The BCW guide was followed for this qualitative, pre-intervention development study. Semi-

structured interviews were conducted with 25 office workers (26-59 years, mean age 40.9 [SD = 10.8] years; 68% female) who were purposively recruited from local council offices and a university in the East of England region. The interview questions were developed using the Theoretical Domains Framework (TDF). Transcripts were deductively analysed using the COM-B (Capability, Opportunity, Motivation - Behaviour) model of behaviour. The Behaviour Change Technique Taxonomy Version 1 (BCTv1) was thereafter used to identify possible strategies that could be used to facilitate change in sitting behaviour of office workers in a future intervention. Results: Qualitative analysis using COM-B identified that participants felt that they had the physical Capability to break up their sitting time, however, some lacked the psychological Capability in relation to the knowledge of both guidelines for sitting time and the consequences of excess sitting. Social and physical Opportunity was identified as important, such as a supportive organisational culture (social) and the need for environmental resources (physical). Motivation was highlighted as a core target for intervention, both reflective Motivation, such as beliefs about capability and intention and automatic in terms of overcoming habit through reinforcement. Seven intervention functions and three policy categories from the BCW were identified as relevant. Finally, 39 behaviour change techniques (BCTs) were identified as potential active components for an intervention to break up sitting time in the workplace. Conclusions: The TDF, COM-B model and BCW can be successfully applied through a systematic process to understand the drivers of behaviour of office workers to develop a co-created intervention that can be used to break up and decrease sitting in the workplace. Intervention designers should consider the identified BCW factors and BCTs when developing interventions to reduce and break up workplace sitting.

Ojo et al. 2019.

BMC Public Health, vol. 19, no. 1.

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Keywords: BCTs; Behaviour change wheel; COM-B; Intervention; Sedentary behaviour; Sitting time; TDF

Evidence Level: 5A

Link: <https://bmcpublikealth.biomedcentral.com/articles/10.1186/s12889-019-7468-8>

Perceived barriers and facilitators to breaking up sitting time among desk-based office workers: A qualitative investigation using the TDF and COM-B.

High amounts of sedentary behaviour, such as sitting, can lead to adverse health consequences. Interventions to break up prolonged sitting in the workplace have used active workstations, although few studies have used behaviour change theory. This study aimed to combine the Theoretical Domains Framework (TDF) and the Capability, Opportunity, and Motivation to Behaviour system (COM-B) to investigate perceived barriers and facilitators to breaking up sitting in desk-based office workers. Semi-structured interviews with 25 desk-based employees investigated barriers and facilitators to breaking up sitting in the workplace. Seven core inductive themes were identified: 'Knowledge-deficit sitting behaviour', 'Willingness to change', 'Tied to the desk', 'Organisational support and interpersonal influences', 'Competing motivations', 'Emotional influences', and 'Inadequate cognitive resources for action'. These themes were then deductively mapped to 11 of the 14 TDF domains and five of the six COM-B constructs. Participants believed that high amounts of sitting had adverse consequences but lacked knowledge regarding recommendations and were at times unmotivated to change. Physical and social opportunities were identified as key influences, including organisational support and height-adjustable desks. Future research should identify intervention functions, policy categories and behaviour change techniques to inform tailored interventions to change sitting behaviour of office workers.

Ojo et al. 2019.

International Journal of Environmental Research and Public Health, vol. 16, no. 16.

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Keywords: Behaviour Change Wheel; COM-B; TDF; Barriers; Desk-based employees; Facilitators; Office workers; Sedentary behaviour

Evidence Level: 5A

Link: <https://www.mdpi.com/1660-4601/16/16/2903>

Exploring adults' experiences of sedentary behaviour and participation in non-workplace interventions designed to reduce sedentary behaviour: a thematic synthesis of qualitative studies.

Background: Sedentary behaviour is any waking behaviour characterised by an energy expenditure of ≤ 1.5 metabolic equivalent of task while in a sitting or reclining posture. Prolonged bouts of sedentary behaviour have been associated with negative health outcomes in all age groups. We examined qualitative research investigating perceptions and experiences of sedentary behaviour and of participation in non-workplace interventions designed to reduce sedentary behaviour in adult populations. Methods: A systematic search of seven databases (MEDLINE, AMED, Cochrane, PsychINFO, SPORTDiscus, CINAHL and Web of Science) was conducted in September 2017. Studies were assessed for methodological quality and a thematic synthesis was conducted. Prospero database ID: CRD42017083436. Results: Thirty individual studies capturing the experiences of 918 individuals were included. Eleven studies examined experiences and/or perceptions of sedentary behaviour in older adults (typically ≥ 60 years); ten studies focused on sedentary behaviour in people experiencing a clinical condition, four explored influences on sedentary behaviour in adults living in socio-economically disadvantaged communities, two examined university students' experiences of sedentary behaviour, two on those of working-age adults, and one focused on cultural influences on sedentary behaviour. Three analytical themes were identified: 1) the impact of different life stages on sedentary behaviour 2) lifestyle factors influencing sedentary behaviour and 3) barriers and facilitators to changing sedentary behaviour. Conclusions: Sedentary behaviour is multifaceted and influenced by a complex interaction between individual, environmental and socio-cultural factors. Micro and macro pressures are experienced at different life stages and in the context of illness; these shape individuals' beliefs and behaviour related to sedentariness. Knowledge of sedentary behaviour and the associated health consequences appears limited in adult populations, therefore there is a need for provision of accessible information about ways in which sedentary behaviour reduction can be integrated in people's daily lives. Interventions targeting a reduction in sedentary behaviour need to consider the multiple influences on sedentariness when designing and implementing interventions.

Rawlings et al. 2019.

BMC Public Health, vol. 19, no. 1.

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Keywords: Physical activity; Qualitative research; Sedentary behaviour; Sitting; Thematic synthesis

Evidence Level: 1A

Link: <https://bmcpublichealth.biomedcentral.com/articles/10.1186/s12889-019-7365-1>

Sedentary work and risk of venous thromboembolism.

This study explored the risk of venous thromboembolism (VTE) according to sitting posture at work amongst 78 936 participants from the Copenhagen City Heart Study and the Copenhagen General Population Study. The study found that during the follow-up period of 582 411 person years 911 participants experienced their first VTE event with no difference in risk of VTE between occupational sitting ≥ 6.5 hours/day and occupational sitting ≤ 3.5 hours/day. This study does not support the hypothesis that sedentary work is a risk factor for VTE in the general population.

Johannesen et al. 2019.

Scandinavian Journal of Work, Environment & Health, [Epub ahead of print]

Keywords: Sedentary work; Venous thromboembolism; Sitting posture; General population

Evidence Level: 4A

Link: http://www.sjweh.fi/show_abstract.php?abstract_id=3841

Physical activity

A loyalty scheme to encourage physical activity in office workers: a cluster RCT.

Background: Increasing physical activity in the workplace can provide physical and mental health benefits for employees and economic benefits for the employer through reduced absenteeism and increased productivity. However, there is limited evidence on effective behaviour change interventions in workplace settings that led to maintained physical activity. This study aimed to address this gap and contribute to the evidence base for effective and cost-effective workplace interventions. Objectives: To determine the effectiveness and cost-effectiveness of the Physical Activity Loyalty scheme, a multicomponent intervention based on concepts similar to those that underpin a high-street loyalty card, which was aimed at encouraging habitual physical activity behaviour and maintaining increases in mean number of steps per day. Design: A cluster randomised controlled trial with an embedded economic evaluation, behavioural economic experiments, mediation analyses and process evaluation. Setting: Office-based employees from public sector organisations in Belfast and Lisburn city centres in Northern Ireland. Participants: A total of 853 participants [mean age 43.6 years (standard deviation 9.6 years); 71% of participants were female] were randomly allocated by cluster to either the intervention group or the (waiting list) control group. Intervention: The 6-month intervention consisted of financial incentives (retail vouchers), feedback and other evidence-based behaviour change techniques. Sensors situated in the vicinity of the workplaces allowed participants to monitor their accumulated minutes of physical activity. Outcome measures: The primary outcome was mean number of steps per day recorded using a sealed pedometer worn on the waist for 7 consecutive days and at 6 and 12 months post intervention. Secondary outcomes included health, mental well-being, quality of life, work absenteeism and presenteeism, and the use of health-care resources. Results: The mean number of steps per day were significantly lower for the intervention group than the control group [6990 mean number of steps per day (standard deviation 3078) vs. 7576 mean number of steps per day (standard deviation 3345), respectively], with an adjusted mean difference of -336 steps (95% confidence interval -612 to -60 steps; $p = 0.02$) at 6 months post baseline, but not significantly lower at 12 months post baseline. There was a small but significant enhancement of mental well-being in the intervention group (difference between groups for the Warwick–Edinburgh Mental Wellbeing Scale of 1.34 points, 95% confidence interval 0.48 to 2.20 points), but not for the other secondary outcomes. An economic evaluation suggested that, overall, the scheme was not cost-effective compared with no intervention. The intervention was £25.85 (95% confidence interval $-\text{£}29.89$ to $\text{£}81.60$) more costly per participant than no intervention and had no effect on quality-adjusted life-years (incremental quality-adjusted life-years -0.0000891 , 95% confidence interval -0.008 to 0.008). Limitations: Significant restructuring of participating organisations during the study resulted in lower than anticipated recruitment and retention rates. Technical issues affected intervention fidelity. Conclusions: Overall, assignment to the intervention group resulted in a small but significant decline in the mean pedometer-measured steps per day at 6 months relative to baseline, compared with the waiting list control group. The Physical Activity Loyalty scheme was deemed not to be cost-effective compared with no intervention, primarily because no additional quality-adjusted life-years were gained through the intervention. Research to better understand the mechanisms of physical activity behaviour change maintenance will help the design of future interventions.

Hunter et al. 2019.

Public Health Research, vol. 7, no. 15.

Keywords: Physical activity; Loyalty scheme; Office workers; Productivity; Mental health; Absenteeism

Evidence Level: 1A

Link: <https://www.ncbi.nlm.nih.gov/books/NBK545825/>

Risk Assessment

Cross-national comparison of two general population job exposure matrices for physical work exposures.

Objectives: Job exposure matrices (JEMs) are increasingly used to estimate physical workplace exposures. We conducted a cross-national comparison of exposure estimates from two general population JEMs to aid the interpretation of exposure-outcome associations across countries and to explore the feasibility of cross-national application of JEMs to provide workplace physical exposure estimates. **Methods:** We compared physical exposure estimates from two general population JEMs created from the French Cohorte des consultants des Centres d'examen de santé study (27 exposure variables) and the American Occupational Information Network database (21 exposure variables). These exposure variables were related to physical demands or ergonomic risk factors for musculoskeletal disorders. We used a crosswalk to match French Profession et Catégorie Sociale job codes with American Standard Occupational Classification job codes and calculated Spearman's correlations and Cohen's kappa values for exposure variable pairs between these French and American JEMs. We defined a priori 50 matched French and American JEM variable pairs that measured similar exposures. **Results:** All variable pairs measuring similar physical exposures demonstrated positive correlations. Among the 50 matched pairs, 33 showed high correlation ($\rho \geq 0.70$) and 46 showed at least moderate agreement ($\kappa \geq 0.41$). Exposures expected to be mutually exclusive (manual work vs office work) showed strongly negative correlations. **Conclusions:** French and American general population physical exposure JEMs were related, sharing moderate to high association and moderate to substantial agreement between the majority of variable pairs measuring similar exposures. These findings will inform cross-national comparisons of study results and support some uses of general population JEMs outside their countries of origin.

Evanoff et al. 2019.

Occupational and Environmental Medicine, vol. 76, no. 8.

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Keywords: Biomechanical exposure assessment; Epidemiology; Ergonomics; Musculoskeletal disorders

Evidence Level: 4B

Link: <https://oem.bmj.com/content/76/8/567.long>

Health and Wellbeing

Predicting work-family balance: A new perspective on person-environment fit.

Work-family balance continues to be a burgeoning topic of organizational research, yet, while the various antecedents of work-family balance have been identified, researchers have, to date, neglected the effect of congruence versus incongruence with regard to work-family integration preferences and the corresponding supplies at work. The current research investigates whether work-family integration preferences and organizational supplies jointly affect work-family balance, and the distal family-related outcomes including marital satisfaction and family functioning, from a person-environment fit perspective. Polynomial regression analysis and response surface methodology are used to test the study's hypotheses. Results of the polynomial regressions on

393 employees are found to support the congruence effect hypotheses. In particular, the results show that employee work-family balance is higher when work-family integration preferences and organizational supplies are congruent, as opposed to incongruent. An individual's balance is higher when preferences and supplies are aligned at higher levels rather than at lower levels. In addition, the asymmetrical shape of the surface along the incongruence line indicated that an employee's work-family balance tends to be damaged once organizational supplies exceed personal preferences. Moreover, through creating a block variable based on the five polynomial terms, we found that congruence/incongruence in respect of work-family integration preferences and supplies yields distal effects on both family functioning and marital satisfaction. Our findings support our hypotheses and are also in line with both person-environment fit theory and balance theory. Theoretical and practical implications for keeping work-family balance are also discussed.

Liu et al. 2019.

Frontiers in Psychology, vol. 10.

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Keywords: Family functioning; Marital satisfaction; Person-environment fit; Polynomial regression; Work-family balance; Work-family integration

Evidence Level: 4B

Link: <https://www.frontiersin.org/articles/10.3389/fpsyg.2019.01804/full>

Work fatigue in a non-deployed military setting: Assessment, prevalence, predictors, and outcomes.

Although work fatigue represents an important issue among military personnel in combat settings, little attention has been paid to work fatigue in the non-deployed setting. This issue was addressed by (a) validating the Three-Dimensional Work Fatigue Inventory (3D-WFI) among non-deployed military personnel, (b) assessing the prevalence of work fatigue in a non-deployed setting, and (c) exploring several potential predictors and outcomes of work fatigue in this setting. Data came from a large national probability sample (N = 1375) of non-deployed Royal Canadian Air Force military personnel. Results demonstrated that the 3D-WFI provided a psychometrically sound assessment of physical, mental, and emotional work fatigue among military personnel, which was invariant across sex, age, military component, and military role. All three types of work fatigue were highly prevalent among military personnel in a non-deployed setting. In terms of predictors, job demands were positively associated, and distributive justice, perceived organizational support, physical activity and sleep quality were negatively associated with each type of work fatigue, whereas role ambiguity was positively associated with mental and emotional work fatigue, and interpersonal justice was negatively associated with physical and emotional fatigue. Abusive supervision and sleep quantity were unrelated to work fatigue. In terms of outcomes, the three types of fatigue were positively associated with workplace cognitive failures and work-to-family conflict. In contrast, mental and emotional work fatigue were negatively related to military morale and positively associated with turnover intentions. This study demonstrates that work fatigue is a critical issue among military personnel in non-deployed settings, and an essential issue for military policy development.

Frone et al. 2019.

International Journal of Environmental Research and Public Health, vol. 16, no. 16.

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Keywords: Exhaustion; Military; Military morale; Personal resources; Turnover intentions; Work demands; Work fatigue; Work resources; Workplace cognitive failure; Work-family conflict

Evidence Level: 5B

Link: <https://www.mdpi.com/1660-4601/16/16/2892>

The association of peer smoking behavior and social support with quit success in employees who participated in a smoking cessation intervention at the workplace.

The current study investigated whether quit success among employees who participated in a smoking cessation intervention at the workplace was associated with social support from, and the smoking behavior of, people in their environment. Tobacco-smoking employees (n = 604) from 61 companies participated in a workplace group smoking cessation program. Participants completed questionnaires assessing social support from, and the smoking behavior of, people in their social environment. They were also tested for biochemically validated continuous abstinence directly after finishing the training and after 12 months. The data were analyzed using mixed-effects logistic regression analyses. Social support from colleagues was positively associated with 12-month quit success (odds ratio (OR) = 1.85, 95% confidence interval (CI) = 1.14-3.00, p = 0.013). Support from a partner was positively associated with short-term quit success (OR = 2.01, 95% CI = 1.23-3.30, p = 0.006). Having a higher proportion of smokers in the social environment was negatively associated with long-term abstinence (OR = 0.81, 95% CI = 0.71-0.92, p = 0.002). Compared to having a non-smoking partner, long-term quit success was negatively associated with having no partner (OR = 0.48, 95% CI = 0.26-0.88, p < 0.019), with having a partner who smokes (OR = 0.40, 95% CI = 0.24-0.66, p < 0.001), and with having a partner who used to smoke (OR = 0.47, 95% CI = 0.26-0.86, p = 0.014). In conclusion, people in a smoker's social environment, particularly colleagues, were strongly associated with quit success. The workplace may, therefore, be a favorable setting for smoking cessation interventions.

van den Brand et al. 2019.

International Journal of Environmental Research and Public Health, vol. 16, no. 16.

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Keywords: Employees; Financial incentives; Peer support; Smoking cessation; Social environment; Social support; Workplace

Evidence Level: 4A

Link: <https://www.mdpi.com/1660-4601/16/16/2831>

Effect of music listening on physiological condition, mental workload, and driving performance with consideration of driver temperament.

This paper presents the study on the association between in-vehicle music listening, physiological and psychological response, and driving performance, using the driving simulator approach, with which personality (temperament) was considered. The performance indicators considered were the standard deviation of speed, lane crossing frequency, perceived mental workload, and mean and variability of heart rate. Additionally, effects of the presence of music and music genre (light music versus rock music) were considered. Twenty participants of different personalities (in particular five, four, seven, and four being choleric, sanguine, phlegmatic, and melancholic, respectively) completed a total of 60 driving simulator tests. Results of mixed analysis of variance (M-ANOVA) indicated that the effects of music genre and driver character on driving performance were significant. The arousal level perceived mental workload, standard deviation of speed, and frequency of lane crossing were higher when driving under the influence of rock music than that when driving under the influence of light music or an absence of music. Additionally, phlegmatic drivers generally had lower arousal levels and choleric drivers had a greater mental workload and were more likely distracted by music listening. Such findings should imply the development of cost-effective driver education, training, and management measures that could mitigate driver distraction. Therefore, the safety awareness and safety performance of drivers could be enhanced.

Wen et al. 2019.

International Journal of Environmental Research and Public Health, vol. 16, no. 15.

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Keywords: Driver temperament; Driving performance; In-vehicle music; Music genre; Physiological condition

Evidence Level: 5A

Link: <https://www.mdpi.com/1660-4601/16/15/2766>

Occupational exposure

The influence of occupational noise exposure on cardiovascular and hearing conditions among industrial workers.

This study was conducted to estimate the current prevalence of hypertension, cardiovascular condition and hearing difficulty of workers exposure to occupational noise, and to analyze any associations between these abnormal signs and occupational noise exposure. The subjects included 5205 noise-exposed workers. Workers with high noise exposure were more likely to have a higher threshold value than low exposure ones ($P < 0.05$). Subjects in the high exposure group had a significantly higher risk of hypertension and hearing loss than the ones in low exposure group. Between the ages of 30 and 45, high-level occupational noise exposure led to a significantly raising risk of both hypertension (Adjusted OR = 1.59, 95% CI, 1.19-2.11) and hearing loss (Adjusted OR = 1.28, 95% CI, 1.03-1.60) when comparing to low-level noise exposure. In male workers, the prevalence of hearing difficulty in high exposure group was approximately 1.2 times worse than in low group ($P = 0.006$). In addition, exposure to high noise level demonstrated a significant association with hypertension and hearing loss when the duration time to occupational noise was longer than 10 years. Hypertension and hearing difficulty is more prevalent in the noise-exposed group (higher than 85 dB[A]). Steps to reduce workplace noise levels and to improve workplace-based health are thus urgently needed.

Li et al. 2019.

Scientific Reports, vol. 9, no. 1.

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Keywords: Occupational exposure; Noise; Cardiovascular conditions; Hypertension; Industrial workers; Occupational noise; Hearing loss

Evidence Level: 4A

Link: <https://www.nature.com/articles/s41598-019-47901-2>

Effectiveness of a field-type liquid cooling vest for reducing heat strain while wearing protective clothing.

This study explored the effectiveness of a field-type liquid cooling vest (LCV) worn underneath an impermeable protective suit on heat strain during walking. The study found a smaller increase in rectal temperature in participants in the LCV than in the CON condition). Walking while wearing the LCV reduced the level of physiological heat strain, as measured by the mean skin temperature, chest sweat rate, chest cutaneous vascular conductance, body weight loss, and heart rate. These changes were accompanied by a decrease in thermal sensation and discomfort, suggesting that a field-type LCV attenuates exertional heat strain while wearing impermeable protective clothing.

Tokizawa et al. 2019.

Industrial Health, [Epub ahead of print]

Keywords: Core temperature; Heat stress; Hypohydration; Microclimate cooling; Thermal strain

Evidence Level: 3B

Link: https://www.jstage.jst.go.jp/article/indhealth/advpub/0/advpub_2018-0182/article

Assessment of the chemical hazard awareness of petrol tanker driver: A case study.

Understanding the tanker driver hazard awareness on chemical exposure is important to ensure that they are fortified with the appropriate information regarding the risk of their occupation. This present study was conducted to determine the awareness of the petrol tanker driver on the chemical exposure during transportation petroleum product. The assessment on hazardous awareness of the petrol tank driver was conducted through questionnaire survey. Wherein, the questionnaire was designed with considering the variables of age of the driver, working experience, working hours in a day and knowledge on chemical hazard presence in the petroleum oil. A reliability test of Cronbach's Alpha was performed to validate the questionnaire and the Chi-Square test was conducted to determine the correlation among the studied variables. The findings of the present study revealed that the drivers who are frequently come into direct contact with petrol cannot identify the spillage had occurred during working. The study identified that there is an urgency to conduct training on safe handling of petroleum oil in order to eliminate the risk of chemical hazards exposure to the tanker driver.

Fizal et al. 2019.

Heliyon, vol. 5, no. 8.

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/Creative Commons Attribution -NonCommercial-NoDerivatives 4.0 International (CC BY-NC-ND 4.0)
(<https://creativecommons.org/licenses/by-nc-nd/4.0/>)

Keywords: Chemical exposure; Chi-square analyses; Hazard awareness; Occupational health; Petroleum oil; Public health; Safety engineering; Tanker driver

Evidence Level: 4B

Link: <https://www.heliyon.com/article/e02368>

Cancer incidence among air transportation industry workers using the National Cohort Study of Korea.

Background: There are increasing concerns regarding increased cancer risks in professional flight attendants due to their exposure to occupational hazards that are known or suspected to be carcinogenic. In this study, we aimed to analyze various cancer risks among a cohort of Korean air transportation industry workers. Methods: We used data from the Korean National Health Insurance Service (NHIS) database from 2002 to 2015. The age-standardized incidence ratios (SIRs) for all types of cancers in the aircraft transport industry workers compared to government employees and the entire employee population were calculated with adjustment for five-year age ranges via the indirect standardized method with gender stratification. Results: Leukemia (ICD-10; C91-C95) showed significantly higher SIRs (95% confidence interval (CI)) compared to the government employee group (1.86, 1.15-2.84) and the whole employee group (1.77, 1.10-2.70). Conclusion: Air transportation industry workers have an increased risk of leukemia compared to other occupational groups.

Lee et al. 2019.

International Journal of Environmental Research and Public Health, vol. 16, no. 16.

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Keywords: Air transportation industry workers; Leukemia; Neoplasms; Cancer incidence; Occupational exposure

Evidence Level: 4B

Link: <https://www.mdpi.com/1660-4601/16/16/2906>

An occupational heat-health warning system for Europe: The HEAT-SHIELD platform.

Existing heat-health warning systems focus on warning vulnerable groups in order to reduce mortality. However, human health and performance are affected at much lower environmental

heat strain levels than those directly associated with higher mortality. Moreover, workers are at elevated health risks when exposed to prolonged heat. This study describes the multilingual "HEAT-SHIELD occupational warning system" platform (<https://heatshield.zonalab.it/>) operating for Europe and developed within the framework of the HEAT-SHIELD project. This system is based on probabilistic medium-range forecasts calibrated on approximately 1800 meteorological stations in Europe and provides the ensemble forecast of the daily maximum heat stress. The platform provides a non-customized output represented by a map showing the weekly maximum probability of exceeding a specific heat stress condition, for each of the four upcoming weeks. Customized output allows the forecast of the personalized local heat-stress-risk based on workers' physical, clothing and behavioral characteristics and the work environment (outdoors in the sun or shade), also taking into account heat acclimatization. Personal daily heat stress risk levels and behavioral suggestions (hydration and work breaks recommended) to be taken into consideration in the short term (5 days) are provided together with long-term heat risk forecasts (up to 46 days), all which are useful for planning work activities. The HEAT-SHIELD platform provides adaptation strategies for "managing" the impact of global warming.

Morabito et al. 2019.

International Journal of Environmental Research and Public Health, vol. 16, no. 16.

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Keywords: European Center for Medium Range Weather Forecasts (ECMWF); Wet-Bulb Globe Temperature (WBGT); Customized forecast; Global warming; Heat adaptation; Hydration; Risk level; Work breaks; Worker

Evidence Level: 6B

Link: <https://www.mdpi.com/1660-4601/16/16/2890>

Results of a cluster randomized controlled trial to promote the use of respiratory protective equipment among migrant workers exposed to organic solvents in small and medium-sized enterprises.

Background: Existing evidence shows an urgent need to improve respiratory protective equipment (RPE) use, and more so among migrant workers in small and medium-sized enterprises (SMEs). The study aimed to assess the effectiveness of a behavioral intervention in promoting the appropriate use of RPE among internal migrant workers (IMWs) exposed to organic solvents in SMEs. Methods: A cluster randomized controlled trial was conducted among 1211 IMWs from 60 SMEs in Baiyun district in Guangzhou, China. SMEs were deemed eligible if organic solvents were constantly used in the production process and provided workers with RPE. There were 60 SMEs randomized to three interventions on a 1:1:1 ratio, namely a top-down intervention (TDI), a comprehensive intervention, and a control group which did not receive any intervention. IMWs in the comprehensive intervention received a module encompassing three intervention activities: An occupational health education and training component (lectures and leaflets/posters), an mHealth component in the form of messages illustrative pictures and short videos, and a peer education component. The TDI incorporated two intervention activities, namely the mHealth and occupational health education and training components. The primary outcome was the self-reported appropriate RPE use among IMWs, defined as using an appropriate RPE against organic solvents at all times during the last week before measurement. Secondary outcomes included IMWs' occupational health knowledge, attitude towards RPE use, and participation in occupational health check-ups. Data were collected and assessed at baseline, and three and six months of the intervention. Generalized linear mixed models were performed to evaluate the effectiveness of the trial. Results: Between 3 August 2015 and 29 January 2016, 20 SMEs with 368 IMWs, 20 SMEs with 390 IMWs, and 20 SMEs with 453 IMWs were assigned to the comprehensive intervention, the TDI, and the control group, respectively. At three months, there were no significant

differences in the primary and secondary outcomes among the three groups. At six months, IMWs in both intervention groups were more likely to appropriately use RPE than the control group (comprehensive intervention: Adjusted odds ratio: 2.99, 95% CI: 1.75-5.10, $p < 0.001$; TDI: 1.91, 95% CI: 1.17-3.11, and $p = 0.009$). Additionally, compared with the control group, the comprehensive intervention also improved all three secondary outcomes. Conclusions: Both comprehensive and top-down interventions were effective in promoting the appropriate use of RPE among IMWs in SMEs. The comprehensive intervention also enhanced IMWs' occupational health knowledge, attitude, and practice. Trial registration: ChiCTR-IOR-15006929. Registered on 15 August 2015.

Chen et al. 2019.

International Journal of Environmental Research and Public Health, vol. 16, no. 17.

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Keywords: Cluster randomized controlled trial; Migrants; Respiratory protective equipment; Small and medium-sized enterprises; Workers

Evidence Level: 2A

Link: <https://www.mdpi.com/1660-4601/16/17/3187>

The use of the internet of things for estimating personal pollution exposure.

This paper proposes a framework for an Air Quality Decision Support System (AQDSS), and as a proof of concept, develops an Internet of Things (IoT) application based on this framework. This application was assessed by means of a case study in the City of Madrid. We employed different sensors and combined outdoor and indoor data with spatiotemporal activity patterns to estimate the Personal Air Pollution Exposure (PAPE) of an individual. This pilot case study presents evidence that PAPE can be estimated by employing indoor air quality monitors and e-beacon technology that have not previously been used in similar studies and have the advantages of being low-cost and unobtrusive to the individual. In future work, our IoT application can be extended to include prediction models, enabling dynamic feedback about PAPE risks. Furthermore, PAPE data from this type of application could be useful for air quality policy development as well as in epidemiological studies that explore the effects of air pollution on certain diseases.

Arano et al. 2019.

International Journal of Environmental Research and Public Health, vol. 16, no. 17.

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Keywords: Air Quality Decision Support System; IoT; Personal Air Pollution Exposure (PAPE); Air pollution monitoring; Health impact

Evidence Level: 5B

Link: <https://www.mdpi.com/1660-4601/16/17/3130>

Glaucoma incidence risk in a cohort of Mayak PA workers occupationally exposed to ionizing radiation.

Glaucoma is a major cause of visual impairment, and secondary glaucoma manifested as neovascular glaucoma has long been known to occur following high-dose fractionated radiation therapy. In contrast, little is known as to whether ionizing radiation exposure causes primary glaucoma, except that a single study in Japanese atomic bomb survivors has reported a significantly increase risk. Therefore, the effect of lower dose and lower dose rate remains unclear. Here we report that in Russian Mayak Production Association workers occupationally exposed to chronic radiation for prolonged periods, incidence of total primary glaucoma and primary open-angle glaucoma is significantly associated with various non-radiation factors (sex, attained age, and cataract diagnosed prior to glaucoma), but neither with cumulative dose from external γ -rays nor with cumulative neutron dose nor with the unweighted sum of cumulative γ

and neutron doses. The present results suggest for the first time that chronic radiation exposure does not cause primary glaucoma, although the analyses need to be made in other cohorts exposed at various dose and dose rate.

Bragin et al. 2019.

Scientific Reports, vol. 9, no. 1.

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Keywords: Glaucoma, Risk, Ionizing radiation, Chronic radiation, Mayak Production Association Workers, Occupational exposure

Evidence Level: 5B

Link: <https://www.nature.com/articles/s41598-019-48915-6>

Occupational Exposure to Solar UV Radiation of a Group of Fishermen Working in the Italian North Adriatic Sea.

Occupational solar radiation exposure is a relevant health risk in the fishing sector. Our aim was to provide a detailed evaluation of individual UV exposure in three different fishing activities in Italy, with personal UV dosimeters and a simple formula to calculate the fraction of ambient erythemal UV dose received by the workers. The potential individual UV exposure of the fishermen was between 65 and 542 Joules/m². The percentages of the ambient exposure were estimated between 2.5% and 65.3%. Workers' UV exposure was mainly influenced by the characteristics of the work activity, the postures adopted, and the type of boats. Overall, our data showed that 43% of the daily measurements could result largely above the occupational limits of 1-1.3 standard erythemal dose (i.e., 100 Joules/m²) per day, in case of exposure of uncovered skin areas. Measurements of individual UV exposure are important not only to assess the risk but also to increase workers' perception and stimulate the adoption of preventive measures to reduce solar UV risk. Furthermore, the simple method proposed, linking ambient erythemal UV dose to the workers' exposure, can be a promising tool for a reliable assessment of the UV risk, as time series of environmental UV dose are widely available.

Modenese et al. 2019.

International Journal of Environmental Research and Public Health, vol. 16, no. 16.

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Keywords: Exposure assessment; Fishermen; Occupational exposure; Occupational safety and health; Personal dosimetry; Risk evaluation; Skin cancer prevention; Solar radiation; Ultraviolet radiation; Workers health

Evidence Level: 5B

Link: <https://www.mdpi.com/1660-4601/16/16/3001>

Do exposure to outdoor temperatures, NO₂ and PM₁₀ affect the work-related injuries risk? A case-crossover study in three Italian cities, 2001-2010.

Objectives: Studies on the effect of temperature on rates of work-related injuries (WRIs) are very recent, and are evolving in depth and scope. However, less is known about potential effects of air pollutants. Our objective was to analyse the association between WRI and NO₂, PM₁₀ and air temperature in three major Italian cities, and to identify groups of workers more at risk in Italy. **Design:** Time-stratified case-crossover study. **Setting:** Milan, Turin, Rome, years 2001-2010. **Participants:** A total of 468 816 WRI occurred between 2001 and 2010 in Milan, Turin and Rome were extracted from the Italian national workers' compensation authority database. **Outcomes:** Associations between WRI and temperature, PM₁₀, NO₂, separately in the warm and in the cold season (WS, May-September; CS, November-February). Effect modification was studied by economic sector, occupational activity and indoor/outdoor job activity. **Results:** Exposure to NO₂ (lag 0-8) showed the highest effect on the risk of WRI, with ORs ranging from 1.20 (95% CI 1.16 to

1.24) in Milan to 1.30 (95% CI 1.24 to 1.37) in Turin in the WS. The effect of exposure to PM10 was milder but consistent across all cities: ORs from 1.09 (95% CI 1.05 to 1.12) in Turin to 1.15 (95% CI 1.11 to 1.18) in Rome. Temperature was associated with risk of WRI only among those working in construction (highest association in Rome 1.06; 95% CI 1.01 to 1.12), transportation (highest association in Milan 1.05; 95% CI 0.96 to 1.14) and the energy industry (highest association in Milan 1.57; 95% CI 1.03 to 2.38) in the WS in all cities. A weak effect of low temperatures was observed in the CS only in Rome. Conclusions: Exposures to NO2 resulted as strongest hazard for WRIs, mainly in warm months, while the independent effect of temperature was significant only in specific subgroups of workers. These results could be considered to better plan safety prevention programmes.

Schifano et al. 2019.

BMJ Open, vol. 9, no. 8.

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Keywords: Air pollution; Case crossover study; Climate change; Occupational health; Temperature; Work-related injuries

Evidence Level: 5B

Link: <https://bmjopen.bmj.com/content/9/8/e023119.long>

Musculoskeletal Health

Exposure to heavy physical work from early to later adulthood and primary healthcare visits due to musculoskeletal diseases in midlife: a register linked study.

Objectives: To examine whether exposure to heavy physical work from early to later adulthood is associated with primary healthcare visits due to cause-specific musculoskeletal diseases in midlife. **Design:** Prospective cohort study. **Setting:** Nationally representative Young Finns Study cohort, Finland. **Participants:** 1056 participants of the Young Finns Study cohort. **Exposure measure:** Physical work exposure was surveyed in early (18-24 years old, 1986 or 1989) and later adulthood (2007 and 2011), and it was categorised as: 'no exposure', 'early exposure only', 'later exposure only' and 'early and later exposure'. **Outcome measures:** Visits due to any musculoskeletal disease and separately due to spine disorders, and upper extremity disorders were followed up from national primary healthcare register from the date of the third survey in 2011 until 2014. **Results:** Prevalence of any musculoskeletal disease during the follow-up was 20%, that for spine disorders 10% and that for upper extremity disorders 5%. Those with physically heavy work in early adulthood only had an increased risk of any musculoskeletal disease (risk ratio (RR) 1.55, 95% CI 1.05 to 2.28) after adjustment for age, sex, smoking, body mass index, physical activity and parental occupational class. Later exposure only was associated with visits due to any musculoskeletal disease (RR 1.46, 95% CI 1.01 to 2.12) and spine disorders (RR 2.40, 95% CI 1.41 to 4.06). Early and later exposure was associated with all three outcomes: RR 1.99 (95% CI 1.44 to 2.77) for any musculoskeletal disease, RR 2.43 (95% CI 1.42 to 4.14) for spine disorders and RR 3.97 (95% CI 1.86 to 8.46) for upper extremity disorders. **Conclusions:** To reduce burden of musculoskeletal diseases, preventive actions to reduce exposure to or mitigate the consequences of physically heavy work throughout the work career are needed.

Halonen et al. 2019.

BMJ Open, vol. 9, no. 8.

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Keywords: Musculoskeletal; Physical work; Spine disorder; Upper extremity

Evidence Level: 4B

Link: <https://bmjopen.bmj.com/content/9/8/e031564.long>

Trajectories of pain intensity over 1 year in adults with disabling subacute or chronic neck pain.

This study explored the 12 month progress of disabling subacute or persistent neck pain and to investigate if they were associated with age, sex, pain characteristics, and depressive symptoms. The study found six different clusters of trajectories with most participants (73%) following a trajectory of decreasing pain throughout follow-up. The remaining experienced persistent pain of high intensity (22%) and slightly (3%) or highly (2%) fluctuating levels of pain. Pain intensity at baseline, depressive symptoms, younger age, female sex, and sudden onset of pain were associated with unfavorable trajectories.

Pico-Espinosa et al. 2019.

The Clinical Journal of Pain, vol. 35, no. 8.

Keywords: Pain; Neck pain; Sub-acute; Acute; Disabling; Trajectory; Depression

Evidence Level: 4A

Link: <https://insights.ovid.com/crossref?an=00002508-201908000-00004>

Patterns in the occurrence and duration of musculoskeletal pain and interference with work among eldercare workers- A one-year longitudinal study with measurements every four weeks.

The objective of this study was to examine patterns of musculoskeletal pain episodes over time. We conducted a one-year follow-up study among 275 eldercare workers with measurements of musculoskeletal pain (low back pain (LBP) and neck/shoulder pain (NSP)) and pain-related work interference (PWI) reported via text message every four weeks. We found a constant, high four-weekly prevalence of LBP and NSP (between 61% and 72%). The distributions of pain episodes for LBP and NSP were similar with approximately 30% of the episodes being 7 days or less per four weeks. There was also a high recurrence of pain, with 33% reporting LBP or NSP every four weeks. In addition, 24% had pain at every measurement in both the low back and neck/shoulder regions combined throughout the year. On days with LBP or NSP, approximately 59% also reported interference with work, and 18% of the eldercare workers reported that pain interfered with their work all measurements throughout the year. A high proportion of eldercare workers reported pain every four weeks throughout the year and the four-weekly prevalence of pain remained high and constant on a group level. During most days with pain, eldercare workers were hampered in their regular work activities.

Rasmussen et al. 2019.

International Journal of Environmental Research and Public Health, vol. 16, no. 16.

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Keywords: Low back pain; Neck pain; Pain episodes; Prevalence; Recovery; Recurrence; Shoulder pain

Evidence Level: 4A

Link: <https://www.mdpi.com/1660-4601/16/16/2990>

Assessment of risk factors for non-specific chronic disabling low back pain in Japanese workers- findings from the CUPID (Cultural and Psychosocial Influences on Disability) study.

This study explored the risk factors for chronic Low back pain (LBP) in Japanese workers, using data from a 1 yr follow-up of 20–59 yr-old workers in the Cultural and Psychosocial Influences on Disability (CUPID) study. Of 198 participants, 35 (17.7%) had LBP during the 1 yr follow-up. The study found an interaction effect of two factors, expectation of LBP problems and excessive working hours (≥ 60 h per week), was associated with chronic LBP.

Matsudaira et al. 2019.

Industrial Health, vol. 57, no. 4.

Keywords: Chronicity; Japanese workers; Non-specific low back pain; Psychosocial factors; Risk factors

Evidence Level: 4B

Link: https://www.istage.ist.go.jp/article/indhealth/57/4/57_2018-0157/article

Chronic Health Issues

Relationships of obesity-related indices and metabolic syndrome with subclinical atherosclerosis in middle-aged untreated Japanese workers.

Aim: Obesity is a social problem due to the prevalence of the Western lifestyle. In particular, visceral fat accumulation, which is a main component of metabolic syndrome, is closely associated with the progression of atherosclerosis. This study aimed to investigate the relationships of obesity-related indices and metabolic syndrome with subclinical atherosclerosis in middle-aged untreated workers. **Methods:** Employees undergoing their periodic health check-up but without previous cardiovascular events or cardiovascular medications were enrolled in this study (n=7,750). Body mass index (BMI), percent body fat, waist circumference, and visceral fat area were evaluated as obesity-related indices. Assessment of visceral fat area was performed by computed tomography (CT). Subclinical atherosclerosis was assessed by measuring arterial stiffness using cardio-ankle vascular index (CAVI) and by ultrasound examination of carotid intima-media thickness (IMT). **Results:** Obesity-related indices were significantly correlated with each other and were positively associated with carotid IMT but negatively associated with CAVI in multivariate regression analysis. In a logistic regression analysis including CAVI and carotid IMT simultaneously, CAVI was negatively associated, but carotid IMT was positively associated, with obesity defined by each obesity-related index. In contrast, both CAVI and carotid IMT were positively associated with the presence of metabolic syndrome based on visceral fat accumulation. **Conclusion:** Obesity-related indices were negatively associated with CAVI and positively associated with carotid IMT in middle-aged untreated workers, while both CAVI and carotid IMT were worsened in the presence of metabolic syndrome.

Sugiura et al. 2019.

Journal of Atherosclerosis and Thrombosis, vol. 26.

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(<https://creativecommons.org/licenses/by-nc-sa/4.0/deed.en>)

Keywords: Atherosclerosis; Cardio-ankle vascular index; Carotid intima-media thickness; Metabolic syndrome; Obesity

Evidence Level: 5B

Link: https://www.istage.ist.go.jp/article/jat/advpub/0/advpub_50633/article

Asbestosis and mesothelioma

Asbestos exposure and malignant mesothelioma of the tunica vaginalis testis: a systematic review and the experience of the Apulia (southern Italy) mesothelioma register.

Background: Malignant mesothelioma of the tunica vaginalis testis (MMTVT) is a rare disease with a poor prognosis. The diagnosis and management of these lesions are often difficult for pathologists, surgeons, oncologists and occupational physicians. A preoperative diagnosis of malignancy is rarely made, and there is no established effective therapy except orchidectomy. **Methods:** A systematic literature review was conducted among the articles published in the English literature on primary MMTVT. Moreover four cases from the Apulia mesothelioma register are reported here. **Results:** Two hundred eighty-nine cases of MMTVT have been reported from 1943 to 2018. Overall asbestos exposure has been investigated only for 58% of all cases reported in this review, while in 41.8% this data are not available. Noteworthy is the fact that in many reports there is not an anamnestic reconstruction of any asbestos exposure. A history of direct occupational, environmental or familial asbestos exposure is found in 27.6% of the cases. The four cases from the Apulia mesothelioma register are all with ascertained occupational exposure to

asbestos. Conclusions: The true incidence of asbestos exposure in MMTVT is underestimated because of insufficient information reported in older literature. To establish a broad consensus on the causal relationship between asbestos and MMTVT in the scientific community its necessary to analyze the same variables in the epidemiological studies. In general it should be recommended that a positive history of exposure to asbestos or to asbestos-containing materials are at risk for the development of a MMTVT and should be monitored.

Vimercati et al. 2019.

Environmental Health, vol. 18, no. 1.

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Keywords: Apulia southern Italy; Asbestos; Mesothelioma; Mesothelioma register; Review; Tunica vaginalis

Evidence Level: 1B

Link: <https://ehjournal.biomedcentral.com/articles/10.1186/s12940-019-0512-4>

Ergonomics

The effect of using a cycling workstation on mouse dexterity.

This study investigated the effect of using a cycling workstation on mouse dexterity, including if and how this changed with practice. Thirty-four healthy adults were allocated to a sitting group (n = 17) or cycling group (n = 17). All participants completed standardised computer tasks on 6 occasions: baseline and final-all participants were seated; practice 1 to 4-sitting group participants were seated, cycling group participants pedalled on an under-desk cycle. Three computer tasks were employed: (1) Tracking (continuous task)-participants used the mouse pointer to track a dot in a figure of 8 pattern at 3 different speeds without a guide then with a guide (2) Aiming (discrete task)-participants moved the mouse pointer to a dot which repeatedly disappeared then reappeared again in different locations, creating the outline of a pentagram (3) Steering (continuous task)-participants steered the mouse pointer around two different pathways. Accuracy was measured during the Tracking and Steering tasks as the root mean square error and penalised path accuracy respectively. Speed was measured during the Aiming task as the movement time. Data was analysed using frequentist and Bayes Factor analyses. During the continuous tasks (Tracking and Steering), accuracy was impaired among participants using the cycling workstation, both compared to their accuracy when seated and to the accuracy of participants in the sitting group. In contrast, no deficits in speed were noted among participants using the cycling work station during the discrete task (Aiming). No learning effects were observed among either group for any tasks. These findings suggest using a cycling workstation may impair the accuracy but not speed of mouse use, regardless of task practice. Overall this supports the implementation of cycling workstations in typical office settings, but suggests cycling workstations may impair productivity among workers performing high precision mouse tasks.

Anderson et al. 2019.

PLoS One, vol. 14, no. 8.

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Keywords: Cycling workstation, Mouse dexterity, Computer tasks, Aiming tasks

Evidence Level: 5A

Link: <https://journals.plos.org/plosone/article?id=10.1371/journal.pone.0220896>

Effects of light intervention on alertness and mental performance during the post-lunch dip: a multi-measure study.

This study explored the effect of light intervention on alleviating the post-lunch dip in alertness and mental performance in 20 volunteers 117 min of four light conditions was preceded by a 13-min initial dim light while performing a continuous performance test (CPT) and undergoing

recording of the electroencephalogram (EEG). The light conditions were blue-enriched white light (BWL), red saturated white light (RWL), normal white light (NWL), and dim light (DL) conditions. The study found that both RWL and BWL, compared to NWL condition, improved the physiological correlates of alertness in EEG measurements. However, these changes did not translate to improvements in task performance and subjective alertness.

Askaripoor et al. 2019.

Industrial Health, vol. 57, no. 4.

Keywords: Alertness; Electroencephalography; Light; Performance; Post-lunch dip

Evidence Level: 5B

Link: [https://www.jstage.jst.go.jp/article/indhealth/57/4/57_2018-0030/ article](https://www.jstage.jst.go.jp/article/indhealth/57/4/57_2018-0030/article)