



Emerging Evidence Alert January 2020

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 provides a review of recent journal articles and relevant content related to Comcare’s five research themes: Fostering Work Participation; Building Employer Capability; Adapting to the Future of Work; Guiding and Supporting Mental Health and Wellbeing; and Enabling Healthy and Safe Workplaces. Collated articles were published in November and December 2019 only.

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How do employers support employees during an emergency?

A recent [qualitative study](#) conducted in England, interviewed employees across a range of sectors including healthcare, emergency services, and commercial organisations, to explore their perceptions of workplace support during a disaster or emergency, and to identify how employers can help reduce the psychological impact of these events.

Many employees reported that workplace support was insufficient and had the tendency to be reactive rather than proactive. This highlighted a significant opportunity for organisations to improve their workplace programs and services.

The study found that mental health education for employees may lead to a better understanding and recognition of symptoms, in addition to less judgement and reduced stigma about psychological injuries. Employers can also create a supportive workplace culture through team building exercises and fostering positive relationships among employees, which can have a positive impact on psychological wellbeing.

Supporting employees during bushfire season

With bushfires impacting communities across Australia, the mental health of workers affected by the bushfires is another important consideration for employers by monitoring and supporting the psychological wellbeing of employees.

Whether employees are directly or indirectly affected by the bushfires, employers have a range of mental health services to support them. Comcare has released [bushfire work health and safety guidance](#), which includes mental health and wellbeing information, available via our website.

Description of Evidence Levels Definitions used in this Review

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

Fostering Work Participation

Return to Work

Sustainable return to work: A systematic review focusing on personal and social factors

Purpose: A systematic review was conducted to evaluate the impact of important personal and social factors on sustainable return to work (RTW) after ill-health due musculoskeletal disorders (MSDs) and common mental disorders (CMDs) and to compare the effects of these personal and social factors across both conditions. Sustainable RTW is defined as a stable full-time or part-time RTW to either original or modified job for a period of at least 3 months without relapse or sickness absence re-occurrence. **Methods:** A literature search was conducted in 13 databases and 79 studies were selected for the review, of which the methodological design was graded as very high, high and low quality. **Results:** The most consistent evidence for achieving sustainable RTW for both MSDs and CMDs was from support from line managers or supervisors and co-workers, positive attitude, self-efficacy, young age and higher education levels. Job crafting, economic status, length of absence and job contract/security showed promising results, but too few studies exist to draw definite conclusions. Results regarding gender were inconsistent. **Conclusions:** This review demonstrates that a variety of personal and social factors have positive and negative influences on sustainable RTW. We suggest that the social environment and how it interrelates with personal factors like attitudes and self-efficacy should be studied in more detail in the future as the inter-relationship between these factors appears to impact positively on sustainable RTW outcomes. Areas for future research include more high-quality studies on job crafting, economic status/income, length of absence, job contract/security and gender.

Etuknwa et al. 2019.

Journal of Occupational Rehabilitation, vol. 29, no. 4.

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Keywords: Mental disorders; Musculoskeletal pain; Occupational health; Return to work; Systematic review

Evidence Level: 1A

Link: <https://link.springer.com/article/10.1007%2Fs10926-019-09832-7>

Presenteeism and Absenteeism

Sick leave due to musculoskeletal pain: Determinants of distinct trajectories over 1 year.

Purpose: This study aimed to identify sub-groups of workers with different trajectories of sick leave due to musculoskeletal pain over 1 year, and to investigate the extent to which the identified trajectories are associated with personal, occupational, lifestyle, and pain-related factors at baseline. **Methods:** Data on 981 blue- and white-collar workers were analyzed in the DPHACTO cohort (2012-2014). The number of days on sick leave due to pain was reported using text messages at 4-week intervals across 1 year. Latent class growth analysis was used to distinguish sub-groups with different trajectories of sick leave. A web-based questionnaire at baseline was used to assess personal, occupational (physical and psychosocial), lifestyle, and pain-related factors. Multinomial regression models were constructed to determine associations between baseline factors and trajectories of sick leave (referencing no sick leave), with adjustment for potential confounders. **Results:** Four distinct sub-groups were identified, with trajectories of sick leave due to pain ranging from no sick leave (prevalence 76%; average 0.5 days/year) to some days and increasing sick leave due to pain over 1 year (2%; 89 days/year). The increasing trajectory of sick leave was associated with higher perceived physical exertion, more time in manual work, less social community and influence at work, less leisure-time physical activity, smoking, and more severe symptoms (e.g., multisite pain, low back pain intensity, and pain interference). **Conclusions:** We identified four distinct trajectories of sick leave due to musculoskeletal pain. The sub-group with increasing sick leave due to pain was associated with several modifiable physical and psychosocial factors at work and outside work, which may have implications for prevention.

Hallman et al. 2019.

International Archives of Occupational and Environmental Health, vol. 92, no. 8.

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Keywords: Longitudinal; Risk factors; Sickness absence; Workers

Evidence Level: 4B

Link: <https://link.springer.com/article/10.1007%2Fs00420-019-01447-y>

Important work demands for reducing sickness absence among workers with neck or upper back pain: a prospective cohort study

Background: The aim of this study was to investigate what exposure to work demands, physical and psychosocial, is associated with lower levels of sickness absence among workers with neck or upper back pain in different groups, by age, gender, duration of sickness absence and work ability score. **Methods:** This study was a prospective study of 4567 workers with neck or upper back pain. Data on neck or upper back pain, work demand and work ability were obtained from the Swedish Work Environment survey over a 3-year period (2009-2013). Register data on sickness absence, 1 year after each survey was conducted, were obtained from the Swedish health insurance database. Analyses were performed to estimate the association between self-reported work demands and registered sick days > 14 days. The analyses were stratified for gender, age group and work ability score. **Results:** Lower numbers of sick days were found for workers reporting low exposure to lifting ≥ 15 kg and twisted or forward-leaning work postures. Lower numbers of sick days were found for workers reporting high work control and seated work. The associations were generally stronger in the older age groups for the physical work demands. **Conclusions:** The findings in this study suggest that certain physical work demands and having high control over one's work can result in lower sickness absence, especially among middle-aged and older workers with neck or upper back pain.

Oliv et al. 2019.

BMC Musculoskeletal Disorders, vol. 20, no. 1.

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Keywords: Occupation; Occupational health; WAI; Work ability

Evidence Level: 4B

Link: <https://bmcmusculoskeletaldisord.biomedcentral.com/articles/10.1186/s12891-019-2909-1>

Who gains the most from improving working conditions? Health-related absenteeism and presenteeism due to stress at work.

Work stress-related productivity losses represent a substantial economic burden. In this study, we estimate the effects of social and task-related stressors and resources at work on health-related productivity losses caused by absenteeism and presenteeism. We also explore the interaction effects between job stressors, job resources and personal resources and estimate the costs of work stress. Work stress is defined as exposure to an unfavorable combination of high job stressors and low job resources. The study is based on a repeated survey assessing work productivity and workplace characteristics among Swiss employees. We use a representative cross-sectional data set and a longitudinal data set and apply both OLS and fixed effects models. We find that an increase in task-related and social job stressors increases health-related productivity losses, whereas an increase in social job resources and personal resources (measured by occupational self-efficacy) reduces these losses. Moreover, we find that job stressors have a stronger effect on health-related productivity losses for employees lacking personal and job resources, and that employees with high levels of job stressors and low personal resources will profit the most from an increase in job resources. Productivity losses due to absenteeism and presenteeism attributable to work stress are estimated at 195 Swiss francs per person and month. Our study has implications for interventions aiming to reduce health absenteeism and presenteeism.

Brunner et al. 2019.

The European Journal of Health Economics, vol. 20, no. 8.

User License: *Creative Commons Attribution (CC BY 4.0)*

Keywords: Absenteeism; Health-related productivity losses; Presenteeism; Self-efficacy; Task-related and social stressors and resources at work

Evidence Level: 4B

Link: <https://link.springer.com/article/10.1007%2Fs10198-019-01084-9>

Prediction of 2-year work participation in sickness absentees with neck or shoulder pain: the contribution of demographic, patient-reported, clinical and imaging information.

Background: In cases of neck and shoulder pain, the responsibility for assessing work prognosis is held by clinicians with access to different domains of information. One of these domains is magnetic resonance imaging (MRI), and although MRI is increasingly used, it is unknown which domains of information contribute the most to the prediction of work prognosis. This retrospective cohort study explored the contribution of demographic, patient-reported, clinical, and MRI information to the prediction of work participation in sickness absentees with neck or shoulder pain. **Methods:** From a secondary care setting, 168 sickness absentees with neck or shoulder pain were included. Based on registry data, a successful work outcome was defined as $\geq 50\%$ work participation score (WPS) from Weeks 1 to 104 after enrolment. Prognostic variables were categorized into four domains (demographic, patient-reported, clinical, and MRI) resembling the order of information obtained in a clinical setting. Crude logistic regression analyses were used to identify prognostic variables for each domain ($p < 0.2$). This was followed by multivariable analyses including the identified variables in a domain-wise order. For each added domain, the probability of successful WPS was dichotomized leaving two possible classifications: $\geq 50\%$ chance of successful WPS or not. In cross-tabulations of chance and the actual WPS outcome, positive and negative predictive values (PPV and NPV), sensitivity, specificity and area under the curve (AUC) were calculated. **Results:** The combination of demographic and patient-reported variables yielded an NPV of 0.72 and a PPV of 0.67, while specificity was 0.82, sensitivity 0.54 and AUC 0.77. None of these values improved notably by adding clinical and MRI variables as predictors of successful WPS. **Conclusions:** These results suggest that - among sickness absentees with neck or shoulder pain - clinical and MRI variables provide no additional information for the prediction of work participation compared with only demographic and patient-reported information.

Moll et al. 2019.

BMC Musculoskeletal Disorders, vol. 20, no. 1.

User License: *Creative Commons Attribution (CC BY 4.0)*

Keywords: Magnetic resonance imaging; Neck pain; Prediction; Prognosis; Shoulder pain; Sick leave

Evidence Level: 4B

Link: <https://bmcmusculoskeletaldisord.biomedcentral.com/articles/10.1186/s12891-019-2906-4>

Sickness absence and disability pension before and after first childbirth and in nulliparous women by numerical gender segregation of occupations: A Swedish population-based longitudinal cohort study

Background: Pregnancy is associated with a temporarily increased sickness absence (SA) risk. This association may vary by the level of occupational gender segregation; however, knowledge in this area is limited. We studied whether trends in SA and disability pension (DP) in the years before and after first childbirth among women with one or more childbirths and with no childbirth during the study period varied by occupational gender segregation. **Methods:** We conducted a population-based register study involving nulliparous women aged 18-39 years, living in Sweden in 2002-2004 ($n = 364,411$). We classified participants in three childbirth groups as: (1) no childbirth in 2005 or in the next 3.75 years, (2) first childbirth in 2005 and no births in the subsequent 3.75 years, and (3) first childbirth in 2005 and at least one additional birth in the subsequent 3.75 years, and into five categories based on the rate of women in their occupations. We compared crude and standardized mean annual net SA and DP days during the three years before and the three years after 2005 across the childbirth and occupational gender segregation categories. **Results:** Women in extremely male-dominated occupations had or tended to have somewhat higher mean combined SA and DP days than women in gender-integrated occupations; women in female-dominated occupations had comparable or tended to have slightly higher mean SA and DP days than women in gender-integrated occupations. Except for the year before the first childbirth, women who gave birth, especially those who gave several births, had generally a lower mean combined standardized SA and DP days than nulliparous women. We found no substantial differences in trends in SA and DP around the time of first childbirth according to occupational gender segregation. **Conclusions:** Trends in SA and DP around the time of first childbirth did not vary by occupational gender segregation.

Laszio et al. 2019.

PLoS One, vol. 14, no. 12.

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Keywords: Sickness absence; Disability pension; Childbirth; Nulliparous

Evidence Level: 4A

Link: <https://journals.plos.org/plosone/article?id=10.1371/journal.pone.0226198>

Do gender and psychosocial job stressors modify the relationship between disability and sickness absence: An investigation using 12 waves of a longitudinal cohort

Objectives: A considerable proportion of the working population reports a disability. These workers may be at risk of adverse outcomes, including longer periods of sickness absence. This study examined the causal effect of disability on sickness absence and the role of psychosocial job stressors and gender as effect modifiers. **Methods:** Data on paid and unpaid sick leave, disability (yes/no) and psychosocial job stressors were available from 2005 to 2017 from the Household, Income and Labour Dynamics in Australia (HILDA) survey. Negative binomial models were used to model the rate of sickness absence in a year. **Results:** In the random effects model, workers with disability had 1.20 greater rate of sickness absence in a year [95% confidence interval (CI) 1.17-1.23, $P < 0.001$] after adjustment for confounders. The rate was slightly lower in the fixed effects model. There was evidence of multiplicative interaction of the effect by gender and job control. The effect of disability on sickness absence was greater among men than women, and higher for people with low job control compared to those with high job control. **Conclusions:** There is a need for more research about the factors that can reduce sickness leave among workers with disabilities.

Milner et al. 2019.

Scandinavian Journal of Work and Environment Health.

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Keywords: Disability; gender; HILDA survey; job control; job stressor; longitudinal cohort; psychosocial; psychosocial job stressor; sick leave; sickness absence; sickness leave; unpaid leave; working condition

Evidence Level: 4A

Link: https://www.sjweh.fi/show_abstract.php?abstract_id=3865

The Contribution of Alcohol Use, Other Lifestyle Factors and Working Conditions to Socioeconomic Differences in Sickness Absence

Introduction: This study investigates how alcohol use contributes to the social gradient in sickness absence. Other factors assessed include lifestyle factors (smoking, physical activity and body mass index), physical and psychosocial working conditions. **Methods:** The study used baseline data from the Stockholm public health cohort 2006, with an analytical sample of 17,008 respondents aged 25-64 years. Outcome variables included self-reported short-term (<14 days) and register-based long-term (>14 days) sickness absence. Socioeconomic position (SEP) was measured by occupational class. Alcohol use was measured by average weekly volume and frequency of heavy episodic drinking. Negative binomial regression was used to estimate sex-specific SEP differences in sickness absence, before and after adjusting for alcohol use and the additional explanatory factors. **Results:** Adjusting for alcohol use attenuated the SEP differences in long-term sickness absence by 20% for men and 14% for women. Alcohol use explained a smaller proportion of the differences in short-term sickness absence. Alcohol use in combination with other lifestyle factors attenuated the SEP differences (20-35%) for both outcomes. Physical working conditions explained more than half of the gradient in long-term sickness absence, whereas psychosocial conditions had greater impact on short-term sickness absence among men. **Conclusion:** Alcohol use explains a substantial proportion of the SEP disparities in long-term sickness absence among men. The effect is smaller among women and for short-term sickness absence. Our findings support the notion that physical working conditions constitute the key explanatory variable for SEP differences in long-term sickness absence, but add that psychosocial working conditions have greater impact on the gradient in short-term sickness absence among men.

Landberg et al. 2019.

European Addiction Research.

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Keywords: Lifestyle factors; Alcohol use; Sickness absence; Socioeconomic differences; Working conditions

Evidence Level: 4B

Link: <https://www.karger.com/Article/FullText/504437>

Predicting the duration of sickness absence spells due to back pain: A population-based study from Sweden

Objectives: We aimed to develop and validate a prediction model for the duration of sickness absence (SA) spells due to back pain (International Statistical Classification of Diseases and Related Health Problems 10th Revision: M54), using Swedish nationwide register microdata. **Methods:** Information on all new SA spells >14 days from 1 January 2010 to 30 June 2012 and on possible predictors were obtained. The duration of SA was predicted by using piecewise constant hazard models. Nine predictors were selected for the final model based on a priori decision and log-likelihood loss. The final model was estimated in a random sample of 70% of the SA spells and later validated in the remaining 30%. **Results:** Overall, 64 048 SA spells due to back pain were identified during the 2.5 years; 74% lasted \leq 90 days, and 9% >365 days. The predictors included in the final model were age, sex, geographical region, employment status, multimorbidity, SA extent at the start of the spell, initiation of SA spell in primary healthcare and number of SA days and specialised outpatient healthcare visits from the preceding year. The overall c-statistic (0.547, 95% CI 0.542 to 0.552) suggested a low discriminatory capacity at the individual level. The c-statistic was 0.643 (95% CI 0.634 to 0.652) to predict >90 days spells, 0.686 (95% CI 0.676 to 0.697) to predict >180 spells and 0.753 (95% CI 0.740 to 0.766) to predict >365 days spells. **Conclusions:** The model discriminates SA spells >365 days from shorter SA spells with good discriminatory accuracy.

Ropponen et al. 2019.

Occupational and Environmental Medicine.

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Keywords: Sickness absence; Back pain; Sweden;

Evidence Level: 4A

Link: <https://oem.bmj.com/content/early/2019/12/10/oemed-2019-106129>

Perceived and content-related emotional demands at work and risk of long-term sickness absence in the Danish workforce: A cohort study of 26 410 Danish employees

Objectives: This study aimed to examine whether high emotional demands at work predict long-term sickness absence (LTSA) in the Danish workforce and whether associations differ by perceived and content-related emotional demands. **Methods:** We included 26 410 individuals from the Work Environment and Health in Denmark Study, a nationwide sample of the Danish workforce. Emotional demands at work were measured with two items: one assessing perceived emotional demands (asking how often respondents were emotionally affected by work) and one assessing content-related emotional demands (frequency of contact with individuals in difficult situations). LTSA was register based and defined as spells of \geq 6 weeks. Respondents with LTSA during 2 years before baseline were excluded. Follow-up was 52 weeks. Using Cox regression, we estimated risk of LTSA per one-unit increase in emotional demands rated on a five-point scale. **Results:** During 22 466 person-years, we identified 1002 LTSA cases. Both perceived (HR 1.20, 95% CI 1.12 to 1.28) and content-related emotional demands (HR 1.07, 95% CI 1.01 to 1.13) predicted risk of LTSA after adjustment for confounders. Further adjustment for baseline depressive symptoms substantially attenuated associations for perceived (HR 1.08, 95% CI 1.01 to 1.16) but not content-related emotional demands (HR 1.05, 95% CI 1.00 to 1.11). Individuals working in occupations with above-average values of both exposures had an increased risk of LTSA (HR 1.32, 95% CI 1.14 to 1.52) compared with individuals in all other job groups. **Conclusions:** Perceived and content-related emotional demands at work predicted LTSA, also after adjustment for baseline depressive symptoms, supporting the interpretation that high emotional demands may be hazardous to employee's health.

Framke et al. 2019.

Occupational and Environmental Medicine, vol. 76, no. 12.

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Keywords: Content-related; emotional demands; perceived; sickness absence; workplace

Evidence Level: 4A

Link: <https://oem.bmj.com/content/76/12/895.long>

Working Hours

A shorter working week for everyone: How much paid work is needed for mental health and well-being?

There are predictions that in future rapid technological development could result in a significant shortage of paid work. A possible option currently debated by academics, policy makers, trade unions, employers and mass media, is a shorter working week for everyone. In this context, two important research questions that have not been asked so far are: what is the minimum amount of paid employment needed to deliver some or all of the well-being and mental health benefits that employment has been shown to bring? And what is the optimum number of working hours at which the mental health of workers is at its highest? To answer these questions, this study used the UK Household Longitudinal Study (2009-2018) data from individuals aged between 16 and 64. The analytical sample was 156,734 person-wave observations from 84,993 unique persons of whom 71,113 had two or more measurement times. Fixed effects regressions were applied to examine how changes in work hours were linked to changes in mental well-being within each individual over time. This study found that even a small number of working hours (between one and 8 h a week) generates significant mental health and well-being benefits for previously unemployed or economically inactive individuals. The findings suggest there is no single optimum number of working hours at which well-being and mental health are at their highest - for most groups of workers there was little variation in wellbeing between the lowest (1-8 h) through to the highest (44-48 h) category of working hours. These findings provide important and timely empirical evidence for future of work planning, shorter working week policies and have implications for theorising the future models of organising work in society.

Kamerade et al. 2019.

Social Science and Medicine, vol. 241.

User License: *Creative Commons Attribution (CC BY 4.0)*

Keywords: Four day week; Future of work; GHQ; Mental health; SF-12; UK; Well-being; Working hours

Evidence Level: 4B

Link: <https://www.sciencedirect.com/science/article/pii/S0277953619303284?via%3Dihub>

How much is too much? The influence of work hours on social development: An empirical analysis for OECD countries

Work is a cornerstone of social development. Quantifying the impact on development of fluctuations in work hours is important because longer work hours increasingly seem to be the norm. Based on an integrative perspective that combines individual, organizational, and social factors, we constructed a model using data from 31 member countries of the Organisation for Economic Co-operation and Development (OECD). The proposed model was used to test the effect of work hours on different levels and to propose feasible suggestions accordingly. The results show that people in developing countries work more hours per week than those in developed countries, and that males work longer hours than females. Furthermore, regression analysis shows that current work hours are having a negative impact on development in OECD countries, especially in developing countries where people are working longer hours. Longer hours, in other words, do not promote development effectively. Specifically, work hours at the individual level are negatively related to health. At the level of organization, work hours are a reverse indicator of organizational performance, and at the level of society, there is a negative relationship between work hours and economic development. This study provides support for the proposition by the International Labour Organization to reduce work hours, and it facilitates our understanding of the relationship between work hours and social development.

Liu et al. 2019.

International Journal of Environmental Research and Public Health, vol. 16, no. 24.

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Keywords: Work hours; individual-organizational-social perspective; health quality; organizational performance; economic development

Evidence Level: 6A

Link: <https://www.mdpi.com/1660-4601/16/24/4914>

Effect of long working hours on depression and mental well-being among employees in Shanghai: The role of having leisure hobbies

Our aim is to examine the associations between long working hours and depression and mental well-being among the working population in Shanghai, as well as to identify the impact of having hobbies on these relationships. A cross-sectional study was conducted in Shanghai, with depression assessed by the Patient Health Questionnaire-9 (PHQ-9) scale and mental well-being assessed by the World Health Organization five-item Well-Being Index (WHO-5) scale. The phenomenon of long working hours (69.3%) was quite common among employees in Shanghai, and the rate of working over 60 h was 19.3%. Those who worked over 60 h had the highest prevalence of poorer mental health compared with individuals working ≤ 40 h per week. After adjustment in the logistic regression model, those who reported weekly working time over 60 h were 1.40 (95%CI: 1.03-1.90) and 1.66 (95%CI: 1.26-2.18) times more likely to have depression and poor mental well-being (PMWB), respectively. Adjusted ORs for having hobbies were 0.78 (95%CI: 0.62-0.97) and 0.62 (95%CI: 0.51-0.75), respectively. Meanwhile, having hobbies could significantly lower the mean score on the PHQ-9 and elevate the mean score on the WHO-5 in each working time group, with no interaction effect. Long working hours could have a significantly negative impact on workers' psychological health. Importantly, having hobbies in their daily lives might help to mitigate the adverse effects of long working hours on workers' depression and mental well-being.

Li et al. 2019.

International Journal of Environmental Research and Public Health, vol. 16, no. 24.

User License: *Creative Commons Attribution (CC BY 4.0)*

Keywords: Depression; having hobbies; long working hours; mental well-being

Evidence Level: 4B

Link: <https://www.mdpi.com/1660-4601/16/24/4980>

Cross-sectional study of the association between long working hours and pre-diabetes: 2010-2017 Korea national health and nutrition examination survey

Objective: Long working hours have been shown to raise the risk of various health outcomes. However, epidemiological evidence has shown inconsistent result in relation to type 2 diabetes mellitus (T2DM) and the association between long working hours and pre-diabetes among non-diabetic adults remains largely unexplored. We thus aimed to investigate whether long working hours were linked with pre-diabetes as determined by glycated haemoglobin (HbA1c) level. **Design:** Cross-sectional survey. **Participants:** This study included 6324 men and 4001 women without diabetes from the 2010 to 2017 Korean National Health and Nutrition Examination Survey. **Outcome measures:** The study outcome of interest was pre-diabetes, defined as HbA1c values 5.7% to 6.4%. **Results:** Logistic regression was performed to obtain the ORs for pre-diabetes according to categories of work hour (40 hours/week, 41 to 52 hours/week, >52 hours/week), after adjusting for relevant covariates. Of the 10 325 eligible participants, 2261 (34.4%) men and 1317 (31.0%) women had pre-diabetes. No statistically significant relationship was found for women. In men, extended working hours (>52 hours per week) was associated with an increased likelihood of pre-diabetes, after adjustment for age, educational attainment, monthly household income, lifestyle related factors, perceived stress, family history of diabetes, hypertension, hypercholesterolaemia and other covariates (adjusted OR=1.22; 95% CI 1.03 to 1.46). In the subgroup analysis by occupational categories, the association was only apparent among men in blue-collar worker groups. **Conclusion:** Extended working hours were significantly related to pre-diabetes in men, with no statistically significant association observed for women. Further subgroup analysis by occupational categories revealed that the increased odds of pre-diabetes associated with long working hours was only apparent among male workers of blue-collar occupations and shift workers.

Baek et al. 2019.

BMJ Open, vol. 9, no. 12.

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Keywords: Hba1c; glucose metabolism; pre-diabetes; working hours

Evidence Level: 4B

Link: <https://bmjopen.bmj.com/content/9/12/e033579.long>

Does working long hours increase the risk of cardiovascular disease for everyone?

Introduction: It has been suggested that long working hours are associated with cardiovascular disease (CVD). Although studies on health inequality caused by income inequality have been performed, income levels of workers have been considered only as an adjusting factor in the relationship between long working hours and CVD. In the present study, we investigated the modifying effects of household income level in the relationship between working hours and estimated risk of CVD. **Methods:** We analysed a total of 11,602 Koreans who were randomly enrolled in the Korea National Health and Nutrition Examination Survey (2007-2016) with complete data. Nonparametric associations between weekly working hours and estimated risk of CVD were explored according to quartiles of equalised household income by gender, and the size of linear associations among weekly working hours and estimated CVD risk after stratifying for equalised household income by gender was considered. **Results:** A 4.1% increased risk of CVD was associated with 10 hours or longer per day weekly working hours among males with the highest household income after adjusting for age, equalised household income, occupation, and shift work, but such was not associated among lower income groups. Negative associations between equalised household income and estimated CVD risk were observed only among low household income males. **Conclusion:** Long working hours and household income level can have differential effects on the risk of CVD by socioeconomic status. This study shows that positive income effect may dominate the potential negative effect of long working hours with respect to the risk of CVD in the low-income group.

Lee et al. 2019.

Journal of Occupational Health, vol. 61, no. 6.

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Keywords: Korean national health and nutrition examination survey; cardiovascular disease; health inequality; long working hours; socioeconomic status

Evidence Level: 5B

Link: <https://onlinelibrary.wiley.com/doi/full/10.1002/1348-9585.12069>

Objective and subjective working hours and their roles on workers' health among Japanese employees.

This study investigated the correlation between objective and subjective working hours (OWH and SWH, respectively) and their relation to the workers' health. The study included 6,806 workers of a Japanese company (response rate=86.6%). OWH were collected as the monthly data during fiscal year 2017 from the company record. SWH were self-reported as the weekly data during the past month in November 2017. Both OWH and SWH corresponded to the same period of one month (October 2017). Additionally, the data for the annual health checkup in fiscal year 2017 and self-reported mental health in November 2017 were collected. The results indicated that the longer OWH was related to more underestimation of SWH. The analyses of covariance adjusted for the selected variables showed that irrespective of OWH or SWH, significant relationships were found for stress responses but not for body mass index, aspartate and alanine aminotransferase, fasting blood glucose, hemoglobin A1c, high-density lipoprotein cholesterol, or triglyceride. However, significant relationships with only OWH were noted for systolic and diastolic blood pressure, low-density lipoprotein cholesterol, gamma-glutamyl transpeptidase, and positive work-related state of mind. The present findings show that SWH should be used carefully when assessing the health effects of long working hours.

Ochiai et al. 2019.

Industrial Health.

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Keywords: Cardiovascular diseases; Exposure assessment; Health checkup; Karoshi; Overtime

Evidence Level: 4B

Link: https://www.jstage.jst.go.jp/article/indhealth/advpub/0/advpub_2019-0126/article

Building Employer Capability

Wellness Programs

A Mobile-Based Comprehensive Weight Reduction Program for the Workplace (Health-On): Development and Pilot Study

Background: There is a growing interest in mobile technology for obesity management. Despite the known effectiveness of workplace-based weight loss programs, there are few studies on mobile phone-delivered interventions. **Objective:** This study aimed to develop and verify an integrated and personalized mobile technology-based weight control program, named Health-On, optimized for workplaces. **Methods:** A weight reduction algorithm was developed for calorie prescription, continuous monitoring, periodic feedback and reevaluation, goal resetting, and offline intervention with behavior-changing strategies. A total of 30 obese volunteers (body mass index ≥ 25 kg/m²) participated in the 12-week Health-On pilot program. The primary outcome was weight reduction, and secondary outcomes were improved anthropometric measures, metabolic profiles, and fat computed tomography measures, all assessed pre- and postintervention. **Results:** Health-On incorporated proprietary algorithms and several strategies intended to maximize adherence, using compatible online and offline interventions. The mean weight of 30 participants decreased by 5.8%, and median weight also decreased from 81.3 kg (interquartile range [IQR] 77.1-87.8) before intervention to 76.6 kg (IQR 70.8-79.5) after the 12-week intervention period ($P < .001$). The metabolic profiles and fat measures (blood pressure, glycosylated hemoglobin, total cholesterol, triglyceride, high-density lipoprotein, low-density lipoprotein, alanine aminotransferase, and visceral and subcutaneous adipose tissue; $P < .05$) also improved significantly. **Conclusions:** In this single-group evaluation of 30 participants before and after the Health-On program, body weight decreased and metabolic profiles and fat measures improved. Follow-up studies are needed to assess effectiveness and long-term adherence.

Han et al. 2019.

JMIR mHealth and uHealth, vol. 7, no. 11.

User License: *Creative Commons Attribution (CC BY 4.0)*

Keywords: Mobile phone; obesity; obesity management; smartphone; weight loss programs; workplaces

Evidence Level: 5B

Link: <https://mhealth.jmir.org/2019/11/e11158/>

Building healthy eating knowledge and behavior: An evaluation of nutrition education in a skill training course for construction apprentices

Prior research has found poor health among construction workers is related to poor nutrition and low fruit and vegetable consumption. Promoting nutrition knowledge can improve dietary behaviors, but nutrition education among construction workers is limited. We evaluated the effectiveness of nutrition education on fruit and vegetable consumption among construction apprentices. In this pilot evaluative study, 36 construction apprentices enrolled in skill training programs received two 1.5-hour nutrition classes. Twelve questions addressing healthy eating knowledge and behavior were administered at baseline, after intervention, and at three months follow-up. After intervention, daily fruit consumption improved from baseline (mean (s.d.) =1.42 (0.55)) to post intervention (mean (s.d.) =1.72 (0.70)) ($p < 0.05$) and to three months follow-up (mean(s.d.) =1.94 (0.83)) ($p > 0.05$). After intervention, daily vegetable consumption improved from baseline (mean (s.d.) =1.67 (0.59)) to post intervention (mean (s.d.) =1.97 (0.74)) ($p < 0.05$) and to three months follow-up (mean (s.d.) = 2.19 (0.82)) ($p > 0.05$). Younger construction apprentices showed better healthy eating knowledge at post intervention and three months follow-up ($p > 0.05$). Working in normal hours showed better healthy eating knowledge at post intervention but not at three months follow up ($p > 0.05$). Both age groups and working hours did not show significant differences on healthy eating behaviour. Nutrition education implemented as a three-hour session within skill courses may possibly promote fruit and vegetable consumption among construction apprentices. Further research with control group is required to support the findings in this study.

Chung et al. 2019.

International Journal of Environmental Research and Public Health, vol. 16, no. 23.

User License: *Creative Commons Attribution (CC BY 4.0)*

Keywords: Construction apprentices; fruit and vegetable consumption; nutrition education

Evidence Level: 5B

Link: <https://www.mdpi.com/1660-4601/16/23/4852>

Organisational Issues

Flexible employment policies, temporal control and health promoting practices: A qualitative study in two Australian worksites

For four decades, theories of job demand-control have proposed that higher occupational status groups have lower health risks due to the stress accompanying jobs featuring high demands but high control. This research examines whether Flexible Work Arrangements (FWAs) can improve the health prospects of a range of workers by giving greater control over work time arrangements. Our setting is Australia, where FWAs were introduced in 2009. In line with these early studies alongside studies of work-life balance, we expected to observe that workers with access to control over daily work times could better control the activities outside of work that influence chronic disease. Using a practice sociology approach, we compared the accounts of twenty-eight workers in blue and white collar industries with differing degrees of work time flexibility. The findings do not contradict early theories describing occupational differences of job demand-control dynamics and their relationship to health risks. However, this study suggests that a) time demands and strains have increased for a broad sweep of workers since the 1980s, b) the greater control of higher occupational status groups has been eroded by the high performance movement, which has attracted less scrutiny than FWAs, and c) more workers are forced to adapt their daily lives, including their approach to health, to accommodate their job demands. Job insecurity further impedes preventative health practices adoption. What might appear to be worker-controlled flexibility can-under the pressures of job insecurity and performance expectations without time limits-transform into health-eroding unpredictability. The answer however is not greater flexibility in the absence of limits on the well-documented precursors of work stress: long hours, job insecurity and intensity-related exhaustion. While there have been welcome developments in job demand-control-health conceptualizations, they typically ignore the out-of-work temporal demands that workers face and which compound on-the-job demands. Redesign of the temporalities of working life within worksites need to be accompanied by society-level policies which address caring responsibilities, gender equality as well as broad labour market conditions.

Dixon et al. 2019.

PloS One, vol. 14, no. 12.

User License: Creative Commons Attribution (CC BY 4.0)

Keywords: Flexible employment; Policy; Health promotion; Qualitative; Worksites

Evidence Level: 5A

Link: <https://journals.plos.org/plosone/article?id=10.1371/journal.pone.0224542>

Happy-productive teams and work units: A systematic review of the 'Happy-Productive Worker Thesis'

The happy-productive worker thesis (HPWT) assumes that happy employees perform better. Given the relevance of teams and work-units in organizations, our aim is to analyze the state of the art on happy-productive work-units (HPWU) through a systematic review and integrate existing research on different collective well-being constructs and collective performance. Research on HPWU (30 studies, 2001-2018) has developed through different constructs of well-being (hedonic: team satisfaction, group affect; and eudaimonic: team engagement) and diverse operationalizations of performance (self-rated team performance, leader-rated team performance, customers' satisfaction, and objective indicators), thus creating a disintegrated body of knowledge about HPWU. The theoretical frameworks to explain the HPWU relationship are attitude-behavior models, broaden-and-build theory, and the job-demands-resources model. Research models include a variety of antecedents, mediators, and moderating third variables. Most studies are cross-sectional, all propose a causal happy-productive relationship (not the reverse), and generally find positive significant relationships. Scarce but interesting time-lagged evidence supports a causal chain in which collective well-being leads to team performance (organizational citizenship behavior or team creativity), which then leads to objective work-unit performance. To conclude, we identify common issues and challenges across the studies on HPWU, and set out an agenda for future research.

Buades et al. 2019.

International Journal of Environmental Research and Public Health, vol. 17, no. 1.

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Keywords: Affect; engagement; happy; performance; productive; satisfaction; team; work-unit

Evidence Level: 1B

Link: <https://www.mdpi.com/1660-4601/17/1/69>

Job Design

Creating positive work experiences through task self-redesign.

Complementing the traditional focus in work design on "top-down" organizational interventions, research into proactive work behavior suggests that "bottom-up" processes, based on the "micro-emancipatory" actions employees engage in, create more rewarding and meaningful work experiences. Based on current theorizing, this study tests a tripartite model of task self-redesign and positive work-related states of meaning, affective commitment, and work-home enrichment. The interactive effects of three modes of task influence are postulated: (a) the active use of existing potentials for task autonomy; (b) job crafting, as unauthorized and self-organized modifications of task features; (c) the individual renegotiation of tasks through idiosyncratic deals (i-deals) with superiors. Survey data from an occupationally heterogeneous convenience sample of N = 279 German-speaking employees were analyzed, using confirmatory factor analysis and moderated linear regression. The regression results confirmed that task i-deals consistently related to positive experiences, whereas autonomy only related to one, and task crafting had no significant main effect. A significant two-way interaction between i-deals and crafting was found only in relation to affective commitment. Supporting the suggested tripartite model, significant (synergistic) three-way interactions explained the additional variance in all three examined outcomes. These results offer some preliminary insights into the interplay of organizationally designed, individually crafted, and interpersonally negotiated work activities. Task autonomy, task-directed job crafting, and task i-deals appear to fulfill complementary roles in the self-directed creation of positive work experiences. Methodological limitations and further research needs are discussed.

Hornung et al. 2019.

Behavioral Science, vol. 9, no. 12.

User License: *Creative Commons Attribution (CC BY 4.0)*

Keywords: Affective commitment; idiosyncratic deals; job crafting; meaning of work; positive work experiences; proactive work behavior; task autonomy; work design; work-home enrichment

Evidence Level: 4B

Link: <https://www.mdpi.com/2076-328X/9/12/140>

Who reported having a high-strain job, low-strain job, active job and passive job? The WIRUS Screening study

Objective: The Job Demands and Control model classifies job types as active, passive, low-strain or high-strain, based on a combination of job demands and control. While studies have shown high-strain jobs to have adverse consequences for health and work participation, prognostic factors for the four job types have been less explored. The aim of this study was to assess the associations between sociodemographic factors and job descriptors and being in high-strain, low-strain, active and passive jobs. **Methods:** The WIRUS Screening study targeted Norwegian employees in private and public enterprises. In this study, associations with job types among 4,487 employees were investigated with binary logistic regression analyses, adjusting for sociodemographic and job-related variables. **Results:** In fully adjusted models, high-strain job was associated with female gender; lower education; shift work; and doing work outside the workplace. Low-strain job was associated with opposite scores on the same variables, and with lower job position. Active job was associated with lower age; female gender; higher levels of education; higher job position level; shift work; and not doing work outside the workplace. Passive job was associated with opposite scores on the same variables. **Conclusions:** The study corroborates the role gender and education have for experiencing the job, and expands on existing knowledge on the role of job position and irregular working hours and spaces. By identifying factors associated with job types, the prevention of health problems and work disability may become be more targeted.

Bonsaksen et al. 2019.

PLoS One, vol. 14, no. 12.

User License: *Creative Commons Attribution (CC BY 4.0)*

Keywords: High-strain job; low-strain job; active job; passive job; screening; classification

Evidence Level: 5B

Link: <https://journals.plos.org/plosone/article?id=10.1371/journal.pone.0227336>

Shift Work

Associations between shift work characteristics, shift work schedules, sleep and burnout in North American police officers: A cross-sectional study

Objectives: To examine associations between shift work characteristics and schedules on burnout in police and whether sleep duration and sleepiness were associated with burnout. **Methods:** Police officers (n=3140) completed the Maslach Burnout Inventory (emotional exhaustion, depersonalisation, personal accomplishment) and self-reported shift schedules (irregular, rotating, fixed), shift characteristics (night, duration, frequency, work hours), sleep duration and sleepiness. **Results:** Irregular schedules, long shifts (>=11 hours), mandatory overtime, short sleep and sleepiness were associated with increased risk of overall burnout in police. Police working a greater frequency of long shifts were more likely to have emotional exhaustion (adjusted OR 1.91, 95% CI 1.35 to 2.72) than those not working long shifts. Night shifts were associated with depersonalisation (1.32, 1.05 to 1.66) compared with not working nights. Police working mandatory overtime had increased risk of emotional exhaustion (1.37, 1.14 to 1.65) than those who did not. Compared with fixed schedules, irregular schedules were associated with emotional exhaustion and depersonalisation (1.91, 1.44 to 2.54 and 1.39, 1.02 to 1.89, respectively). Police sleeping <6 hours were more likely to have emotional exhaustion (1.60, 1.33 to 1.93) than those sleeping longer, and excessive sleepiness was associated with emotional exhaustion (1.81, 1.50 to 2.18). **Conclusions:** Irregular schedules and increased night shifts, sleep disturbances and work hours were related to higher burnout risk in police. Future research should evaluate work schedules in law enforcement that optimise shift duration and frequency, and increase consistency in scheduling and control over work hours to limit burnout in police.

Peterson et al. 2019.

BMJ Open, vol. 9, no. 11.

User License: *Creative Commons Attribution (CC BY 4.0)*

Keywords: Shift work; work schedule; sleep; burnout; police officers

Evidence Level: 4A

Link: <https://bmjopen.bmj.com/content/9/11/e030302>

Influence of circadian disruption associated with artificial light at night on micturition patterns in shift workers

Shift workers often experience problems associated with circadian disruption associated with artificial light at night and nocturia is commonly noted in night-shift workers. Nocturia associated with circadian disruption is due to increased urine production of the kidney and decreased storage function of the bladder. A recent discovery of peripheral clock genes in the bladder and their role in contractile property of the bladder support that micturition is closely related to the circadian rhythm. Moreover, there are clinical studies showed that shift workers more often experienced nocturia due to circadian disruption. However, comparing with other health problems, concerns on nocturia and voiding dysfunction associated with circadian disruption are insufficient. Therefore, further studies about voiding dysfunction associated with the circadian disruption in shift workers are necessary.

Kim et al. 2019.

International Neurological Journal, vol. 23, no. 4.

User License: *Creative Commons Attribution (CC BY 4.0)*

Keywords: Artificial light at night; Circadian clock; Nocturia; Sleep; Urinary bladder; Urination

Evidence Level: 6B

Link: <https://www.einj.org/journal/view.php?doi=10.5213/inj.1938236.118>

Relationship of shift work with endoscopic gastritis among workers of an electronics company.

Objectives: The current study aimed to examine the cross-sectional association between shift work and gastritis using endoscopic evaluation. **Methods:** We collected questionnaire data from 964 non-shift

workers and 290 shift workers aged 22-40 years at an electronics company, comprising age, smoking status, alcohol consumption, physical activity, occupational stress, and gastrointestinal symptoms. We performed a gastroendoscopy of participants. Along with describing the gastroendoscopic results, we analyzed the correlations between gastritis and shift work using multiple logistic regression analysis. **Results:** In terms of gastrointestinal symptoms, night shift workers complained more of indigestion than non-shift workers ($P < 0.01$), and the rate of gastritis was higher. The odds of gastritis was significantly higher among shift workers after adjusting for covariates. The odds ratio (OR) for gastritis was 2.24 [95% confidence interval (CI) 1.47-3.43] in shift workers compared with non-shift workers. Among seven subtypes of gastritis, only superficial gastritis was significantly associated with shift work (OR 1.58, 95% CI 1.12-2.24). **Conclusions:** We found that shift workers experience gastritis more than non-shift workers as well as more gastrointestinal symptoms, particularly indigestion. Using endoscopic findings, our study supports that shift work negatively affects the gastrointestinal system.

Lee et al. 2019.

Scandinavian Journal of Work and Environmental Health.

User License: *Creative Commons Attribution (CC BY 4.0)*

Keywords: Shift work; Endoscopic gastritis; Workers; Electronics company

Evidence Level: 4B

Link: https://www.sjweh.fi/show_abstract.php?abstract_id=3862

Shift work and use of psychotropic medicine: a follow-up study with register linkage

Objective: This study aimed to investigate a prospective association between shift work and use of psychotropic medicine. **Methods:** Survey data from random samples of the general working population of Denmark (N=19 259) were linked to data from national registers. Poisson regression was used for analyses of prospective associations between shift work and redeemed prescriptions of psychotropic medicine. Prevalent cases were excluded at baseline. In secondary analyses, we tested differential effects on subsets of psychotropic medicine and, cross-sectionally, we studied correspondence between estimates based on psychotropic medicine and self-reported mental health. According to the protocol we interpret results from the secondary analyses following the principles for nested hypothesis testing, if the primary analyses reject the null-hypothesis, and otherwise we regard it as hypothesis generating exploratory analyses. **Results:** In the primary analysis, the rate ratio for incidence of psychotropic medicine among shift workers was 1.09 (95% confidence interval 0.99-1.21). Results from the secondary analyses suggested increased incidence of use of hypnotics, sedatives and antidepressants and decreased incidence of use of anxiolytics. Cross-sectional analysis suggested increased risk for use of psychotropic medicine (all kinds), but not for poor self-rated mental health. **Conclusions:** Results did not support that working in shifts to the extent that is currently practiced in Denmark is associated with an increased incidence of overall psychotropic medicine use. Future studies should test, whether there is a differential incidence for different drugs among shift workers as suggested by the secondary analyses and how psychotropic medicine use and mental health are related.

Albertsen et al. 2019.

Scandinavian Journal of Work and Environmental Health.

User License: *Creative Commons Attribution (CC BY 4.0)*

Keywords: Shift work; Psychotropic medicine; Usage; Register

Evidence Level: 4B

Link: https://www.sjweh.fi/show_abstract.php?abstract_id=3872

Management and Leadership

How ethical leadership shapes employees' readiness to change: The mediating role of an organizational culture of effectiveness

Today's organizations are operating in a highly competitive and changing environment that pushes them to continuously adapt their organizational structures to such environment. However, the success of change initiatives may face a barrier in the response of employees, especially when they lack readiness to change. While leadership can shape the culture of an organization and a culture of effectiveness can help increase

employees' readiness to change, ethical leaders, who serve as a guide and offer support, can also make a difference by reducing uncertainty. Yet existing research on the role of ethical leadership in the enhancement of the employees' readiness to change is practically non-existent. Far less is the research that analyses the mechanisms that ethical leadership can use to foster employees' readiness to change. This study aims to investigate whether the ethical leadership of middle-lower echelons influences on employees' readiness to change positively (H1) and if this relationship is mediated through shaping an organizational culture of effectiveness (H2). Using data from 270 direct reports of middle-lower managers in public foreign trade Egyptian companies, the findings reveal that ethical leadership enhances employees' readiness to change and that this impact is partially mediated by an organizational culture of effectiveness. Thus, with these findings, new light is shed on the positive role of ethical leadership and the mechanisms it uses to enhance employees' readiness to change.

Matwally et al. 2019.

Frontiers in Psychology, vol. 10.

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Keywords: Ethical leadership; organizational change; organizational culture; organizational culture of effectiveness; readiness to change

Evidence Level: 5B

Link: <https://www.frontiersin.org/articles/10.3389/fpsyg.2019.02493/full>

A comparison of face-to-face and online training in improving managers' confidence to support the mental health of workers

Background: In recognition of the important role managers play in the well-being of the staff they supervise, many workplaces are implementing specialised training for leaders to help them better understand and support the mental health needs of their staff. This training can be delivered through face-to-face or online training sessions. Evaluation of such programs have found positive results for each format when compared to a control group, but to date, face-to-face and online manager mental health training have not been compared with one another. **Aims:** This study brings together results from two trials evaluating the same program content, each employing a different mode of content delivery. Both types of training aimed to change managers' confidence to better support the mental health needs of the staff they supervise. **Methods:** Utilising data derived from two previously conducted trials, mean change in manager confidence from baseline at both post-intervention and follow-up were examined for each method of content delivery. An identical way of measuring confidence was used in each study. **Results:** Managers' confidence improved from baseline with both methods of training. A greater change was observed with face-to-face training than for online, although both methods had sustained improvement over time. Analyses indicate that at follow-up, improvements in confidence were significant for both face-to-face ($t_{18} = 5.99$; $P < .001$) and online training ($t_{39} = 3.85$; $P < .001$). Analyses focused on managers who fully completed either type of training indicated very similar impacts for face-to-face and online training. **Conclusions:** Both face-to-face and online delivery of manager mental health training can significantly improve managers' confidence in supporting the mental health needs of their staff. This change is sustained over various follow-up periods. However, lower retention rates common in online training reduce the relative effect of this method of delivery.

Gayed et al. 2019.

Internet Interventions.

User License: *Creative Commons Attribution -NonCommercial-NoDerivatives 4.0 International (CC BY-NC-ND 4.0)*

Keywords: Manager; Mental health education; Online intervention; Supervisor training; Workplace mental health

Evidence Level: 5B

Link: <https://www.sciencedirect.com/science/article/pii/S2214782919300223?via%3Dihub>

An eye for an eye? Third parties' silence reactions to peer abusive supervision: The mediating role of workplace anxiety, and the moderating role of core self-evaluation

Currently, a few scholars have studied the spillover effects of abusive supervision from third parties' perspective. However, these limited researches mainly focus on third parties' explicit behavior response to peer abusive supervision, ignoring their implicit reactions (e.g., silence) and the emotional mechanism

among it. To fill the above gaps, drawing on affective events theory, we construct a theoretical model that explains the relationship among peer abusive supervision, third parties' workplace anxiety, third parties' silence, and third parties' core self-evaluation. Multi-wave data from 283 front-line employees (57% male and 43% female; 57.2% are 30 years old and below, 31.1% are 31-40 years old and 11.7% are over 40 years old), who come from eight real estate and insurance companies in China, were used to support our framework. In particular, our empirical results indicated that peer abusive supervision was positively related to third parties' silence, among which workplace anxiety played a partial mediating role. In addition, third parties' core self-evaluation moderated the relationship between peer abusive supervision and silence, meanwhile, the mediating role of workplace anxiety. Specifically, the effect of peer abusive supervision on workplace anxiety, and the mediating effect of workplace anxiety, was weaker when the third parties' core self-evaluation was higher rather than lower. The results contribute to both theory and practice.

Huang et al. 2019.

International Journal of Environmental Research and Public Health, vol. 16, no. 24.

User License: *Creative Commons Attribution (CC BY 4.0)*

Keywords: Affective events theory; peer abusive supervision; silence; workplace anxiety

Evidence Level: 4B

Link: <https://www.mdpi.com/1660-4601/16/24/5027>

Work Ability

Association Between Objectively Measured Physical Activity and Musculoskeletal Disorders, And Perceived Work Ability Among Adult, Middle-Aged And Older Women.

Purpose: The purpose of this study was to assess the relationship between objectively measured physical activity and perceived work ability and musculoskeletal disorders among adult, middle-aged, and older women. **Methods:** This study used a cross-sectional design with a convenience sample of 348 women divided into 3 age groups: 30-49 years (n=111), 50-65 years (n=120), 66-75 years (n=117). Weekly physical activity was monitored using tri-axial accelerometer ActiGraph Gt3X. Perceived work ability was assessed using the standardized Work Ability Index (WAI) questionnaire. Information about the occurrence and intensity of musculoskeletal disorders was collected using standardized Nordic Musculoskeletal Questionnaire (NMQ) expanded by visual analog pain intensity scale (VAS). **Results:** Regardless of age, women who met physical activity recommendations achieved higher scores in each part of the WAI, and also in the total WAI scores. However, the most significant differences were found in women aged 50-64 years, and included the following items: subjective work ability, work ability in relation to demands, work impairments, sick leave in the past year. Total WAI scores were also significantly higher in women aged 30-49 and 50-64 years who met PA recommendations in comparison to women who did not meet recommendations. Also, significant relations between the frequency of occurrence of musculoskeletal problems and meeting physical activity recommendations were found in women aged 50-64 years. Those who were more physically active reported less musculoskeletal problems in shoulders (p=0.006) and ankles/feet (p=0.018) regions. **Conclusion:** Adherence to Global Recommendations on Physical Activity for Health disseminated by WHO is related to better-perceived work ability among adult (30-49 years) and middle-aged (50-64 years) women. There is also a relationship between adherence to recommendations of physical activity and frequency and intensity of musculoskeletal pain among middle-aged women.

Nawrocka et al. 2019.

Clinical Interventions in Training.

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Keywords: NMQ; WAI; WHO recommendations; accelerometry; actigraph; exercises

Evidence Level: 4B

Link: <https://www.dovepress.com/association-between-objectively-measured-physical-activity-and-musculo-peer-reviewed-article-CIA>

Adapting to the Future of Work

Technology

Determinant Factors of Public Acceptance of Stress Management Apps: Survey Study.

Background: Chronic stress is a major public health concern. Mobile health (mHealth) apps can help promote coping skills in daily life and prevent stress-related issues. However, little is known about the determinant factors of public acceptance of stress management in relation to preferences for psychological services. **Objective:** The aim of this survey study was to (1) assess determinant factors of public acceptance (behavioral use intention) of stress management apps based on an adapted and extended version of the Unified Theory of Acceptance and Use of Technology (UTAUT) model and (2) explore preferences for mHealth apps compared with other mental health services. **Methods:** Using convenience sampling, participants completed a multiscale 54-item Web-based survey. Based on significant correlations with acceptance, hierarchical stepwise regression analysis was performed within three blocks: (1) background and stress-related control variables, (2) beliefs and attitudes toward using mHealth, and (3) the core UTAUT determinants. The preference for mHealth apps in comparison with nine other mental health services (operationalized as readiness to use) was analyzed using paired t tests. **Results:** Of 141 participants, nearly half (69/141, 48.9%) indicated prior mHealth use. Acceptance of stress coping apps was moderate (mean 3.10, SD 1.03, range 1-5). Hierarchical stepwise regression including four of 11 variables ($R^2=.62$; $P=.01$, $f^2=1.63$) identified positive attitudes toward using mHealth for stress coping ($\beta=0.69$, $P<.001$, 46% R^2 increase above block 1, $f^2=0.85$), skepticism/perceived risks ($\beta=-0.14$, $P=.01$, $f^2=0.16$), and stress symptoms ($\beta=0.12$, $P=.03$, $f^2=0.14$) as significant predictors of acceptance. UTAUT determinants added no predictive contribution beyond attitudes (all $P>.05$, R^2 increase of 1%), whereas post hoc analysis showed significant R^2 increases of attitudes and skepticism/perceived risks beyond UTAUT determinants (all $P<.001$, R^2 increase of 13%). The readiness to use apps was equivalent to or significantly higher than most service types, but lower than information websites. **Conclusions:** Attitudes may be at least as predictive for the acceptance of stress management apps as for more elaborated outcome beliefs. Efforts aimed at improving the public adoption of mHealth could put more emphasis on the pleasant aspects of app use, address misconceptions, offer stress screening tools on health websites, and increase options to try high-quality apps.

Hagen et al. 2019.

JMIR Mental Health Hagen, vol. 6, no. 11.

User License: *Creative Commons Attribution (CC BY 4.0)*

Keywords: Acceptability of health care; attitude to computers; eHealth; mHealth; mental health; mobile apps; stress, psychological

Evidence Level: 4B

Link: <https://mental.jmir.org/2019/11/e15373/>

Work-related Internet use as a threat to work-life balance - A comparison between the emerging on-line professions and traditional office work.

Objectives: In the present study, the authors focused on the comparison of work characteristics related to the possibility of striking the right work- nonwork balance, as well as satisfaction with the actual work-life balance (WLB), negative work-to-home conflict and the quality of life related to social relationships, between a new group of on-line workers (social media or e-marketing specialists, search engine optimization or search engine marketing specialists, e-public relations experts etc.) and traditional office workers. **Methods:** The authors conducted a questionnaire study covering 189 on-line workers (whose work required permanent presence on-line) and 200 office workers (using the Internet mainly to communicate with other departments and to search for information). **Results:** The results showed that the on-line workers reported a significantly lower satisfaction with WLB and a higher negative work-home interaction. The authors found no differences as regards the social quality of life between the studied groups. **Conclusions:** These findings confirm that technology advancement opens a new chapter in organizational psychology and occupational health, especially in the context of the emerging on-line occupations.

Jacukowicz et al. 2019.

International Journal of Occupation Medicine and Environmental Health.

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Keywords: Office work; on-line work; overtime work; quality of life; work-home interaction; work-life balance

Evidence Level: 5B

Link: <http://ijomeh.eu/WORK-RELATED-INTERNET-USE-AS-A-THREAT-TO-WORK-LIFE-BALANCE-COMPARISON-BETWEEN-THE,112115,0,2.html>

Relationship Amongst Technology Use, Work Overload, and Psychological Detachment from Work

Permanent connection to the work world as a result of new technologies raises the possibility of workday extensions and excessive workloads. The present study addresses the relationship between technology and psychological detachment from work resulting from work overload. Participants were 313 professionals from the health sector who responded to three instruments used in similar studies. Through PLS-SEM, regression and dependence analyses were developed, and through the bootstrapping method, significance of factor loadings, path coefficients and variances were examined. Results of the study corroborate a negative effect of technology use on psychological detachment from work and a positive correlation between technology and work overload. Additionally, there is a significant indirect effect of technology on psychological detachment from work as a result of work overload. Findings extend the literature related to the stressor-detachment model, and support the idea that workers who are often connected to their jobs by technological tools are less likely to reach adequate psychological detachment levels. Implications for the academic community and practitioners are discussed.

Reyes et al. 2019.

International Journal of Environmental Research and Public Health, vol. 16, no. 23.

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Keywords: PLS-SEM; psychological detachment; psychological well-being; technology use; work overload

Evidence Level: 4B

Link: <https://www.mdpi.com/1660-4601/16/23/4602>

The fourth industrial revolution and its impact on occupational health and safety, worker's compensation and labor conditions

The "fourth industrial revolution" (FIR) is an age of advanced technology based on information and communication. FIR has a more powerful impact on the economy than in the past. However, the prospects for the labor environment are uncertain. The purpose of this study is to anticipate and prepare for occupational health and safety (OHS) issues. In FIR, nonstandard employment will be common. As a result, it is difficult to receive OHS services and compensation. Excessive trust in new technologies can lead to large-scale or new forms of accidents. Global business networks will cause destruction of workers' biorhythms, some cancers, overwork, and task complexity. The social disconnection because of an independent work will be a risk for worker's mental health. The union bonds will weaken, and it will be difficult to apply standardized OHS regulations to multinational enterprises. To cope with the new OHS issues, we need to establish new concepts of "decent work" and standardize regulations, which apply to enterprises in each country, develop public health as an OHS service, monitor emerging OHS events and networks among independent workers, and nurture experts who are responsible for new OHS issues.

Min et al. 2019.

Safety and Health at Work, vol. 10, no. 4.

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Keywords: Fourth industrial revolution; Occupational health and safety; Workers' compensation; Workers' health

Evidence Level: 6A

Link: <https://www.sciencedirect.com/science/article/pii/S2093791119304056?via%3Dihub>

Work Environment

Working in a cold environment, feeling cold at work and chronic pain: A cross-sectional analysis of the Tromsø Study.

Aim: The aim of this study was to investigate if working in a cold environment and feeling cold at work are associated with chronic pain (ie, lasting ≥ 3 months). **Methods:** We used data from the sixth survey (2007-2008) of the Tromsø Study. Analyses included 6533 men and women aged 30-67 years who were not retired, not receiving full-time disability benefits and had no missing values. Associations between working in a cold environment, feeling cold at work and self-reported chronic pain were examined with logistic regression adjusted for age, sex, education, body mass index, insomnia, physical activity at work, leisure time physical activity and smoking. **Results:** 779 participants reported working in a cold environment $\geq 25\%$ of the time. This exposure was positively associated with pain at ≥ 3 sites (OR 1.57; 95% CI 1.23 to 2.01) and with neck, shoulder and leg pain, but not with pain at 1-2 sites. Feeling cold sometimes or often at work was associated with pain at ≥ 3 sites (OR 1.58; 95% CI 1.22 to 2.07 and OR 3.90; 95% CI 2.04 to 7.45, respectively). Feeling cold often at work was significantly and positively associated with pain at all sites except the hand, foot, stomach and head. **Conclusion:** Working in a cold environment was significantly associated with chronic pain. The observed association was strongest for pain at musculoskeletal sites and for those who often felt cold at work.

Farbu et al. 2019.

BMJ Open, vol. 9, no. 11.

User License: *Creative Commons Attribution (CC BY 4.0)*

Keywords: Epidemiology; occupational & industrial medicine; public health

Evidence Level: 4B

Link: <https://bmjopen.bmj.com/content/9/11/e031248.long>

Aging Workforce

Job requirement level, work demands, and health: A prospective study among older workers

Purpose: Persons in lower occupational positions experience higher rates of morbidity compared to workers in higher advantaged positions. Working conditions may explain this occupational health gradient. Most studies consider either psychosocial or physical work demands at one point in time. In our study, we examine both physical and psychosocial work demands and their association with health status differentiated by job requirement level. We further distinguish between constant and changing work demands. **Methods:** Using data from the first two waves of the German cohort study on work, age and health, we analyse a sample of 3644 older workers born in 1959 and 1965. We test direct and mediating effects of high physical and psychosocial work demands on functional physical and mental health. For this, we estimate a prospective path model using multiple linear regression models. **Results:** Our results show that (1) constant high physical and psychosocial work demands affect physical and mental health negatively and (2) high physical workload partly mediates the relationship between job requirement level and physical health. Moreover, at least for men, a reduction of physical and psychosocial workload improves mental health status. **Conclusions:** Research and prevention measures currently focus particularly on psychosocial work demands. Our study shows that high physical workload is still present among older workers. Its negative health effect refers to occupational safety and health measures that take into account both the physical and psychosocial work environment as well as workers' occupational positions.

Hiesinger et al. 2019.

International Archives of Occupational and Environmental Medicine, vol. 92, no. 8.

User License: *Creative Commons Attribution (CC BY 4.0)*

Keywords: Mediation; Mental health; Older workers; Physical health; Physical work demands; Psychosocial work demands

Evidence Level: 4B

Link: <https://link.springer.com/article/10.1007%2Fs00420-019-01451-2>

Perceived work ability index of public service employees in relation to ageing and gender: A comparison in three European countries

Background: Increasing longevity raised the prospect of a workplace for ageing workers. Previous studies reveal that work ability decreases with age, even among the healthy, and decreased significantly with age among women. The aim of the study is to examine the perception of work ability of public sector

employees aged 55 years and older and gender differences in three European countries. **Methods:** A prospective longitudinal study design and standardized "Work Ability Index" (WAI) were used. This study analysed the relationship between ageing, gender, and perceived work ability among 1653 employees aged 45.06+/-10.90 years (562 men and 1091 women) from Spain, Bosnia and Herzegovina and Monte Negro. The research was conducted in 2018. **Results:** Older employees had a better WAI than their younger colleagues ($P < 0.001$). The lowest prevalence rate 20% of excellent WAI was between 35 and 44 years of age. The reduction of WAI in Bosnia and Herzegovina was huge 68%, compared with 30% in Monte Negro (more than 2 times) and 14% in Spain (almost 5 times more). **Conclusion:** Gender and age was not protector and predictor of excellent or reduced work ability. Work ability did not decrease with age among women and men, public sector employees. Work ability depends of health and safety, promotion and preventive activities at the workplace.

Pranjic et al. 2019.

Zdr Varst, vol. 58, no. 4.

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Keywords: Ageing, gender, work ability, public sector employees

Evidence Level: 4B

Link: <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC6778419/>

Older adult males who worked at small-sized workplaces have an increased risk of decline in instrumental activities of daily living: A community-based prospective study

Background: To examine the relationship of working history from early adulthood through old age with instrumental activities of daily living (IADL). **Methods:** Analyzed participants were 5,857 community-dwelling older Japanese people aged ≥ 65 years. Using the Tokyo Metropolitan Institute of Gerontology Index of Competence, IADL decline was defined as individuals who had no IADL dependence at baseline but were deemed as dependent in IADL at follow-up. Work history was based on working status at baseline, total working years, and information concerning the longest held job, including occupation, employment pattern, and workplace size (number of employees). We conducted multiple logistic regression analyses and estimated the odds ratios (ORs) for IADL decline with 95% confidence intervals (CIs) by gender. **Results:** At the 33-month follow-up, 428 men (16.6%) and 275 women (8.4%) developed IADL decline. After covariate adjustments, men with unstable employment reported significantly increased IADL decline (OR 1.52; 95% CI, 1.19-1.95) compared to men with stable employment, and men who worked in small workplaces with 1-49 employees had an increased risk for IADL decline (OR 1.53; 95% CI, 1.21-1.93) compared to men in large-sized workplaces with ≥ 50 employees. After mutual adjustment for all working history items, only the association between small workplaces and IADL decline remained significant in men (OR 1.37; 95% CI, 1.03-1.84). Among women, none of the working history items were associated with IADL decline. **Conclusion:** Our results suggest that not only promoting older people's workforce participation, but also providing workers employed at small workplaces with sufficient occupational health services, may be effective in helping men retain IADL in later life.

Tomioka et al. 2019.

Journal of Epidemiology, vol. 29, no. 11.

User License: *Creative Commons Attribution (CC BY 4.0)*

Keywords: Active aging; gender differences; instrumental activities of daily living; work history; workplace size

Evidence Level: 4B

Link: https://www.istage.jst.go.jp/article/jea/29/11/29_JE20180113/article

Guiding and Supporting Mental Health and Wellbeing

Mental Health

Cultural activity at work: Reciprocal associations with depressive symptoms in employees

Purpose: Several studies have shown that cultural activities may promote health. There are also prospective population studies which show that regular participation in cultural activities could reduce

morbidity and mortality. To what extent such associations could be applied to the work arena is not so well known, although findings in a few studies support the assumption that cultural activities organized from the work site might improve employee health. An important question discussed in the literature is the extent to which associations between cultural activity at work and employee mental health could be reversed, for instance, with depressive mood resulting in withdrawal from cultural activity at work (backwards) rather than the opposite (forwards). The present study addresses this question. **Methods:** Using a biennial national job survey with seven waves (SLOSH), we examined 2-year follow-up periods in 7193 men and 9313 women in the years 2006-2018. The question regarding cultural activity at work was examined prospectively (using multilevel structural equation modelling) both forwards and backwards in relation to a standardized score for depressive mood (SCL-CD6) in participants working at least 30% both at start and end of the 2-year period. **Results:** The analyses were made separately for men and women and with age and education level as confounders. The findings show that there are highly significant prospective relationships for both men and women in both directions concomitantly. **Conclusion:** Participation in cultural activity at work may protect employees from worsening depressive feelings, but depressive feelings may also inhibit participation in such activities.

Theorell et al. 2019.

International Archives Occupational and Environmental Medicine, vol. 92, no. 8.

User License: *Creative Commons Attribution (CC BY 4.0)*

Keywords: Age; Cultural activity; Depressive symptoms; Education; Gender

Evidence Level: 4B

Link: <https://link.springer.com/article/10.1007%2Fs00420-019-01452-1>

Impact of depressive symptoms on worklife expectancy: A longitudinal study on Danish employees

Objective: Depressive symptoms are associated with sickness absence, work disability and unemployment, but little is known about worklife expectancy (WLE). This study investigates the impact of depressive symptoms on the WLE of a large sample of Danish employees. **Methods:** We used occupational health survey data of 11 967 Danish employees from 2010 and linked them with register data on salary and transfer payments from 2010 to 2015. Depressive symptoms were self-reported using the Major Depression Inventory. We used multistate data and a life table approach with Cox proportional hazard modelling to estimate the WLE of employees, expressed by time in work, unemployment and sickness absence. Separate analyses were conducted for sex and employees with a voluntary early retirement pension scheme. Using age as time axis, we used inverse probability weights to account for differences in educational level, sector, body mass index, smoking habits and loss of employment during sickness absence. **Results:** The WLE of employees reporting depressive symptoms was shorter compared with those not reporting depressive symptoms; that is, the expected time in unemployment and sickness absence was longer, while the expected time in work was shorter. The shorter WLE was most pronounced in women; for example, a 40-year-old woman with depressive symptoms can expect 3.3 years less in work, 0.8 years more in unemployment and 0.7 years more in sickness absence. Employees with a voluntary early retirement pension scheme showed an even lower WLE. **Conclusions:** Our study showed a meaningful impact of depressive symptoms on the WLE of Danish employees using a multistate framework.

Pedersen et al. 2019.

Occupational and Environmental Medicine, vol. 76, no. 11.

User License: *Creative Commons - Attribution-NonCommercial 4.0 International (CC BY-NC 4.0)*

Keywords: Depression; Multi-state; Worklife expectancy

Evidence Level: 4B

Link: <https://oem.bmj.com/content/76/11/838.long>

Relationship of occupational category with risk of physical and mental health problems

Objectives: We evaluated the physical and mental health problems of waged workers in Korea who had different classes of occupation. **Methods:** We used data from the Korean National Health and Nutrition Examination Survey (2007-2017) to examine 22,788 workers who were waged employees and categorized these workers into 5 occupational classes. **Results:** "Unskilled manual workers" were more likely to be older, less educated, have lower monthly income, and work fewer hours per week. Among men and relative to "managers and professionals" (reference group), "skilled manual workers" were more likely to

have physician-diagnosed osteoarthritis, "clerks" were less likely to report suicidal ideation, and "unskilled manual workers" were more likely to report suicidal ideation. Among women and relative to "managers and professionals" (reference group), "service and sales workers" and "unskilled manual workers" were more likely to report physician-diagnosed osteoarthritis, depressive feelings, and suicidal ideation. However, hypertension, hyperlipidemia, diabetes, and cardiovascular diseases did not differ among the occupational classes for men and women. **Conclusion:** We identified differences between men and women and among those in different occupational classes regarding employment status, physical health, and mental health. "Unskilled manual workers" of both genders were more likely to be older, less educated, have less monthly income, work fewer hours per week, and have suicidal ideation. Female "service and sales workers" were more likely to have osteoarthritis, depressive feelings, and suicidal ideation.

Ahn et al. 2019.

Safety, Health and Work, vol. 10, no. 4.

User License: *Creative Commons Attribution -NonCommercial-NoDerivatives 4.0 International (CC BY-NC-ND 4.0)*

Keywords: Cardiovascular disease; Depression; Employee; Osteoarthritis; Suicide

Evidence Level: 4B

Link: <https://www.sciencedirect.com/science/article/pii/S2093791119303075?via%3Dihub>

Bullying and Harassment

Explaining active and passive types of counterproductive work behavior: The moderation effect of bullying, the dark triad and job control

Objectives: Drawing on the stressor-emotion model, the study aimed to identify some predictors of the active and passive types of counterproductive work behavior (CWB). Specifically, 1) the direct effect of bullying on CWB, 2) the 2-way interaction effects of the Dark Triad (DT) and job control (JC), as well as 3) the 3-way interaction effect (DT×JC) on the bullying-CWB link were investigated. **Methods:** Data were collected from 659 white- and blue-collar workers. The 2- and 3-way interactional effects were analyzed by means of PROCESS macros. **Results:** The analysis showed that high bullying was directly related to high active and passive types of CWB. The 2- and 3-way interactional effects were observed but only in relation to active (not passive) CWB. Bullying was associated with active CWB when the Dark Triad and job control were high. **Conclusions:** The study showed different ways of both types of CWB development. The findings provide further insight into processes leading to an increase in active and passive CWB.

Baka et al. 2019.

International Journal of Occupational Medicine and Environmental Health, vol. 32, no. 6.

User License: *Creative Commons Attribution (CC BY 4.0)*

Keywords: Dark Triad; bullying at workplace; counterproductive work behavior; job control; job stress; organizational behavior

Evidence Level: 4B

Link: <http://ijomeh.eu/Explaining-Active-and-Passive-types-of-Counterproductive-Work-Behavior-The-Moderation,110716,0,2.html>

Workplace bullying as experienced by managers and how they cope: A qualitative study of Swedish managers.

Background: The aim of the study was to describe factors that contribute to the occurrence of workplace bullying, that enable it to continue and the coping strategies managers use when they are bullied.

Methods: A qualitative study design was applied. Twenty-two managers from the private and public sectors were interviewed. Data were analyzed by means of content analysis. **Results:** Several factors could be linked to the bullying: being new in the managerial position; lack of clarity about roles and expectations; taking over a work group with ongoing conflicts; reorganizations. The bullying usually lasted for quite some time. Factors that allowed the bullying to continue were passive bystanders and the bullies receiving support from higher management. The managers in this study adopted a variety of problem-focused and emotion-focused coping strategies. However, in the end most chose to leave the organization. Only four remained in their managerial position at the time of the interview. **Conclusions:** The study concludes that

bullying can occur in all types of organization. To prevent it we need to look primarily at organizational factors. Social support is also crucial for managers' ability to cope successfully with bullying.

Bjorklund et al. 2019.

International Journal of Environmental Research and Public Health, vol. 16, no. 23.

User License: *Creative Commons Attribution (CC BY 4.0)*

Keywords: Managers; qualitative study; work environment; workplace bullying

Evidence Level: 5B

Link: <https://www.mdpi.com/1660-4601/16/23/4693>

Employment and Unemployment

Is being employed always better for mental wellbeing than being unemployed? Exploring the role of gender and welfare state regimes during the economic crisis.

The growth of poor jobs related to economic crisis adds to its increase since the mid-1970s as a result of new forms of flexible employment. In Europe, there is no clear evidence on whether working in a poor-quality job is better for mental wellbeing than being unemployed. The objectives of this study were to compare mental wellbeing between the unemployed and those working in jobs with different quality levels and to examine gender and welfare state differences in Europe. We selected 8324 men and 7496 women from the European Social Survey, 2010. Hierarchical multiple logistic regression models were fitted, separated by sex and country group. No significant differences in mental wellbeing were shown between unemployed-non-active, unemployed-active, and those working in low-quality jobs in either sex. Only men from Conservative countries in low-quality jobs had better mental wellbeing than unemployed (non-active) men. Only having a good-quality job reduced the likelihood of poor mental wellbeing compared with being unemployed (non-active) among men in all countries (except Social-Democratic) and among women in Eastern and Southern European countries. No differences were observed among men or women in Social-Democratic countries, while strong gender differences were found in Conservative and Liberal countries. Our study indicates the need to take job quality into account, in addition to creating jobs during economic crises. The main mechanisms to explain the strong gender and welfare state differences identified could be social protection for unemployed, labor market regulations, and family models.

Cortes-Franch et al. 2019.

International Journal of Environmental Research and Public Health, vol. 16, no. 23.

User License: *Creative Commons Attribution (CC BY 4.0)*

Keywords: Europe; gender; job quality; mental wellbeing; unemployment; welfare states

Evidence Level: 4B

Link: <https://www.mdpi.com/1660-4601/16/23/4799>

Educational inequalities in health after work exit: The role of work characteristics

Background: Educational inequalities in health have been widely reported. A low educational level is associated with more adverse working conditions. Working conditions, in turn, are associated with health and there is evidence that this association remains after work exit. Because many countries are raising the statutory retirement age, lower educated workers have to spend more years working under adverse conditions. Therefore, educational health inequalities may increase in the future. This study examined (1) whether there were educational differences over time in health after work exit and (2) whether work characteristics mediate these educational inequalities in health. **Methods:** Data from five prospective cohort studies were used: The Netherlands (Longitudinal Aging Study Amsterdam), Denmark (Danish Longitudinal Study of Aging), England (English Longitudinal Study of Ageing), Germany (German Aging Study), and Finland (Finnish Longitudinal Study on Municipal Employees). In each dataset we used Generalized Estimating Equations to examine the relationship between education and self-rated health after work exit with a maximum follow-up of 15 years and possible mediation of work characteristics, including physical demands, psychosocial demands, autonomy, and variation in activities. **Results:** The low educated reported significantly poorer health after work exit than the higher educated. Lower educated workers had a higher risk of high physical demands and a lower risk of high psychosocial demands, high variation in tasks, and high autonomy at work, compared to higher educated workers. These work

characteristics were found to be mediators of the relationship between education and health after work exit, consistent across countries. **Conclusion:** Educational inequalities in health are still present after work exit. If workers are to spend an extended part of their lives at work due to an increase in the statutory retirement age, these health inequalities may increase. Improving working conditions will likely reduce these inequalities in health.

De Breij et al. 2019.

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

User License: *Creative Commons Attribution (CC BY 4.0)*

Keywords: Education; European countries; Health inequalities; Mediation analysis; Post-retirement health; Work characteristics

Evidence Level: 4B

Link: <https://bmcpublikealth.biomedcentral.com/articles/10.1186/s12889-019-7872-0>

Patterns of change in employment status and their association with self-rated health, perceived daily stress, and sleep among young adults in South Korea

We identified distinct trajectories of temporal changes in employment status and investigated their association with self-rated health, perceived stress, and sleep. Data pertaining to 1228 respondents (age: 17-31 years) were extracted from the Korea Youth Panel (YP2007) survey (3rd-9th wave) datasets. Participants were either paid employees (permanent or precarious) or currently unemployed but seeking a job at baseline. Latent class growth analyses were employed to extract different classes based on the annual change in employment status (permanent/precarious/unemployed). Logistic regression analyses were performed using extracted classes as predictor variables and health-related variables at the final time-point as outcome variables. Five trajectories of employment status change were identified: stability sustained; gradually deteriorated; swiftly alleviated; gradually alleviated; instability sustained. Compared with the stability sustained group, the gradually deteriorated and gradually alleviated groups showed higher odds of perceived stress. The gradually deteriorated, instability sustained, and gradually alleviated groups showed significantly higher odds of shorter sleep than the stabilized group. We highlight the adverse health effects of prolonged unstable employment and the need for interventions to mitigate these effects.

Lee et al. 2019.

International Journal of Environmental Research and Public Health, vol. 16, no. 23.

User License: *Creative Commons Attribution (CC BY 4.0)*

Keywords: Employment status change; latent class growth modeling; perceived stress; self-rated health; sleep; trajectory

Evidence Level: 4B

Link: <https://www.mdpi.com/1660-4601/16/22/4491>

Psychosocial Issues – Risk Factors

Culture, work, and subjective well-being: The role of LMX and resilience in Spanish and Chinese cultures.

Globalization and interdependencies among nations require a better understanding of the influence of culture on organizational processes. In order to succeed in global business, leaders have to respond to practices that may be different in diverse cultures. This study was conducted within the framework of the leader member exchange approach and from a positive perspective of organizations linking successful businesses and workers' well-being. The aim of this study was to examine whether the quality of the relationship with the leader predicts engagement and life satisfaction, and whether resilience moderates this relationship in two different cultural contexts (Spanish and Chinese). The sample was composed of 277 workers (127 Chinese workers corresponding to a vertical-collectivistic culture and 150 Spanish workers representing a horizontal-individualistic culture). To test the hypotheses, a structural equations model (SEM) was conducted using the maximum likelihood (ML) estimation method. Results revealed that leader-member exchange (LMX) positively predicts engagement and life satisfaction and that the moderator role of resilience varies across cultures. Resilience moderated the relationship between LMX and engagement and life satisfaction only in the Spanish sample. In the Chinese sample, resilience only moderated the

relation between LMX and life satisfaction. Finally, our study contributes to a better understanding of the relationship between leaders and subordinates operating in a global context.

Gonzalez-Navarro et al. 2019.

International Journal of Environmental Research and Public Health, vol. 16, no. 24.

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Keywords: Culture; engagement; leader-member exchange; resilience; well-being

Evidence Level: 4B

Link: <https://www.mdpi.com/1660-4601/16/24/4945>

How stress hinders health among Chinese public sector employees: The mediating role of emotional exhaustion and the moderating role of perceived organizational support

Drawing on the conservation of resources theory, this study examines the detrimental effect of hindrance stressors on self-rated health among a sample of Chinese public sector employees. Analysis of survey data based on 404 MPA students from a leading Chinese university who are working in various public organizations across China suggested that hindrance stressors were negatively related to both physical and mental health ($\beta = -0.11$, $p < 0.01$ and $\beta = -0.38$, $p < 0.001$, respectively), and emotional exhaustion mediated those relationships (95% bias-corrected confidence intervals for the indirect effects on physical and mental health based on 5000 bootstrapped samples were -1.64 to -0.35 and -3.51 to -1.81, respectively, excluding 0). Furthermore, perceived organizational support moderated the effect of hindrance stressors on emotional exhaustion ($\beta = -0.10$, $p < 0.05$), and moderated the indirect effects of hindrance stressors on physical and mental health via emotional exhaustion (index of moderated mediation was 0.116 with bootstrapped confidence interval of 0.018-0.296 for physical health, and 0.317 with bootstrapped confidence interval of 0.008-0.663 for mental health). The effects of hindrance stressors were weaker when perceived organizational support was high, suggesting a moderating effect. Our findings not only provide important theoretical contributions to the literature on public employees' work-related stress and associated health outcomes, but also offer practical implications to those who are interested in stress intervention to improve the wellbeing of public employees and general society.

Bao et al. 2019.

International Journal of Environmental Research and Public Health, vol. 16, no. 22.

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Keywords: Emotional exhaustion; hindrance stressor; mental health; perceived organizational support; physical health

Evidence Level: 5B

Link: <https://www.mdpi.com/1660-4601/16/22/4408>

Longitudinal associations between cardiorespiratory fitness and stress-related exhaustion, depression, anxiety and sleep disturbances

Background: In the last few years, so-called "common mental disorders", including adjustment disorder and stress-related exhaustion, have outrivalled musculoskeletal disorders as being the leading cause of long-term sick leave in Sweden. Cardiorespiratory fitness level defined as "the maximal amount of physiological work that an individual can do as measured by oxygen consumption" has in many studies shown to reduce the risk of several life-style related diseases and moreover to improve mood, well-being and physical performance. The aim of the present study was to investigate, longitudinal associations between cardiorespiratory fitness and self-reported physical activity levels and the severity of symptoms connected to stress-related exhaustion, depression, anxiety, and sleep disturbances among women clinically diagnosed with stress-related exhaustion disorder (ED). **Methods:** The study was that of a longitudinal cohort study consisting of women ($n = 88$) diagnosed with stress-related ED in a specialist clinic in Gothenburg, Sweden. Cardiorespiratory fitness was measured with the Astrand indirect test of maximal oxygen uptake (VO₂max) and subjective measures of physical activity levels were rated on 4-graded physical activity scale. To measure and follow symptoms of ED over time the SMBQ-questionnaire (Shirom Melamed Burnout Questionnaire) was used. The Hospital Anxiety and Depression Scale (HADS) was used to measure depression and anxiety. A proxy variable for capturing overall disturbed sleep used to measure sleep. Longitudinal associations for continuous outcome variables and the dichotomous variable sleep were analysed using mixed-effects regression models with random intercepts. Regression coefficients along with

the 95% confidence interval (CI) are presented as measures of association. Both exposures and the outcome were measured simultaneously over six waves (T1-T6). **Results:** The results showed statistically significant associations between level of fitness and reduced symptoms of stress-related exhaustion over time. Best improvements over time were seen in patients having a medium cardiorespiratory fitness level. No associations could be found between cardiorespiratory fitness level over time and anxiety, depression or sleep disturbances. **Conclusion:** Having medium cardiorespiratory fitness was positively associated with a more sustained reduction in symptoms of ED overtime compared to those having low or high cardiorespiratory fitness levels. The clinical implication following this result is that an individual recommendation based on a medium level of physical activity in line with the recommendations from ACSM (American College of Sports Medicine) is preferable compared to recommendations including more vigorous physical activity in order to restore and sustainably reduce symptoms of exhaustion disorder over time.

Lindegard et al. 2019.

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

User License: Creative Commons Attribution (CC BY 4.0)

Keywords: Cardiorespiratory fitness, Longitudinal associations, Stress-related exhaustion disorder, Sleep quality, Depression, Anxiety

Evidence Level: 4A

Link: <https://bmcpublichealth.biomedcentral.com/articles/10.1186/s12889-019-8081-6>

Perceived stress among different occupational groups and the interaction with sedentary behaviour

Sedentary lifestyle and low physical activity are associated with health issues, including both physical and mental health, non-communicable diseases, overweight, obesity and reduced quality of life. This study investigated differences in physical activity and other individual factors among different occupational groups, highlighting the impact of sedentary behaviour on perceived stress by occupation. Cross-sectional study included 571 full-time workers of Kaunas city, Lithuania. The outcome of this study was assessment of perceived stress. Time spent sedentary per day, occupation and other individual characteristics were self-reported using questionnaires. Two main occupational groups were analysed: white-collar and blue-collar workers. Multivariate logistic regression was used to assess the impact of sedentary behaviour on perceived stress among different occupational groups. The prevalence of high sedentary behaviour was 21.7 and 16.8 % among white-collar and blue-collar workers, respectively. Blue-collar workers had a higher risk of high perceived stress (OR 1.55, 95% CI 1.05-2.29) compared to white-collar workers; however, sedentary time did not have any impact on high perceived stress level. Meanwhile, white-collar male (OR 4.34, 95% CI 1.46-12.95) and white-collar female (OR 3.26, 95% CI 1.23-8.65) workers who spend more than three hours per day sedentary had a greater risk of high levels of perceived stress. These findings indicate sedentary behaviour effect on perceived stress among two occupational groups-white-collar and blue-collar workers-and other important factors associated with perceived stress.

Dedele et al. 2019.

International Journal of Environmental Research and Public Health, vol. 16, no. 23.

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Keywords: Blue-collar; occupation; perceived stress; physical activity; sedentary behaviour; white-collar

Evidence Level: 4B

Link: <https://www.mdpi.com/1660-4601/16/23/4595>

Who is more susceptible to job stressors and resources? Sensory-processing sensitivity as a personal resource and vulnerability factor

This study aimed to investigate whether people scoring higher (compared to lower) on sensory-processing sensitivity respond differently to the work environment. Specifically, based on the literature on sensory-processing sensitivity and the Job Demands-Resources model, we predicted that the three components of sensory-processing sensitivity (i.e. ease of excitation, aesthetic sensitivity and low sensory threshold) amplify the relationship between job demands (i.e. workload and emotional demands) and emotional exhaustion as well as the relationship between job resources (i.e. task autonomy and social support) and helping behaviour. Survey data from 1019 Belgian employees were analysed using structural equation modelling analysis. The results showed that ease of excitation and low sensory threshold amplified the

relationship between job demands and emotional exhaustion. Low sensory threshold also strengthened the job resources-helping behaviour relationship. This study offered first evidence on the greater susceptibility among highly sensitive persons to the work environment and demonstrated that the moderating role might differ for the three components of sensory-processing sensitivity. Additionally, it adds sensory-processing sensitivity to the Job Demands-Resources model and highlights the idea that personal factors may act both as a personal vulnerability factor and a personal resource, depending on the nature of the perceived work environment.

Vander Elst et al. 2019.

PLoS One, vol. 14, no. 11.

User License: *Creative Commons Attribution (CC BY 4.0)*

Keywords: Job stressors; Resources; Sensory processing; Sensitivity; Work environment

Evidence Level: 4B

Link: <https://journals.plos.org/plosone/article?id=10.1371/journal.pone.0225103>

Firefighters' occupational stress and its correlations with cardiorespiratory fitness, arterial stiffness, heart rate variability, and sleep quality.

This study investigated the correlations between firefighters' occupational stress and cardiorespiratory fitness, arterial stiffness, heart rate variability, and sleep quality. We examined 705 male firefighters aged 40-50 years in Seoul City, Korea from November 2016-December 2017. The Occupational stress scale was used to evaluate occupational stress; an exercise stress test was administered to measure participants' maximal oxygen uptake (VO₂max); brachial-ankle pulse wave velocity was used to measure firefighters' arterial stiffness; their autonomic nervous system activities were analyzed to determine heart rate variability (HRR); and the Pittsburgh Sleep Quality Index was used to assess their sleep quality. We divided the sample population into tertile groups per their occupational stress scores; i.e., low-stress group (n = 233), medium-stress group (n = 237), and high-stress group (n = 235). They were compared per each indicator and correlations were examined. There was a significant difference in VO₂max (p < .01), and arterial stiffness (p < .001) according to occupational stress levels. Occupational stress was significantly correlated with cardiorespiratory fitness (r = -.820, p < .05), arterial stiffness (r = .085, p < .05), and sleep quality (r = .276, p < .001), but not HRR. In conclusion, Firefighters' occupational stress is a key factor behind their elevated risk of cardiovascular diseases; therefore, we recommend programs aimed at reducing their occupational stress and preventing cardiovascular diseases.

Yook et al. 2019.

PLoS One, vol. 14, no. 12.

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Keywords: Firefighter, Stress, Occupation, Fitness, Sleep

Evidence Level: 4A

Link: <https://journals.plos.org/plosone/article?id=10.1371/journal.pone.0226739>

The combined effect of poor perceived indoor environmental quality and psychosocial stressors on long-term sickness absence in the workplace: A follow-up study

Background: Poor perceived indoor environmental quality (IEQ) can generate conflicts and experiences of injustice in workplaces. Therefore we examined whether the combined effect of poor IEQ and self-reported psychosocial stressors (low social support from supervisors and experiences of injustice) increase the risk of employees' long-term sickness absence (more than 10 days) in comparison to employees who report only poor perceived IEQ and no psychosocial stressors. Methods: Using negative binomial modelling, we analysed a representative sample of the working-age population in Finland (N = 16,084) from the Finnish Quality of Work Life Surveys (FQWLS) from 1997, 2003, 2008 and 2013, combined with register-based follow-up data on employees' long-term absences covering a period of one to three years after each FQWLS was collected. Results: After background variables were included in the model, employees who reported poor IEQ and low social support had 1.18 (incidents rate ratios; 95% CI 1.05-1.33) higher rates of long-term absence than those who reported poor IEQ and high support. Similarly, employees who reported poor IEQ and experiences of injustice had 1.31 (incidents rate ratios; 95% CI 1.15-1.48) higher rates of absence than those who reported poor IEQ and no injustice. Conclusions: Employees who reported poor perceived IEQ and a psychosocial stressor had higher rates of long-term sickness absence one to three

years later, in comparison with those who report only poor perceived IEQ and no psychosocial stressors. These findings demonstrate the importance of taking account of psychosocial stressors as well, when resolving indoor environmental problems.

Finell et al. 2019.

International Journal of Environmental Research and Public Health, vol. 16, no. 24.

User License: *Creative Commons Attribution (CC BY 4.0)*

Keywords: Discrimination; experiences of injustice; indoor environmental quality; occupational health; sickness absence; social support from supervisors

Evidence Level: 4A

Link: <https://www.mdpi.com/1660-4601/16/24/4997>

Association between work-related stress and QT prolongation in male workers

Background: Work-related stress is a potential cardiovascular risk factor, but the underlying mechanism is not fully explained. The autonomic nervous system control of cardiac function might play a specific role; therefore, monitoring the QT interval in the electrocardiogram can highlight an autonomic imbalance induced by occupational stressors. The aim of our study was to explore the QT interval parameters as early indicators of imbalance of the autonomic cardiac function in relation to work-related stress. **Methods:** During 2015-2016 annual workplace health surveillance, we measured work-related stress in 484 workers of a logistic support company using the Health and Safety Executive (HSE) tool. We assessed the frequency-corrected QT (QTc) interval and the QT index (QTi) on the electrocardiogram of each participant, and collected demographic and clinical data. We compared the QTc values by the four Karasek's categories (active/passive jobs, low/high strain job), and by job support (present/lacking), and conducted multivariate analysis to adjust for possible confounders. **Results:** The results of the multivariate regression analysis showed that QTc was prolonged among workers operating at a specific site where stress level was found to be elevated. Regular physical activity showed a beneficial effect against QTc prolongation. We did not observe an effect on QTc length by the cross-combined Karasek's categories of job control, job demand, and job support. **Conclusions:** Our study suggests subclinical effects of conditions associated with work-related stress on the autonomic regulation of cardiac function. Further research is warranted to elucidate the combined effect of work organization and lifestyle factors on autonomic cardiac function.

Lecca et al. 2019.

International Journal of Environmental Research and Public Health, vol. 16, no. 23.

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Keywords: QT index; QTc interval; autonomic nervous system; cardiovascular diseases; work-related stress

Evidence Level: 4B

Link: <https://www.mdpi.com/1660-4601/16/23/4781>

Anxiety, depression and sleep disturbance among customer-facing workers

Background: Mental health problems are a growing issue among customer-facing workers. This study aimed to investigate the workers' symptoms of anxiety, depression, and sleep disturbance caused by customer complaints and the suppression of one's emotions at work. **Methods:** This study used the data from the fifth Korean Working Conditions Survey 2017 database. The subjects comprised 23,128 workers (men, 11,007; women, 12,121). The odds ratios (ORs) and 95% confidence intervals (CIs) were calculated using multiple logistic regression models, to determine the effect of the exposure level of engaging with angry clients and suppressing one's emotions at work on mental health. **Results:** Among the workers engaging with angry customers, compared to the "Rarely" group as a reference point, the "Always" group showed elevated OR values (at [95% CI]) of 1.52 (1.10-2.10), 1.86 (1.05-3.27), 4.43 (3.11-6.33), 3.74 (2.51-5.55), 3.89 (2.65-5.70) for men workers; and 2.86 (1.94-4.22), 2.55 (1.73-3.75), 3.75 (2.82-4.98), 3.81 (2.84-5.09), 3.84 (2.88-5.12) for women workers, for depression, anxiety, difficulty falling asleep, waking up during sleep, and extreme fatigue after waking up, respectively. For suppressing one's emotions at work, the OR values of the "Always" group were 2.32 (1.53-3.51), 2.46 (1.73-3.50), 2.54 (1.88-3.43), 2.64 (1.92-3.64), 2.42 (1.81-3.24) for men workers; and 2.23 (1.53-3.25), 2.31 (1.61-3.33), 2.26 (1.72-2.96), 1.53 (1.19-1.97), 2.15 (1.62-2.85) for women workers, for depression, anxiety, and difficulty falling asleep, waking up during sleep, and extreme fatigue after waking up, respectively. **Conclusion:** The emotional labor

demanded from customer-facing workers, incurred by facing customer complaints and suppressing one's emotions at work, was found to be significantly associated with the development of depression, anxiety, and sleep disturbance symptoms among the Korean working population.

Kang et al. 2019.

Journal of Korean Medicine Science, vol. 34, no. 48.

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Keywords: Anxiety; Depression; Emotional Labor; Mental Health; Sleep Disturbance

Evidence Level: 4B

Link: <https://jkms.org/DOIx.php?id=10.3346/jkms.2019.34.e313>

Psychosocial Issues – Assessment and Management

The Impact of Acute Stress Physiology on Skilled Motor Performance: Implications for Policing.

Investigations of police performance during acutely stressful situations have primarily focused on higher-order cognitive processes like attention, affect or emotion and decision-making, and the behavioral outcomes of these processes, such as errors in lethal force. However, behavioral outcomes in policing must be understood as a combination of both higher-order processes and the physical execution of motor skills. What is missing from extant police literature is an understanding of how physiological responses to acute stress contribute to observed decrements in skilled motor performance at the neuromuscular level. The purpose of the current paper is to fill this knowledge gap in the following ways: (1) review scientific evidence for the physiological (i.e., autonomic, endocrine, and musculoskeletal) responses to acutely stressful exposures and their influence on skilled motor performance in both human and animal models, (2) review applied evidence on occupationally relevant stress physiology and observed motor decrements in performance among police, and (3) discuss the implications of stress physiology for police training and identify future directions for applied researchers. Evidence is compelling that skill decay is inevitable under high levels of acute stress; however, robust evidence-informed training practices can help mitigate this decay and contribute to officer safety.

Anderson et al. 2019.

Frontiers in Psychology, vol. 10.

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Keywords: Cortisol; hypothalamic-pituitary-adrenal axis; motor control; movement; muscle tension; police; stress response

Evidence Level: 6B

Link: <https://www.frontiersin.org/articles/10.3389/fpsyg.2019.02501/full>

Improving stress and positive mental health at work via an app-based intervention: A large-scale multi-center randomized control trial

Mobile health interventions (i.e., "apps") are used to address mental health and are an increasingly popular method available to both individuals and organizations to manage workplace stress. However, at present, there is a lack of research on the effectiveness of mobile health interventions in counteracting or improving stress-related health problems, particularly in naturalistic, non-clinical settings. This project aimed at validating a mobile health intervention (which is theoretically grounded in the Job Demands-Resources Model) in preventing and managing stress at work. Within the mobile health intervention, employees make an evidence-based, personalized, psycho-educational journey to build further resources, and thus, reduce stress. A large-scale longitudinal randomized control trial, conducted with six European companies over 6 weeks using four measurement points, examined indicators of mental health via measures of stress, wellbeing, resilience, and sleep. The data were analyzed by means of hierarchical multilevel models for repeated measures, including both self-report measures and user behavior metrics from the app. The results ($n = 532$) suggest that using the mobile health intervention (vs. waitlist control group) significantly improved stress and wellbeing over time. Higher engagement in the intervention increased the beneficial effects. Additionally, use of the sleep tracking function led to an improvement in sleeping troubles. The intervention had no effects on measures of physical health or social community at work. Theoretical and

practical implications of these findings are discussed, focusing on benefits and challenges of using technological solutions for organizations to support individuals' mental health in the workplace.

Weber et al. 2019.

Frontiers of Psychology, vol. 10.

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Keywords: Stress; mental health; work; application

Evidence Level: 2A

Link: <https://www.frontiersin.org/articles/10.3389/fpsyg.2019.02745/full?report=reader>

A systematic review of the current evidence regarding interventions for anxiety, PTSD, sleepiness and fatigue in the law enforcement workplace.

Law enforcement is inherently stressful, and police officers are particularly vulnerable to mental and physical disorders. As such, researchers are currently assessing intervention strategies that may combat or manage these psychological, physical and mental issues. To review most recent information regarding anxiety, PTSD, and sleepiness and fatigue and identify the interventions and treatments proposed to overcome work related stressors and associated mental illnesses inflicting law enforcement officers. The EMBASE, OVID MEDLINE and PsycINFO databases were canvassed for articles investigating anxiety, post-traumatic stress disorder, sleepiness, and fatigue. Initial article selections were made based on title, whilst final inclusion was informed by a full critical appraisal with respect to the primary and secondary effects. The systematic search returned 363 records, of which 183 were unique. Following screening, 43 records were included in the final review. The included literature assessed the efficacy of several interventions, and provided a number of recommendations regarding interventions, and policy. Moreover, literature indicates that police officers benefit from interventions targeting work-related stress and potential psychological disorders, if these interventions are continuous. Furthermore, larger controlled studies are required to further elucidate the benefits of psychosocial intervention in law enforcement.

Lees et al. 2019.

Industrial Health, vol. 57, no. 6.

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Keywords: Anxiety; Fatigue; Management; Mental health; Police; Post-traumatic stress disorder (PTSD); Wellbeing programs

Evidence Level: 1A

Link: https://www.jstage.jst.go.jp/article/indhealth/57/6/57_2018-0088/article

Protecting the psychological wellbeing of staff exposed to disaster or emergency at work: a qualitative study

Background: Disasters are becoming more prevalent across the world and people are frequently exposed to them as part of their occupational groups. It is important for organisations to understand how best to support employees who have experienced a trauma such as a disaster. The purpose of this study was to explore employees' perceptions of workplace support and help-seeking in the context of a disaster.

Methods: Forty employees in England took part in semi-structured interviews. Thematic analysis was used to extract recurring themes from the data. **Results:** Participants reported both positive and negative psychological outcomes of experiencing a disaster or emergency at work. Most had little training in how to prepare for, and cope with, the psychological impact. They perceived stigma around mental health and treatment for psychological issues which often made them reluctant to seek help. Many reported that the psychological support available in the workplace was insufficient and tended to be reactive rather than proactive. Interpersonal relationships at work were viewed as being important sources of support, particularly support from managers. Participants suggested that psychosocial training in the workplace could be beneficial in providing education about mental health, encouraging supportive workplace relationships, and developing listening skills and empathy. **Conclusions:** Organisations can take steps to reduce the psychological impact of disasters on employees. This could be done through provision of training workshops incorporating mental health education to reduce stigma, and team-building exercises to encourage supportive workplace relationships.

Brooks et al. 2019.

BMC Psychology, vol. 7, no. 1.

User License: Creative Commons Attribution (CC BY 4.0)

Keywords: Disasters; Employees; Mental health; Psychological impact; Qualitative research

Evidence Level: 6A

Link: <https://bmcpyschology.biomedcentral.com/articles/10.1186/s40359-019-0360-6>

Burnout

Moderating role of job satisfaction on turnover intention and burnout among workers in primary care institutions: A cross-sectional study

Background: Global countries are suffering from a shortage of health professionals. Turnover intention is closely related to job satisfaction and burnout, making good use of these relationships could alleviate the crisis. Our research aims to examine the mediating role of job satisfaction in the relationship between burnout and turnover intention. **Methods:** This research was conducted in Huangpi, China. The convenience sampling method and self-administered questionnaires were used. 1370 of valid samples were collected with 97.72% effective rate. Descriptive analyses were conducted to describe social demographic factors. The structural equation model (SEM) was performed to adjust model fitting, and the mediation effect test was carried out by using the bootstrap method. Sobel-Z test was used to verify the significance of mediation effect. **Results:** The mean age was 36.98 (SD = 9.84). The fitting indices of hypothetical model are not good. After the adjustments, $\chi^2/df = 5.590$, GFI = 0.932, AGFI = 0.901, CFI = 0.977, NFI = 0.973, IFI = 0.977, TLI = 0.970, RESEA = 0.058. The revised model fitted well, and the SEM was put up by using the bootstrap method. The mediating effect is partial, and Sobel-Z test indicates that the mediation effect is significant. Burnout is negatively correlated with job satisfaction ($p < 0.01$) and the standardized path coefficient is - 0.41. Job satisfaction is also negatively correlated with turnover intention ($p < 0.01$) and the standardized path coefficient is - 0.18. Burnout is positively correlated with turnover intention ($p < 0.01$) and the standardized path coefficient is 0.83. **Conclusions:** Job satisfaction is a mediating variable that affects the relationship between burnout and turnover intention. The mediating effect was a partial mediating effect and has a low impact of 7.4%. Improving treatment and giving more promotion opportunities for workers to improve job satisfaction, conducting career planning course and paying attention to employee psychological health to reduce job burnout. The above measures may be helpful to reduce employee turnover rate and alleviating the current situation of a shortage of health personnel in China.

Chen et al. 2019.

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

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Keywords: Job satisfaction; Turnover; Burnout; Primary care

Evidence Level: 4B

Link: <https://bmcpublichealth.biomedcentral.com/articles/10.1186/s12889-019-7894-7>

Burnout syndrome in Europe: Towards a harmonized approach in occupational health practice and research.

Health practitioners and decision makers in the medical and insurance systems need knowledge on the work-relatedness of burnout. To gather the most reliable information regarding burnout diagnosis and recognition in Europe, we used an 8-item standard questionnaire sent by e-mail to occupational health specialists identified via the Network on the Coordination and Harmonization of European Occupational Cohorts (OMEGA-NET) within the European Cooperation in Science and Technology (COST) Action. Participation rate was 100%, and the questionnaire was completed for 37 countries. In 14 (38%) countries burnout syndrome can be acknowledged as an occupational disease. However, only one country included burnout on the list of occupational diseases. The results showed a high variability in burnout diagnosis, in assessment of its work-relatedness, and in conditions allowing compensation of patients. These results reflect a lack of graded evidence on burnout and its determinants. The ongoing research on burnout conducted in the frame of the OMEGA-NET COST Action should be helpful through facilitating standardization of both existing and new data on burnout, a priority outcome requiring harmonization.

Guseva et al. 2019.

Industrial Health, vol. 57, no. 6.

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Keywords: Burnout; Diagnosis; Epidemiology; Harmonization; Occupation; Work-relatedness

Evidence Level: 5B

Link: https://www.jstage.jst.go.jp/article/indhealth/57/6/57_2018-0159/article

Effect of burnout on post-traumatic stress disorder symptoms among firefighters in Korea: Data from the Firefighter Research on Enhancement of Safety & Health (FRESH)

Objectives: It is well-known that post-traumatic stress disorder (PTSD) among firefighters contributes to their job-related stress. However, the relationship between burnout and PTSD in firefighters has rarely been studied. This study therefore explored the association between burnout and its related factors, such as trauma and violence, and PTSD symptoms among firefighters in Korea. **Methods:** A total of 535 firefighters participated in the Firefighter Research on Enhancement of Safety & Health study at 3 university hospitals from 2016 to 2017. The 535 participants received a baseline health examination, including questionnaires assessing their mental health. A Web-based survey was also conducted to collect data on job-related stress, history of exposure to violence, burnout, and trauma experience. The associations among burnout, its related factors, and PTSD symptoms were investigated using structural equation modeling. **Results:** Job demands ($\beta=0.411$, $p<0.001$) and effort-reward balance ($\beta=-0.290$, $p<0.001$) were significantly related to burnout. Burnout ($\beta=0.237$, $p<0.001$) and violence ($\beta=0.123$, $p=0.014$) were significantly related to PTSD risk. Trauma ($\beta=0.131$, $p=0.001$) was significantly related to burnout; however, trauma was not directly associated with PTSD scores ($\beta=0.085$, $p=0.081$). **Conclusions:** Our results show that burnout and psychological, sexual, and physical violence at the hands of clients directly affected participants' PTSD symptoms. Burnout mediated the relationship between trauma experience and PTSD.

Kim et al. 2019.

Journal of Preventative Medicine and Public Health, vol. 52, no. 6.

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Keywords: Firefighters; Occupational stress; Post-traumatic stress disorders; Psychological burnout

Evidence Level: 4B

Link: <https://www.jpmp.org/journal/view.php?doi=10.3961/jpmp.19.116>

Combined interventions to reduce burnout complaints and promote return to work: A systematic review of effectiveness and mediators of change

Burnout has adverse effects on the health and work-related outcomes of employees. Nevertheless, little is known about effective ways of reducing burnout complaints and facilitating full return to work, which defines rehabilitation. This study consists of a systematic review of the effects of combined interventions (i.e., both person-directed and organization-directed). It also includes the identification and description of mediators of change, thereby explaining how combined interventions do or do not work. Seven electronic databases were searched for English peer-reviewed publications: the Psychology and Behavioral Sciences Collection; PsycARTICLES; Web of Science; Scopus; SocINDEX; PubMed; and PsycINFO, using various combinations of search terms (e.g., burnout AND intervention). Out of 4110 abstracts published before 29 September, 2019, 10 studies (reporting the effects of nine combined interventions) fulfilled the inclusion criteria, which were defined using PICOS criteria (participants, interventions, comparators, outcomes and study design). Although the risk of bias of the included studies is high, all combined interventions were effective in facilitating rehabilitation. Results suggest that involving employees in decision-making and enhance their job control and social support, while eliminating stressors, explain the effectiveness of the intentions. With caution, workplace health promotion practitioners are encouraged to use these findings to tackle burnout among employees.

Pijpker et al. 2019.

International Journal of Environmental Research and Public Health, vol. 17, no. 1.

User License: *Creative Commons Attribution (CC BY 4.0)*

Keywords: Burnout; Return to work; Systematic review; Workplace; Health promotion

Evidence Level: 1A

Link: <https://www.mdpi.com/1660-4601/17/1/55>

Enabling Healthy and Safe Workplaces

Health and Wellbeing

Knowledge, attitude and practice related to Vitamin D and its relationship with Vitamin D status among Malay female office workers.

This study assessed knowledge, attitude and practice (KAP) related to vitamin D and its relationship with vitamin D status among Malay female office workers. A total of 147 women aged between 20 and 55 years were recruited from a university in Kuala Lumpur. They answered questionnaires related to KAP on vitamin D, sun exposure, dietary vitamin D intake and physical activity. Serum 25-hydroxyvitamin D (25OHD) was analysed using an enzyme-linked immunoassay. Nearly half (45%) of the subjects had good knowledge but moderate attitude (76%) and practice (84%) towards sunlight exposure and dietary vitamin D intake. Median serum 25OHD was 34.1 nmol/L with the majority (91%) had vitamin D insufficiency (25OHD < 50 nmol/L). Knowledge was weakly associated with attitude ($r = 0.29$, $p < 0.001$) but no association was found between knowledge and practice ($r = 0.08$, $p = 0.355$) nor attitude and practice ($r = -0.001$, $p = 0.994$). Serum 25OHD was positively associated with sunlight exposure ($r = 0.22$, $p = 0.008$) and dietary vitamin D intake ($r = 0.37$, $p < 0.001$). It can be implied that this group is at increased risk of low bone health status, which highlights the needs of public health campaigns to improve their vitamin D status.

Jamil et al. 2019.

International Journal of Environmental Research and Public Health, vol. 16, no. 23.

User License: *Creative Commons Attribution (CC BY 4.0)*

Keywords: KAP; female; office workers; sunlight exposure; vitamin D

Evidence Level: 5B

Link: <https://www.mdpi.com/1660-4601/16/23/4735>

Dietary habits and myocardial infarction in occupationally active men.

Objective: Only a few studies have been undertaken to analyze the dietary habits of people with cardiovascular diseases. The aim of this study was to evaluate the dietary behaviors of working people who were hospitalized due to experiencing the first acute cardiovascular incident. **Methods:** In the study, the Functional Activity Questionnaire was used. The study was conducted in 2 groups. The first group included all the men hospitalized during 1 year (January-December 2009) in 2 clinics of cardiology, who were professionally active until the first myocardial infarction (MI). It comprised 243 men aged 26-70 years. The reference group consisted of 403 men, blue- and white-collar workers, aged 35-65 years. **Results:** The body mass index of the MI patients was significantly higher ($p = 0.006$). The frequency of consumption of particular products in the MI group and in the reference group differed significantly for 11 of 21 products. The MI patients significantly less frequently reported the daily consumption of fruit, raw vegetables, cheese, vegetable oils and fish. In this group, the consumption of salty ($p = 0.0226$) or fatty ($p < 0.0001$) foods was significantly higher. It was shown that, after adjusting for age, education and the type of work, the daily consumption of fish, salads and cooked vegetables, as well as fruit and vegetable oils, significantly reduced the risk of myocardial infarction. An increased MI risk was, in turn, associated with obesity and preference for fatty foods. **Conclusions:** The authors found that diet significantly modified the MI risk in the examined workers. This indicates that an important aspect of prevention activities among working people should involve education about proper dietary habits.

Bortkiewicz et al. 2019.

International Journal of Occupational Medicine and Environmental Health, vol. 32, no. 6.

User License: *Creative Commons Attribution (CC BY 4.0)*

Keywords: Acute myocardial infarction; body mass index; food; mental work; nutrition; physical work

Evidence Level: 4B

Link: <http://ijomeh.eu/Dietary-habits-and-myocardial-infarction-in-occupationally-active-men,111776,0,2.html>

Sleep problems are a strong predictor of stress-related metabolic changes in police officers. A prospective study

Objectives: Previous studies have shown that workers chronically exposed to occupational stress have an increased risk of metabolic syndrome (MetS) and sleep problems (SPs). The purpose of this study was to verify whether SPs mediate the relationship between stress and MetS. **Method:**

A 5-year prospective cohort study included 242 police officers from a rapid response unit engaged exclusively in maintaining law and order. Perceived stress levels were measured repeatedly with the demand-control-support and the effort-reward-imbalance questionnaires; insomnia symptoms were assessed with the Pittsburgh Sleep Quality Index; excessive daytime sleepiness was measured using the Epworth Sleepiness Scale. MetS and its components were evaluated at baseline and at follow-up. **Results:** During 5-year follow-up period, 26 new cases of MetS were identified. Both occupational stress and SPs were significantly related to incident cases of MetS. Insomnia symptoms showed a highly significant association with MetS (aOR 11.038; CI95% 2.867-42.493). Mediation analysis confirmed that SPs mediate the relationship between stress and MetS. A reciprocal relationship was found between job stress and SPs. Work-related stress was a significant predictor of insomnia symptoms, short sleep duration, sleep dissatisfaction, and sleepiness. Compared to the reference group, police officers with SPs at baseline had significantly higher odds of reporting high stress at follow-up. **Conclusion:** SPs play a mediating role in the relationship between occupational stress and MetS. Prevention of MetS must include the control of stress factors and an increase in the resilience of workers, but correct sleep hygiene is also an essential factor.

Garbarino et al. 2019.

PLoS One, vol. 14, no. 10.

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Keywords: Sleep problems; Stress; Metabolic changes; Police officers

Evidence Level: 4B

Link: <https://journals.plos.org/plosone/article?id=10.1371/journal.pone.0224259>

Long-term occupational sleep loss and post-retirement cognitive decline or dementia

Introduction: Recent evidence suggests that poor sleep is a risk factor that contributes to the development of Alzheimer's disease (AD). Most studies have focused on short-term effects of sleep deprivation on cognitive function, whereas longitudinal studies are limited to self-reported sleep and the risk of later-life dementia. Because sleep loss could be an early manifestation of neurodegenerative disease, reverse causality in these studies cannot be excluded. **Objective:** In this explorative, observational study, we investigated the effects of extended periods of extrinsically (work-related) caused sleep loss on later-life cognitive function, early dementia symptoms, and current sleep quality. **Methods:** We approached a community of retired male maritime pilots (approx. n = 500) through a newsletter. We investigated 50 respondents (mean age 71.7 years \pm 7.7), with a history of >25 years of work on irregular schedules, which resulted in extended periods of sleep loss. Validated questionnaires on cognitive complaints (Cognitive Failure Questionnaire [CFQ]), early dementia symptoms (Early Dementia Questionnaire [EDQ]), current sleep quality (Pittsburgh Sleep Quality Index [PSQI] and sleep-wake diaries), quality of life (QoL, EQ-5D), and mood (Hospital Anxiety and Depression Scale [HADS]) were administered by a single investigator (J.T.), who also completed an observer rating of cognitive function. **Results:** Scores on the CFQ, EDQ, PSQI, EQ-5D, and HADS were within normal ranges adjusted for age, sex, and education. The observer rating was not indicative of cognitive decline. **Conclusion:** We found no evidence that long-term exposure to work-related sleep loss had resulted in cognitive decline or early dementia symptoms in this sample of retired maritime pilots.

Thomas et al. 2019.

Dementia and Geriatric Cognitive Disorders, vol. 48, no. 1.

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Keywords: Ageing and cognition; Alzheimer's disease; Cognitive decline; Shift work; Sleep loss

Evidence Level: 4B

Link: <https://www.karger.com/Article/FullText/504020>

RE-AIM evaluation of a one-year trial of a combined educational and environmental workplace intervention to lower salt intake in Switzerland

Reducing excessive dietary sodium may reduce cardiovascular disease risk. Environmental and behavioral interventions in workplaces may reduce salt consumption, but information on the effectiveness of workplace nutrition interventions is sparse. We used the RE-AIM framework to evaluate a one-year trial in 2015-2016 of an educational and environmental intervention to lower salt intake of employees in organizations with catering facilities in Switzerland. Five educational workshops for employees and assessments that included 24-hour urine collection were combined with five coaching sessions and food analyses in catering operations. We studied the adoption, reach, implementation, effectiveness, and maintenance of the intervention. Eight of 389 candidate organizations participated in the trial in which 145 (50% men) out of 5794 potentially eligible employees consented to participate, and 138 completed the trial with 13 in the control group. The overall mean change of daily salt intake was -0.6 g from 8.7 g to 8.1 g (6.9%). Though the mean daily salt intake of women was unaltered from 7 g, the mean intake of men declined by -1.2 g from 10.4 g to 9.2 g. Baseline salt intake, sex, and waist-to-height ratio were significant predictors of salt reduction. The analysis also highlighted pivotal determinants of low adoption and reach, and program implementation in catering operations. We conclude that a workplace program of nutrition intervention for employees and catering staff is feasible. The acceptance, effectiveness, and maintenance of nutrition interventions in the workplace require strong employer support. In a supportive food environment, interventions tailored to sex, age, and CVD risk inter alia could be successful.

Beer-Borst et al. 2019.

Preventive Medicine Reports.

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Keywords: BMI, body mass index; CI, confidence interval; CVD, cardiovascular diseases; Education; Environment; Evaluation; FL, food literacy; FSVO, Food Safety and Veterinary Office; HL, health literacy; HP, health promotion; K, potassium; Na, sodium; Nutrition intervention; Salt; Sodium; Trial; WHtR, waist-to-height ratio; Workplace; t0, baseline; t12, study end; t3/t6/t9, follow-up at 3, 6, 9 months

Evidence Level: 4B

Link: <https://www.sciencedirect.com/science/article/pii/S2211335519301536?via%3Dihub>

Prevalence of Vitamin D deficiency and its associated work-related factors among indoor workers in a multi-ethnic southeast Asian country

Little is known about the effect of working conditions on vitamin D status in Southeast Asia, where vitamin D deficiency is common despite the presence of sunlight all year round in most places. We examined the prevalence of vitamin D deficiency and its associated work-related factors among indoor workers using the data of 213 participants (aged ≥ 21 years) from a workplace cohort study in Singapore. Vitamin D deficiency was defined as serum 25-hydroxyvitamin D (25(OH)D) concentration < 50 nmol/L. Data on work-related factors, socio-demographic characteristics, and lifestyle habits were collected using standardized questionnaires. Clinical and biochemical measurements were performed using standard tools and protocols. Multivariate Poisson regression was used to examine the independent association of work-related factors with vitamin D deficiency. Mean serum 25(OH)D concentration was 59.6 nmol/L. The prevalence of vitamin D deficiency was 32.9% (95% confidence interval (CI): 26.6-39.6%). In the multivariate analysis, office workers (prevalence ratio (PR): 2.16, 95% CI: 1.12-4.16 versus control room workers), workshop workers (PR: 2.25, 95% CI: 1.05-4.81 versus control room workers), and night shift workers (PR: 1.31, 95% CI: 1.03-1.67) were at a greater risk for vitamin D deficiency. Workplace policies and wellness programs should encourage workers to take regular breaks to go outdoors for sunlight exposure and to consume adequate amounts of vitamin D-rich foods to maintain optimal vitamin D levels.

Divakar et al. 2019.

International Journal of Environmental Research and Public Health, vol. 17, no. 1.

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Keywords: Singapore; cross-sectional study; indoor workers; vitamin D deficiency; workplace

Evidence Level: 4B

Link: <https://www.mdpi.com/1660-4601/17/1/164>

Commuting time to work and behaviour-related health: A fixed-effect analysis

Objectives: Long commuting times are linked to poor health outcomes, but the evidence is mainly cross-sectional. We examined longitudinal within-individual associations between commuting time and

behaviour-related health. **Methods:** Data were from the Swedish Longitudinal Occupational Survey of Health study. We selected workers who responded to a minimum of two surveys conducted every other year between 2008 and 2018. We included all study waves with self-reported commuting time (ie, the exposure, 1-5, 6-10, 11-15 or ≥ 15 hours/week), body mass index (based on weight and height), physical (in)activity, smoking, alcohol use and sleep problems (ie, the outcomes) (individuals=20 376, observations=46 169). We used conditional logistic regression for fixed effects analyses that controls for time-varying confounders by design. Analyses were stratified by working hours: normal (30-40 hours/week) or longer than normal (>40 hours/week) and adjusted for time dependent covariates: age, marital status, occupational position, presence of children, chronic disease, depressive symptoms, job strain and shift work. **Results:** Those working >40 hours/week had higher odds of physical inactivity (OR 1.25, 95% CI 1.03 to 1.51) and sleep problems (OR 1.16, 95% CI 1.00 to 1.35) when they were commuting >5 hours/week than when they were commuting 1-5 hours/week. Among women working normal hours, longer commuting time associated with lower odds of problem drinking. **Conclusion:** Our findings suggest that lengthy commuting time increases the risk of physical inactivity and sleep problems if individuals have longer than normal weekly working hours. Effects of work arrangements that decrease commuting time should be examined in relation to health behaviours.

Halonen et al. 2019.

Occupational and Environmental Medicine.

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Keywords: Body mass index; commuting; physical activity; sleep problem; smoking

Evidence Level: 4A

Link: <https://oem.bmj.com/content/early/2019/12/13/oemed-2019-106173.long>

Developing a health-promotion program based on the action research paradigm to reduce cardiovascular disease risk factors among blue collar workers.

This study developed and evaluated a health management program based on the participant-centered concept of action research to reduce cardiovascular disease (CVD) risk factors among blue collar workers. Data from structured questionnaires completed by 32 workers in a small-to-medium sized workplace from September 2015 to October 2016 as well as participants' anthropometrical (weight and waist) and biological (blood pressure, glucose, total cholesterol, triglyceride, high-density lipoprotein (HDL), and low-density lipoprotein (LDL) cholesterol) data were analyzed using paired t-test and Fisher's exact test. To examine the longitudinal effect of the intervention, survival analysis and linear mixed model (LMM) were used. There was an improvement in participants' self-regulation in maintaining health-promoting behaviors, body weight, blood pressure, and HDL cholesterol following the intervention. Furthermore, the effects of the health management program continued even after the program ended. These findings suggest that the health management program developed in this study could be effective in reducing CVD risk factors among workers in small-to-medium sized workplaces and should be applied to other small-to-medium sized workplaces to foster health-promoting behaviors.

Hwang et al. 2019.

International Journal of Environmental Research and Public Health, vol. 16, no. 24.

User License: *Creative Commons Attribution (CC BY 4.0)*

Keywords: Cardiovascular disease; health promotion; occupational health; participatory action research; workplace

Evidence Level: 4B

Link: <https://www.mdpi.com/1660-4601/16/24/4958>

Work Health and Safety

Predisposing factors influencing occupational injury among frontline building construction workers in Ghana.

Objective: This study aims to examine the predisposing factors influencing occupational injuries among frontline construction workers in Ghana. A cross-sectional survey was carried out with 634 frontline construction workers in Kumasi metropolis of Ghana using a structured questionnaire. The study was

conducted from December 2016 to June 2017 using a household-based approach. The respondents were selected through a two-stage sampling approach. A multivariate logistics regression model was employed to examine the association between risk factors and injury. Data was analyzed employing descriptive and inferential statistics with STATA version 14. **Results:** The study found an injury prevalence of 57.91% among the workers. Open Wounds (37.29%) and fractures (6.78%) were the common and least injuries recorded respectively. The proximal factors (age, sex of worker, income) and distal factors (e.g. work structure, trade specialization, working hours, job/task location, and monthly off days) were risk factors for occupational injuries among frontline construction workers. The study recommends that policymakers and occupational health experts should incorporate the proximal and distal factors in the design of injury prevention as well as management strategies.

Amissah et al. 2019.

BMC Research Notes, vol. 12, no. 1.

User License: Creative Commons Attribution (CC BY 4.0)

Keywords: Frontline construction workers; Ghana; Kumasi; Occupational Injury; Prevalence

Evidence Level: 4B

Link: <https://bmresnotes.biomedcentral.com/articles/10.1186/s13104-019-4744-8>

Risk assessment for metalworking fluids and respiratory outcomes

Background: Metalworking fluids (MWFs) are mixtures with inhalation exposures as mists, dusts, and vapors, and dermal exposure in the dispersed and bulk liquid phase. A quantitative risk assessment was performed for exposure to MWF and respiratory disease. **Methods:** Risks associated with MWF were derived from published studies and NIOSH Health Hazard Evaluations, and lifetime risks were calculated. The outcomes analyzed included adult onset asthma, hypersensitivity pneumonitis, pulmonary function impairment, and reported symptoms. Incidence rates were compiled or estimated, and annual proportional loss of respiratory capacity was derived from cross-sectional assessments. **Results:** A strong healthy worker survivor effect was present. New-onset asthma and hypersensitivity pneumonitis, at 0.1 mg/m³ MWF under continuous outbreak conditions, had a lifetime risk of 45%; if the associated microbiological conditions occur with only 5% prevalence, then the lifetime risk would be about 3%. At 0.1 mg/m³, the estimate of excess lifetime risk of attributable pulmonary impairment was 0.25%, which may have been underestimated by a factor of 5 or more by a strong healthy worker survivor effect. The symptom prevalence associated with respiratory impairment at 0.1 mg/m³ MWF was estimated to be 5% (published studies) and 21% (Health Hazard Evaluations). **Conclusion:** Significant risks of impairment and chronic disease occurred at 0.1 mg/m³ for MWFs in use mostly before 2000. Evolving MWFs contain new ingredients with uncharacterized long-term hazards.

Park et al. 2019.

Safety and Health at Work, vol. 10, no. 4.

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Keywords: Risk assessment; metalworking; fluids; respiratory outcomes

Evidence Level: 5B

Link: <https://www.sciencedirect.com/science/article/pii/S2093791119302215>

Occupational health and safety of immigrant workers in Italy and Spain: A scoping review.

The main aim of the present study was to summarize the available literature on the topic of occupational health and safety (OH&S) among immigrant workers (IMWs) in Italy and Spain. We conducted a scoping review, searching Medline, Social Sciences Citation Index, PsycINFO, CINAHL Plus, SciELO, and EMBASE for peer-reviewed articles, published in English, Italian, or Spanish, between 1999-2018. 34 studies were included, 28 with quantitative methodology and 6 with qualitative. Main findings were that, compared to natives, IMWs in Italy and Spain showed higher prevalence of low-skilled jobs and of perceived discrimination at work; higher physical demands, poorer environmental working conditions, and more exposure to occupational risks (e.g., ergonomic and psychosocial hazards); a greater risk of occupational injuries; worse general and mental health; and a plausible worsening of their health status, especially in Spain, as a result of the economic crisis. The findings of the present scoping review constitute warning signs that indicate the need for a holistic global response to ensure that adverse OH&S outcomes among IMWs workers are improved and that equitable access to health care is guaranteed. Such a response will require a

concrete and evidence-based approach to prevent and monitor occupational risk factors and associated outcomes in the workplaces.

Arici et al. 2019.

International Journal of Environmental Research and Public Health, vol. 16, no. 22.

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Keywords: Italy; Spain; economic crisis; migrant workers; occupational diseases; occupational health and safety; occupational injuries; review; working conditions

Evidence Level: 6A

Link: <https://www.mdpi.com/1660-4601/16/22/4416>

Exploring the impact of unsafe behaviors on building construction accidents using a Bayesian Network

Unsafe behavior is a critical factor leading to construction accidents. Despite numerous studies supporting this viewpoint, the process by which accidents are influenced by construction workers' unsafe behaviors and the extent to which unsafe behaviors are involved in this process remain poorly discussed. Therefore, this paper selects cases from Chinese building construction accidents to explore the probabilistic transmission paths from unsafe behaviors to accidents using a Bayesian network. First, a list of unsafe behaviors is constructed based on safety standards and operating procedures. Second, several chains of unsafe behaviors are extracted from 287 accident cases within four types (fall, collapse, struck-by and lifting) to form a Bayesian network model. Finally, two accidents are specifically analyzed to verify the rationality of the proposed model through forward reasoning. Additionally, critical groups of unsafe behaviors leading to the four types of accidents are identified through backward reasoning. The results show the following: (i) The time sequence of unsafe behaviors in a chain does not affect the final posterior probability of an accident, but the accident attribute strength of an unsafe behavior, affects the growth rate of the posterior probability of an accident. (ii) The four critical groups of unsafe behaviors leading to fall, collapse, struck-by, and lifting are identified. This study is of theoretical and practical significance for on-site behavioral management and accident prevention.

Gou et al. 2019.

International Journal of Environmental Research and Public Health, vol. 17, no. 1.

User License: *Creative Commons Attribution (CC BY 4.0)*

Keywords: Bayesian network; accident prevention; building construction; chains of unsafe behaviors; probabilistic transmission path

Evidence Level: 5B

Link: <https://www.mdpi.com/1660-4601/17/1/221>

The use of proactive risk management to reduce emergency service vehicle crashes among firefighters

Introduction: Emergency service vehicle crashes (ESVCs), including rollovers and collisions with other vehicles and fixed objects, are a leading cause of death among U.S. firefighters. Risk management (RM) is a proactive intervention to identifying and mitigating occupational risks and hazards. The goal of this study was to assess the effect of RM in reducing ESVCs. **Methods:** Three fire departments (A, B and C), representing urban and suburban geographies, and serving medium to large populations, participated in facilitated RM programs to reduce their ESVCs. Interventions were chosen by each department to address their department-specific circumstances and highest risks. Monthly crash rates per 10,000 calls were calculated for each department an average of 28 months before and 23 months after the start of the RM programs. Interrupted time series analysis was used to assess the effect of the RM programs on monthly crash rates. Poisson regression was used to estimate the number of crashes avoided. Economic data from Department A were analyzed to estimate cost savings. **Results:** Department A had a 15.4% ($P = 0.30$) reduction in the overall monthly crash rate immediately post-RM and a 1% ($P = 0.18$) decline per month thereafter. The estimated two-year average cost savings due to 167 crashes avoided was \$253,100 (95%CI= \$192,355 - \$313,885). Department B had a 9.7% ($P = 0.70$) increase in the overall monthly crash rate immediately post-RM and showed no significant changes in their monthly crash rate. Department C had a 28.4% ($P = 0.001$) reduction in overall monthly crash rate immediately post-RM and a 1.2% ($P = 0.09$) increase per month thereafter, with an estimated 122 crashes avoided.

Conclusion: RM programs have the potential to reduce ESVCs in the fire service and their associated costs; results may vary based on the interventions chosen and how they are implemented. **Practical applications:**

Risk management may be an effective and broadly implemented intervention to reduce ESVs in the US fire service.

Bui et al. 2019.

Journal of Safety Research, vol. 71.

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Keywords: Crash prevention; Fire service; Risk management; Safety and health; Time series analysis

Evidence Level: 5A

Link: <https://www.sciencedirect.com/science/article/pii/S0022437519306346?via%3Dihub>

Assessment of the perceived safety culture in the petrochemical industry in Japan: A cross-sectional study

This study assessed the perceived safety culture among five petrochemical production companies in Japan. Current effects of the perceived safety culture on employee safety motivation and performance were also examined. A total of 883 workers from the five petrochemical companies, which were located in the Chugoku region of Japan, provided valid responses to the survey distributed by email. Structural equation modeling was used to evaluate the personnel safety culture in these industries. The endogenous variables considered in this study included petrochemical safety culture, personnel error behavior and personnel attitudes toward violation behaviors. Petrochemical personnel safety motivation was a mediating variable. This study's findings highlight the importance of the perceived safety culture as a significant component of the organizational culture that influences employee behaviors and safety attitudes. This study further verifies the significant impact of the perceived safety culture in this industry sector on improving petrochemical personnel safety motivation and performance. Future research should explore the differences between the subcultures that have formed under larger safety cultures within similar high-risk industries, such as construction, aviation, manufacturing and mining.

Cakit et al. 2019.

PLoS One, vol. 14, no. 12.

User License: *Creative Commons Attribution (CC BY 4.0)*

Keywords: Safety culture; petrochemical industry; perceived; employee safety

Evidence Level: 4B

Link: <https://journals.plos.org/plosone/article?id=10.1371/journal.pone.0226416>

Risk Assessment

New risk methodology based on control charts to assess occupational risks in manufacturing processes

The accident rate in the EU-28 region of the European Union showed a value of 2 fatal accidents per 100,000 people in 2019 that mainly affect construction (24%), manufacturing (19%) and logistics (19%). To manage situations that affect occupational risk at work, a review of existing tools is first carried out taking into account three prevention, simultaneity and immediacy characteristics. As a result, a new dynamic methodology called Statistical Risk Control (SRC) based on Bayesian inference, control charts and analysis of the hidden Markov chain is presented. The objective is to detect a situation outside the limits early enough to allow corrective actions to reduce the risk before an accident occurs. A case is developed in a medium-density fiberboard (MDF) manufacturing plant, in which five inference models based on Poisson, exponential and Weibull distributions and risk parameters following gamma and normal distributions have been tested. The results show that the methodology offers all three characteristics, together with a better understanding of the evolution of the operators in the plant and the safety barriers in the scenario under study.

Folch-Calvo et al. 2019.

Materials, vol. 12, no. 22.

User License: *Creative Commons Attribution (CC BY 4.0)*

Keywords: Bayesian inference; control chart; dynamic methodology; hidden Markov chain; occupational accident; risk assessment; risk control; risk management

Evidence Level: 6B

Link: <https://www.mdpi.com/1996-1944/12/22/3722>

Ergonomics

Biomechanical and metabolic effectiveness of an industrial exoskeleton for overhead work

Overhead work activities can lead to shoulder pain and serious musculoskeletal disorders (WMSD), such as rotator cuff injury and degeneration. Recently developed exoskeletons show promising results in supporting workers in such activities. In this study, a novel exoskeleton was investigated for two different overhead tasks with twelve participants. To investigate the effects of the device, electromyographic (EMG) signals of different shoulder and adjacent muscles as well as kinematic and metabolic parameters were analyzed with and without the exoskeleton. The mean EMG amplitude of all evaluated muscles was significantly reduced when the exoskeleton was used for the overhead tasks. This was accompanied by a reduction in both heart rate and oxygen rate. The kinematic analysis revealed small changes in the joint positions during the tasks. This study demonstrated the biomechanical and metabolic benefits of an exoskeleton designed to support overhead work activities. The results suggest improved physiological conditions and an unloading effect on the shoulder joint and muscles which are promising indicators that the exoskeleton may be a good solution to reduce shoulder WMSD among workers who carry out overhead tasks on a regular basis.

Schmalz et al. 2019.

International Journal of Environmental Research and Public Health, vol. 16, no. 23.

User License: *Creative Commons Attribution (CC BY 4.0)*

Keywords: Biomechanics; EMG; Ergonomics; Occupational health; assistive device; exoskeleton; shoulder; work-related musculoskeletal disorders

Evidence Level: 5B

Link: <https://www.mdpi.com/1660-4601/16/23/4792>

The influence of information on the prevention of occupational risks and ergonomic requirements in the development of non-traumatic osteomuscular diseases of the shoulder - A pilot study

Objective: Shoulder pain associated with upper limb musculoskeletal disorders is an important health problem in clinical practice due to its high prevalence, frequent consultations in primary healthcare and occupational health. Preventive strategies, including information disseminated among workers, can be useful. The aim of this study is to analyze the associations between non-traumatic osteomuscular diseases of the shoulder and the workers' knowledge of the risks at the workplace and preventive measures developed there, as well as the association with ergonomic requirements. **Methods:** An observational case-control study was carried out on an occupationally active population assisted during 1 year in 1 healthcare center, involving 690 participants. Data were collected through a questionnaire including sociodemographic variables, the workplace, the knowledge of prevention and ergonomic requirements. The independent effect of the variables associated with non-traumatic shoulder pathology was explored through logistic regression. **Results:** In total, 66.7% of the participants stated that they had been informed of the occupational hazards related to their jobs. The following variables were associated with a lower probability of shoulder injuries: male gender, working hours > 9 h/day or > 40 h/week, as well as having information on the risks associated with the workplace, using personal protective equipment, the existence of an occupational risks prevention service and/or risk assessment, the knowledge of the prevention plan, periodic medical examinations, and using one arm or physical force at work. A multivariate analysis revealed that the risk increased with age and lower educational levels, forced postures, repeated gestures, monotony and temporary absences from work. Furthermore, being informed of workplace risks, and using a single arm as well as physical force were shown as independent protective factors. **Conclusion:** Information on both the ergonomic requirements and how to prevent occupational risks is a useful tool for the prevention of non-traumatic shoulder diseases. Preventive policies including health education interventions in the workplace could benefit other developed preventive activities.

Blanes et al. 2019.

International Journal of Occupational Medicine and Environmental Health, vol. 32, no. 6.

User License: *Creative Commons Attribution (CC BY 4.0)*

Keywords: Cumulative trauma disorders; musculoskeletal disorders; occupational health; prevention; primary healthcare; shoulder

Evidence Level: 5B

Link: <http://ijomeh.eu/INFLUENCE-OF-INFORMATION-ON-PREVENTION-OF-OCCUPATIONAL-RISKS-AND-ERGONOMIC-REQUIREMENTS,111423,0,2.html>

Chronic Health Issues

Costs of workplace productivity loss in patients with fibrotic interstitial lung disease

Background: Fibrotic interstitial lung diseases (ILDs) are highly morbid chronic disorders that frequently occur in working age individuals. The goal of this study was to determine workplace productivity loss, its determinants, and its estimated costs in patients with fibrotic ILD. **Methods:** Patients with idiopathic pulmonary fibrosis, chronic hypersensitivity pneumonitis, idiopathic nonspecific interstitial pneumonia, or unclassifiable ILD were identified from the six-center Canadian Registry for Pulmonary Fibrosis (CARE-PF). The Work Productivity and Activity Impairment questionnaire was used to determine health-related productivity loss. Independent predictors of low workplace productivity were identified by using multivariate regression. Patient data were compared with Canadian population census data. The average productivity loss (hours per week) and the individual's hourly wage were used to estimate the costs of productivity loss. **Results:** Of 650 eligible patients, 148 (23%) were employed. Productivity loss was reported by 55% of employed patients with an average productivity loss of 7.8 ± 0.9 h per week (2.3 ± 0.6 h per week related to absenteeism and 5.5 ± 0.6 h per week related to presenteeism). Employment among patients with ILD aged 25 to 54 years was 23% lower than the age- and sex-matched general Canadian population (60% vs 83%; $P < .001$). Employment among patients with ILD aged ≥ 55 years was 18% lower than in the age- and sex-matched population (20% vs 38%; $P < .001$). Dyspnea and cough were independent predictors of workplace productivity loss. Estimated annual costs of productivity loss were 11,610 Canadian dollars per employee with ILD. **Conclusion:** Workplace productivity loss is common in fibrotic ILD, strongly correlated with symptom severity, and associated with significant cost.

Algami et al. 2019.

Chest, vol. 156, no. 5.

User License: Creative Commons Attribution -NonCommercial-NoDerivatives 4.0 International (CC BY-NC-ND 4.0)

Keywords: Economics; hypersensitivity pneumonia; idiopathic pulmonary fibrosis; interstitial lung disease

Evidence Level: 4A

Link: [https://journal.chestnet.org/article/S0012-3692\(19\)30885-2/fulltext](https://journal.chestnet.org/article/S0012-3692(19)30885-2/fulltext)

Patient-reported outcomes from a workplace intervention program for cancer survivors highlight ongoing needs to support continuation of work

Purpose: The aim of this study was to investigate the perceptions of cancer survivors who continue to work and provide information to evaluate and develop a supportive workplace program (Ensemble) based on the principles of navigation. **Methods:** A mixed-methods design using surveys and open-ended questions was used to study the perceptions of two groups of cancer survivors in the same workplace: those who chose to use a workplace navigational program (Ensemble program users) and those who declined (non-users). Key outcomes were communication and attitudinal self-efficacy, measured by the Communication and Attitudinal Self-Efficacy scale for cancer (CASE-cancer); emotional and informational social support, measured by the Patient-Reported Outcomes Measurement Information System Social Support domain (PROMIS-Social Support); and satisfaction with the navigator relationship, measured using the Patient Satisfaction with Interpersonal Relationship with Navigator (PSN-I). **Results:** The study included 7 program users and 17 non-users. There were no significant differences in attitudinal self-efficacy, emotional support, or informational support between the groups. The relationship with the Nurse Navigator was rated highly by program users. The most frequent themes to the open-ended responses included work demands, privacy, integration of life and work, and program improvement. **Conclusions:** Successful reintegration into/continuation of work remains a key need for cancer survivors. The navigation program design for cancer survivors should be further improved and applied across work settings.

Aubel et al. 2019.

Support Care Cancer, vol. 27, no. 11.

User License: *Creative Commons Attribution (CC BY 4.0)*

Keywords: Cancer survivors; Nurses; Patient navigation; Patient-reported outcomes; Self-efficacy; Social support

Evidence Level: 4A

Link: <https://link.springer.com/article/10.1007%2Fs00520-019-04964-1>

Multimorbidity and its impact on workers: A review of longitudinal studies

Objective: This study investigates the impact of multimorbidity on work through a literature review of longitudinal studies. **Methods:** A systematic review was carried out in the databases Lilacs, SciELO, PAHO, PubMed/Medline, Scopus, Web of Science, and Cochrane. There were no restrictions regarding the year of publication or language to maximize the identification of relevant literature. The quality of studies was assessed by the protocol STrengthening the Reporting of OBservational studies in Epidemiology (STROBE). **Results:** An initial database search identified 7522 registries, and at the end of the analysis, 7 manuscripts were included in the review. Several studies have demonstrated direct and indirect impacts of multimorbidity on the health of workers. For this, the number of missed days due to health-related issues was evaluated, as well as the reduction in work productivity of the unhealthy worker, vulnerability of the worker with multimorbidity regarding higher indices of dismissal and recruitment difficulties, and incidence of early retirement and/or receipt of benefits due to disabilities. **Conclusions:** Multimorbidity has a negative impact on work, with damages to quality of life and work productivity, worsening the absenteeism/presenteeism indices, enhancing the chances of temporary or permanent leaves, and lowering employability and admission of individuals with multimorbidity.

Cabral et al. 2019.

Safety, health and Work, vol. 10, no. 4.

User License: *Creative Commons Attribution -NonCommercial-NoDerivatives 4.0 International (CC BY-NC-ND 4.0)*

Keywords: Morbidity; Multimorbidity; Review; Work; Workers

Evidence Level: 1B

Link: <https://www.sciencedirect.com/science/article/pii/S2093791119300885?via%3Dihub>

Work disability patterns before and after incident acute myocardial infarction and subsequent risk of common mental disorders: A Swedish cohort study

This study investigated the extent to which work disability patterns including sickness absence and disability pension (SA/DP) before and after acute myocardial infarction (AMI) were associated with subsequent common mental disorders (CMDs) such as depression and anxiety in AMI patients without previous CMD. Total 11,493 patients 26-64 years with incident AMI during 2008-10 were followed up for CMD (measured as antidepressant prescription) through 2013. Four SA/DP trajectory groups during the 3-years pre-AMI and 1-year post-AMI were identified. Hazard ratios (HRs) with 95% confidence intervals for subsequent CMD were estimated in Cox models. Higher pre-AMI SA/DP annual levels (>1-12 months/year) were associated with 40-60% increased CMD rate than the majority (78%) with low increasing levels (increasing up to 1 month/year). Regarding post-AMI findings, constant high (~25-30 days/month) SA/DP levels within the first 3 months was associated with a 76% higher CMD rate, compared to constant low (0 days/month). A gradually decreasing post-AMI SA/DP pattern over a 12-month period suggested protective influences for CMD (HR = 0.80). This is the first study to demonstrate that pre- and post-AMI work disability patterns are associated with subsequent CMD risk in AMI patients. Work disability patterns should be considered as an indicator of AMI prognosis in terms of CMD risk.

Bokenberger et al. 2019.

Scientific Reports, vol. 9, no. 1.

User License: *Creative Commons Attribution (CC BY 4.0)*

Keywords: Work; Disability; Myocardial infarction; Risk; Mental disorders

Evidence Level: 4B

Link: <https://www.nature.com/articles/s41598-019-52487-w>

Organizational justice and illness reporting among Japanese employees with chronic diseases

Purpose: This study examined the association between perceived organizational justice (i.e., procedural justice and interactional justice) and reporting of illness to one's company (illness reporting) among Japanese employees with chronic diseases. **Methods:** This online cross-sectional survey included 1,134 employees (aged 18-65 years) who required workplace support to combine work with disease treatment. Participants were classified into tertiles of perceived organizational justice (low, moderate, and high). Multiple logistic regression analyses were conducted to examine sex differences in the associations between perceived justice and illness reporting. **Results:** Males reporting perceived high levels of procedural and interactional justice had significantly higher odds of illness reporting than those with perceived low levels of procedural (odds ratio [OR] 2.62, 95% confidence interval [CI]: 1.47-4.66) and interactional justice (OR 4.34, 95% CI: 2.28-8.27). Females with perceived high levels of interactional justice had significantly higher odds of illness reporting than those with perceived low levels of interactional justice (OR 1.74, 95% CI: 1.08-2.80). There was no significant association between procedural justice and illness reporting among females. **Conclusion:** The findings indicate that high perceived organizational justice is positively associated with illness reporting among Japanese employees who require workplace support to combine work and disease treatment.

Eguchi et al. 2019.

PLoS One, vol. 14, no. 10.

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Keywords: Organisation justice; Illness; Employees; Chronic diseases; Reporting

Evidence Level: 4B

Link: <https://journals.plos.org/plosone/article?id=10.1371/journal.pone.0223595>

Occupational Exposure

Occupational co-exposure to biomechanical factors and neurotoxic chemicals in a representative sample of French employees

Objective: Musculoskeletal disorders, mainly carpal tunnel syndrome, represent a leading cause of compensation claims of workers worldwide. Despite this, and the fact that occupational exposures to biomechanical factors and neurotoxic chemicals have been individually associated with peripheral nerve damage, the prevalence of occupational co-exposure to biomechanical factors and neurotoxic chemicals has rarely been explored. Therefore, our aim was to assess the prevalence of occupational co-exposure to biomechanical factors and neurotoxic chemicals in a national representative sample of the French working population. **Methods:** The study was based on the French representative cross-sectional survey SUMER 2010. A total of 47 983 employees who had worked in their current job for at least one year were included. Occupational exposure to biomechanical factors and neurotoxic chemicals within the previous week of work were assessed using a questionnaire during face-to-face interviews with occupational physicians. **Results:** Approximately 5% of male employees and 1% of female employees were co-exposed to biomechanical factors and neurotoxic chemicals. This prevalence was up to 10% among male blue-collar workers and 13%, 8%, and 6%, respectively, among male employees in the construction, agriculture, and industry sectors. Male employees under 30 years old, in apprenticeships, and working in small companies were more co-exposed to biomechanical factors and neurotoxic chemicals than their counterparts. **Conclusions:** Occupational co-exposure to biomechanical factors and neurotoxic chemicals was observed in a significant proportion of French male employees, suggesting that further studies are required to investigate its potential adverse effects on peripheral neuropathies.

Bertin et al. 2019.

Journal of Occupational Health.

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Keywords: Biomechanical factors; multiple exposures; neurotoxic chemicals; occupational exposure

Evidence Level: 4A

Link: <https://onlinelibrary.wiley.com/doi/full/10.1002/1348-9585.12090>

Effect of occupational exposure to radar radiation on cancer risk: A systematic review and meta-analysis

Objective: Microwave radiation is one of the most growing environmental workplace factors that exposes too many workers in the various workplaces. Regard to concerns about cancer incidence in these workers and lack of systematic or meta-analytic studies about this object, so, we conducted a meta-analysis to acquire an understanding of the association between cancer risk and occupational exposure to radar radiation. **Methods:** A systematic search was carried out on case-control, cohort and clinical control trial studies that published in the Cochrane Library, PubMed, ISI Web of Science, Scopus and Google scholar databases that accomplished from March 2017 to March 2018 and updated on 30 September, 2018 in English and Persian articles without time limit in publication date. Keywords were selected based on PICO principle and collected from MeSH database. After removal of duplicated studied, taking into inclusion and exclusion criteria, the process of screening was carried out and data were extracted after preparation of the full text of included articles. Article collection was completed by manually searching for a reference list of eligible studies. For quality assessment of included studies, Newcastle-Ottawa scale was used. **Results:** A total of 533 studies was found in the first step of literature search, only 6 were included with 53,008 sample size according to inclusion and exclusion criteria. Estimated pooled random effects size analysis showed no significant increasing effect of occupational exposure to radar radiation on mortality rate (MR=0.81, 95%CI: 0.78, 0.83) and relative risk (RR=0.87, 95%CI: 0.75, 0.99, P <0.0001) of cancer with a significant heterogeneity between the selected studies. **Conclusions:** In conclusion, the results of this meta-analysis study have shown no significant increase in overall mortality ratio and cancer risk ratio from occupational exposure to the radar frequency of workers. But, these results are not conclusive. As regards to some limitation such as fewer numbers of included studies, lack of data about exposure characterizations and demographic characterizations in this meta-analysis, this result is not certain and conclusive. It is recommended to conduct future studies.

Variani et al. 2019.

Asian Pacific Journal of Cancer Prevention, vol. 20, no. 11.

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Keywords: Meta-analysis; Occupational exposure; Occupational cancer; Radar; neoplasm

Evidence Level: 1A

Link: <http://journal.waocp.org/?sid=Entrez:PubMed&id=pmid:31759343&key=2019.20.11.3211>

Occupational chemical exposure and breast cancer risk according to hormone receptor status: A systematic review

Breast cancers include a heterogeneous group of diseases with clinical behaviors that may vary according to the hormonal receptor status. However, limited knowledge is available on the role of breast cancer environmental and occupational risk factors in the onset of specific molecular disease phenotypes. Therefore, the aim of this review was to provide an overview on the possible correlation between occupational chemical exposures and breast cancers with a specific receptor pattern. Pubmed, Scopus, and ISI Web of Science databases were systematically reviewed to identify all the studies addressing chemical exposure in workplaces and risk of breast cancer classified according to the presence of estrogen and/or progesterone receptors. Some positive associations were reported between solvent, polycyclic aromatic hydrocarbon, organophosphoric insecticide, and synthetic fiber exposure and estrogen receptor-positive cases, while other investigations demonstrated a relationship with receptor-negative tumors or failed to detect any significant effect. Overall, further investigation should overcome limitations due to the self-reported information on work histories, the chemical classification in general categories, and the lack of environmental or biological monitoring exposure data. This may support the development of suitable and individually "tailored" occupational risk assessment and management strategies to protect the health of exposed workers, particularly those with hypersusceptibility conditions.

Leso et al. 2019.

Cancers (Basel), vol. 11, no. 12.

User License: *Creative Commons Attribution (CC BY 4.0)*

Keywords: Breast cancer; estrogen receptor; hormone receptor status; occupational chemical exposure; progesterone receptor; risk management; workplace risk factors

Evidence Level: 1A

Link: <https://www.mdpi.com/2072-6694/11/12/1882>

Occupational exposure to formaldehyde and risk of non-hodgkin lymphoma: A meta-analysis

Background: Formaldehyde, a widely used chemical, is considered a human carcinogen. We report the results of a meta-analysis of studies on the relationship between occupational exposure to formaldehyde and risk of non-Hodgkin lymphoma (NHL). **Methods:** We performed a systematic review and meta-analysis according to international guidelines and we identified 12 reports of occupational populations exposed to formaldehyde. We evaluated inter-study heterogeneity and we applied a random effects model. We conducted a cumulative meta-analysis and a meta-analysis according to estimated average exposure of each study population. **Results:** The meta-analysis resulted in a summary relative risk (RR) for NHL of 0.93 (95% confidence interval 0.83-1.04). The cumulative meta-analysis suggests that higher RRs were detected in studies published before 1986, while studies available after 1986 did not show an association. No differences were found between different levels of occupational exposure. **Conclusions:** Notwithstanding some limitations, the results of this meta-analysis do not support the hypothesis of an association between occupational exposure to formaldehyde and risk of NHL.

Catalani et al. 2019.

BMC Cancer, vol. 9, no. 1.

User License: *Creative Commons Attribution (CC BY 4.0)*

Keywords: Cancer; Formaldehyde; Meta-analysis; Non-Hodgkin lymphoma

Evidence Level: 1A

Link: <https://bmccancer.biomedcentral.com/articles/10.1186/s12885-019-6445-z>

Asbestosis and Mesothelioma

Investigating the association between occupational exposure to asbestos and ovarian carcinoma: Results from a pilot study in Germany.

Background: The aim of this pilot study was to assess the feasibility of a large-scale epidemiologic investigation elucidating the quantitative association between occupational exposure to asbestos and ovarian cancer in former German asbestos workers. **Methods:** Between December 2017 and May 2018, a random sample of one thousand insured women registered at the health service of a German trade association as formerly occupationally exposed to asbestos were invited to participate in a pilot study. Participation included a phone interview using a standardised questionnaire. The feasibility of the project was evaluated using a priori defined criteria. They included response, number of cases, eligibility of the questionnaire data for exact estimation of asbestos fibre-years, and availability of relevant medical documentation (imaging procedures, medical reports, and histologic materials). **Results:** The response (17%) was clearly below the intended number of 60%. With six tumour suspects, of which two could be confirmed by medical documents, the number of cases was within the expected range of two to eleven cases. Exact asbestos fibre-year estimations could be performed for 29% of all interviewees, but only for one suspected case. Medical documentation could be collected for only few participants, while no histology reports could be obtained for all cases. Thus, only the feasibility criterion of the expected number of cases was fulfilled. **Conclusion:** The results of the pilot study indicate that the planned project is feasible only to a very limited extent. For further planning of the study, measures to improve recruitment of participants are necessary.

Rajput et al. 2019.

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

User License: *Creative Commons Attribution (CC BY 4.0)*

Keywords: Asbestos; Cancer epidemiology; Epidemiological methods; Occupational diseases; Ovarian neoplasms

Evidence Level: 3B

Link: <https://bmcpublihealth.biomedcentral.com/articles/10.1186/s12889-019-7590-7>

Pulmonary function and CT scan imaging at low-level occupational exposure to asbestos

Background: In spite of the reduced exposure level, and its ban in numerous countries, compensation claims for asbestos-related diseases are far from decreasing. **Methods:** We used retrospective exposure

assessment techniques to explore respiratory function and a computerized tomography (CT) scan in relation to past asbestos exposure in 115 male workers retired from an acrylic and polyester fiber plant. Based on detailed information on exposure circumstances, we reconstructed a cumulative exposure estimate for each patient. **Results:** Time-weighted average exposure in our study population was 0.24 fibers/ml (95% confidence interval (CI) 0.19-0.29), and the average cumulative exposure was 4.51 fibers/mL-years (95% CI 3.95-5.07). Exposure was elevated among maintenance workers, compared to other jobs ($p = 0.00001$). Respiratory function parameters did not vary in relation to the exposure estimates, nor to CT scan results. Risk of interstitial fibrosis showed a significant upward trend (Wald test for trend = 2.62, $p = 0.009$) with cumulative exposure to asbestos; risk associated with 5.26 fibers/mL-years or more, was 8-fold (95% CI 1.18-54.5). **Conclusions:** Our results suggest that a CT scan can detect pleuro-parenchymal lung alterations at asbestos exposure levels lower than previously thought, in absence of respiratory impairment. Further studies are required to validate our techniques of retrospective assessment of asbestos exposure.

Satta et al. 2019.

International Journal of Environmental Research and Public Health, vol. 17, no. 1.

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Keywords: Asbestos; respiratory function; CT scan; retrospective exposure assessment

Evidence Level: 3A

Link: <https://www.mdpi.com/1660-4601/17/1/50>

Sedentary Practices

Controversies in the science of sedentary behaviour and health: Insights, perspectives and future directions from the 2018 Queensland Sedentary Behaviour Think Tank.

The development in research concerning sedentary behaviour has been rapid over the past two decades. This has led to the development of evidence and views that have become more advanced, diverse and, possibly, contentious. These include the effects of standing, the breaking up of prolonged sitting and the role of moderate-to-vigorous physical activity (MVPA) in the association between sedentary behaviour and health outcomes. The present aim is to report the views of experts ($n = 21$) brought together (one-day face-to-face meeting in 2018) to consider these issues and provide conclusions and recommendations for future work. Each topic was reviewed and presented by one expert followed by full group discussion, which was recorded, transcribed and analysed. The experts concluded that (a). standing may bring benefits that accrue from postural shifts. Prolonged (mainly static) standing and prolonged sitting are both bad for health; (b). 'the best posture is the next posture'. Regularly breaking up of sitting with postural shifts and movement is vital; (c). health effects of prolonged sitting are evident even after controlling for MVPA, but high levels of MVPA can attenuate the deleterious effects of prolonged sitting depending on the health outcome of interest. Expert discussion addressed measurement, messaging and future directions.

Biddle et al. 2019.

International Journal of Environmental Research and Public Health, vol. 16, no. 23.

User License: *Creative Commons Attribution (CC BY 4.0)*

Keywords: Breaks; debate; health; mediation; moderation; physical activity; posture; sedentary; standing

Evidence Level: 6A

Link: <https://www.mdpi.com/1660-4601/16/23/4762>

Health economic evaluations of interventions to increase physical activity and decrease sedentary behavior at the workplace: A systematic review

Objective: The workplace is an ideal setting to implement public health strategies, but economic justification for such interventions is needed. Therefore, we performed a critical appraisal and synthesis of health economic evaluations (HEE) of workplace interventions aiming to increase physical activity (PA) and/or decrease sedentary behavior (SB). **Methods:** A comprehensive search filter was developed using appropriate guidelines, such as the Peer Review of Electronic Search Strategies (PRESS) checklist, and published search algorithms. Six databases and hand searches were used to identify eligible studies. Full HEE of workplace interventions targeting PA/SB were included. Methodological quality was assessed using

the Consensus Health Economic Criteria (CHEC) list. Two researchers independently performed all procedures. Hedges' *g* was calculated to compare intervention effects. Outcomes from HEE were recalculated in 2017 euros and benefit-standardized. **Results:** Eighteen HEE were identified that fulfilled on average 68% of the CHEC list criteria. Most studies showed improvements in PA/SB, but effects were small and thus, their relevance is questionable. Interventions were heterogeneous, no particular intervention type was found to be more effective. HEE were heterogeneous regarding methodological approaches and the selection of cost categories was inconsistent. Indirect costs were the main cost driver. In all studies, effects on costs were subject to substantial uncertainty. **Conclusions:** Due to small effects and uncertain impact on costs, the economic evidence of worksite PA/SB-interventions remains unclear. Future studies are needed to determine effective strategies. The HEE of such interventions should be developed using guidelines and validated measures for productivity costs. Additionally, studies should model the long-term costs and effects because of the long pay-back time of PA/SB interventions.

Lutz et al. 2019.

Scandinavian Journal of Work and Environmental Health.

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Keywords: Health economic evaluations; interventions; physical activity; sedentary behavior; workplace

Evidence Level: 1A

Link: https://www.sjweh.fi/show_abstract.php?abstract_id=3871

Low back pain and its relationship with sitting behaviour among sedentary office workers.

The relationships between sedentary lifestyle, sitting behaviour, and low back pain (LBP) remain controversial. In this study, we investigated the relationship between back pain and occupational sitting habits in 64 call-centre employees. A textile pressure mat was used to evaluate and parameterise sitting behaviour over a total of 400 h, while pain questionnaires evaluated acute and chronic LBP. Seventy-five percent of the participants reported some level of either chronic or acute back pain. Individuals with chronic LBP demonstrated a possible trend (t-test not significant) towards more static sitting behaviour compared to their pain-free counterparts. Furthermore, a greater association was found between sitting behaviour and chronic LBP than for acute pain/disability, which is plausibly due to a greater awareness of pain-free sitting positions in individuals with chronic pain compared to those affected by acute pain.

Bontrup et al. 2019.

Applied Ergonomics, vol. 81.

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Keywords: Dynamic sitting; Low back pain; Office chair; Pressure distribution; Sitting behaviour

Evidence Level: 5A

Link: <https://www.sciencedirect.com/science/article/pii/S0003687019301279?via%3Dihub>

Temporal features of sitting, standing and stepping changes in a cluster-randomised controlled trial of a workplace sitting-reduction intervention.

Background: There is now a body of evidence on the effectiveness of interventions to reduce workplace sitting time. However, there has been limited reporting of how such interventions may impact behaviour both during and outside of work. Sitting, standing and stepping changes following a workplace intervention were examined across five timeframes (work time on work days; non-work time on work days; work days; non-work days; overall (i.e. work and non-work time on all days)), and the relationships between changes during and outside of work was assessed. **Methods:** The cluster-randomised controlled trial, 'Stand Up Victoria', delivered a multi-component workplace-delivered intervention that successfully reduced workplace and overall sitting time (relative to controls). Separately, over the five timeframes, changes in device (activPAL3)-assessed outcomes - sitting; prolonged sitting (≥ 30 min bouts); standing; and, stepping - were compared between intervention ($n = 114$) and controls ($n = 84$), along with the time-course of sitting changes during work hours, using mixed models. The potential relationships of changes during work with changes outside of work were examined using compositional data analysis. **Results:** On workdays, intervention participants significantly ($p < 0.05$) improved their activity profile relative to controls, with reduced sitting (- 117 min/8-h workday, 95% CI: - 141, - 93) and prolonged sitting (- 77 min/8 h workday, 95% CI: - 101, - 52); increased standing (114 min/8 h workday, 95% CI: 92, 136) and maintenance of stepping (3 min/8 h workday, 95% CI: - 7, 11, $p = 0.576$). Effects were nearly identical for time at work;

similar but slightly weaker for overall; and, small and non-significant outside of work on workdays and non-work days. Improvements occurred at all times, but not equally, during work hours ($p < 0.001$). Correlations between changes during and outside of work on workdays were very weak in both the intervention group ($r = -0.07$) and controls ($r = -0.09$). **Conclusions:** Sitting time was reduced almost exclusively during work hours (via replacement with standing), with reductions evident during all working hours, to varying degrees. There was no evidence of compensation, with minimal change in activity outside of work, in response to changes in activity at work. Future interventions may benefit from exploring how best to elicit change throughout the whole day, and across work and non-work domains.

Stephens et al. 2019.

International Journal of Behavioral Nutrition and Physical Activity, vol. 16, no. 1.

User License: *Creative Commons Attribution (CC BY 4.0)*

Keywords: Compositional data analysis; Intervention; Office workers; Sedentary; Sitting time; Workplace

Evidence Level: 2A

Link: <https://ijbnpa.biomedcentral.com/articles/10.1186/s12966-019-0879-1>

"Why would you want to stand?" an account of the lived experience of employees taking part in a workplace sit-stand desk intervention

Background: Sit-stand desk interventions have the potential to reduce workplace sedentary behaviour and improve employee health. However, the extent of sit-stand desk use varies between employees and in different organisational contexts. Framed by organisational cultural theory and product design theory, this study examined employees' lived experience of taking part in a workplace sit-stand desk intervention, to understand the processes influencing feasibility and acceptability. **Methods:** Participant observations and qualitative interviews were conducted with 15 employees from two office-based workplaces in the UK, as part of a process evaluation that ran alongside a pilot RCT of a workplace sit-stand desk intervention. Observational field notes and transcripts were analysed using thematic analysis. **Results:** Three themes related to the experience of using a sit-stand desk at work were generated: employees' relationship with their sit-stand desk; aspirations and outcomes related to employee health and productivity; and cultural norms and interpersonal relationships. The perceived usability of the desk varied depending on how employees interacted with the desk within their personal and organisational context. Employees reported that the perceived influence of the desk on their productivity levels shaped use of the desk; those who perceived that standing increased energy and alertness tended to stand more often. Sit-stand desks were voiced as being more acceptable than intervention strategies that involve leaving the desk, as productivity was conflated with being at the desk. **Conclusion:** The findings indicate a range of organisational, social-cultural and individual-level factors that shape the feasibility and acceptability of sit-stand desk use, and suggest strategies for improving employees' experiences of using a sit-stand desk at work, which might positively influence sedentary behaviour reduction and health.

Hall et al. 2019.

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

User License: *Creative Commons Attribution (CC BY 4.0)*

Keywords: Multi-component intervention; Organisational culture; Physical activity; Product design; Qualitative; Sedentary behaviour; Sitting; Standing; UK; Workplace health

Evidence Level: 6A

Link: <https://bmcpublihealth.biomedcentral.com/articles/10.1186/s12889-019-8038-9>

Physical Activity

Relationships between physical Activity, sedentary behaviour and cognitive functions in office workers.

Increasing evidence from animal experiments suggests that physical activity (PA) promotes neuroplasticity and learning. For humans, most research on the relationship between PA, sedentary behaviour (SB), and cognitive function has relied on self-reported measures of behaviour. Office work is characterised by high durations of SB combined with high work demands. While previous studies have shown that fitter office workers outperform their less fit colleagues in cognitive tests, the importance of PA and SB remains unknown. This study investigated associations between objectively measured PA and SB, using hip-worn

accelerometers, and cognitive functions in 334 office workers. Time spent in moderate-to-vigorous PA (MVPA) was not associated with any cognitive outcome. However, time spent in SB tended to be positively associated with words recalled in free recall ($\beta = 0.125$). For the least fit participants, the average length of MVPA bouts was favourably related to Stroop performance ($\beta = -0.211$), while for the fitter individuals, a longer average length of MVPA bouts was related to worse recognition ($\beta = -0.216$). While our findings indicate that the length of MVPA bouts was associated with better Stroop performance in the least fit participants, our findings do not support the notion that more time spent in MVPA or less time in SB is associated with better cognitive function.

Moller et al. 2019.

International Journal of Environmental Research and Public Health, vol. 16, no. 23.

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Keywords: Cognition; episodic memory; executive functions; office workers; physical activity; sedentary behaviour

Evidence Level: 5A

Link: <https://www.mdpi.com/1660-4601/16/23/4721>

Effect of workplace physical activity interventions on the cardio-metabolic health of working adults: Systematic review and meta-analysis

Background: Adults in urban areas spend almost 77% of their waking time being inactive at workplaces, which leaves little time for physical activity. The aim of this systematic review and meta-analysis was to synthesize evidence for the effect of workplace physical activity interventions on the cardio-metabolic health markers (body weight, waist circumference, body mass index (BMI), blood pressure, lipids and blood glucose) among working adults. **Methods:** All experimental studies up to March 2018, reporting cardio-metabolic worksite intervention outcomes among adult employees were identified from PUBMED, EMBASE, COCHRANE CENTRAL, CINAHL and PsycINFO. The Cochrane Risk of Bias tool was used to assess bias in studies. All studies were assessed qualitatively and meta-analysis was done where possible. Forest plots were generated for pooled estimates of each study outcome. **Results:** A total of 33 studies met the eligibility criteria and 24 were included in the meta-analysis. Multi-component workplace interventions significantly reduced body weight (16 studies; mean diff: - 2.61 kg, 95% CI: - 3.89 to - 1.33) BMI (19 studies, mean diff: - 0.42 kg/m²), 95% CI: - 0.69 to - 0.15) and waist circumference (13 studies; mean diff: - 1.92 cm, 95% CI: - 3.25 to - 0.60). Reduction in blood pressure, lipids and blood glucose was not statistically significant. **Conclusions:** Workplace interventions significantly reduced body weight, BMI and waist circumference. Non-significant results for biochemical markers could be due to them being secondary outcomes in most studies. Intervention acceptability and adherence, follow-up duration and exploring non-RCT designs are factors that need attention in future research.

Mulchandani et al. 2019.

The International Journal of Behavioral Nutrition and Physical Activity, vol. 16, no. 1.

User License: *Creative Commons Attribution (CC BY 4.0)*

Keywords: Physical activity, Worksite interventions, Cardiovascular disease

Evidence Level: 1A

Link: <https://ijbnpa.biomedcentral.com/articles/10.1186/s12966-019-0896-0>

Activity level and body mass index as predictors of physical workload during working career

The increasing prevalence of inactivity and obesity, along with aging, has implications on work capacity of labor force. This study reports the relationships between activity level and BMI by age with objectively measured physical workload. Data were examined from a sample of 19 481 Finnish employees using an estimate of minute-to-minute oxygen consumption based on R-R interval recordings. The mean estimated %VO₂max during the working day was 12.1 (+/-3.6) and 15.1 (+/-4.5)% for men and women, respectively. Based on a linear model, the mean %VO₂max increased by 1.5%-unit per 10-year increase in age, by 2.1%-unit per 5 kg/m² increase in BMI, and decreased by 1.6%-unit if improving physical activity class by two ($p < 0.001$ for all). Overweight and obesity, together with inactivity, notably increases workload throughout the career, even though at young adulthood, the daily workload is almost the same for each person regardless of the BMI, activity level, or gender. This study highlights the importance of regular physical

activity and normal weight in protecting the worker from excessive physical (cardiovascular) workload during the whole working career.

Manttari et al. 2019.

Safety and Health in Work, vol. 10, no. 4.

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Keywords: Aging worker; Big data; Functional capacity; Physical activity; Work ability

Evidence Level: 5A

Link: <https://www.sciencedirect.com/science/article/pii/S2093791118302531?via%3Dihub>

Acute myocardial infarction in relation to physical activities at work: A nationwide follow-up study based on job-exposure matrices.

Objective: This study aimed to evaluate sex-specific risks of acute myocardial infarction (AMI) according to lifting and standing/walking at work. **Methods:** The study population included 1.15 million Danish wage earners. Annual job codes from 1976 onwards were linked to specific exposures using job-exposure matrices (JEM). Cases of AMI during follow-up 1996-2016 were retrieved from national registers. Incidence rate ratios (IRR) were computed by Poisson regression adjusting for demographic and JEM-assessed lifestyle factors. Models addressed physical activities at work the previous 0-2 years (short-term risk) and cumulative physical activities (long-term risk). **Results:** During 21.4 million person-years of follow-up, 22 037 AMI occurred in men and 6942 in women. Exposure-response relationships between recent physical activities at work and AMI were not evident. In men, the fully adjusted long-term IRR for the highest of five exposure categories compared to the lowest were 1.09 [95% confidence interval (CI) 1.03-1.15] for lifting and 1.01 (95% CI 0.96-1.07) for standing/walking. In women, the corresponding figures were 1.27 (95% CI 1.15-1.40) and 1.18 (95% CI 1.07-1.30). The latter risk estimate was strongly attenuated, and the trend became insignificant when adjusted for lifting. Findings were only partially supported by sensitivity analyses. **Conclusion:** The study provides limited support to the hypothesis that long-term lifting and standing/walking at work is related to increased risk of AMI. Possible effects of acute physical exertion are not addressed and bias towards the null because of crude exposure assignment cannot be ruled out.

Bonde et al. 2019.

Scandinavian Journal of Work and Environmental Health.

User License: *Creative Commons Attribution (CC BY 4.0)*

Keywords: Work; Myocardial infarction; Physical activities; Job exposure

Evidence Level: 5B

Link: https://www.sjweh.fi/show_abstract.php?abstract_id=3863

The effects of walking intervention on preventing neck pain in office workers: A randomized controlled trial

Objective: This study aimed to evaluate the efficacy of increased daily walking steps on the 6-month incidence of neck pain among office workers. **Methods:** Healthy office workers with high risk of neck pain were recruited into a 6-month prospective cluster-randomized controlled trial. Participants were randomly assigned at the cluster level, into either intervention (n = 50) or control (n = 41) groups. Participants in the intervention group were instructed to increase their daily walking steps to a designated level for a duration of 6 months. Participants in the control group received no intervention. The outcome measures included the 6-month incidence of neck pain as well as its pain intensity and disability level. Analyses were performed using multivariable logistic regression model. **Results:** Of the participants in the intervention and control groups, 22% and 34% reported a 6-month incidence of neck pain, respectively. After adjusting for confounders, a significant preventive effect of walking intervention was found (adjusted odd ratio 0.22, 95% confidence interval 0.06-0.75). No significant difference in pain intensity and disability level was found between those in the intervention and control groups. **Conclusion:** An intervention to increase daily walking steps reduced onset neck pain in high-risk office workers. However, the walking interventions did not decrease pain intensity and disability in those increasing the number of daily walking steps compared to the control group.

Sitthipornvorakul et al. 2019.

Journal of Occupational Health.

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Keywords: Walking intervention; neck pain; prevention; office workers

Evidence Level: 1A

Link: <https://onlinelibrary.wiley.com/doi/full/10.1002/1348-9585.12106>

The role of leisure-time physical activity in the change of work-related stress (ERI) over Time

Background: Every second employee in Europe complains about work-related stress. Occupational stress due to an imbalance between efforts spent and rewards gained (effort-reward imbalance = ERI) is well investigated and it is associated with mental and physical health. A common guess is that leisure-time physical activity (LTPA) has beneficial effects on work-related stress. Yet, evidence in support of this assumption is weak, especially regarding ERI-stress. Longitudinal studies investigating the role of LTPA on ERI are missing. Therefore, this study aims to investigate the effect of LTPA on work-related stress by ERI over time. **Methods:** 3961 socially insured employees that were born in 1959 or 1965 and working in the first (t1: 2011) and second wave (t2: 2014) of the lidA-study were included. Work-related stress was measured by ERI, LTPA by the self-rated weekly frequency of physical activities. Besides the direct effect, a moderating effect of LTPA on ERI over time was tested in the multiple linear regression analysis. **Results:** The ERI at t1 was strongly associated with ERI at t2. While LTPA had no direct effect on ERI(t2), it was a significant moderator of ERI from t1 to t2: The higher the frequency of LTPA, the lower ERI was over time. This interaction of LTPA with ERI remained after adjustment for socio-demographic factors. **Conclusions:** The long-term moderating effect of LTPA on ERI is in agreement with former investigations on the role of LTPA on work-related stress, generally, and on its cross-sectional effect on ERI-stress, specifically. Some of Hill's criteria of a causal association in epidemiology (biological gradient, temporality, consistency) support our findings. As LTPA has also been shown to exert a protective effect on health outcomes that are associated with ERI, the moderation of ERI by LTPA could partly explain this protective effect. Future observational and interventional studies are required to support our results over more than two age groups and study times.

Du Prel et al. 2019.

International Journal of Environmental Research and Public Health, vol. 16, no. 23.

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Keywords: Effort-reward imbalance; leisure-time physical activity; longitudinal research; older employees; work-related stress

Evidence Level: 4A

Link: <https://www.mdpi.com/1660-4601/16/23/4839>

Relationship of workplace exercise with work engagement and psychological distress in employees: A cross-sectional study from the MYLS study

We investigated the relationship between workplace exercise and psychological distress, and work engagement, both of which are factors related to the mental health and work productivity of employees. Data from the Meiji Yasuda Lifestyle study, collected from July 2017 through December 2017, were used. Data from an annual health checkup and questionnaire were collected from the Meiji Yasuda Shinjuku Medical Center in Tokyo, Japan. The 1321 participants (mean age: 50.8 ± 9.5 years, rate of female: 68.2%, rate of white-collar workers: 64.7%) were divided into three groups based on the frequency of performing workplace exercise: less than once, once or twice, and three or more times a week. Vigor of work engagement and psychological distress were assessed using the Utrecht Work Engagement Scale and Kessler Psychological Distress Scale (K6). Logistic regression analyses were performed to examine relationships between workplace exercise frequencies and work engagement or psychological distress. Demographic variables, health behaviors, health status, work characteristics, and objectively measured physical activity and sedentary behavior were adjusted for odds ratio (OR) and 95% confidence interval (95% CI). Participants who performed workplace exercise once or twice and three or more times a week showed a significantly higher OR (OR = 1.93, 95% CI = 1.00-3.71, $p = 0.049$, OR = 1.63, 95% CI = 1.23-2.15, $p = 0.001$, respectively) for vigor of work engagement. Neither groups of workplace exercise showed a significant OR for psychological distress even when adjusted for covariates. The practice of workplace exercise is positively and independently related to vigor of work engagements of physical activity and sedentary behavior, and the association was observed regardless of the frequency of once or twice, or three or more times a week. Workplace exercise, however, does not correlate with psychological distress.

Our findings indicated that workplace exercise at least once or twice a week could have practical implications for the enhancement of vigor of work engagement, especially among white-collar workers.

Jindo et al. 2019.

Preventative Medicine Reports.

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Keywords: BMI, body mass index; K6, Kessler Psychological Distress Scale; METs, Metabolic equivalents; MYLS, Meiji Yasuda Lifestyle; Mental health; OR, odds ratio; PA, physical activity; Physical activity; SB, sedentary behavior; Sedentary behavior; UWES-9, Utrecht work engagement scale; Work productivity; Worker

Evidence Level: 4B

Link: <https://www.sciencedirect.com/science/article/pii/S2211335519302013?via%3Dihub>

The effectiveness of workplace nutrition and physical activity interventions in improving productivity, work performance and workability: A systematic review

Background: Healthy lifestyles play an important role in the prevention of premature death, chronic diseases, productivity loss and other social and economic concerns. However, workplace interventions to address issues of fitness and nutrition which include work-related outcomes are complex and thus challenging to implement and appropriately measure the effectiveness of. This systematic review investigated the impact of workplace nutrition and physical activity interventions, which include components aimed at workplace's physical environment and organizational structure, on employees' productivity, work performance and workability. **Methods:** A systematic review that included randomized controlled trials and or non-randomized controlled studies was conducted. Medline, EMBASE.com, Cochrane Library and Scopus were searched until September 2016. Productivity, absenteeism, presenteeism, work performance and workability were the primary outcomes of our interest, while sedentary behavior and changes in other health-related behaviors were considered as secondary outcomes. Two reviewers independently screened abstracts and full-texts for study eligibility, extracted the data and performed a quality assessment using the Cochrane Collaboration Risk-of-Bias Tool for randomized trials and the Risk-of-Bias in non-randomized studies of interventions. Findings were narratively synthesized. **Results:** Thirty-nine randomized control trials and non-randomized controlled studies were included. Nearly 28% of the included studies were of high quality, while 56% were of medium quality. The studies covered a broad range of multi-level and environmental-level interventions. Fourteen workplace nutrition and physical activity intervention studies yielded statistically significant changes on absenteeism (n = 7), work performance (n = 2), workability (n = 3), productivity (n = 1) and on both workability and productivity (n = 1). Two studies showed effects on absenteeism only between subgroups. **Conclusions:** The scientific evidence shows that it is possible to influence work-related outcomes, especially absenteeism, positively through health promotion efforts that include components aimed at the workplace's physical work environment and organizational structure. In order to draw further conclusions regarding work-related outcomes in controlled high-quality studies, long-term follow-up using objective outcomes and/or quality assured questionnaires are required.

Grimani et al. 2019.

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

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Keywords: Absenteeism; Fitness programs; Non-randomized controlled study designs; Nutritional interventions; Randomized controlled trials; Risk of bias; Work-related outcomes; Workplace health promotion interventions

Evidence Level: 1A

Link: <https://bmcpublichealth.biomedcentral.com/articles/10.1186/s12889-019-8033-1>

Musculoskeletal Health

A game-theory method to design job rotation schedules to prevent musculoskeletal disorders based on workers' preferences and competencies.

Job rotation is an organizational strategy based on the systematic exchange of workers between jobs in a planned manner according to specific criteria. This study presents the GS-Rot method, a method based on Game Theory, in order to design job rotation schedules by considering not only workers' job preferences, but also the competencies required for different jobs. With this approach, we promote workers' active participation in the design of the rotation plan. It also let us deal with restrictions in assigning workers to job positions according to their disabilities (temporal or permanent). The GS-Rot method has been implemented online and applied to a case in a work environment characterized by the presence of a high repetition of movements, which is a significant risk factor associated with work-related musculoskeletal disorders (WMSDs). A total of 17 workstations and 17 workers were involved in the rotation, four of them with physical/psychological limitations. Feasible job rotation schedules were obtained in a short time (average time 27.4 milliseconds). The results indicate that in the rotations driven by preference priorities, almost all the workers (94.11%) were assigned to one of their top five preferences. Likewise, 48.52% of job positions were assigned to workers in their top five of their competence lists. When jobs were assigned according to competence, 58.82% of workers got an assignment among their top five competence lists. Furthermore, 55.87% of the workers achieved jobs in their top five preferences. In both rotation scenarios, the workers varied performed jobs, and fatigue accumulation was balanced among them. The GS-Rot method achieved feasible and uniform solutions regarding the workers' exposure to job repetitiveness.

Asensio-Cuesta et al. 2019.

International Journal of Environmental Research and Public Health, vol. 16, no. 23.

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Keywords: Gale-Shapley method; competencies; ergonomics; game-theory; job rotation; musculoskeletal disorders; preferences

Evidence Level: 5B

Link: <https://www.mdpi.com/1660-4601/16/23/4666>

Association between low back pain and various everyday performances: Activities of daily living, ability to work and sexual function

A Low back pain (LBP) is a widely prevalent chronic pain disorder associated with a high burden on individuals and society. In the subjective perception of patients with LBP, probably the most important health outcomes associated with LBP are those that effect everyday performance. Such outcomes include reduction in activities of daily living (ADL), in work ability (WA), and in sexual function. This narrative review aimed to (1) examine the association between LBP and the three mentioned outcomes of everyday performance, (2) to explain possible mediating factors promoting these associations, and (3) to discuss possible implications for treatment and rehabilitation. Studies have shown that LBP can generate anxiety of movement leading to movement avoidance (fear-avoidance beliefs), which may lead to deconditioning and further increasing problems with ADL, WA and decreasing sexual function. Furthermore, common mental disorders, such as depression, anxiety, and stress-related disorders, which also often co-occur with LBP can lead to adverse effects on everyday performance and vice versa, can be the consequence of such problems and aggravate LBP. Although there is no universally accepted treatment modality that fits every patient with LBP, physical training, comprehensive patient education, and workplace or home modifications have been shown to be able to interrupt the mutual influence between LBP and the described mediating factors, and have a beneficial effect on ADL, WA, and sexual function. For this, a multidisciplinary approach is necessary which includes multiprofessional care teams, participation of the patients, and involvement of different settings, such as workplace, home, and physical training facilities.

Grabovac et al. 2019.

Wien Klin Wochenschr, vol. 131, no. 21.

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Keywords: Activities of daily living; Everyday functioning; Low back pain; Sexual function; Work ability

Evidence Level: 6B

Link: <https://link.springer.com/article/10.1007%2Fs00508-019-01542-7>

Health, work and demographic factors associated with a lower risk of work disability and unemployment in employees with lower back, neck and shoulder pain

Background: Chronic musculoskeletal pain affects over 20% of the adult population and is one of the most common reasons for sick leave in Sweden. The aim of this study was to investigate which demographic, health and psychosocial work environment factors are of importance for a lower risk of future work disability and unemployment among workers with low back pain (LBP) and/or neck shoulder pain (NSP), and if familial factors influence these associations. **Methods:** All 5556 persons that reported having LBP and/or NSP in a web-based questionnaire study in 2004-2006 were included. They were followed up for work disability (sick leave > 90 days or disability pension), and unemployment (> 180 days in a year) until 31 December 2013. Hazard ratios (HR) with 95% confidence intervals were calculated using cox proportional hazard models of the whole sample, adjusting for covariates. In addition, co-twin analyses of outcome discordant twin pairs were conducted to assess the impact of familial confounding on the associations. **Results:** Being male, 19-28 years old, having higher education, only NSP, no history of depression or anxiety, good self-rated health, low job demands and high job control were associated with a lower risk of work disability (adjusted HR ranging between 0.29-0.85). No history of anxiety and depression and high job control was associated with a lower risk of unemployment (adjusted HR ranging from 0.53 and 0.67). Familial factors were found to affect the association between education and work disability, but none of the other associations investigated. **Conclusions:** Among those with LBP or NSP, good health in terms of mental- and self-rated health, few pain sites, as well as good psychosocial working conditions seem to indicate a lower risk for work disability.

Mather et al. 2019.

BMC Musculoskeletal Disorders, vol. 20, no. 1.

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Keywords: Work disability; risk; health; demographic factors; unemployment; back pain; neck pain; shoulder pain

Evidence Level: 5A

Link: <https://bmcmusculoskeletaldisord.biomedcentral.com/articles/10.1186/s12891-019-2999-9>

Effectiveness of a multidisciplinary BIOPSYCHOSOCIAL intervention for non-specific SUBACUTE low back pain in a working population: A cluster randomized clinical trial

Background: Low back pain (LBP) is a multifactorial condition with individual and societal impact that affects populations globally. Current guidelines for the treatment of LBP recommend pharmacological and non-pharmacological strategies. The aim of this study was to compare usual clinical practice with the effectiveness of a biopsychosocial multidisciplinary intervention in reducing disability, severity of pain and improving quality of life in a working population of patients with subacute (2-12 weeks), non-specific LBP. **Methods:** Longitudinal cluster randomized clinical trial conducted in 39 Primary Health Care Centres (PHCC) of Barcelona, with patients aged 18-65 years (n = 501; control group = 239; 26 PHCC, intervention group = 262; 13 PHCC). The control group received usual clinical care. The intervention group received usual clinical care plus a biopsychosocial multidisciplinary intervention, which consisted of physiotherapy, cognitive-behavioural therapy and medication. The main outcomes were changes in the Roland Morris Disability Questionnaire (RMDQ), and the minimal clinically important differences. Secondary outcomes were changes in the McGill Pain (MGPPQ) and Quality of Life (SF-12) questionnaires. Assessment was conducted at baseline, 3 and 12 months. Analysis was by intention-to-treat and analyst-blinded. Multiple imputations were used. **Results:** Of the 501 enrolled patients, 421 (84%) provided data at 3 months, and 387 (77.2%) at 12 months. Mean age was 46.8 years (SD: 11.5) and 64.7% were women. In the adjusted analysis of the RMDQ outcome, only the intervention group showed significant changes at 3 months (- 1.33 points, p = 0.005) and at 12 months (- 1.11 points, p = 0.027), but minimal clinically important difference were detected in both groups. In the adjusted analysis of the RMDQ outcome, the intervention group improvement more than the control group at 3 months (- 1.33 points, p = 0.005) and at 12 months (- 1.11 points, p = 0.027). The intervention group presented a significant difference. Both groups presented a minimal clinically important difference, but more difference in the intervention group. The intervention group presented significant differences in the MGPPQ scales of current pain intensity and VAS scores at 3 months. No statistically significant differences were found in the physical and mental domains of the SF-12. **Conclusions:** A multidisciplinary biopsychosocial intervention in a working population with non-specific

subacute LBP has a small positive impact on disability, and on the level of pain, mainly at short-term, but no difference on quality of life.

Mas et al. 2019.

BMC Health Services Research, vol. 19, no. 1.

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Keywords: Biopsychosocial intervention; low back pain; subacute; working population

Evidence Level: 1A

Link: <https://bmchealthservres.biomedcentral.com/articles/10.1186/s12913-019-4810-x>

A description of musculoskeletal injuries in a Canadian police service.

Objectives: Police officers run a risk of injury that is higher than in most other occupations. This study aims to quantify injury prevalence and identify common musculoskeletal injuries (MSIs) among police officers, using injury data from a municipal police service in Alberta, Canada. **Methods:** This is a descriptive study based on a secondary data analysis of the MSIs reported to the police service over a 41-month period; January 1, 2013 - June 2, 2016. Data from 1325 active police officers were examined, and injury prevalence was reported according to sex, injury diagnosis, the body part injured, and the work area. **Results:** The prevalence of strains and sprains was very high, at 89.2%. The back and shoulder were most frequently affected. Overall, injury proportions did not differ significantly across work areas. The injury risk was age-related but no significant differences in injuries between sexes were identified. **Conclusions:** Minor injuries such as strains and sprains occur frequently in the police occupation. Future research should focus on specific risk factors for MSIs in police officers in order to aid prevention.

Lentz et al. 2019.

International Journal of Occupational Medicine and Environmental Health.

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Keywords: Injury; musculoskeletal; occupation; police; prevalence; sprains and strains

Evidence Level: 5B

Link: <http://ijomeh.eu/A-description-of-musculoskeletal-injuries-in-a-Canadian-police-service,112275,0,2.html>

Distribution of age, gender, and occupation among individuals with carpal tunnel syndrome based on the National Health Insurance data and National Employment Insurance data.

Background: The present study aimed to investigate the basic characteristics of carpal tunnel syndrome (CTS) and its differences between occupations using Korea's National Health Insurance (NHI) and National Employment Insurance (NEI). **Methods:** The study participants were obtained from the NEI and NHI data from 2008 to 2015, with a diagnosis code of G560 (CTS) as the main or sub-diagnosis. Data about gender, age, diabetes mellitus, smoking, drinking, and length of employment, information about type of occupation, and number of employees according to age and occupation were obtained from NHI and NEI data. In total, 240 occupations were classified into blue-collar (BC) and white-collar (WC) work. In addition, each occupation was classified as high-risk and low-risk groups depending on the degree of wrist usage.

Results: The number of patients with CTS per 100,000 individuals increased with advancing age, and it was higher in women (4,572.2) than in men (1,798.5). Furthermore, the number was higher in BC workers (3,247.5) than in WC workers (1,824.1) as well as in the high-risk group than in the low-risk group in both BC workers (3,527.8 vs. 1,908.2) and WC workers (1,829.9 vs. 1,754.4). The number of patients with CTS was higher in the high-risk group than in the low-risk group among male and female BC workers and female WC workers. However, the number was higher in the low-risk group among male WC workers. In the BC category, the number of patients with CTS was highest among food processing-related workers (19,984.5). In the WC category, the number of patients with CTS was highest among social workers and counselors (7,444.1). **Conclusions:** The results of this study are expected to help identify occupational differences in patterns of CTS. High number of patients with CTS was seen in new jobs, as well as in previous studies.

Lee et al. 2019.

Annals of Occupational and Environmental Medicine, vol. 31, no. 31.

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Keywords: Age; Blue-collar worker; Carpal tunnel syndrome; Gender; National Employment Insurance; National Health Insurance; Occupations; Risk groups; White-collar worker

Evidence Level: 4B

Link: <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC6850790/>

Risk factors for development of lower limb osteoarthritis in physically demanding occupations: A narrative umbrella review

Objectives: Osteoarthritis (OA) is a common disorder which affects the joints. As relationships between occupational factors and lower limb OA have been widely studied in systematic reviews, the aim of this umbrella review was to synthesize their key findings in the risk factors for development of lower limb OA.

Methods: A systematic search was conducted using the databases PUBMED, Cumulative Index of Nursing and Allied Health Literature, and Elton B Stevens Company to identify reviews examining associations between lower limb OA and occupational tasks. These reviews were rated for their methodological quality before key data were extracted and synthesized. **Results:** Sixteen reviews were found, seven pertained to the knee, four to the hip, two to a variety of joints, and three to both the hip and knee. One was deemed to be of high methodological quality, one of critically low methodological quality, and the others of moderate methodological quality. The reviews found moderate to good evidence for heavy occupational lifting to be associated with an increased risk of OA at the knee and the hip. Kneeling, squatting, and climbing, previous injuries to joints, being overweight and obese were also predictive of lower limb OA. **Conclusion:** Occupations which involve heavy physical workloads increase the risk of developing lower limb OA. Heavy lifting, squatting, knee bending, kneeling, and climbing may all increase the risk of developing OA in both the knees and hips. Efforts to reduce exposure to these tasks, reducing joint injuries, optimizing bodyweight may reduce the risks of lower limb OA for occupations which are physically demanding.

Schram et al. 2019.

Journal of Occupational Health.

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Keywords: Risk factors; Lower limb; Arthritis; OA; Occupation

Evidence Level: 1B

Link: <https://onlinelibrary.wiley.com/doi/full/10.1002/1348-9585.12103>