Australian Government
Comcare

Emerging Evidence Alert March 2021

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 February 2021 only.

Contents

The impact of intervening in workplace bullying

There is comprehensive evidence that workplace bullying is detrimental to worker health and wellbeing. A recent research study explores the mental health outcomes, for witnesses and targets of bullying, when bystanders intervene.

The research demonstrates that the association between observing bullying and negative mental health outcomes is dependent on whether the observers try to intervene in the bullying they witnessed. That is, observers who did not intervene reported increased mental health problems. The research also found even failed interventions were still beneficial for the targets of bullying, as the demonstration of social support from colleagues buffered the negative effects of bullying.

Employers may benefit from investing in educating bystanders and witnesses regarding how to be active and constructive in negative social situations at work and to prevent bullying-related risks in the workplace.

For more information about managing the risks of bullying in the workplace, visit the Comcare website. Further guidance on preventing and responding to bullying in the workplace is available from Safe Work Australia.

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

Physical activity, return to work self-efficacy, and work status among employees undergoing chemotherapy for cancer - a prospective study with 12 months follow-up
Background: Numerous studies emphasize the positive effects of physical activity on health and well-being in cancer patients. The effects of physical activity on the working lives of cancer patients have received less attention. The aim of the present study was to examine the association between physical activity and work status in employees with cancer, and the mediating role of return to work self-efficacy (RTWSE) in this association. **Methods:** Data from questionnaires (physical activity, RTWSE, performance status, sociodemographic), patient records, and Danish national registries (work status, education) were collected for 217 employees initiating chemotherapy for cancer. The associations of physical activity at baseline with work status at baseline and at twelve months follow-up, respectively, were estimated with logistic regression. The mediating role of RTWSE was investigated using the Sobel Goodmann test.
Results: Employees with moderate (> 30 min/day) or high (> 150 min/day) levels of current daily activity at baseline had significantly increased odds for working at baseline (OR = 2.83, 95%CI = 0.73-10.96 and OR = 6.13, 95%CI = 1.68-22.40, respectively) and at twelve months (OR = 3.90, 95%CI = 1.19-12.77 and OR = 3.43, 95%CI = 1.12-10.51, respectively), compared to sedentary employees. Likewise, employees, physically active in their leisure time (light or vigorous psychical activity) for 2-4 h/week or > 4 h/week of light activity at baseline, had increased odds for working at twelve months (OR range = 1.20 (95%CI = 0.40-3.61)-5.39(95%CI = 0.78-37.32)), compared to sedentary employees. RTWSE was not found to mediate the observed associations. **Conclusions:** Physical activity appears positively associated with work status in employees undergoing treatment for cancer in the twelve months period after initiating chemotherapy.
Rosbjerg et al. 2021.
BMC Cancer, vol. 21, no. 1.

Keywords: Cancer; physical activity; return to work; self-efficacy; work status.
Evidence Level: 4A
Link: https://bmccancer.biomedcentral.com/articles/10.1186/s12885-021-07824-6

Shared decision making from reintegration professionals' perspectives to support return to work: a qualitative study
Background: Work participation is an important determinant of public health; being unemployed leads to a decrease in an individual's health. In the Netherlands, people with a work disability can apply for disability benefits, in which people also receive support to return to work (RTW). A method, currently used in the medical sector, that can include both the perspective of the reintegration professional and of the individual in the process of RTW, is shared decision making (SDM). In this article we explore to what extent reintegration professionals currently use SDM, and to what extent they prefer to use SDM in their ideal interaction with clients. **Methods:** We performed semi-structured interviews with fourteen reintegration professionals from four different municipalities. The transcripts were coded according to content analysis, applying open and axial coding. **Results:** Reintegration professionals emphasised the importance of having a good relationship with clients, of building trust and collaborating as a team. They did not inform their clients that they could be part of the decision-making process, or discussed a shared goal. Although professionals did emphasise the importance of aligning their approach with the preferences of the client and though they tried to offer some choice options, they did not mention available options, discussed the pros and cons of these options or evaluated decisions with their clients. Furthermore, they did not mention any of these aspects in their ideal interaction with clients. **Conclusions:** SDM has a potential value, because all professionals underline the importance of having an alliance with clients, collaborating as a team, and striving to align their approach with the preferences of the client. However, professionals currently perform a limited set of SDM steps. Additional knowledge and skills are needed for both reintegration professionals and municipalities so that professionals can consider and reflect on the value of using SDM, or SDM steps,

in supporting RTW. Providing clients with knowledge and skills seems necessary to facilitate both self-management and SDM.
Vooijs et al. 2021.
BMC Public Health, vol. 21, no. 1.

Keywords: Autonomy; employability; employment; evidence based; patient participation; return to work; shared decision making.
Evidence Level: 5A
Link: https://bmcpublichealth.biomedcentral.com/articles/10.1186/s12889-021-10365-z

Characteristics of patients returning to work after brain tumor surgery
Objective: To investigate the differences between patients returning to work and those who did not after brain tumor surgery. **Methods:** Patients were evaluated before surgery and after 3 months. The Montreal Cognitive Assessment test, Trail-Making Test (parts A and B), 15-word Rey-Osterrieth Word List (immediate and delayed recall), F-A-S tests, and Karnosfky Performance Status were used to assess cognitive status, attention, executive functions, memory, word fluency, and functional status. Patient-reported outcome measures (PROMs) used to evaluate emotional distress and disability were the Hospital Anxiety and Depression Scale and World Health Organization Disability Assessment Schedule. Clinical and work-related variables, PROMs, and cognitive tests were compared using chi-squared, *t*-test or Mann-Whitney *U* test. **Results:** Sixty patients were included. Patients returning to work were 61.3 and 31.0% among people with meningioma and glioma, respectively. They reported lower postoperative disability and lesser home-to-work travel time. Patients with meningioma also showed better preoperative and postoperative attention and executive functions, better postoperative functional and cognitive status, and lower frequency of treatments. **Conclusions:** These variables should be considered in a clinical context to plan interventions for people who need support during return to work and in future research to investigate preoperative and postoperative predictive factors of going back to work.
Schiavolin et al. 2021.
Frontiers of Human Psychology, vol. 14.

Keywords: Cognitive evaluation; glioma; meningioma; neurosurgery; patient reported outcome measures; return to work.
Evidence Level: 5A
Link: https://www.frontiersin.org/articles/10.3389/fnhum.2020.609080/full

The associations between late effects of cancer treatment, work ability and job resources: a systematic review
Objective: The aim of this review is to evaluate associations between possible late effects of cancer treatment (i.e. physical complaints, fatigue, or cognitive complaints) and work ability among workers beyond 2 years after cancer diagnosis who returned to work. The role of job resources (social support, autonomy, leadership style, coaching, and organizational culture) is also evaluated. **Methods:** The search for studies was conducted in PsycINFO, Medline, Business Source Premier, ABI/Inform, CINAHL, Cochrane Library and Web of Science. A quality assessment was used to clarify the quality across studies. **Results:** The searches included 2303 records. Finally, 36 studies were included. Work ability seemed to decline shortly after cancer treatment and recover in the first 2 years after diagnosis, although it might still be lower than among healthy workers. No data were available on the course of work ability beyond the first 2 years. Late physical complaints, fatigue and cognitive complaints were negatively related with work ability across all relevant studies. Furthermore, social support and autonomy were associated with higher work ability, but no data were available on a possible buffering effect of these job resources on the relationship between late effects and work ability. As far as reported, most research was carried out among salaried workers. **Conclusion:** It is unknown if late effects of cancer treatment diminish work ability beyond two years after being diagnosed with cancer. Therefore, more longitudinal research into the associations between possible late effects of cancer treatment and work ability needs to be carried out. Moreover, research is needed on the buffering effect of job resources, both for salaried and self-employed workers.

Boelhouwer et al. 2021.
International Archives of Occupational and Environmental Health, vol. 94, no. 2.

Keywords: Cancer treatment; job resources; late effects; work ability; work ability index.
Evidence Level: 1A
Link: https://link.springer.com/article/10.1007/s00420-020-01567-w

Sickness absence after carpal tunnel release: a multicentre prospective cohort study
Objectives: To describe when patients return to different types of work after elective carpal tunnel release (CTR) surgery and identify the factors associated with the duration of sickness absence. **Design:** Multicentre prospective observational cohort study. **Setting and participants:** Participants were recruited preoperatively from 16 UK centres and clinical, occupational and demographic information were collected. Participants completed a weekly diary and questionnaires at four and 12 weeks postoperatively. **Outcomes:** The main outcome was duration of work absence from date of surgery to date of first return to work. **Results:** 254 participants were enrolled in the study and 201 provided the follow-up data. Median duration of sickness absence was 20 days (range 1-99). Earlier return to work was associated with having surgery in primary care and a self-reported work role involving more than 4 hours of daily computer use. Being female and entitlement to more than a month of paid sick leave were both associated with longer work absences. The duration of work absence was strongly associated with the expected duration of leave, as reported by participants before surgery. Earlier return to work was not associated with poorer clinical outcomes reported 12 weeks after CTR. **Conclusions:** There was wide variation in the duration of work absence after CTR across all occupational categories. A combination of occupational, demographic and clinical factors was associated with the duration of work absence, illustrating the complexity of return to work decision making. However, preoperative expectations were strongly associated with the actual duration of leave. We found no evidence that earlier return to work was harmful. Clear, consistent advice from clinicians preoperatively setting expectations of a prompt return to work could reduce unnecessary sickness absence after CTR. To enable this, clinicians need evidence-informed guidance about appropriate timescales for the safe return to different types of work.
Newington et al. 2021.
BMJ Open, vol. 11, no. 2.

Keywords: Hand; wrist; occupation; industrial medicine; primary care.
Evidence Level: 4A
Link: https://bmjopen.bmj.com/content/11/2/e041656.long

Presenteeism and Absenteeism

Increase in sickness absence due to mental disorders in Finland: trends by gender, age and diagnostic group in 2005-2019
Aims: Mental disorders are among the key public health challenges and cause a significant share of sickness absence. The aim of this study was to examine gender and age-specific trends in sickness absence in Finland among non-retired persons aged 16-67 years during 2005-2019 by main diagnostic groups. Special focus was put on the development of sickness absence due to mental and behavioural disorders.
Methods: Data on compensated sickness allowance days were retrieved from the database of the Social Insurance Institution of Finland, and data on the non-retired population aged 16-67 years from the database of Statistics Finland for years 2005-2019. Yearly age-standardised sickness absence rates (yearly sickness absence days per each person in the population at risk) according to diagnostic group were calculated for women and men in age groups 16-34, 35-49 and 50-67 years. **Results:** A steep increase in sickness absence due to mental disorders was observed between 2016 and 2019 in all age groups among both genders, but the increase was more prominent among women. The age group 16-34 years also showed a longer-term gradual increase. In all examined gender and age groups, the increase was mainly a consequence of an increase in sickness absence due to depression and anxiety disorders.

Conclusions: Increase in sickness absence due to mental disorders is an early sign of threats to work ability and productivity of the working-age population. Several factors may simultaneously drive the development. The specific reasons for the recent trend need to be studied.
Blomgren et al. 2021.
Scandinavian Journal of Public Health.

Keywords: Finland; sickness absence; depression; mental disorders; mental health.
Evidence Level: 4B
Link: https://journals.sagepub.com/doi/full/10.1177/1403494821993705

Building Employer Capability

Organisational Issues

Public health employees' perceptions about the impact of emerging public health trends on their day-to-day work: Effects of organizational climate and culture
Objective: The purpose of this research was to assess the workforce characteristics associated with public health employees' perceived impact of emerging trends in public health on their day-to-day work. Methods: Multinomial logistic regression was performed to analyze data from the 2017 PH WINS, a cross-sectional survey utilizing a nationally representative sample of the United States public health workforce. **Results:** More than 55% of the public health workforce perceived that their day-to-day work was impacted by the emerging public health trends. Workplace environment was significantly associated with the perception of their day-to-day work being impacted by emerging public health trends such as quality improvement (QI) (AOR = 1.04, $p < 0.001$), and evidence-based public health practice (EBPH) (AOR = 1.04, $p < 0.001$). Race, ethnicity, and educational status were also positively associated with the perceived impact of the emerging public health trends. **Conclusions:** The organizational culture of a public health agency influences the engagement of the workforce and their perception of the meaningfulness of their work. As practitioners shift into chief health strategists, it will be imperative for them to have training in public health foundations and tools in order to efficiently serve their communities.
Waterfield et al. 2021.
International Journal of Environmental Research and Public Health, vol. 18, no. 4.

Keywords: PH WINS; organizational climate; public health workforce; workplace environment.
Evidence Level: 4B
Link: https://www.mdpi.com/1660-4601/18/4/1703

Job Design

Comparing depressive symptoms, emotional exhaustion, and sleep disturbances in self-employed and employed workers: Application of approximate bayesian measurement invariance
Studies investigating differences in mental health problems between self-employed and employed workers have provided contradictory results. Many of the studies utilized scales validated for employed workers, without collecting validity evidence for making comparisons with self-employed. The aim of this study was (1) to collect validity evidence for three different scales assessing depressive symptoms, emotional exhaustion, and sleep disturbances for employed workers, and combinators; and (2) to test if these groups differed. We first conducted approximate measurement invariance analysis and found that all scales were invariant at the scalar level. Self-employed workers had least mental health problems and employed workers had most, but differences were small. Though we found the scales invariant, we do not find them optimal for comparison of means. To be more precise in describing differences between groups, we recommend using clinical cut-offs or scales developed with the specific purpose of assessing mental health problems at work.

Bergman et al. 2021.
Frontiers of Psychology, vol. 11.

Keywords: Entrepreneurship; Sweden; approximate measurement invariance; depressive symptoms; emotional exhaustion; mental health problems; self-employed; sleep disturbances.
Evidence Level: 5A
Link: https://www.frontiersin.org/articles/10.3389/fpsyg.2020.598303/full

Shift Work

Cardiovascular mortality in a Swedish cohort of female industrial workers exposed to noise and shift work

Purpose: The aim was to study mortality due to cardiovascular disease as well as total mortality, among female industrial workers, and the association to occupational noise and shift work. **Methods:** Women from cohorts of soft tissue paper mills (N = 3013) and pulp and paper mills (N = 1483) were merged into one cohort. Job exposure matrices were developed and used for classification of shift work and noise exposure. Every year was classified as shift work excluding nights or shift work including nights. Noise was classified into seven 5 dB(A) bins from < 75 to ≥ 100 dB(A). Mortality from cardiovascular diseases and total mortality during 1956-2013 was calculated as a standardized mortality ratio (SMR) with 95% confidence interval (CI) using the female general population as a reference. **Results:** Fatal myocardial infarctions (N = 144) were increased in the total cohort, SMR 1.20 (95% CI 1.01-1.41) but not total mortality. The SMR for myocardial infarction for women exposed to noise ≥ 90 dB(A) for > 10 years was 1.41 (95% CI 1.02-1.89) and for those exposed to night shifts > 10 years, 1.33 (95% CI 0.91-1.89). Shift workers without nights ≤ 65 years, with noise exposure ≥ 90 dB(A), had SMR 2.41 (95% CI 1.20-4.31) from myocardial infarction. There was no increased mortality from cerebrovascular disease. **Conclusions:** Female paper mill workers had an increased mortality from acute myocardial infarction, especially before retirement age, when exposed to noise ≥ 90 dB(A) and with long-time employment. Exposure to shift work and noise usually occurred concurrently.
Eriksson et al. 2021.
International Archives of Occupational and Environmental Health, vol. 94, no. 2.

Keywords: Cerebrovascular disease; JEM; myocardial infarction; night work; noise; paper mills.
Evidence Level: 4B
Link: https://link.springer.com/article/10.1007%2Fs00420-020-01574-x

Differential DNA methylation in recovery from shift work disorder

The human DNA methylome is responsive to our environment, but its dynamics remain underexplored. We investigated the temporal changes to DNA methylation (DNAme) in relation to recovery from a shift work disorder (SWD) by performing a paired epigenome-wide analysis in an occupational cohort of 32 shift workers (25 men, age = 43.8 ± 8.8 years, 21 SWD cases). We found that the effect of vacation on DNAme was more prominent in the SWD-group as compared to controls, with respect to the amount of significantly differentially methylated positions (DMPs; $P_{unadj} < 0.05$) 6.5 vs 3.7%, respectively. The vast majority (78%) of these DMPs were hypomethylated in SWD but not in controls (27%) during the work period. The Gene Ontology Cellular component "NMDA glutamate receptor" ($P_{FDR} < 0.05$) was identified in a pathway analysis of the top 30 genes in SWD. In-depth pathway analyses revealed that the Reactome pathway "CREB phosphorylation through the activation of CaMKII" might underlie the recovery. Furthermore, three DMPs from this pathway, corresponding to GRIN2C, CREB1, and CAMK2B, correlated with the degree of recovery ($P_{unadj} < 0.05$). Our findings provide evidence for the dynamic nature of DNAme in relation to the recovery process from a circadian disorder, with biological relevance of the emerging pathways.
Lahtinen et al. 2021.
Scientific Reports, vol. 11, no. 1.

Keywords: DNA methylation; recovery; shift work disorder; occupation.
Evidence Level: 5A
Link: https://www.nature.com/articles/s41598-021-82627-0

Work-fitness evaluation for shift work disorder

Shift work disorder (SWD), which is characterized by insomnia and excessive sleepiness related with shift work, is one of the most common health problems in shift workers. Shift work disorder causes insomnia, fatigue, worse work performance, an increased likelihood of accidents, and a poor quality of life. In addition, SWD is associated with decreased productivity and increased economic costs. The correct management of SWD is important to prevent sleep disturbances and maintain work performance in shift workers. To diagnose and evaluate SWD, it is necessary to take detailed medical histories, assess the severity of sleep disturbances, and evaluate shift workers' sleep using a sleep diary and actigraphy. The work-fitness evaluation should include recommendations on how shift workers can reduce their sleep disturbances and increase work performance, as well as the assessment of work performance. This paper reviews previous research on the evaluation, diagnosis, and management of SWD and summarizes the work-fitness evaluation of SWD.

Jang et al. 2021.
International Journal of Environmental Research and Public Health, vol. 18, no. 4.
User License: *Creative Commons Attribution (CC BY 4.0) (https://creativecommons.org/licenses/by/4.0/)*
Keywords: Actigraphy; circadian disruption; circadian rhythm; shift work; sleep diary; sleep disturbances; sleep work disorder; work-fitness.
Evidence Level: 6A
Link: https://www.mdpi.com/1660-4601/18/3/1294

Management and Leadership

Does employee care trigger innovation under a healthy and safe working environment? Evidence from the pharmaceutical industry in China

Sustainability of the workforce becomes a crucial issue, of which responsible care for employees can increase job satisfaction and human capital that impact corporate ability to absorb and generate new knowledge. Firms are obligated to provide a healthy and safe working environment for their employees, but it may in turn hinder innovation due to rigid and structured institutional regulations. Drawing on data of 308 China's pharmaceutical firms from 2010 to 2017, we investigated whether employee care can trigger innovation under corporate adoption of the occupational health and safety management system (OHSMS). Our results suggest that both employee care and OHSMS adoption have a positive impact on innovation. Moreover, the positive relationship between employee care and innovation was more pronounced in firms that had adopted the OHSMS certification. These findings are valuable to policymakers and corporate managers in emerging economies through corroborating the important role of workforce sustainability in facilitating firm innovation.

Yang et al. 2021.
Healthcare, vol. 9, no. 2.
User License: *Creative Commons Attribution (CC BY 4.0) (https://creativecommons.org/licenses/by/4.0/)*
Keywords: Employee care; innovation; occupational health and safety; pharmaceutical industry; workforce sustainability.
Evidence Level: 5B
Link: https://www.mdpi.com/2227-9032/9/2/194

Work Ability

Does work disability contribute to trajectories of work participation before and after vocational labour market training for job seekers?

The contribution of ill-health to labour market participation in relation to vocational training is unclear. Using nationally representative Finnish register data on 42,691 vocational labour market trainees in 2008-

2010, we constructed latent trajectory groups of work participation in the open labour market three years before and after training, identifying groups called "High-High", "High-Low", "Low-High", and "Low-Low". We plotted further patterns of labour market participation within these trajectory groups and, using multinomial logistic regression, examined assignment to these groups focusing on previous work disability status. Those with compared to those without previous work disability had previous employment more often and spent less time in economic inactivity within the two trajectory groups with low pre-training levels of work participation. Having a previous work disability was associated with assignment to the "High-Low" trajectory group of work participation instead of the "High-High" comparison group. The associations of other background factors with the assignment to the different trajectory groups were relatively similar amongst those with and without previous work disability. However, some of these associations were weaker amongst the former. Along with other key background factors, previous work disability should be accounted for when assessing the effects of vocational training.

Leinonen et al. 2021.

International Journal of Environmental Research and Public Health, vol. 18, no. 3.

Keywords: Active labour market programme; disability retirement; latent groups; occupation; open labour market; paid employment; public employment services; register study; sickness absence; unemployment.

Evidence Level: 4B

Link: https://www.mdpi.com/1660-4601/18/3/1347

Influence of lifestyle risk factors on work ability and sick leave in a general working population in Norway: a 5-year longitudinal study

Objectives: The aim of this study is to assess (1) whether lifestyle risk factors are related to work ability and sick leave in a general working population over time, and (2) these associations within specific disease groups (ie, respiratory diseases, cardiovascular disease and diabetes, and mental illness). **Setting:** Telemark county, in the south-eastern part of Norway. **Design:** Longitudinal study with 5 years follow-up. **Participants:** The Telemark study is a longitudinal study of the general working population in Telemark county, Norway, aged 16 to 50 years at baseline in 2013 (n=7952) and after 5-year follow-up. **Outcome measure:** Self-reported information on work ability (moderate and poor) and sick leave (short-term and long-term) was assessed at baseline, and during a 5-year follow-up. **Results:** Obesity (OR=1.64, 95% CI: 1.32 to 2.05) and smoking (OR=1.62, 95% CI: 1.35 to 1.96) were associated with long-term sick leave and, less strongly, with short-term sick leave. An unhealthy diet (OR=1.57, 95% CI: 1.01 to 2.43), and smoking (OR=1.67, 95% CI: 1.24 to 2.25) were associated with poor work ability and, to a smaller extent, with moderate work ability. A higher lifestyle risk score was associated with both sick leave and reduced work ability. Only few associations were found between unhealthy lifestyle factors and sick leave or reduced work ability within disease groups. **Conclusion:** Lifestyle risk factors were associated with sick leave and reduced work ability. To evaluate these associations further, studies assessing the effect of lifestyle interventions on sick leave and work ability are needed.

De Bortoli et al. 2021.

BMJ Open, vol. 11, no. 2.

Keywords: Occupational & industrial medicine; preventive medicine; public health.

Evidence Level: 4B

Link: https://bmjopen.bmj.com/content/11/2/e045678.long

Adapting to the Future of Work

Aging Workforce

Employable as we age? A systematic review of relationships between age conceptualizations and employability

This systematic review aimed to provide an overview of earlier research on the relationships between age conceptualizations (i.e., calendar age, organizational age, lifespan age, psychosocial age, and functional age) and indicators of employability. We have conducted a systematic literature search using PsycINFO, Academic Search Premier, Business Source Complete, CINAHL, ERIC, MEDLINE, and Science Direct. Two raters evaluated the articles and subsequently distinguished $k = 41$ studies that met the inclusion criteria for this systematic review. Our review revealed that many researchers adopted different operationalizations to measure employability (15 studies were based on an input- or competence-based measure of employability, 23 studies included an output- or labor market-based measure of employability, and three studies included a combination of both measures). Moreover, most studies included calendar age (40 studies, 97.6%) as indicator of aging at work, and were based on a cross-sectional design (34 studies, 82.9%; 17.1% a longitudinal design). Based on the Standardized Index of Convergence (SIC) method, different types of evidence were found for the relationships between age and the employability measures. For relationships between psychosocial age and lifespan age, on the one hand, and employability measures, on the other hand, too few studies were found to draw conclusions. Yet, for relationships between calendar age and labor market-based measures strong consistent negative relationships were found across the studies, and moderately strong positive relationships were found for functional age and labor market- based measures. For organizational age and both competence-based as well as labor market-based measures moderately strong negative relationships were found. We discuss the implications of these results and propose a research agenda for future studies.

Lange et al. 2021.

Frontiers of Psychology, vol. 11.

Keywords: Age conceptualizations; employability; functional age; organizational age; systematic

Evidence Level: 1A

Link: https://www.frontiersin.org/articles/10.3389/fpsyg.2020.605684/full

Technology

Worker perspectives on incorporating artificial intelligence into office workspaces: Implications for the future of office work

Workplace environments have a significant impact on worker performance, health, and well-being. With machine learning capabilities, artificial intelligence (AI) can be developed to automate individualized adjustments to work environments (e.g., lighting, temperature) and to facilitate healthier worker behaviors (e.g., posture). Worker perspectives on incorporating AI into office workspaces are largely unexplored. Thus, the purpose of this study was to explore office workers' views on including AI in their office workspace. Six focus group interviews with a total of 45 participants were conducted. Interview questions were designed to generate discussion on benefits, challenges, and pragmatic considerations for incorporating AI into office settings. Sessions were audio-recorded, transcribed, and analyzed using an iterative approach. Two primary constructs emerged. First, participants shared perspectives related to preferences and concerns regarding communication and interactions with the technology. Second, numerous conversations highlighted the dualistic nature of a system that collects large amounts of data; that is, the potential benefits for behavior change to improve health and the pitfalls of trust and privacy. Across both constructs, there was an overarching discussion related to the intersections of AI with the complexity of work performance. Numerous thoughts were shared relative to future AI solutions that could enhance the office workplace. This study's findings indicate that the acceptability of AI in the workplace is complex and dependent upon the benefits outweighing the potential detriments. Office worker needs are complex and diverse, and AI systems should aim to accommodate individual needs.

Fukumura et al. 2021.

International Journal of Environmental Research and Public Health, vol. 18, no. 4.

Keywords: Artificial intelligence; computer workstations; office work; workspace.
Evidence Level: 5A
Link: https://www.mdpi.com/1660-4601/18/4/1690

Guiding and Supporting Mental Health and Wellbeing

Mental Health

The moderating role of psychosocial working conditions on the long-term relationship between depressive symptoms and work ability among employees from the Baby Boom generation
Objective: Mental disorders have been identified as a leading cause for reduced work ability in industrialized countries. Identification of workplace factors that can increase the work ability of employees with depressive symptoms from the Baby Boom generation is, therefore, highly relevant. This study thus aims to investigate whether changes in psychosocial working conditions can moderate the negative association between depressive symptoms and work ability. **Methods:** Two waves with a 3-year time lag of the German lidA cohort study with 3609 participants born in 1959 and 1965 (aged 46 and 52 years at first wave) were analyzed. Self-report data about depressive symptoms at baseline and changes of working conditions from baseline to follow-up were used to calculate main and interaction effects on perceived work ability at follow-up. These analyses were controlled for baseline work ability and working conditions. **Results:** Depressive symptoms were predictive for an unfavorable course of work ability from baseline to follow-up (B = - 0.173, 95% CI = - 0.219 to - 0.128). However, no interaction effect between depressive symptoms and psychosocial working conditions was found. Instead, independent from the level of depressive symptoms, a decrease in quantitative demands (B = - 0.279, 95% CI = - 0.326 to - 0.232) and increases in leadership quality (B = 0.242, 95% CI = 0.192-0.292) and development opportunities (B = 0.177, 95% CI = 0.127-0.277) were related to a more favorable course of work ability. Only small effects were found for social support (B = 0.057, 95% CI = 0.008-0.106) and job control (B = 0.043, 95% CI = - 0.005-0.091). **Conclusions:** The results indicate that the lagged and negative effect of depressive symptoms on work ability was not moderated by changes in psychosocial working conditions. However, the promotion of favorable working conditions may contribute to a positive development of work ability among employees from the Baby Boom generation independently from the level of depressive symptoms.
Weber et al. 2021.
International Archives of Occupational and Environmental Medicine, vol. 94, no. 2.

Keywords: Aging; mental health; occupational disability; workplace; lidA cohort study.
Evidence Level: 4A
Link: https://link.springer.com/article/10.1007%2Fs00420-020-01570-1

Bullying and Harassment

Does workplace bullying produce employee voice and physical health issues? Testing the mediating role of emotional exhaustion
Workplace bullying is a reality in organizations. Employees' experiences of workplace bullying can produce their voice that intends to challenge the *status quo* at work and can damage their physical health. This study examines the effects of workplace bullying on employee voice and physical health issues and considers individuals' emotional reactions as a critical mechanism operating between workplace bullying and its consequences in workplace situations. Emotional exhaustion mediates the influence of workplace bullying on employee voice and damaged health. Data for 694 employees from a large Taiwanese retail organization revealed that workplace bullying relates to its outcomes at work. The findings of this study

show that emotional exhaustion is a critical mechanism between workplace bullying and its consequences, i.e., employee voice and health issues. A time-lag study design is applied to reduce common method bias.
Liang et al. 2021.
Frontiers of Psychology, vol. 12.

Keywords: emotional exhaustion; employee voice; harassment among peers/peer bullying; physical health; workplace bullying.
Evidence Level: 5B
Link: https://www.ncbi.nlm.nih.gov/pmc/articles/PMC7900544/

Killing two birds with one stone: how intervening when witnessing bullying at the workplace may help both target and the acting observer
Objective: This study examines under which conditions being an observer of bullying can be detrimental to health and well-being. It was hypothesized that health-related problems following observations of bullying are determined by (1) whether the observer has been exposed to bullying her/himself and (2) whether the observer have tried to intervene in the bullying situation that they witnessed. **Methods:** The study was based on a longitudinal probability survey of the Swedish workforce, with an 18-month time lag between assessment points (N = 1096). **Results:** Witnessing bullying at work were associated with an increase in subsequent levels of mental distress among the observers, although this association became insignificant when adjusting for the observers' own exposure to bullying. Intervening against bullying moderated the relationship between observations of bullying and mental health problems. Observers who did not try to intervene reported a significant increase in mental health problems at follow-up, whereas there were no significant changes in levels of mental health problems among those who did intervene. **Conclusions:** the findings suggest that observer interventions against bullying may be highly beneficial for both the targets and observers of bullying. Organizations should therefore invest in ways to increase constructive bystander behavior in negative social situations at the workplace.
Nielsen et al. 2021.
International Archives of Occupational and Environmental Health, vol. 94, no. 2.

Keywords: Bystander; conflict; harassment; health; psychosocial.
Evidence Level: 4B
Link: https://link.springer.com/article/10.1007%2Fs00420-020-01575-w

Workplace violence and health in human service industries: a systematic review of prospective and longitudinal studies
Objectives: To provide systematically evaluated evidence of prospective associations between exposure to physical, psychological and gender-based violence and health among healthcare, social care and education workers. **Methods:** The guidelines on Preferred Reporting Items for Systematic Reviews and Meta-Analyses were followed. Medline, Cinahl, Web of Science and PsycInfo were searched for *population:* human service workers; *exposure:* workplace violence; and *study type:* prospective or longitudinal in articles published 1990-August 2019. Quality assessment was performed based on a modified version of the Cochrane's 'Tool to Assess Risk of Bias in Cohort Studies'. **Results:** After deduplication, 3566 studies remained, of which 132 articles were selected for full-text screening and 28 were included in the systematic review. A majority of the studies focused on healthcare personnel, were from the Nordic countries and were assessed to have medium quality. Nine of 11 associations between physical violence and poor mental health were statistically significant, and 3 of 4 associations between physical violence and sickness absence. Ten of 13 associations between psychological violence and poor mental health were statistically significant and 6 of 6 associations between psychological violence and sickness absence. The only study on gender-based violence and health reported a statistically non-significant association. **Conclusion:** There is consistent evidence mainly in medium quality studies of prospective associations between psychological violence and poor mental health and sickness absence, and between physical violence and poor mental health in human service workers. More research using objective outcomes, improved exposure assessment and that focus on gender-based violence is needed.

Nyberg et al. 2021.
Occupational and Environmental Medicine, vol. 78, no. 2.

Keywords: Healthcare workers; longitudinal studies; mental health; sickness absence; violence.
Evidence Level: 1A
Link: https://oem.bmj.com/content/78/2/69.long

Psychosocial Issues – Assessment

Computer mouse movements as an indicator of work stress: A longitudinal observational field study
Background: Work stress afflicts individual health and well-being. These negative effects could be mitigated through regular monitoring of employees' stress. Such monitoring becomes even more important as the digital transformation of the economy implies profound changes of working conditions. **Objective:** To investigate the association between computer mouse movements (CMMs) and work stress in the field. **Methods:** We hypothesized that stress is associated with a speed-accuracy tradeoff in CMMs. To test this hypothesis, we conducted a longitudinal field study at a large business organization, where CMMs from regular work activities were monitored over seven weeks (70 subjects, n=1,829 observations). A Bayesian regression model was used to estimate whether self-reported acute work stress was associated with a speed-accuracy tradeoff in CMMs. **Results:** There was a negative association between stress and the two-way interaction term of mouse speed and accuracy (mean = -0.36, lower = -0.66, upper = -0.08), which means that stress was associated with a speed-accuracy tradeoff. The estimated association was not sensitive to different processing of the data and remained negative after controlling for the demographics, health, and personality traits of subjects. **Conclusions:** Self-reported acute stress is associated with CMMs, specifically in the form of a speed-accuracy tradeoff. This finding suggests that the regular analysis of CMMs could indicate work stress.
Banholzer et al. 2021.
Journal of Medical Internet Research.

Keywords: Computer; mouse; movements; work stress; health; wellbeing.
Evidence Level: 4A
Link: https://preprints.jmir.org/preprint/27121/accepted

Occupational stress in Spanish police officers: Validating the effort-reward imbalance questionnaire
The Effort-Reward Imbalance Questionnaire (hereinafter, ERIQ) has been largely used worldwide to assess job stress, but it has not yet been applied in Spanish police. The objective of this study was to examine the construct validity and the internal consistency of the ERIQ in police officers. A cross-sectional study was carried out, using a nonprobability sampling (quota). A total of 217 Spanish police officers participated, 192 men (88.47%) and 25 women (11.53%). The mean age was 41 years (*SD* = 7.51). These police officers completed the ERIQ together with some other questionnaires (DECORE-21, MBI, GHQ and STAI) in order to provide evidence for validity based on the relationships to other constructs. A confirmatory factor analysis was performed and a matrix of correlations with the rest of constructs was created. The results showed an appropriate fit to the original model consisting of three scales. In addition, the scales of the ERIQ presented the expected relationship with the other constructs. The ERIQ is a valid instrument for assessing occupational stress in Spanish police officers and can improve the interventions in this professional group.
Luceno-Moreno et al. 2021.
International Journal of Environmental Research and Public Health, vol. 18, no. 4.

Keywords: ERIQ; assessment; harm reduction; job stress; occupational health; police.
Evidence Level: 4B
Link: https://www.mdpi.com/1660-4601/18/4/1393

Psychosocial Issues – Risk Factors

The association between job quality profiles and work-life balance among female employees in Korea: A latent profile analysis

Women's participation in society has been increasing; however, they often remain overloaded with housework, and this gender role difference can hinder their work-life balance in Korea. Therefore, this study classified latent profiles according to job quality indices for South Korean female employees and examined the characteristics of each profile and how they affect work-life balance. This study was a secondary analysis of data collected through the fifth Korean Working Conditions Survey in South Korea. The Bayesian information criterion, entropy, and the Lo-Mendell-Rubin adjusted likelihood ratio test were used to determine the number of latent profiles. Chi-square tests were conducted to understand the characteristics of each profile. Comparisons between work-life balance and the latent profiles were made using the Bolck-Croon-Hagenaars method. Female employees in South Korea were classified into five profiles: "high-flying," "smooth," "footloose," "strict," and "manual." The "footloose" profile showed the most positive work-life balance, and the "manual" profile had the highest level of work-family conflict. Therefore, policies and social supports should be created with the aim of improving the implementation of current strategies promoting work-life balance to better fit each working condition.

Choi et al. 2021.

International Journal of Research and Public Health, vol. 18, no. 4.

Keywords: Employee; job quality; latent profile analysis; work-life balance.

Evidence Level: 5B

Link: https://www.mdpi.com/1660-4601/18/4/1672

Self-perceived workplace discrimination and mental health among immigrant workers in Italy: a cross-sectional study

Background: The process of immigration is associated with poor mental and physical health. While the workplace represents an important context of social integration, previous studies evaluating the effect of discrimination experienced in the workplace found worse mental health status among immigrants. The aim of this study was to investigate whether self-perceived workplace discrimination has any role in the mental health status of immigrants living and working in Italy, evaluating the contribution of other personal experiences, such as loneliness and life satisfaction. **Methods:** A cross-sectional study was conducted on a sample of 12,408 immigrants (aged 15-64) living and working in Italy. Data were derived from the first national survey on immigrants carried out by the Italian National Institute of Statistics (Istat). Mental health status was measured through the Mental Component Summary (MCS) of the SF-12 questionnaire. A linear multivariate linear regression was carried out to evaluate the association between mental health status, self-perceived workplace discrimination, and sociodemographic factors; path analysis was used to quantify the mediation effect of self-perceived loneliness, level of life satisfaction, and the Physical Component Summary (PCS). **Results:** Mental health status was inversely associated ($p < 0.001$) with self-perceived workplace discrimination (β:-1.737), self-perceived loneliness (β:-2.653), and physical health status (β:-0.089); it was directly associated with level of life satisfaction (β:1.122). As confirmed by the path analysis, the effect of self-perceived workplace discrimination on MCS was mediated by the other factors considered: self-perceived loneliness (11.9%), level of life satisfaction (20.7%), and physical health status (3.9%). **Conclusions:** Our study suggests that self-perceived workplace discrimination is associated with worse mental health status in immigrant workers through personal experiences in the workplace and explains the effect of the exposure to workplace discrimination on immigrants' psychological well-being. Our findings suggest that an overall public health response is needed to facilitate the social integration of immigrants and their access to health services, particularly those services that address mental health issues.

Di Napoli et al. 2021.

BMC Psychiatry, vol. 21, no. 1.

Keywords: Discrimination; immigrant; mediation analysis; mental health status; workplace.

Evidence Level: 4B
Link: https://bmcpsychiatry.biomedcentral.com/articles/10.1186/s12888-021-03077-6

Occupational stress and anger: Mediating effects of resiliency in first responders
First responders experience substantial stress due to the nature of their work (Carleton et al. 2017). Occupational stress (OS) results from a myriad of employment conditions (e.g., ambiguous work expectations, unreasonable workload; Osipow 1998). OS can lead to maladaptive anger, which negatively impacts personal well-being and work performance (Velichkovsky 2009). In contrast, resilience to demanding working conditions is associated with lower state and trait anger (Wilson et al. 2001); thus, resilience may serve a protective 'buffer' role against anger in the face of stress. Thus, we hypothesized that resiliency would mediate relations between dimensions of OS and anger. The current study included 201 first responders (male = 77.6%; M_{age} = 43.73 years (SD = 10.97); police officers = 64.2%) who completed measures of OS (OSI-R; Osipow 1998), Anger (DSM-5 CC Anger; APA 2013), and Resiliency (CD-RISC; Connor and Davidson 2003). Results indicated that resiliency mediated relations between five components of OS and anger: Role Overload ($p < .001$); Insufficiency ($p < .001$); Role Boundary ($p < .001$); Role Ambiguity ($p < .001$); and Role Responsibility ($p < .001$). Results support the importance of resiliency-enhancing interventions to offset the experience of anger when confronted with occupational stress in first responders.
Doyle et al. 2021.
Journal of Police and Criminal Psychology.
User License: *PMC Open Access Subset*
Keywords: Anger; first responders; occupational stress; police employees; resiliency.
Evidence Level: 5B
Link: https://www.ncbi.nlm.nih.gov/pmc/articles/PMC7857936/

Enabling Healthy and Safe Workplaces

Health and Wellbeing

Associations of job strain, stressful life events, and social strain with Coronary Heart Disease in the women's health initiative observational study
Background The association between psychosocial stress and coronary heart disease (CHD) may be stronger in women than men and may differ across types of stressors. In this study, we assessed associations of psychosocial stressors, including job strain, stressful life events, and social strain with the incidence of CHD in women. **Methods and Results** We used longitudinal data from 80 825 WHI-OS (Women's Health Initiative Observational Study) participants with a mean age of 63.4 years (7.3 years) at baseline. Job strain was assessed through linkage of Standard Occupational Classification codes to the Occupational Information Network. Stressful life events and social strain were assessed via validated self-reported questionnaires. Cox proportional hazard models were used to evaluate associations of each stressor with CHD separately and jointly. A total of 3841 (4.8%) women developed CHD during an average of 14.7 years of follow-up. After adjustment for age, other stressors, job tenure, and socioeconomic factors, high stressful life events score was associated with a 12% increased CHD risk, and high social strain was associated with a 9% increased CHD risk. Job strain was not independently associated with CHD risk, but we observed a statistically significant interaction between job strain and social strain (P=0.04), such that among women with high social strain, passive job strain was associated with a 21% increased CHD risk. **Conclusions** High stressful life events and social strain were each associated with higher CHD risk. Job strain and social strain work synergistically to increase CHD risk.
Wang et al. 2021.
Journal of American Heart Association, vol. 10, no. 5.
User License: *Creative Commons Attribution -NonCommercial-NoDerivatives 4.0 International (CC BY-NC-ND 4.0) (https://creativecommons.org/licenses/by-nc-nd/4.0/)*
Keywords: Coronary heart disease; job strain; social strain; stressful life events; women.
Evidence Level: 4A

Link: https://www.ahajournals.org/doi/10.1161/JAHA.120.017780

The early detection of osteoporosis in a cohort of healthcare workers: Is there room for a screening program?

Workforce aging is becoming a significant public health problem due to the resulting emergence of age-related diseases, such as osteoporosis. The prevention and early detection of osteoporosis is important to avoid bone fractures and their socio-economic burden. The aim of this study is to evaluate the sustainability of a screening workplace program able to detect workers with osteoporosis. The screening process included a questionnaire-based risk assessment of 1050 healthcare workers followed by measurement of the bone mass density (BMD) with a pulse-echo ultrasound (PEUS) at the proximal tibia in the at-risk subjects. Workers with a BMD value ≤ 0.783 g/cm² were referred to a specialist visit ensuring a diagnosis and the consequent prescriptions. Any possible association between the outcome variable BMD ≤ 0.783 g/cm² and the risk factors was evaluated. The costs were calculated with a full costing method. We identified 60 pathological subjects. We observed increased risks for women, older ages, and menopause ($p < 0.01$). The yearly cost of our screening program estimated for this study was 8242 euros, and, considering the fragility bone fracture costs, we hypothesize a considerable economic savings, with a possible positive benefits/cost ratio of 2.07. We can say that the margin between the investment and results leads to a preference for this type of screening program. Osteoporosis is an occupational health problem, and a workplace screening program could be a cost-effective intervention.

Rinaldi et al. 2021.

International Journal of Environmental Research and Public Health, vol. 18, no. 3.

Keywords: Osteoporosis; prevention; public health; screening; worker health; workplace.

Evidence Level: 4A

Link: https://www.mdpi.com/1660-4601/18/3/1368

Effect of wearing a novel electronic wearable device on hand hygiene compliance among health care workers: A stepped-wedge cluster randomized clinical trial

Importance: Hand hygiene (HH) is essential to prevent hospital-acquired infections. **Objective:** To determine whether providing real-time feedback on a simplified HH action improves compliance with the World Health Organization's "5 Moments" and the quality of the HH action. **Design, setting, and participants:** This open-label, cluster randomized, stepped-wedge clinical trial was conducted between June 1, 2017, and January 6, 2018 (with a follow-up in March 2018), in a geriatric hospital of the University of Geneva Hospitals, Switzerland. All 12 wards and 97 of 306 eligible health care workers (HCWs) volunteered to wear a novel electronic wearable device that delivered real-time feedback on duration of hand rubbing and application of a hand-sized customized volume of alcohol-based handrub (ABHR). **Interventions:** This study had 3 sequential periods: baseline (no device), transition (device monitoring without feedback), and intervention (device monitoring and feedback). The start of the transition period was randomly allocated based on a computer-generated block randomization. **Main outcomes and measures:** The primary outcome was HH compliance, according to the direct observation method during intervention as compared with baseline. Secondary outcomes included the volume of ABHR and duration of hand rubbing measured by the device during intervention as compared with transition. **Results:** All wards and respective HCWs were evenly assigned to group 1 (26 participants), 2 (22 participants), 3 (25 participants), or 4 (24 participants). Twelve HCWs did not fully complete the intervention but were included in the analysis. During 759 observation sessions, 6878 HH opportunities were observed. HH compliance at intervention (62.9%; 95% CI, 61.1%-64.7%) was lower than at baseline (66.6%; 95% CI, 64.8%-68.4%). After adjusting for covariates, HH compliance was not different between periods (odds ratio, 1.03; 95% CI, 0.75-1.42; P = .85). Days since study onset (OR, 0.997; 95% CI, 0.994-0.998; P < .001), older age (OR, 0.97; 95% CI, 0.95-0.99; P = .015), and workload (OR, 0.29; 95% CI, 0.20-0.41; P < .001) were independently associated with reduced HH compliance. The median (interquartile range) volume of ABHR and duration of hand rubbing in transition and intervention increased from 1.12 (0.76-1.68) mL to 1.71 (1.01-2.76) mL and from 6.5 (4.5-10.5) seconds to 8 (4.5-15.5) seconds, respectively. There were no serious adverse events.

Conclusions and relevance: The use of this device did not change HH compliance, but increased the duration of hand rubbing and volume of ABHR used by HCWs.
Pires et al. 2021.
JAMA Network Open, vol. 4, no. 2.

Keywords: Wearable device; electronic; hand hygiene; compliance; health care workers.
Evidence Level: 2A
Link: https://jamanetwork.com/journals/jamanetworkopen/fullarticle/2776020

Associations of sleep and health functioning with premature exit from work: A cohort study with a methodological emphasis
Sleep and functioning are associated with a risk of early workforce exit. However, patterns of change in sleep and functioning through time have not been investigated using person-oriented approaches to show what features of sleep and functioning are associated with an early exit. We examined the pattern of interactions between sleep and health functioning characterizing homogenous subgroups of employees and their associations with premature work exit. An additional aim was to provide a tutorial providing detailed description on how to apply these models, compared to traditional variable based risk factors. We analyzed data from 5148 midlife employees of the City of Helsinki, Finland, surveyed over three phases (2000-02, 2007, and 2012). Using repeated measures latent class analyses (RMLCA) we classified people into groups based on their trajectories in sleep and functioning. We identified four longitudinal groups: (1) Stable good sleep and functioning (reference), (2) Persistent sleep problems and good or moderate functioning, (3) Poor functioning with good sleep, and (4) Problematic sleep and health functioning. Compared to group 1, elevated risk was found in all classes with group 4 being the worst. In conclusion, focusing on person-orientated patterns of interactions between sleep and functioning helped produce qualitatively different and quantitatively stronger predictions than using conventional risk factor methodology. Thus, longitudinal person-oriented approaches may be a more powerful method for quantifying the role of sleep and health functioning as risks for premature exit from work.
Kronholm et al. 2021.
International Journal of Environmental Research and Public Health, vol. 18, no. 4.

Keywords: Epidemiology; health functioning; insomnia; premature retirement; sleep problems.
Evidence Level: 4B
Link: https://www.mdpi.com/1660-4601/18/4/1725

Irregular work hours and the risk of sleep disturbance among Korean service workers required to suppress emotion
Although a necessity in a modern society, irregular work schedule can lead to sleep problems. We investigated the effect of work schedule irregularity on sleep disturbance of 17,846 Korean service workers using the fifth Korean Working Conditions Survey. The odds ratio (OR) and 95% confidence interval (CI) for sleep disturbance occurrence were calculated through a multiple logistic regression model. The adjusted ORs for moderate and severe sleep disturbances for those with irregular work hours were 2.11 (95% CI 1.90-2.33) and 3.10 (95% CI 2.62-3.66), respectively. Work schedule irregularity and emotion suppression at work showed synergistic effect on both moderate and severe sleep disturbances. Sleep disturbances can lead to brain function deterioration and work-related injuries; therefore, appropriate measures should be addressed for the vulnerable population.
Yun et al. 2021.
International Journal of Environmental Research and Public Health, vol. 18, no. 4.

Keywords: Irregular schedule; shift work; sleep disturbance; work schedule.
Evidence Level: 4B
Link: https://www.mdpi.com/1660-4601/18/4/1517

Disclosure in online vs. face-to-face occupational health screenings: A cross-sectional study in Belgian hospital employees

Replacing or supplementing face-to-face health screening by occupational physicians with online surveys can be attractive for various reasons. However, the (cost-)effectiveness of both depends on employees' willingness to disclose occupational health problems. This article investigates whether employees show a different willingness to disclose information in online surveys compared to face-to-face consultations with an occupational physician. Employees from four Flemish hospitals were asked whether they would disclose a range of typical occupational health problems to either surveys or physicians. The results were analyzed through chi-square tests and multilevel ordinary least squares regression. Of the 776 respondents, 26% indicated that they did not always disclose health problems. Respondents were more inclined to disclose mental health problems to a survey than face-to-face to a physician, whereas the opposite was true for medication misuse. Being male, younger, with lower educational attainment or lower trust in physicians, taking medication, or having a lower risk on alcohol abuse increased the likelihood of a person withholding information. We conclude that this study provides indications that online vs. face-to-face health check-ups have different strengths and weaknesses in this respect. These must be considered when evaluating the need to use online surveys (instead of, or together with, face-to-face contacts) for health screening.

Steel et al. 2021.

International Journal of Environmental Research and Public Health, vol. 18, no. 4.

Keywords: Deception; disclosure; health screening; honest reporting; occupational physician; survey.

Evidence Level: 4B

Link: https://www.mdpi.com/1660-4601/18/4/1460

How can wellbeing at work and sustainable employability of gifted workers be enhanced? A qualitative study from a capability approach perspective

Background: Being gifted with a very high IQ (> 98 percentile) can provide an advantage in the occupational context but can also come with its` own specific challenges. Where some studies found higher than average levels of wellbeing at work and successful careers amongst the gifted, other studies report boredom and less job satisfaction. This poses the question what gifted people value in work, and which factors are associated with the achievement of valued work related outcomes, wellbeing and sustainable employability. In this study these questions were explored using the value driven capability approach as a theoretical framework. **Method:** A qualitative approach was chosen and 16 in-depth semi-structured interviews with gifted workers (IQ > 130) were conducted. The transcripts were analysed using a reflexive thematic analysis aimed at identifying the work related outcomes participants aspired to achieve and the contextual and personal factors that affected the actualisation of these outcomes. **Results:** Participants placed great value on the opportunity to learn, to use their knowledge and skills, and tended to have high ethical standards. If realized, these values contributed to wellbeing whereas if not fulfilled, this often resulted in frustration and sadness. The most important personal factors associated with wellbeing at work and sustainable employability were the level of organizational awareness, self-knowledge, a willingness to compromise, and fear of stigmatisation. Contextually a facilitating leadership style of managers was important, allowing the worker autonomy and decision latitude. Socially, participants enjoyed others as sparring partners but often had an aversion to small talk which could lead to social avoidance and loneliness. **Conclusions:** If gifted workers managed (to get) what they valued in work, this was associated with wellbeing and sustainable employment Coaching aimed at improving organizational awareness, specific social skills (e.g. small talk, adaptability) and understanding their own cognitive processes could be valuable. The application of an autonomy supporting facilitative leadership style by supervisors would be beneficial. Further research should try to confirm the findings using quantitative methods and needs to examine more closely the impact of stigmatisation and leadership styles.

Van Casteren et al. 2021.

BMC Public Health, vol. 21, no. 1.

Keywords: Capabilities; capability approach; gifted; intelligence; qualitative; sustainable employability; wellbeing.

Evidence Level: 6A
Link: https://bmcpublichealth.biomedcentral.com/articles/10.1186/s12889-021-10413-8

Work Health and Safety

Shorter sleep duration is associated with potential risks for overwork-related death among Japanese truck drivers: use of the Karoshi prodromes from worker's compensation cases
Purpose: We aimed to cross-sectionally investigate how work and sleep conditions could be associated with excessive fatigue symptoms as an early sign of Karoshi (overwork-related cerebrovascular and cardiovascular diseases; CCVDs). **Methods:** We distributed a questionnaire regarding work, sleep, and excessive fatigue symptoms to 5410 truck drivers, as the riskiest occupation for overwork-related CCVDs, and collected 1992 total samples (response rate: 36.8%). The research team collected 1564 investigation reports required for compensation for Karoshi. Of them, 190 reports listed the prodromes of Karoshi, which were used to develop the new excessive fatigue symptoms inventory. **Results:** One-way analyses of variance showed that the excessive fatigue symptoms differed significantly by monthly overtime hours ($p < 0.001$), daily working time ($p < 0.001$), work schedule ($p = 0.025$), waiting time on-site ($p = 0.049$), number of night shifts ($p = 0.011$), and sleep duration on workdays ($p < 0.001$). Multivariate mixed-model regression analyses revealed shorter sleep duration as the most effective parameter for predicting excessive fatigue symptoms. Multiple logistic regression analysis confirmed that the occurrences of CCVDs were significantly higher in the middle [adjusted ORs = 3.56 (1.28-9.94)] and high-score groups [3.55 (1.24-10.21)] than in the low-score group. **Conclusion:** The findings suggested that shorter sleep duration was associated more closely with a marked increase in fatigue, as compared with the other work and sleep factors. Hence, ensuring sleep opportunities could be targeted for reducing the potential risks of Karoshi among truck drivers.
Kubo et al. 2021.
International Archives of Occupational and Environmental Health.

Keywords: Excessive fatigue; Karoshi; overtime; overwork-related cerebrovascular and cardiovascular diseases; recovery from fatigue; sleep; working hours.
Evidence Level: 5B
Link: https://link.springer.com/article/10.1007%2Fs00420-021-01655-5

Work exposure and associated risk of hospitalisation with pneumonia and influenza: A nationwide study
Background: Pneumonia and influenza are major health concerns and constitute a high economic burden. However, few data are available on the associated risk of pneumonia and influenza and work exposure on a large population scale. **Aim:** This study aimed to examine the associated risk of pneumonia and influenza by type of work exposure. **Methods:** By cross-linking administrative Danish registries, we classified people in 10 different profession types. The main outcome was hospitalisation with pneumonia or influenza. A multivariable Poisson regression analysis was used to assess the associated incidence rate ratio (IRR) of being hospitalised with pneumonia or influenza by type of profession. **Results:** A total of 1,327,606 people added risk time to the analyses. In a multivariable model, work in day care, public transportation, sewers and nursing home care was associated with an increased risk of hospitalisation with pneumonia compared to work within public administration: IRR=1.20 (95% confidence interval (CI) 1.12-1.28), IRR=1.21 (95% CI 1.09-1.34), IRR=1.61 (95% CI 1.19-2.19) and IRR=1.10 (95% CI 1.03-1.18), respectively. In a multivariable analysis, people working within public transportation were associated with an increased risk of hospitalisation with influenza compared to people working within public administration: IRR=2.54 (95% CI 1.79-3.58). **Conclusions:** Working in day care, public transportation, sewers and nursing home care increased the associated risk of hospitalisation with pneumonia, and working within public transportation increased the associated risk of being hospitalised with influenza compared to working within public administration.
Ostergaard et al. 2021.
Scandinavian Journal of Public Health, vol. 49, no. 1.

Keywords: Pneumonia; influenza; population-based study; work exposure.
Evidence Level: 4A
Link: https://www.ncbi.nlm.nih.gov/pmc/articles/PMC7859585/

A comparison of safety, health, and well-being risk factors across five occupational samples
Objective: The aim of this study was to present safety, health and well-being profiles of workers within five occupations: call center work (*N* = 139), corrections (*N* = 85), construction (*N* = 348), homecare (*N* = 149), and parks and recreation (*N* = 178). **Methods:** Baseline data from the Data Repository of Oregon's Healthy Workforce Center were used. Measures were compared with clinical healthcare guidelines and national norms. **Results:** The prevalence of health and safety risks for adults was as follows: overweight (83.2%), high blood pressure (16.4%), injury causing lost work (9.9%), and reported pain (47.0%). Young workers were least likely to report adequate sleep (46.6%). Construction workers reported the highest rate of smoking (20.7%). All of the adult workers reported significantly lower general health than the general population. **Conclusion:** The number of workers experiencing poor safety, health and well-being outcomes suggest the need for improved working conditions.
Hanson et al. 2021.
Frontiers of Psychology, vol. 9.

Keywords: Health; health behaviours; health promotion; occupational safety; well-being.
Evidence Level: 4B
Link: https://www.frontiersin.org/articles/10.3389/fpubh.2021.614725/full

Simulation as a training method for electricity workers' safety
Background: Simulation is a useful method to improve learning and increase the safety of work operations, both for technical and non-technical skills. However, the observation, assessment, and feedback about these skills is particularly complex, because the process needs expert observers, and the feedback could be judgmental and ineffective. Therefore, a structured process to develop effective simulation scenarios and tools for the observation and feedback about performance is crucial. To this aim, in the present research, we developed a training model for electricity distribution workers, based on high fidelity simulation. **Methods:** We designed simulation scenarios based on real cases, developed, and tested a set of observation and rating forms for the non-technical skills behavioral markers, and we tracked behaviors based on non-verbal cues (physiological and head orientation parameters). **Results:** The training methodology proved to be highly appreciated by the participants and effective in fostering reflexivity. An in-depth analysis of physiological indexes and behaviors compliant to safety procedures revealed that breath rate and heart rate patterns commonly related with mindful and relaxed states were correlated with compliant behaviors, and patterns typical of stress and anxiety were correlated with non-compliant behaviors. **Conclusions:** a new training method based on high fidelity simulation, addressing both technical and non-technical skills is now available for fostering self-reflection and safety for electricity distribution workers. Future research should assess the long-term effectiveness of high-fidelity simulation for electricity workers, and should investigate non-invasive and real-time methods for tracking physiological parameters.
Bracco et al. 2021.
International Journal of Environmental Research and Public Health, vol. 18, no. 4.

Keywords: Industrial safety; non-technical skills; simulation.
Evidence Level: 5A
Link: https://www.mdpi.com/1660-4601/18/4/1591

Risk Assessment

Comparison of the qualitative and the quantitative risk assessment of hazardous substances requiring management under the occupational safety and health act in South Korea

The risk assessment of hazardous substances has become increasingly important for the efficient prevention and management of various diseases or accidents caused by increased amounts of hazardous substances in the workplace. In this study, risk assessment was conducted for 36 kinds of hazardous substances requiring management by using qualitative and quantitative risk assessments. Qualitative risk assessment was performed by multiplying the exposure level class by the hazard class according to the Korea Occupational Safety and Health Agency's (KOSHA) Chemical Hazard Risk Management (CHARM). The quantitative risk assessment was followed by a four-step risk assessment system presented in the Guidelines for Hazard Risk Assessment of Chemicals (KOSHA GUIDE W-6-2016). In the quantitative assessments, we presented a new method of classifying risk levels into four steps, much like qualitative assessments. In this study, the quantitative risk assessment was considered difficult to predict through qualitative risk assessment. Therefore, it is necessary to perform a quantitative risk assessment after a qualitative risk assessment for a higher level of risk assessment.

Moon et al. 2021.

International Journal of Environmental Research and Public Health, vol. 18, no. 3.

Keywords: Control banding; hazardous substances requiring management; occupational safety and health act; qualitative risk assessment; quantitative risk assessment.

Evidence Level: 6B

Link: https://www.mdpi.com/1660-4601/18/3/1354

Ergonomics

Impact of ergonomics on cardiometabolic risk in office workers transition to activity-based working with height-adjustable Desk

Objective: Ergonomic office redesigning possibly improves physical activity (PA) and sedentary behavior (SB); however, its impact on cardiometabolic risk has not yet been determined. This study aimed to examine the effect of office relocation on cardiometabolic risk factors. Methods: Annual health check-up data of 95 office workers from four offices in Tokyo, Japan, who relocated to an office with activity-based working (ABW) and height-adjustable desk (HAD) and a propensity-score matched control-cohort were analyzed. PA and SB on weekdays were measured only in the relocation group before and 10 months after relocation. Results: Significant interactions were observed for waist circumference, high-density lipoprotein cholesterol, and glycosylated hemoglobin (HbA1c). HbA1c changes showed a significant negative association with moderate-to-vigorous-intensity PA. Conclusion: An ABW office with HAD improves cardiometabolic risk factors in office workers, possibly through changes in PA and SB.

Jindo et al 2021

Journal of Occupational and Environmental Medicine, vol. Publish Ahead of Print

Keywords: Office environment change; Workplace health promotion; Sit–stand desk; Sitting behavior; Cardiovascular disease

Evidence Level: 4B

Link: https://europepmc.org/article/med/33657061

The dynamic computer workstation - A pilot study of clinical and biochemical investigation during work at static respectively mobile keyboards

A large and increasing number of the work force in the population spend their work hours at the keyboard. There is evidence that repetitive high levels of static work, or extreme working postures involving the neck-shoulder muscles are an increased risk for chronic neck-shoulder pain. The aim of this study was to investigate the effect of dynamic computer working (DCW), using a mobile application to the desk surface, on pain characteristics and biomarkers in office workers. We included 10 female subjects. All subjects

answered questionnaires about general health, pain intensity and characteristics. The pressure pain threshold (PPT), neck range and motion, neck and shoulder strength were measured. Microdialysis was conducted in trapezius muscle. Measurements were performed before and 4 weeks after DCW. Multivariate analysis, orthogonal partial least square discriminate analysis (OPLS-DA) and univariate analysis paired test, Wilcoxon, was performed. There was significant improvement in reported neck pain, quality of life, and psychological distress after 4 weeks DCW. The PPT and strength in neck and shoulder were significantly increased after DCW. A significant OPLS-DA model showed clear separation between the samples collected before and after 4 weeks DCW. In conclusion, these results show that keyboard work at a movable desk application might decrease the risk of repetitive strain injuries in the neck and shoulder muscles.

Ghafouri et al. 2021.

International Journal of Environmental Research and Public Health, vol. 18, no. 4.

Keywords: Biomarkers; chronic pain; computer working; neck/shoulder pain; work-related neckpain.

Evidence Level: 3A

Link: https://www.mdpi.com/1660-4601/18/4/1493

The effect of occupational exposure to ergonomic risk factors on osteoarthritis of hip or knee and selected other musculoskeletal diseases: A systematic review and meta-analysis from the WHO/ILO Joint Estimates of the Work-related Burden of Disease and Injury

Background: The World Health Organization (WHO) and the International Labour Organization (ILO) are developing joint estimates of the work-related burden of disease and injury (WHO/ILO Joint Estimates), with contributions from a large network of experts. Evidence from mechanistic data suggests that occupational exposure to ergonomic risk factors may cause selected other musculoskeletal diseases, other than back or neck pain (MSD) or osteoarthritis of hip or knee (OA). In this paper, we present a systematic review and meta-analysis of parameters for estimating the number of disability-adjusted life years from MSD or OA that are attributable to occupational exposure to ergonomic risk factors, for the development of the WHO/ILO Joint Estimates. **Objectives:** We aimed to systematically review and meta-analyse estimates of the effect of occupational exposure to ergonomic risk factors (force exertion, demanding posture, repetitiveness, hand-arm vibration, lifting, kneeling and/or squatting, and climbing) on MSD and OA (two outcomes: prevalence and incidence). **Data sources:** We developed and published a protocol, applying the Navigation Guide as an organizing systematic review framework where feasible. We searched electronic academic databases for potentially relevant records from published and unpublished studies, including the International Trials Register, Ovid Medline, EMBASE, and CISDOC. We also searched electronic grey literature databases, Internet search engines and organizational websites; hand-searched reference list of previous systematic reviews and included study records; and consulted additional experts. **Study eligibility and criteria:** We included working-age (≥15 years) workers in the formal and informal economy in any WHO and/or ILO Member State but excluded children (<15 years) and unpaid domestic workers. We included randomized controlled trials, cohort studies, case-control studies and other non-randomized intervention studies with an estimate of the effect of occupational exposure to ergonomic risk factors (any exposure to force exertion, demanding posture, repetitiveness, hand-arm vibration, lifting, kneeling and/or squatting, and climbing ≥ 2 h/day) compared with no or low exposure to the theoretical minimum risk exposure level (<2 h/day) on the prevalence or incidence of MSD or OA. **Study appraisal and synthesis methods:** At least two review authors independently screened titles and abstracts against the eligibility criteria at a first stage and full texts of potentially eligible records at a second stage, followed by extraction of data from qualifying studies. Missing data were requested from principal study authors. We combined odds ratios using random-effect meta-analysis. Two or more review authors assessed the risk of bias and the quality of evidence, using Navigation Guide tools adapted to this project. **Results:** In total eight studies (4 cohort studies and 4 case control studies) met the inclusion criteria, comprising a total of 2,378,729 participants (1,157,943 females and 1,220,786 males) in 6 countries in 3 WHO regions (Europe, Eastern Mediterranean and Western Pacific). The exposure was measured using self-reports in most studies and with a job exposure matrix in one study and outcome was generally assessed with physician diagnostic records or administrative health data. Across included studies, risk of bias was generally moderate.

Compared with no or low exposure (<2 h per day), any occupational exposure to ergonomic risk factors increased the risk of acquiring MSD (odds ratio (OR) 1.76, 95% confidence interval [CI] 1.14 to 2.72, 4 studies, 2,376,592 participants, I^2 70%); and increased the risk of acquiring OA of knee or hip (OR 2.20, 95% CI 1.42 to 3.40, 3 studies, 1,354 participants, I^2 13%); Subgroup analysis for MSD found evidence for differences by sex, but indicated a difference in study type, where OR was higher among study participants in a case control study compared to study participants in cohort studies. **Conclusions:** Overall, for both outcomes, the main body of evidence was assessed as being of low quality. Occupational exposure to ergonomic risk factors increased the risk of acquiring MSD and of acquiring OA of knee or hip. We judged the body of human evidence on the relationship between exposure to occupational ergonomic factors and MSD as "limited evidence of harmfulness" and the relationship between exposure to occupational ergonomic factors and OA also as "limited evidence of harmfulness". These relative risks might perhaps be suitable as input data for WHO/ILO modelling of work-related burden of disease and injury.
Hulshof et al. 2021.
Environment International, vol. 150.

Keywords: Ergonomic risk factors; global burden of disease; occupational exposure; osteoarthritis; other musculoskeletal diseases; systematic review.
Evidence Level: 1A
Link: https://www.sciencedirect.com/science/article/pii/S0160412020323047?via%3Dihub

Chronic Health Issues

Work absence in patients with asthma and/or COPD: a population-based study
Chronic obstructive pulmonary disease (COPD) and asthma impact on work productivity, but their population-based burden and clinical predictors are understudied. In this observational, real-life study, work absence of 14,383 asthma and/or COPD patients present in the MAJORICA cohort (Spain) was compared with the general population. Using multivariable regression, we studied the association of work absence with demographic and clinical characteristics. Patients with asthma and/or COPD had more work absence than the general population (15.2% vs 8.9%, $p < 0.0001$). Patients with asthma had more often periods of work absence compared to patients with COPD (16.0% vs 12.8%, $p < 0.0001$). The number of days absent were, however, less in asthma than in COPD (median: 15 days [IQR: 5-51] vs 39 days [IQR: 13-134], $p < 0.001$). Patients with asthma-COPD overlap were in between (14.5% with absence; median: 27 days [IQR: 10-82]). Comorbid anxiety, allergic rhinitis, and sleep apnoea were independently associated with more work absence.
Dierick et al. 2021.
NPJ Primary Care and Respiratory Medicine, vol. 31, no. 1.

Keywords: Work absence; patients; asthma; COPD.
Evidence Level: 4B
Link: https://www.ncbi.nlm.nih.gov/pmc/articles/PMC7887233/

Impact of work and recreational physical activity on prediabetes condition among U.S. adults: NHANES 2015-2016
More minutes of physical activity (PA) accumulated during a day are associated with a lower risk of diabetes mellitus type 2. However, it is less known if distinct dimensions of PA can produce a different protective effect in the prevention of prediabetes. The aim of this study was to analyze the impact of work and recreational PA on prediabetes among U.S. adults during the period 2015-2016 using the National Health and Nutrition Examination Survey (NHANES) database. Individuals (n = 4481) with hemoglobin A1c (HbA1c) test values of 5.7% to 6.4% were included. A logistic regression multivariate-adjusted analysis was conducted to estimate the association between the odds ratios (ORs) and 95% confidence intervals (CIs) of prediabetes, with work and recreational PA. The prevalence of prediabetes among U.S. adults was lower in physically active individuals both at work (~24%) and recreational (~21%) physical activities compared to individuals who were not physically active (27 to 30%). Individuals lacking practice of recreational PA had a

high risk of prediabetes (OR = 1.26, 95% CI: 1.080 to 1.466). PA may be a protective factor for prediabetes conditions depending on gender, age, ethnic group, waist circumference, and thyroid disease.
Pazmino et al. 2021.
International Journal of Environmental Research and Public Health, vol. 18, no. 4.

Keywords: NHANES; physical activity; prediabetes; sedentary behaviour.
Evidence Level: 4A
Link: https://www.mdpi.com/1660-4601/18/4/1378

The sense and meaning ascribed to professional work by women with cancer
Background: The fact that professional activity is reduced is a very challenging experience for persons with cancer whose sense of self-worth is linked to their work. Not only does cancer often become the reason for their deteriorated socio-economic position but it also reduces the quality of life assessment in cancer patients. **Material and methods:** The aim of the study was to discover the sense and meaning that women with cancer ascribe to their professional work. The research was carried out among 6 women diagnosed with cancer, aged 32-49 years. A qualitative research strategy was adopted in the study and interpretative phenomenological analysis was applied. **Results:** Based on the conducted research, when faced with cancer, the respondents often perceive professional work as a factor that triggers cancer and, at the same time, one that can increase their self-esteem, giving meaning to their life. It, therefore, seems crucial to support the professional activity of cancer patients and to create jobs promoting health.
Conclusions: When working with a person suffering from cancer, it is worth considering the possibilities that returning to work is likely to carry. It is important to create such jobs and work environments that would be consistent with the concept of health promotion. It seems that the key factors here are the appointment of persons responsible for the return process of a person with a chronic illness, accompanied by efficient communication between the employer and occupational health services, and efficient exchange of information between the treating physician and the workplace (with the employee's consent).
Stankiewicz et al. 2021.
Medycyna Pracy, vol. 72, no. 1.

Keywords: Cancer; chronic illness; professional work; quality of life; role of the patient; women.
Evidence Level: 5B
Link: http://medpr.imp.lodz.pl/Senses-and-meanings-given-to-professional-work-by-women-with-cancer,126994,0,2.html

Occupational Exposure

Carbon nanotubes: Probabilistic approach for occupational risk assessment
In this study, the occupational risk assessment of carbon nanotubes (CNTs) was performed by means of a probabilistic approach. Chronic and subchronic inhalation exposure studies were retrieved during the hazard identification phase of the study. These studies were then used to obtain a guidance value (BMC_h, expressed as a lognormal distribution with geometric mean ± geometric standard deviation = 10.0 ± 4.2 $\mu g/m^3$) for occupational inhalation exposure to CNTs. An exposure scenario was selected from the scientific literature: three different work events (WEs) related to the production of conductive films were considered: (WE1) manufacturing of single walled carbon nanotubes films during normal operation using local exhaust ventilation (LEV); (WE2) manufacturing of SWCNT film without LEV; and (WE3) cleaning of one of the reactors. For each WE, a probability distribution function was applied, considering exposure expressed as mass concentration, as derived from three different measurement techniques. The ratio of the exposure and the BMC_h distributions (i.e., the risk characterization ratio-RCR) was used to calculate the probability of occurrence of a relevant occupational risk. All the considered WEs indicated the presence of a risk (i.e., RCR distributions ≥ 1); however, only WE2 resulted in a statistically significant level of risk.
Spinazze et al. 2021.
Nanomaterials, vol. 11, no. 2.

Keywords: MWCNTs; SWCNTs; engineered nanomaterials; nanotechnology; occupational exposure; occupational health.
Evidence Level: 6A
Link: https://www.mdpi.com/2079-4991/11/2/409

The effect of occupational exposure to noise on ischaemic heart disease, stroke and hypertension: A systematic review and meta-analysis from the WHO/ILO Joint Estimates of the Work-Related Burden of Disease and Injury

Background: The World Health Organization (WHO) and the International Labour Organization (ILO) are developing joint estimates of the work-related burden of disease and injury (WHO/ILO Joint Estimates), with contributions from a large number of individual experts. Evidence from mechanistic data suggests that occupational exposure to noise may cause cardiovascular disease (CVD). In this paper, we present a systematic review and meta-analysis of parameters for estimating the number of deaths and disability-adjusted life years from CVD that are attributable to occupational exposure to noise, for the development of the WHO/ILO Joint Estimates. **Objectives:** We aimed to systematically review and meta-analyse estimates of the effect of any (high) occupational exposure to noise (≥85 dBA), compared with no (low) occupational exposure to noise (<85 dBA), on the prevalence, incidence and mortality of ischaemic heart disease (IHD), stroke, and hypertension. **Data sources:** A protocol was developed and published, applying the Navigation Guide as an organizing systematic review framework where feasible. We searched electronic academic databases for potentially relevant records from published and unpublished studies up to 1 April 2019, including International Trials Register, Ovid MEDLINE, PubMed, Embase, Lilacs, Scopus, Web of Science, and CISDOC. The MEDLINE and Pubmed searches were updated on 31 January 2020. We also searched grey literature databases, Internet search engines and organizational websites; hand-searched reference lists of previous systematic reviews and included study records; and consulted additional experts. **Study eligibility and criteria:** We included working-age (≥15 years) workers in the formal and informal economy in any WHO and/or ILO Member State but excluded children (<15 years) and unpaid domestic workers. We included randomized controlled trials, cohort studies, case-control studies and other non-randomized intervention studies with an estimate of the effect of any occupational exposure to noise on CVD prevalence, incidence or mortality, compared with the theoretical minimum risk exposure level (<85 dBA). **Study appraisal and synthesis methods:** At least two review authors independently screened titles and abstracts against the eligibility criteria at a first stage and full texts of potentially eligible records at a second stage, followed by extraction of data from qualifying studies. We prioritized evidence from cohort studies and combined relative risk estimates using random-effect meta-analysis. To assess the robustness of findings, we conducted sensitivity analyses (leave-one-out meta-analysis and used as alternative fixed effects and inverse-variance heterogeneity estimators). At least two review authors assessed the risk of bias, quality of evidence and strength of evidence, using Navigation Guide tools and approaches adapted to this project. **Results:** Seventeen studies (11 cohort studies, six case-control studies) met the inclusion criteria, comprising a total of 534,688 participants (39,947 or 7.47% females) in 11 countries in three WHO regions (the Americas, Europe, and the Western Pacific). The exposure was generally assessed with dosimetry, sound level meter and/or official or company records. The outcome was most commonly assessed using health records. We are very uncertain (low quality of evidence) about the effect of occupational exposure to noise (≥85 dBA), compared with no occupational exposure to noise (<85 dBA), on: having IHD (0 studies); acquiring IHD (relative risk (RR) 1.29, 95% confidence interval (95% CI) 1.15 to 1.43, two studies, 11,758 participants, I^2 0%); dying from IHD (RR 1.03, 95% CI 0.93-1.14, four studies, 198,926 participants, I^2 26%); having stroke (0 studies); acquiring stroke (RR 1.11, 95% CI 0.82-1.65, two studies, 170,000 participants, I^2 0%); dying from stroke (RR 1.02, 95% CI 0.93-1.12, three studies, 195,539 participants, I^2 0%); having hypertension (0 studies); acquiring hypertension (RR 1.07, 95% CI 0.90-1.28, three studies, four estimates, 147,820 participants, I^2 52%); and dying from hypertension (0 studies). Data for subgroup analyses were missing. Sensitivity analyses supported the main analyses. **Conclusions:** For acquiring IHD, we judged the existing body of evidence from human data to provide "limited evidence of harmfulness"; a positive relationship is observed between exposure and outcome where chance, bias, and confounding cannot be ruled out with reasonable confidence. For all other included outcomes, the bodies

of evidence were judged as "inadequate evidence of harmfulness". Producing estimates for the burden of CVD attributable to occupational exposure to noise appears to not be evidence-based at this time.
Teixeira et al. 2021.
Environment International.

Keywords: Global burden of disease; hypertension; ischaemic heart disease; noise; stroke; systematic review.
Evidence Level: 1A
Link: https://www.sciencedirect.com/science/article/pii/S0160412021000118?via%3Dihub

Health problems in agricultural workers occupationally exposed to pesticides
Agricultural workers are susceptible to several health problems as a result of occupational exposure to toxic substances, especially pesticides. The aim of this review was to describe the health issues associated with occupational exposure to pesticides in agricultural workers. A descriptive study, in the form of an integrative literature review, was conducted based on articles retrieved from the LILACS, SciELO and PubMed databases, published between January 2015 and October 2018. The searches were conducted using the keywords "pesticides," "workers' health," "occupational exposure" and "agricultural workers." The study was guided by the following research question: what health problems do agricultural workers experience as a result of occupational exposure to pesticides? The screening process led to the selection of 35 studies performed in several countries and continents, all of which shed light on the vulnerability of agricultural workers, especially due to the misuse of personal protective equipment and lack of knowledge about the correct use of these devices. The studies investigated a variety of health issues, and most reported a positive association between these conditions, which include cancer, and the use of pesticides. Educational and preventive measures must be implemented to promote the health of rural workers. Furthermore, it is crucial that governments play an active role in these initiatives and provide alternatives to pesticides for pest control.
De-Assis et al. 2021.
Revista Brasileira de Medicina do Trabalho, vol. 18, no. 3.

Keywords: Agricultural workers; occupational exposure; occupational health; pesticides.
Evidence Level: 6A
Link: https://www.ncbi.nlm.nih.gov/pmc/articles/PMC7879472/

Oxidative stress induction in woodworkers occupationally exposed to wood dust and formaldehyde
Background: Many workers are exposed to wood dust (WD) and formaldehyde (FA), whose carcinogenic activity is supposed to be oxidative stress-mediated. This study aims to assess to what extent the occupational exposure to WD and FA, albeit within regulatory limits, could result in OS induction in a woodworkers' population. **Methods:** The sample population consisted of 127 woodworkers from 4 factories and 111 unexposed controls. Individual exposure was assessed by personal air-samplers. Each participant enrolled in the study filled out a questionnaire and provided a urinary sample to quantify OS biomarkers, namely 15-F_{2t}-IsoProstane (15-F_{2t}-IsoP) and 7,8-dihydro-8-oxo-2'-deoxyguanosine (8-oxo-dGuo). The main confounding factor for OS, i.e. tobacco smoking exposure, was assessed by measuring cotinine in urine samples. **Results:** Woodworkers were exposed to significantly higher amounts of WD and FA as compared to controls ($p < 0.001$). Among OS biomarkers, 15-F_{2t}-IsoP showed statistically significant higher values in woodworkers compared to controls ($p = 0.004$). A significant, positive correlation was observed between 15-F_{2t}-IsoP and 8-oxo-dGuo ($p = 0.005$), cotinine ($p = 0.05$), FA ($p < 0.001$) and WD ($p = 0.01$); 8-oxo-dGuo was significantly correlated with cotinine ($p = 0.001$) and WD ($p = 0.004$). In addition, WD and FA were significantly correlated each other ($p < 0.001$). **Conclusions:** The study confirms that WD and FA may induce OS in woodworkers, and highlights that even the compliance with occupational exposure limits can result in measurable biological outcomes.
Ghelli et al. 2021.
Journal of Occupational Medicine and Toxicology, vol. 16, no. 1.

Keywords: Biomonitoring; epidemiology; formaldehyde; occupational hygiene; wood dust.
Evidence Level: 5A
Link: https://occup-med.biomedcentral.com/articles/10.1186/s12995-021-00293-4

Airborne occupational exposures and inflammatory biomarkers in the Lifelines cohort study
Introduction: Inflammatory biomarkers are associated with negative health outcomes. In this study, we investigated the associations between airborne occupational exposures and levels and changes in inflammatory biomarkers. **Methods:** We included 79 604 adults at baseline from the Lifelines cohort of which 48 403 (60.8%) subjects were followed for a median of 4.5 years. Airborne occupational exposures at the current or last-held job at baseline were estimated with the occupational asthma-specific job-exposure matrix. Both in cross-sectional and longitudinal analyses, we used linear regression models (adjusted for age, sex, education, monthly income, body mass index, smoking, pack-years, asthma and anti-inflammatory medication) to investigate the associations between airborne occupational exposures (allergens, reactive chemicals, pesticides and micro-organisms) and inflammatory biomarkers (C reactive protein (CRP), eosinophils and neutrophils). **Results:** In the cross-sectional analyses, exposure to allergens, reactive chemicals and micro-organisms was associated with a lower (Log) CRP level (B(95% CI)=-0.05 (-0.08 to -0.02),-0.05(-0.08 to -0.02) and -0.09(-0.16 to -0.02), respectively). Likewise, exposure to allergens, reactive chemicals, pesticides and micro-organisms was associated with a lower (log) neutrophils count (-0.01 (-0.02 to -0.01), -0.01 (-0.02 to -0.01),-0.02 (-0.04 to -0.01) and -0.02(-0.03 to -0.01), respectively). No association between airborne occupational exposures and eosinophils count was found. In the longitudinal analyses, no association between airborne occupational exposures and changes in inflammatory biomarkers was found. **Conclusions:** At baseline, airborne occupational exposures are inversely associated with inflammation; no effect of occupational exposures on inflammation was found at follow-up. In the future studies, details of occupational exposures, such as duration of exposures and cumulative exposures, need to be included to investigate the airborne occupational exposures and inflammatory biomarkers.
Faruque et al. 2021.
Occupational and Environmental Medicine, vol. 78, no. 2.

Keywords: Epidemiology; international occupational health; occupational health practice.
Evidence Level: 4A
Link: https://oem.bmj.com/content/78/2/82.long

Work-related exposure to organic solvents and the risk for multiple sclerosis-a systematic review
Purpose: Multiple sclerosis (MS) is a chronic progressive neurological disorder. Several environmental factors have been discussed as possible causing agents, e.g. organic solvents, whose impact on the disease is analysed in this review. **Methods:** Systematic search strategies were used to identify high-quality studies of workers exposed to organic solvents, published up to September 30, 2019, in databases, such as PubMed, Cochrane library and Scopus. The exposure was in most studies obtained by questionnaires, supplemented with telephone interviews. The diagnosis MS was mainly determined following a thorough neurological examination. Finally, fourteen case-control studies and two cohort studies met the inclusion criteria and were included in the meta-analysis. Random effects models were used to pool the results of the studies. **Results:** The odds ratios from the 14 case-control studies included in the meta-analysis ranged from 0.12-4.0. Five case-control studies and one cohort study showed a significant association between the development of multiple sclerosis and exposure to organic solvents. The results from the other nine case-control studies and from one of the two cohort studies did not reach statistical significance. The pooled data from the 14 case-control studies gave an OR of 1.44 (95% CI 1.03-1.99), which shows a moderately increased risk of developing MS after exposure to organic solvents. **Conclusions:** The final interpretation of the result is that organic solvents may be slightly associated with an increased risk to develop MS. In addition, other factors, e.g. genetic markers and smoking, may contribute to the development of the disease.
Gerhardsson et al. 2021.
International Archives of Occupational and Environmental Medicine, vol. 94, no. 2.

Keywords: Meta-analysis; multiple sclerosis; occupational exposure; organic solvents.
Evidence Level: 1A
Link: https://link.springer.com/article/10.1007%2Fs00420-020-01564-z

Blood magnesium level and selected oxidative stress indices in lead-exposed workers
Occupational exposure to lead is one of the important hazards to human global population. Lead interferes with divalent cations, such as calcium, magnesium, and iron. Magnesium is the fourth most common mineral in the human body and a cofactor in more than 325 enzymes. There are many disorders associated with magnesium deficiency. It has been postulated that hypomagnesemia promotes oxidative stress. Study population included 232 male employees of lead-zinc works and was divided into two sub-groups based on the median of magnesium serum level: low magnesium level (L-Mg) group and high magnesium level (H-Mg) group. Magnesium level was significantly higher in the H-Mg group than in the L-Mg group due to the study design. The level of zinc protoporphyrin was significantly higher in the L-Mg group than in the H-Mg group by 13%, while the blood lead levels were similar in the examined groups. The serum level of MDA was significantly higher in the L-Mg group than in the H-Mg group by 12%, while the serum levels of thiol groups, TAC, and bilirubin were significantly lower in that group by 6%, 3%, and 27%, respectively. Similarly, the erythrocyte SOD activity was lower in the L-Mg group than in the H-Mg group by 5%. Low serum magnesium levels contribute to lead-induced oxidative stress, result in unfavorable modification of antioxidant system function, and promote lead-induced impairment of heme synthesis. Obtained results indicate that prevention of hypomagnesemia should be regarded as an important step in ensuring adequate prophylaxis of chronic lead poisoning.
Wyparlo-Wszelaki et al. 2021.
Biological Trace Element Research, vol. 199, no. 2.

Keywords: Lead exposure; magnesium; oxidative stress.
Evidence Level: 5A
Link: https://link.springer.com/article/10.1007%2Fs12011-020-02168-x

Musculoskeletal Health

Prevalence and associated factors of low back pain among bank workers in Gondar City, Northwest Ethiopia
Introduction: Low back pain is a very common health problem that most people experience at some point in their working life. It results in sick leave, disability, producing significant restrictions on usual activity and participation among many office workers. The working style of bank workers is sedentary mostly and the alignment of their chairs, table, and computers is not designed based on their health aspects which exposes them to low back pain. **Objective:** This study aimed to assess the prevalence and associated factors of low back pain among bank workers in Gondar city. **Methods:** Institution-based cross-sectional study was conducted from 20th October to 10th November 2020 at banks in Gondar city. A simple random sampling technique was employed to select 296 bank workers. A structured pretested self-administered questionnaire was used to collect data. Data were entered in epi-info version 7, analyzed using SPSS version 21, and presented by frequencies, percentages, and tables. Bivariable and multivariable analyses were employed using a binary logistic regression model. Variables with a p-value < 0.05 were considered as factors significantly associated and the odds ratio with a 95% CI was used to determine the strength of association. **Results:** The prevalence of low back pain among bank workers in the last 12 months was 55.4%. Being female, work-related stress, lack of physical activity, using a fixed chair and a chair without an armrest, and lifting heavy objects increases the risk of developing low back pain. **Conclusion:** The prevalence of low back pain among bank workers in Gondar city was high. It is better to establish a health screening team, avail a movable chair and a chair with an armrest, and give special attention to female workers and bank workers with stress, and do physical activity to reduce the risk of developing low back pain.
Workneh et al. 2021.

Orthopedic Research and Reviews, vol. 13.

Keywords: Ethiopia; associated factors; bank workers; banks; low back pain; prevalence
Evidence Level: 4B
Link: https://www.dovepress.com/prevalence-and-associated-factors-of-low-back-pain-among-bank-workers--peer-reviewed-article-ORR

Study on the associations of individual and work-related factors with low back pain among manufacturing workers based on logistic regression and structural equation model
Work-related musculoskeletal injuries are one of the major occupational health issues of the workers, especially low back pain (LBP). The aim of this study was to survey the prevalence of LBP among manufacturing workers and to identify associations of individual and work-related factors with LBP. A cross-sectional questionnaire study was performed with 1173 participating manufacturing workers. The questionnaire included individual factors, psychosocial and physical exposures, and musculoskeletal discomfort. It was analyzed by logistic regression and structural equation modelling (SEM). The 1-year prevalence of LBP among Chinese manufacturing workers was 33.6%. Logistic regression analysis showed that job tenure, awkward postures, vibration and job demand were positively-while social support and job control were negatively associated with LBP ($p < 0.05$). The SEM results indicated that, as shown in other studies, job types, job tenure, postural load, high job demand, low job control and vibration were directly associated with LBP, but also that job types, high job demand, low social support and vibration may have indirect effects on LBP-mediated by postural load.
Dong et al. 2021.
International Journal of Environmental Research and Public Health, vol. 18, no. 4.

Keywords: Awkward postures; ergonomics; low back pain; manufacturing workers; psychosocial factors; structural equation model.
Evidence Level: 4B
Link: https://www.mdpi.com/1660-4601/18/4/1525

Work-time compositions of physical behaviours and trajectories of sick leave due to musculoskeletal pain
We aimed to investigate the association between work-time compositions of physical behavior and sick leave trajectories due to musculoskeletal pain over one year. We conducted a secondary analysis using the data of 981 workers in a Danish prospective cohort (DPHACTO 2012-2014). At baseline, we assessed physical behaviors (sitting, standing, light physical activity (LIPA), and moderate-to-vigorous physical activity (MVPA)) at work and during leisure, using accelerometers. Over 1 year follow-up, workers reported sick-leave days due to musculoskeletal pain at 4-week intervals. Four distinct trajectories of sick leave were previously identified in this cohort ("no sick leave", "few days-increasing trajectory", "some days-decreasing trajectory", "some days-increasing trajectory"), and used as an outcome in multinomial regression models with work-time compositions as predictors, adjusted for compositions of behavior during leisure, age, sex, body mass index, and smoking habits. More time spent sitting relative to the other behaviors was negatively associated with the trajectory of few days-increasing sick leave ($p = 0.004$), while time in LIPA was positively associated with the trajectory of some days-increasing sick leave ($p = 0.009$). Standing and MVPA were not significantly associated with sick leave trajectories. In conclusion, work-time compositions with more sitting relative to the other behaviors had lower risk for an increasing trajectory of sick leave due to pain, while compositions with more LIPA had higher risk. This may have implications for prevention of pain-related sick leave in blue-collar workers.
Hallman et al. 2021.
International Journal of Environmental Research and Public Health, vol. 18, no. 4.

Keywords: Compositional data analysis; physical activity; sickness absence; sitting.
Evidence Level: 4A
Link: https://www.mdpi.com/1660-4601/18/4/1508

COVID 19

Guiding and Supporting Mental Health and Wellbeing

The relationship between mental toughness, job loss, and mental health issues during the COVID-19 pandemic

Concerns toward public well-being and mental health are increasing considering the COVID-19 pandemic's global societal and individual impact. The present study builds on the current body of COVID-19 literature by examining the role of mental toughness (MT) in predicting negative affective states (depression, anxiety and stress) during the pandemic. The study also examined the effects of changes in employment on mental health and MT. Participants (N = 723) completed a battery of questionnaires including the Mental Toughness Questionnaire 48-item, The State-Trait Anxiety Inventory, and the Depression, Anxiety and Stress Scale - 21 items. Participants reported relatively higher levels of depression, stress and anxiety in comparison to pre-COVID-19 samples from previous research, with respondents who had lost their jobs during the pandemic reporting higher levels of negative affective states. Despite this, mentally tough individuals appeared to report lower levels of depression, anxiety and stress. Moreover, moderation analyses identified some interaction between MT and employment status when predicting depression, anxiety and stress. Our findings suggest that MT may have some utility in reducing the adverse mental health effects of the pandemic on individuals, however, further longitudinal research is needed to support these implications.

Mojtahedi et al. 2021.

Frontiers of Psychology, vol. 11.

Keywords: COVID-19; anxiety; depression; mental health; mental toughness; stress; unemployment.

Evidence Level: 5A

Link: https://www.frontiersin.org/articles/10.3389/fpsyt.2020.607246/full

Enabling Healthy and Safe Workplaces

Changes in work and life patterns associated with depressive symptoms during the COVID-19 pandemic: an observational study of health app (CALO mama) users

Background: During the COVID-19 pandemic, many people refrained from going out, started working from home (WFH), and suspended work or lost their jobs. This study examines how such pandemic-related changes in work and life patterns were associated with depressive symptoms. **Methods:** An online survey among participants who use a health app called *CALO mama* was conducted from 30 April to 8 May 2020 in Japan. Participants consisted of 2846 users (1150 men (mean age=50.3) and 1696 women (mean age=43.0)) who were working prior to the government declaration of a state of emergency (7 April 2020). Their daily steps from 1 January to 13 May 2020 recorded by an accelerometer in their mobile devices were linked to their responses. Depressive symptoms were assessed using the Two-Question Screen. **Results:** On average, participants took 1143.8 (95% CI -1557.3 to -730.2) fewer weekday steps during the declaration period (from 7 April to 13 May). Depressive symptoms were positively associated with female gender (OR=1.58, 95% CI 1.34 to 1.87), decreased weekday steps (OR=1.22, 95% CI 1.03 to 1.45) and increased working hours (OR=1.73, 95% CI 1.32 to 2.26). Conversely, starting WFH was negatively associated with depressive symptoms (OR=0.83, 95% CI 0.69 to 0.99). **Conclusions:** Decreased weekday steps during the declaration period were associated with increased odds of depressive symptoms, but WFH may mitigate the risk in the short term. Further studies on the longitudinal effects of WFH on health are needed.

Sato et al. 2021.

Occupational and Environmental Medicine.

Keywords: Environment; international occupational health; psychology.

Evidence Level: 5B

Link: https://www.ncbi.nlm.nih.gov/pmc/articles/PMC7907629/

Strategies to exiting the COVID-19 lockdown for workplace and school: A scoping review
In an attempt to curb the COVID-19 pandemic, several countries have implemented various social restrictions, such as closing schools and asking people to work from home. Nevertheless, after months of strict quarantine, a reopening of society is required. Many countries are planning exit strategies to progressively lift the lockdown without leading to an increase in the number of COVID-19 cases. Identifying exit strategies for a safe reopening of schools and places of work is critical in informing decision-makers on the management of the COVID-19 health crisis. This scoping review describes multiple population-wide strategies, including social distancing, testing, and contact tracing. It highlights how each strategy needs to be based on both the epidemiological situation and contextualize at local circumstances to anticipate the possibility of COVID-19 resurgence. However, the retrieved evidence lacks operational solutions and are mainly based on mathematical models and derived from grey literature. There is a need to report the impact of the implementation of country-tailored strategies and assess their effectiveness through high-quality experimental studies.
D'angelo et al. 2021.
Safety Science, vol. 134.
User License: *Elsevier COVID-19 resource centre*
Keywords: Covid-19; exit strategy; school; work.
Evidence Level: 6A
Link: https://www.ncbi.nlm.nih.gov/pmc/articles/PMC7604014/

Return to Work: Managing Employee Population Health During the COVID-19 Pandemic
Coronavirus disease-2019 (COVID-19), caused by the severe acute respiratory syndrome coronavirus-2 (SARS-CoV-2), has abruptly transformed the outlook of employer health benefits plans for 2020 and 2021. Containing the spread of the virus and facilitating care of those infected have quickly emerged as immediate priorities. Employers have adjusted health benefits coverage to make COVID-19 testing and treatment accessible and remove barriers to care in order to facilitate the containment of the disease. Employers also are introducing strategies focused on testing, surveillance, workplace modifications, and hygiene to keep workforces healthy and workplaces safe. This paper is intended to provide evidence-based perspectives for self-insured employers for managing population health during the COVID-19 pandemic. Such considerations include (1) return to work practices focused on mitigating the spread of COVID-19 through safety practices, testing and surveillance; and (2) anticipating the impact of COVID-19 on health benefits and costs (including adaptations in delivery of care, social and behavioral health needs, and managing interrupted care for chronic conditions).
Fragala et al. 2021.
Population Health Management, vol. 24, no. S1.
User License: *Creative Commons Attribution (CC BY 4.0) (https://creativecommons.org/licenses/by/4.0/)*
Keywords: COVID-19 pandemic; SARS-CoV-2; employee population health; health benefits and costs; return to work practices.
Evidence Level:
Link: https://www.liebertpub.com/doi/full/10.1089/pop.2020.0261

COVID-19 and essential workers: A narrative review of health outcomes and moral injury
The COVID-19 pandemic has introduced a number of added obstacles to safe employment for already-challenged essential workers. Essential workers not employed in the health sector generally include racially diverse, low-wage workers whose jobs require close interaction with the public and/or close proximity to their coworkers, placing them at increased risk of infection. A narrative review facilitated the analyses of health outcome data in these workers and contributing factors to illness related to limited workplace protections and a lack of organizational support. Findings suggest that this already marginalized population may also be at increased risk of "moral injury" due to specific work-related factors, such as limited personal protective equipment (PPE) and the failure of the employer, as the safety and health "duty holder," to protect workers. Evidence suggests that ethical and, in some cases, legally required safety protections benefit not only the individual worker, but an employer's enterprise and the larger community which can retain access to resilient, essential services.

Gaitens et al. 2021.
International Journal of Environmental Research and Public Health, vol. 18, no. 4.

Keywords: COVID-19; essential workers; moral injury; worker protections.
Evidence Level: 6A
Link: https://www.mdpi.com/1660-4601/18/4/1446

Experience of comprehensive interventions in reducing occupational exposure to COVID-19
Importance: The infection of medical personnel with COVID-19 was a disaster for both patients and doctors. However, some effective measures can prevent medical staff from becoming infected. This article introduces those measures and thus provides a reference for other hospitals. **Objective:** In order to reduce the risk of occupational exposure and of the infection of medical staff, this article analyzed the factors, causes and experience of medical personnel on their occupational exposure to COVID-19. Some effective and targeted intervention measures can be implemented in order to avoid the occupational exposure of medical staff to COVID-19. **Evidence review:** In this single-center case series involving 196 medical personnel, occupational exposure to COVID-19 was present. Nursing staff accounted for 67.35% of those cases. The relationships with an exposure source were found to be as follows: doctors and patients (87.24%), colleagues (10.20%), and roommates (2.55%). Occupational exposure was found to be present in the clinical department, radiology department, central sterile supply department, as well as in the outpatient clinics and operating rooms. The non-surgical departments accounted for 72.96% and direct contact accounted for 84.69% while failure to wear surgical masks (84.18%) and operating on the patient without wearing goggles/face shield (8.16%) were the main causes of occupational exposure. The occurrence of occupational exposure to COVID-19 declined to 0.19% after an extensive and comprehensive intervention program. **Conclusions and relevance:** Some effective measures such as hand hygiene, wearing surgical masks in and around the hospital, reasonable use of goggles/face screens, raising awareness of protective measures, minimizing the number of elective operations, strengthening training as well as many other control measures were instrumental in reducing occupational exposure. For any medical institution there is room for improvement in terms of personal protection to reduce occupational exposure.
Liu et al. 2021.
Journal of Infections and Public Health, vol. 14, no. 2.

Keywords: COVID-19; medical personnel; occupational exposure; personal protection; prevent.
Evidence Level: 5A
Link: https://www.sciencedirect.com/science/article/pii/S187603412030767X?via%3Dihub

COVID-19 vaccine hesitancy in a representative working-age population in France: a survey experiment based on vaccine characteristics
Background: Opinion polls on vaccination intentions suggest that COVID-19 vaccine hesitancy is increasing worldwide; however, the usefulness of opinion polls to prepare mass vaccination campaigns for specific new vaccines and to estimate acceptance in a country's population is limited. We therefore aimed to assess the effects of vaccine characteristics, information on herd immunity, and general practitioner (GP) recommendation on vaccine hesitancy in a representative working-age population in France. **Methods:** In this survey experiment, adults aged 18-64 years residing in France, with no history of SARS-CoV-2 infection, were randomly selected from an online survey research panel in July, 2020, stratified by gender, age, education, household size, and region and area of residence to be representative of the French population. Participants completed an online questionnaire on their background and vaccination behaviour-related variables (including past vaccine compliance, risk factors for severe COVID-19, and COVID-19 perceptions and experience), and were then randomly assigned according to a full factorial design to one of three groups to receive differing information on herd immunity (>50% of adults aged 18-64 years must be immunised [either by vaccination or infection]; >50% of adults must be immunised [either by vaccination or infection]; or no information on herd immunity) and to one of two groups regarding GP recommendation of vaccination (GP recommends vaccination or expresses no opinion). Participants then completed a series of

eight discrete choice tasks designed to assess vaccine acceptance or refusal based on hypothetical vaccine characteristics (efficacy [50%, 80%, 90%, or 100%], risk of serious side-effects [1 in 10 000 or 1 in 100 000], location of manufacture [EU, USA, or China], and place of administration [GP practice, local pharmacy, or mass vaccination centre]). Responses were analysed with a two-part model to disentangle outright vaccine refusal (irrespective of vaccine characteristics, defined as opting for no vaccination in all eight tasks) from vaccine hesitancy (acceptance depending on vaccine characteristics). **Findings:** Survey responses were collected from 1942 working-age adults, of whom 560 (28·8%) opted for no vaccination in all eight tasks (outright vaccine refusal) and 1382 (71·2%) did not. In our model, outright vaccine refusal and vaccine hesitancy were both significantly associated with female gender, age (with an inverted U-shaped relationship), lower educational level, poor compliance with recommended vaccinations in the past, and no report of specified chronic conditions (ie, no hypertension [for vaccine hesitancy] or no chronic conditions other than hypertension [for outright vaccine refusal]). Outright vaccine refusal was also associated with a lower perceived severity of COVID-19, whereas vaccine hesitancy was lower when herd immunity benefits were communicated and in working versus non-working individuals, and those with experience of COVID-19 (had symptoms or knew someone with COVID-19). For a mass vaccination campaign involving mass vaccination centres and communication of herd immunity benefits, our model predicted outright vaccine refusal in 29·4% (95% CI 28·6-30·2) of the French working-age population. Predicted hesitancy was highest for vaccines manufactured in China with 50% efficacy and a 1 in 10 000 risk of serious side-effects (vaccine acceptance 27·4% [26·8-28·0]), and lowest for a vaccine manufactured in the EU with 90% efficacy and a 1 in 100 000 risk of serious side-effects (vaccine acceptance 61·3% [60·5-62·1]). **Interpretation:** COVID-19 vaccine acceptance depends on the characteristics of new vaccines and the national vaccination strategy, among various other factors, in the working-age population in France.

Schwarzinger et al. 2021.

Lancet Public Health, vol. 21.

Keywords: COVID-19; vaccine; hesitancy; vaccine characteristics.

Evidence Level: 4A

Link: https://www.thelancet.com/journals/lanpub/article/PIIS2468-2667(21)00012-8/fulltext

Change of willingness to accept COVID-19 vaccine and reasons of vaccine hesitancy of working people at different waves of local epidemic in Hong Kong, China: Repeated cross-sectional surveys.

Vaccine hesitancy is among the major threats to the effectiveness of vaccination programmes. This study aimed to report the trend in response to willingness to accept the COVID-19 vaccine between two waves of the local epidemic and examine differences among occupations. Two cross-sectional surveys were conducted online during the first wave (February) and third wave (August to September) of the local epidemic in 2020. Acceptance of the COVID-19 vaccine was measured along with personal protection behaviours and occupations. A total of 2047 participants provided valid responses. The willingness to accept the COVID-19 vaccine among the participants was lower in the third wave (34.8%) than the first wave (44.2%). There were more concerns over vaccine safety in the third wave. Clerical/service/sales workers were less likely to accept the vaccine (adjusted odds ratio: 0.62, 95% confidence interval: 0.43–0.91). A high-level compliance of facemask wearing was found, and more people maintained social distancing and used alcohol hand rub in the third wave. Decreasing willingness to accept the COVID-19 vaccine may be associated with increasing concerns about vaccine safety and growing compliance of personal protection behaviours. The rush of vaccine development with higher risks of safety issues may jeopardize the public's trust and lower uptake rates. Education and favourable policy should be provided to the general working population for the vaccination, especially for those who are not professional and are frequently exposed to crowds.

Wang et al 2021

Vaccines, vol. 9, no.2

Keywords: COVID-19 vaccine; vaccine acceptance; vaccine hesitancy; vaccine safety; health behaviour; occupation

Evidence Level: 5B
Link: https://www.mdpi.com/2076-393X/9/1/62

Occupational Safety and Health and response to COVID-19 using the Fourth Industrial Revolution Technologies

Introduction: The world is currently facing an all-out crisis over the coronavirus disease 2019 (COVID-19). This review study aimed to determine the applications of the assistive intelligent technologies of the Fourth Industrial Revolution (Industry 4.0) in occupational safety and health (OSH) and response to COVID-19. Material and Methods: The given review was carried out from May to June 2020 and the search strategy was fulfilled in the databases of Google Scholar, PubMed, and Scopus. The keywords were collected from the Medical Subject Headings (MeSH) database and searched individually or in combination. Accordingly, the articles with the term “COVID-19” in their titles or abstracts and some other keywords such as “smart hospital, Industry 4.0, or intelligent technology” were selected and reviewed. Next, the titles, abstracts, and keywords of these studies were examined. To augment the sensitivity of the search, the keywords and the references of the selected articles were also surveyed. Then, the related studies were separated from the irrelevant ones and the duplicates were removed. Finally, the full texts of the selected articles were reviewed. Results: In this resepct, a total number of 175 studies, published in the databases of Google Scholar, PubMed, and Scopus in 2020 were retrieved. According to the inclusion and exclusion criteria and qualitative screening, 30 articles were included in this review. The assistive intelligent technologies such as artificial intelligence (AI), the internet of things (IoT), big data, virtual reality (VR), holography, cloud computing, autonomous robots (autorobots), three-dimensional (3D) scanning, 3D printing, and biosensors were established as useful ones to respond to COVID-19. In addition, AI and autorobots could be the most significant technologies of Industry 4.0 in the incoming articles. Conclusion: These technologies can thus help governments to identify, track, monitor, and treat patients and increase resilience in society and workplace environments during the COVID-19 pandemic.

Zaroushani V 2021
Journal of Health and safety at Work , vol.10, no.4

Keywords: Fourth Industrial Revolution, Covid-19, Epidemics, Assistive Technologies, Occupational Safety and Health, Intelligent Technologies
Evidence Level: 1A
Link: https://jhsw.tums.ac.ir/files/site1/user_files_0ab0c0/eng/sayeh-A-10-74-62-e743529.pdf