



MENTAL WELLBEING AND DIGITAL WORK

An evidence review



Scientific summary
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1. Background

Employee mental wellbeing is recognised as an important component of overall health. It is widely assumed that a poor work–life balance, an ‘always-on’ culture, and adoption of virtual working solutions negatively affect employees’ mental wellbeing, and thus reduce their ability to contribute meaningfully in both their personal and professional lives. For these reasons, the CIPD approached the Center for Evidence-Based Management (CEBMa) to undertake a rapid evidence assessment (REA) of the research literature to learn more about the nature and antecedents of work-related mental wellbeing.

2. About CEBMa

CEBMa is the leading authority on evidence-based practice in the field of management and leadership. We are an independent, non-profit foundation providing support and resources to managers, leaders, consultants, teachers, academics and others interested in evidence-based practice and decision-making. We are proud of the support of prominent universities including Stanford, Carnegie Mellon, the Australian National University, and the Free University of Amsterdam.

3. What is a rapid evidence assessment?

Evidence reviews come in many forms. One of the best-known types is the conventional literature review, which provides an overview of the relevant scientific literature published on a topic. However, a conventional literature review’s trustworthiness is often low: clear criteria for inclusion are often lacking and studies are selected based on the researcher’s personal preferences. As a result, conventional literature reviews are prone to severe bias. ‘Rapid evidence assessments’ (REAs) are a preferred alternative. This type of review uses a specific research methodology to comprehensively identify the most relevant studies on a specific topic, and selects studies based on explicit criteria. Independent reviewers use explicit criteria to assess the methodological

quality of the studies included. Unlike a conventional literature review, the REA is transparent, verifiable and reproducible, and, as a result, the likelihood of bias is considerably smaller.

4. Main question: What does the REA answer?

What is known in the scientific literature about work-related mental wellbeing?

Sub-questions are:

- 1 What is mental wellbeing and how can it be measured?
- 2 What are work-related antecedents (that is, predictors or drivers) of mental wellbeing, such as work–life balance, ‘always-on’ culture, digital working, workplace setting, and demographic factors?
- 3 What is known about the effect of interventions aimed at enhancing employee mental wellbeing?

5. Search process: How was the research evidence obtained?

The following databases were used to identify studies: ABI/INFORM Global from ProQuest, Business Source Premier from EBSCO, and PsycINFO from Ovid. The following generic search filters were applied to all databases during the search:

- scholarly journals, peer-reviewed
- published in 1980–2021 for meta-analyses and 2010–2021 for primary studies
- articles in English.

First, a search was conducted using terms such as ‘mental wellbeing’ or ‘mental health’ and terms related to the workplace. An additional search was conducted using terms such as antecedents, drivers, and predictors to identify longitudinal studies on the antecedents of mental wellbeing. Next, a search was conducted using terms such as ‘computer’, ‘digital’, ‘virtual’, and ‘online’ to find studies on the effects of digital work. Finally, the references listed in the retrieved studies were screened to identify additional studies for possible inclusion.

We conducted 11 different search queries which yielded 131 meta-analyses and 337 primary studies. An overview of all search terms and queries is provided in Appendix 1.

6. Selection process: How were studies selected?

Study selection took place in two phases. First, the titles and abstracts of the studies identified were screened for their relevance to this review. In case of doubt or lack of information, the study was included. Duplicate publications were removed. This first phase yielded 32 meta-analyses and 36¹ primary studies. Second, studies were selected based on a screening of their full text according to the following inclusion criteria:

- 1 **Type of studies:** focusing on quantitative, empirical studies.
- 2 **Measurement:** only studies in which relationships between mental wellbeing and its antecedents were quantitatively measured.
- 3 **Outcome:** only studies that provided an estimate of the risk of an adverse mental health outcome were included, that is, risk assessed via a validated scale or diagnosed by a health professional.
- 4 **Context:** focusing on studies related to workplace settings.

5 **Quality:** only meta-analyses and longitudinal studies that were graded level C or higher.

In addition, the following exclusion criteria were applied.

- studies on the nature of work-related stress and work pressure
- studies involving workers with pre-existing mental disorders
- studies on mental health problems in general as predictors of problems at work
- studies in work environments with (structural) psychosocial work stressors that increase risks for worker mental wellbeing, such as emergency departments, disaster relief units, and so on
- studies of populations with emotionally demanding work such as ambulance personnel, sex workers, disaster relief workers, fire fighters, and so on
- studies of a specific population, such as immigrant workers with family abroad, long-haul truck drivers, and so on.

This second phase yielded a total number of 25 meta-analyses and 36 primary studies. An overview of the selection process is provided in Appendix 2.

7. Data extraction: What data were extracted?

Data extraction involves the collation of the results of the studies included. From each study we extracted and interpreted information relevant to the review question, such as year of publication, research design, sample size, population (such as industry, type of employees), possible moderators or mediators, main findings, effect sizes, and limitations. An overview of all studies included is in Appendix 3.

8. Critical appraisal: How was the quality of the included studies judged?

Often, it is possible to find a scientific study to either support or refute a given theory or claim. Thus, it is important to determine which studies are trustworthy (that is, valid and reliable) and which are not. The trustworthiness of a scientific study is first determined by its methodological appropriateness. To determine the methodological appropriateness of the included study's research design, the classification system of Shadish et al (2002), and Petticrew and Roberts (2006) was used. In addition, a study's trustworthiness is determined by its methodological quality (its strengths and weaknesses). For instance, was the sample size large enough and were reliable measurement methods used? To determine methodological quality, all the studies included were systematically assessed on explicit quality criteria. Finally, the effect sizes were identified. An effect (such as a correlation, Cohen's d or odd ratio) can be statistically significant but may not necessarily be of practical relevance: even a trivial effect can be statistically significant if the sample size is big enough. For this reason, the effect size – a standard measure of the magnitude of the effect – was assessed. For a detailed explanation of how the quality of included studies was judged, see CEBMa Guideline for Rapid Evidence Assessments in Management and Organizations (Barends et al 2017).

9. Critical appraisal: What is the quality of the studies included?

Our search yielded 25 meta-analyses of which 14 included [controlled studies](#). In addition, this review identified 33 [prospective cohort studies](#) which were classified as level B or higher,

indicating a high level of trustworthiness. This indicates that the area of work-related mental wellbeing is well established and is based on a large body of (high-quality) research.

10. Main findings

Question 1a: What is mental wellbeing?

Mental wellbeing is a positive concept related to the social and emotional wellbeing of individuals. It is often used as a synonym for mental health (NHS 2021). According to the World Health Organization, mental health is '*an integral and essential component of health*' (WHO 2018). The WHO states that mental health is more than just the absence of mental health problems or disorders. Nevertheless, empirical studies on the antecedents or predictors of work-related mental wellbeing mainly focus on mental health problems, such as clinical symptoms of depression and anxiety. Epidemiological studies have estimated that the year prevalence² of mental health problems such as anxiety and depression among adults aged 18 or older in Western countries varies from 6% to 10%.³ For the working population, this number will most likely be somewhat lower, say 5%.⁴

Work stress

The Health and Safety Executive (the British national regulator for workplace health and safety) defines stress as '*the adverse reaction people have to excessive pressures or other types of demand placed on them*'. For example, employees may get stressed if they feel they don't have the skills or time to meet certain job demands. However, work stress affects employees differently – what stresses one person may not affect another. In addition, it is unclear whether work stress is an indication for mental health problems (Virtanen et al 2007). According to the European Agency for Safety & Health at Work, about 44% of British workers frequently experience work-related stress (OSHA Annual Report 2013). For this reason, most authors do not consider work stress to be an adequate indicator or symptomatic of poor mental wellbeing.

Burnout

The term 'burnout' was first described in the 1970s (Freudenberger 1974) and has since been regarded as a job-induced syndrome involving emotional exhaustion, depersonalisation, cynicism, and a sense of reduced personal accomplishment (Maslach 1976). In the past decade, however, it has become clear that the construct of burnout has serious limitations. First, what constitutes burnout (what it is and how it can be measured) is unclear. Second, the WHO has defined burnout as a syndrome resulting from '*chronic workplace stress that has not been successfully managed*'. However, contrary to this popular view, recent studies indicate that burnout is unlikely to be the job-induced syndrome it has been posited to be. Finally, the discriminant validity of the burnout construct (whether it is different from related constructs such as depression) is unsatisfactory. These fundamental problems mean that burnout is not diagnosable.⁵ For this reason, most authors consider symptoms of burnout such as emotional exhaustion to be an unreliable indication of poor mental health.

Clinical symptoms of depression and/or anxiety

Most studies included in this review only considered clinical symptoms of depression and/or anxiety – assessed via a validated medical scale or diagnosed by a medical professional – to be reliable indicators of an adverse mental health outcome. Other measures such as negative mood, work stress, feelings of frustration, or emotional fatigue are considered more transient states of psychological wellbeing and therefore unreliable indicators of an adverse mental health outcome.

Clinical depression is a common but serious mood disorder. Those who suffer from depression experience *‘persistent feelings of sadness and hopelessness and lose interest in activities they once enjoyed’* (American Psychiatric Association 2013). Aside from the emotional problems caused by depression, individuals can also experience physical symptoms such as chronic pain or digestive issues. To be diagnosed with depression, symptoms must be present for at least two weeks and cause significant distress or impairment in both occupational and social areas of functioning.

Experiencing occasional anxiety is a normal part of life (Mayo Clinic 2018). However, people with an anxiety disorder frequently experience intense, excessive and persistent worry or fear about everyday situations that interferes with daily activities, is difficult to control, and can last a long time. *The Diagnostic and Statistical Manual of Mental Disorders* (DSM-V, American Psychiatric Association 2013) distinguished six major categories of anxiety disorders, of which generalised anxiety disorder is the most common. According to large epidemiological studies, up to 34% of the population experience an anxiety disorder in their lifetime (Bandelow and Michaelis 2015).

Question 1b: How can work-related mental wellbeing be measured?

As explained above, most studies in this review used validated medical scales to assess mental health outcomes. An overview of the most widely used scales is provided below.

Table 1: Medical scales to assess mental health outcomes

SCL-90	The Hopkins Symptom Checklist-90-R (SCL-90-R) is a 90-item self-report psychometric instrument designed to assess a broad range of mental health problems. A large number of studies has demonstrated the scale’s reliability and validity, for this reason it is one of the most widely used measures of psychological distress. Often only subscales are used, such as the ‘Hamilton-subscale’ for depression (HAM-D, HRSD) or anxiety (HAM-A).
DASS	The Depression, Anxiety and Stress Scale (DASS) is a set of three self-report scales, each containing 14 items. In addition to the 42-item questionnaire, a short version, the DASS21, is available with only 7 items per scale. The DASS has been shown to have high internal consistency and to yield meaningful discriminations in a variety of settings.
BDI	The Beck Depression Inventory (BDI) is used to screen for depression and to measure behavioural manifestations and severity of depression. The BDI contains 21 self-report items that take approximately 10 minutes to complete. Validity and reliability of the BDI have been tested across populations worldwide.

CES-D	The Centre for Epidemiologic Studies Depression Scale (CES-D) was designed for use in the general population. This scale includes 20 self-report items, scored on a 4-point scale, taking about 20 minutes to administer, including scoring. It has been tested across genders and cultural populations and maintains consistent validity and reliability.
MHI-5	The Mental Health Inventory-5 (MHI-5) is an ultra-brief (5-item) but well-validated and reliable instrument for assessing mental health in the general population. The MHI-5 has a good specificity and sensitivity for detecting mental health problems in adults. Compared with other instruments, the MHI-5 is very brief and easy to administer.
GAD7	The Generalised Anxiety Disorder Assessment (GAD-7) is a self-administered patient questionnaire used as a screening tool and severity measure for generalised anxiety disorder. Studies have demonstrated the scale's reliability and validity.
PHQ9	The Patient Health Questionnaire (PHQ-9) is the depression module of the PRIME-MD diagnostic instrument for common mental disorders. It is a self-administered questionnaire primarily used to monitor the severity of depression, but can also be used to make a tentative diagnosis of depression. A large number of studies has demonstrated the scale's reliability and validity.

Box 1: How to interpret the studies' findings: a few words about risk

As explained, a study may find a significant predictor of employee mental wellbeing that may not necessarily be of practical relevance. Even trivial effects can be statistically significant. For this reason it is important to look at the *effect size* – a standard measure of the magnitude (impact) of the effect.

Relative risk

Studies in the realm of mental health often report effect sizes such as risk ratios (RR), odds ratios (OR), or hazard ratios (HR). This is because medical researchers are interested in knowing whether the presence of a risk factor (predictor) alters the risk of an outcome (such as mental health) as compared with the absence of that risk factor. It is worth noting that 'risk' carries a different meaning in science and statistics than in common language. In everyday lay terms risk is generally associated with a bad event; however, risk in statistical terms refers to the *probability that an outcome will occur*, regardless of whether it is a good or a bad outcome (BMJ 2020). For comparison of risks between groups, the risk ratio (RR), also referred to as relative risk, is the statistic of choice. Risk ratio is the ratio of risk of an outcome in one group (often a group exposed to a particular predictor or risk factor) relative to the risk of the outcome in another group (an unexposed group).

An RR of 1.0 indicates that there is no difference in risk between the groups being compared. An RR greater than 1.0 indicates an increase in risk for the exposed group compared with the unexposed. An RR less than 1.0 indicates a decrease in risk in the exposed group (Ranganathan et al 2015). For example, when a study finds an RR of 1.45 for the impact of extremely long working hours on the development of mental health problems, the employees in the study exposed to long hours had a 45% *higher risk* of developing mental health problems than the employees unexposed to long hours. Likewise, when a study finds an RR of 0.73 for the impact of social support from colleagues on the development of mental health problems, the employees in the study with social support had a 27% *lower risk* of developing mental health problems than the employees without social support.

The basic difference between an RR and an OR is that an OR is a ratio of two odds, whereas the RR is a ratio of two probabilities. The main difference between RRs and HRs is that RRs (like ORs) do not take into account the timing of an outcome – they only take into account the occurrence of the outcome at the end of the study (for example after two years). HRs on the other hand represent the risk of an outcome *at any given time* in the study.

At first glance, RRs, ORs and HRs look similar, but technically they are not the same. For example, only when the baseline risk of an outcome of interest is low (< 10%), an OR may be interpreted as an RR (Stare and Maucort-Boulch 2016). In this case, the outcome of interest is mental wellbeing, in particular mental health problems such as clinically relevant symptoms of depression or anxiety. Epidemiological studies have estimated that the year prevalence⁶ of mental health problems such as anxiety and depression among adults aged 18 or older in Western countries varies from 6% to 10%.⁷ Thus, the ORs reported in this review may be interpreted as RRs.

Absolute risk

To give a clearer idea of what the above forms of *relative risk* mean in practice, we have converted them into estimates of *absolute risk* in terms of the *additional days' absence per 100 employees per year* (ADY/100). The calculation of this metric is based on the Netherlands Mental Health Survey and Incidence Study-2 (NEMESIS-2), a large psychiatric epidemiological cohort study in the Dutch general population. This study found that mental health problems account for 13.4% of all absence days⁸ (de Graaf et al 2012). For depression and anxiety disorders this percentage is 8% and 4.3% respectively. In addition, workers with mental health problems on average tend to have 8.7 more days absent from work compared with workers with no mental health problems. For workers with clinical symptoms of depression and anxiety, this number is 19.9 and 5.5 respectively. Although these results should be interpreted with some caution, we consider these findings to be reasonably representative of other Western countries such as the UK (see also Alonso et al 2011).

As mentioned, the annual prevalence of depression and anxiety disorders among adults in Western countries is about 6–10%. For the working population, this number will most likely be somewhat lower, say 5%.⁹ Based on this number, we can now convert the ratios reported by the studies included in this review into absence days. For example, when a study finds an OR of 1.25 for the impact of extreme long working hours on the development of mental health problems, a

company with 100 employees that have extreme working hours may expect $.25 \times 5 = 1.25$ more employees with mental health problems. Consequently these 1.25 more employees result in an additional $1.25 \times 8.7 = 10.9$ absent days per year. In the overview of main findings below, this metric is referred to as ADY (additional days absent per year).

Question 2a: What are the most important risk factors of mental wellbeing?

Finding 1: Socio-demographic variables such as sex, level of education, socio-economic status and psychosocial variables are strongly associated with mental health (Level A).

In the past decades, large epidemiological studies have identified several risk factors that predispose adults to mental health problems. Aside from biological risk factors such as family history, genetic vulnerability, and traumatic life events, it was found that women are twice as likely to be diagnosed with mental health problems such as depression or anxiety disorder than men, especially young women between the ages of 25 and 35. Similar findings were found for young mothers, especially when they lack social support from family and friends. In addition, socio-demographic variables such as low income, low education, unemployment, poor health, and psychosocial stressors including lack of social support, financial strain, perceived discrimination, and social isolation have all been consistently shown to have a profound impact on the onset of mental health problems. Thus they are significant risk factors for mental health problems (see for example Silva et al 2016, Li et al 2011, and the studies mentioned in footnote 2). Finally, age was not found to be a risk factor, suggesting that older workers are not more likely to suffer from mental health problems (Ng and Feldman 2013).

Question 2b: What are the most important work-related risk factors that affect employees’ mental wellbeing?

Finding 2: There is a wide range of work-related antecedents/risk factors that affect employees’ mental wellbeing (level A/B).

In the past four decades, a large number of longitudinal studies have been published on the work-related antecedents/risk factors of mental health (see Appendix 3). Their findings provide useful insights for managers. An overview of all risk factors reported in the included studies is provided in Appendix 4. The most impactful risk factors are listed in Table 2. As explained in Box 1, the probability that a certain factor affects employee mental health is often expressed as a risk ratio, odds ratio, or hazard ratio. Where possible we have converted these ratios into absent days per year per 100 employees (ADY/100).

Table 2: Greatest risk factors in mental wellbeing at work

Risk factor	Effect size (min – max)	ADY/100 (estimate)	Level of evidence
Bullying	OR = 2.33 – 3.37	58–103	B
Working hours	HR 2.67 – 2.84 (fem)	80	B

Perceived injustice	OR = 1.30 – 2.84	13–80	B
Sense of coherence	HR 1.42 – 2.20	18–52	B
Effort–reward imbalance	HR = 1.33 – 2.0	14–44	B
Organisational change	HR = 1.21 – 1.85	9–37	B
Control (job, employee, decision)	HR = 1.28 – 1.48	12–21	B
Social support	OR = 1.34	15	B
Demands (job, work, psychological)	HR = 1.04 – 1.30	2–13	B

Below we provide a short explanation of each factor. It should be noted that when employees experience more than one risk factor, their risk to develop mental health problems increases.

Bullying

Unlike the term ‘harassment, which carries a specific meaning, bullying is not defined in UK law, but it nonetheless is a major discussion point in employment policy and practice, and features strongly in research.¹⁰ Bullying refers to situations where a person repeatedly and over a period of time is exposed to negative acts (that is, constant abuse, harassment, offensive remarks or teasing, ridicule or social exclusion) on the part of supervisors, co-workers, or subordinates. The negative impact of workplace incivility on individual employees, teams and organisations is indisputable. Indeed, a recent review by CEBMa identified a large number of studies confirming that workplace incivility is related to an array of health-related outcomes including anxiety, depression, burnout, frustration, negative emotions, and physical symptoms (Bowling and Beehr 2006, Demir et al 2014, Escartín 2016, Hershcovis and Barling 2010, Hodgins et al 2014, Reio and Ghosh 2009, Verkuil et al 2015). Large prospective cohort studies included in the current review confirmed this finding and found a large impact of bullying on the development of mental health problems such as anxiety and depression (Butterworth et al 2016, Finne et al 2014, Nielsen 2012b, Einarsen and Nielsen 2015).

Working hours

In the past decades, numerous studies have found sufficient evidence to raise serious concerns about the health risks to employees with long working hours (for example Sparks et al 1997, Spurgeon et al 1997, Bannai and Tamakoshi 2014). Prospective cohort studies included in this review confirm this finding and suggest that long working hours may be one of the most prominent risk factors for developing mental health problems (Laaksonen et al 2012, Ng and Feldman 2008, Virtanen 2011). However, although overtime workers of both genders were found to have a higher prevalence of anxiety and depressive disorders compared with those working normal hours, working long hours is particularly a risk factor for women (Shields 1999, Virtanen 2011, Kleppa et al 2008).

Perceived injustice

Justice (or fairness) is a fundamental concept that takes many forms in different disciplines. In most cases, the construct does not refer to a universal or absolute form of justice, but fairness perceptions, particularly on the part of employees. The academic literature distinguishes three types of justice: distributive justice (outcomes), procedural justice (process), and interactional justice (interaction). This distinction is also reflected in what is considered fair leadership: distributing work and rewards fairly and treating workers equally (Finne et al 2014). Controlled longitudinal studies have found that perceived organisational injustice and unfair leadership are strongly associated with adverse mental health outcomes (Finne et al 2014, Inoue et al 2013, Bernhard-Oettel 2020). In addition, a meta-analysis found that mental health problems were most pronounced for employees experiencing distributive injustice (Robbins et al 2012). A possible explanation for this finding is that distributive justice is the form of organisational justice most closely linked to outcomes and rewards.

Sense of coherence

Sense of coherence (SOC) is a multi-dimensional construct that refers to the belief that what happens in one's life is comprehensible (rational, predictable, understandable), manageable (through adequate and sufficient resources), and meaningful (Antonovsky 1993). Work-related sense of coherence (work-SOC) is *'the perceived comprehensibility, manageability and meaningfulness of an individual's current work situation'* (Vogt et al 2013). Although research on work-SOC is still in its early stages, several prospective longitudinal studies have found that higher levels of SOC predict greater psychological resilience (Eshel et al 2017, Kimhi et al 2017, Surtees et al 2006). It is argued that employees with a strong sense of coherence perceive that they can mobilise additional resources, such as time, budget, and good relationships with colleagues and supervisors, which may help them to cope with unexpected, adverse events. Not surprisingly, a large controlled longitudinal study found that employees with a weaker SOC were at a higher risk of perceiving organisational change negatively and had an elevated risk of developing mental health problems (Pahkin et al 2011).

Effort–reward imbalance

Another influential model that is widely used to explain adverse health outcomes is the effort–reward imbalance model. This model posits that workers have a higher risk of deteriorating health when high efforts at work are accompanied by low rewards (in terms of monetary gratification, career opportunities, esteem, respect and job security). Indeed, evidence from prospective epidemiological studies have found that long exposure to a large effort–reward imbalance increases the risk of stress-related mental health disorders, such as depression and anxiety (Ndjaboue et al 2017a, Ndjaboue et al 2017b, Rugulies et al 2013). A recent two-year prospective study found that this negative effect on mental health is most pronounced among employees that are overcommitted (Hinsch et al 2019).

Organisational change

Organisational change and its effect on workers' health is an important theme in contemporary management literature. However, a lack of a clear definition of what organisational change entails has led to inconsistency in this area. Partly for this reason, researchers have focused on the health effects of specific types of organisational change, such as the impact of mergers,

downsizing and restructuring. Several studies have found that these types of change, in particular when perceived as negative by employees, substantially increase risk of mental health problems (Fløvik et al 2019, Väänänen 2011). In addition, multiple and/or repeated organisational change tends to increase this risk (Finne et al 2014, Finne et al 2016, Loretto et al 2010).

Control

One of the most influential theories in the realm of management and organisation is the 'job demand control' model developed by the American sociologist Robert Karasek in the late 1970s. This model, also referred to as the demand control support model, states that employee health may be negatively associated with job demands and positively associated with control and social support at work. Although the model continues to be debated, large epidemiological studies have provided fairly consistent evidence that workplace control is indeed positively associated with health outcomes. Workplace control does not only concern 'decision' control (that is, workers' influence on decisions regarding work tasks, choice of co-workers, or contacts with clients), but also concerns control over work intensity (that is, worker influence on working hours, pace, and breaks). A large number of controlled longitudinal studies included in this review found that workers that experience little or no workplace control are indeed more likely to develop mental health problems compared with workers that experience high levels of empowerment and workplace control (Egan et al 2007, Finne et al 2014, Finne et al 2016, Fløvik et al 2019, Joensuu 2010, Laaksonen et al 2012, Loretto et al 2010, Niedhammer et al 2020, Strazdins et al 2011). Lack of control may also be an important factor in the negative associations found between job insecurity and the development of mental health problems.

Social support

Social support is referred to as *'the extent to which a job provides opportunities for getting assistance and advice from either supervisors or co-workers'* (Karasek et al 1998). Most authors distinguish different sources of social support, such as colleagues, peers, supervisors, friends, or family. A recent review conducted by CEBMa for the CIPD has shown that social support is a strong predictor for [psychological resilience](#) (for example Dyrbye et al 2010, Jain et al 2012, de Terte et al 2014). Of these sources, colleagues were found to have the largest positive impact. In line with that review, several controlled longitudinal studies identified by the current review found that lack of social support from colleagues, supervisors, or sources outside of work such as family and friends, is an important risk factor for developing mental health problems (Egan et al 2007, Finne et al 2014, Finne et al 2016, Joensuu 2010, Laaksonen et al 2012, Marchand and Blanc 2011, Niedhammer et al 2020, Peters et al 2018). Note that some of the odds ratios in the table in Appendix 4 are below 1, indicating that strong social support *reduces* the risk of developing mental health problems.

Demands

Demands refers to all aspects of work that require sustained physical and mental effort, such as time pressure, work volume, and high/challenging goals. As hypothesized by the demand control model mentioned above, a large number of epidemiological studies have shown that both high physical and high psychological work demands substantially increase the risk of developing mental health problems (Egan et al 2007, Fløvik et al 2019, Laaksonen et al 2012, Loretto et al 2010, Marchand and Blanc 2011, Niedhammer et al 2020, Strazdins et al 2011).

Question 2c: What is the effect of digital work on employees' mental wellbeing?

Finding 3: There is no direct evidence of an association between digital work and mental wellbeing.

Although the increasing volume of email, text messages, video meetings and other technology-enabled communication are widely regarded as a growing stressor in worker lives, this review did not find direct evidence that digital work affects employees' mental health. This is consistent with the outcome of recent systematic reviews that found no epidemiological studies on this topic (Dragano and Lunau 2020, La Torre et al 2019, Schlachter et al 2018).

Given the increasing number of studies on the possible negative effects of work-related technology, this may come somewhat as a surprise. However, primary studies on this topic often lack methodological rigor, as the majority focus on the association of IT use with stress or burnout and are cross-sectional (Dragano and Lunau 2020). In addition, findings are often mixed or inconsistent. For example, there is no doubt that the increasing volume of email may cause stress among some workers (for example Mark 2012), yet some studies suggest that the use of modern communication technology also affords workers flexibility and control over their work and as such positively affects work–family balance (see for example Hill et al 2001, Valcour and Hunter 2005, Leung and Zhang 2017). Still, digital work and the overload of emails in particular may function as a symbol for workers' perceptions of work overload (Barley et al 2011). As a result, managers may focus on the negative effects of digital work while overlooking the role played by above-mentioned risk factors, such as lack of control, high work demands, lack of social support, and perceived effort–reward imbalance in worker-experienced work stress.

Finding 4: There is indirect evidence that digital work can negatively affect employees' mental wellbeing (Level B).

Although this review did not find direct evidence that digital work may affect workers' mental health, it can be argued that modern communication technology may be an antecedent of other well-established work-related risk factors. Indeed, several studies have found associations between the use of email, text messages, video meetings, and other technology-enabled communications and risk factors of mental health (La Torre et al 2019). Examples are provided below.

Lack of control

Cross-sectional studies indicate that an overload of emails is often associated with a lack of control. For example, it was found that some workers explicitly associate the volume of email they receive with a loss of control, which they articulate in terms of two anxieties: the fear of falling behind in one's work and the fear of missing important information (Barley et al 2011). As mentioned above, a large number of controlled longitudinal studies found that workers who experience little or no control are more likely to develop mental health problems.

High demands

The organisational requirement to work with new technologies, respond to emails in a timely fashion, and be constantly accessible is considered by most workers to reflect increased psychological work demands (Day et al 2012, Barley et al 2011, Stadin et al 2016, Dragano and Lunau 2020, La Torre et al 2019). A recent epidemiological study found that repeated exposure to high ICT demands at work was associated with suboptimal self-rated health at two-year follow-up (Stadin et al 2019). As mentioned above, a large number of epidemiological studies consistently show high psychological work demands to increase the risk of developing mental health problems.

Long working hours

Digital working is likely to contribute to longer work hours. For example, due to modern communication technology, workers can handle their email both at work and at home – in the evening, early in the morning, or on weekends. Indeed, some studies suggest that the volume of email and the demand for employees to participate in calls and videoconferences tend to increase working hours (for example Barley et al 2011) and pressure employees to work outside the traditional nine-to-five workday (Ng and Feldman 2008). As a result, an ‘always-on’ culture is emerging with boundaries between work life and personal life becoming blurred (Schlachter et al 2018). Long working hours and working outside conventional working hours are prominent risk factors for developing mental health problems, particularly for women.

Question 3: What is the effect of interventions aimed at enhancing employees’ mental wellbeing?

Finding 5: The evidence of the effect of interventions aimed at enhancing employees’ mental wellbeing is mixed and sometimes inconsistent.

This review identified 12 systematic reviews and/or meta-analyses of studies examining the effect of interventions aimed at enhancing employee mental wellbeing. Most of these interventions concerned prevention strategies aimed at depression and anxiety and involved a wide range of techniques, such as cognitive behavioural therapy (CBT), stress prevention, coping skills, mindfulness, physical exercise, problem-solving, work health promotion, positive psychology, and resilience training. The strength of the evidence supporting these interventions is mixed and sometimes inconclusive.

Strong evidence was found for the effectiveness of improving workers’ mental health literacy (Lee et al 2014), stress management interventions based on cognitive behavioural therapy (Joyce et al 2016), resilience training (for example, Robertson et al 2015, Joyce 2018) and contemplative interventions such as mindfulness (Bartlett et al 2019, Slemp et al 2019, Lomas et al 2017); and for the delivery of such interventions through digital channels (Stratton 2017). Contemplative interventions had small to moderate effects, and CBT and stress management approaches had small short-term effects. We do not know about the effect sizes of mental health literacy interventions. Resilience training had moderate to large impacts on employees’ psychological resilience. The effectiveness of resilience training is contingent on various design and delivery characteristics (Cleary et al 2018; see also the CIPD/CEBMA [evidence review of the scientific literature on employee resilience](#)).

Finding 6: The best way to enhance employees' mental wellbeing is targeting risk factors.

This review identified a range of risk factors that affect employee mental wellbeing. An overview of the most impactful risk factors is provided under Finding 2. All factors listed are 'actionable': the organisation determines employee working hours and work demands; and its management provides employee supports, grants them influence and control over their daily work, and safeguards a fair balance between efforts and rewards. As such, targeting these risk factors has the highest probability of enhancing employees' mental wellbeing.

11. Conclusion

In the past decades, a large number of high-quality studies have been published on the antecedents of workplace mental wellbeing. These studies consistently demonstrate that employees' mental wellbeing is affected by a wide range of work-related antecedents. This review found that job control, work demands, social support, effort–reward imbalance, organisational change, perceived (in)justice, bullying, sense of coherence, and working hours are positive or negative 'risk factors' that tend to have the largest impact on employees' mental health. Targeting these risk factors is the best way to enhance employees' mental wellbeing.

Although epidemiological studies on the association between digital work and adverse mental health outcomes are lacking, it can be argued that modern communication technology may be an antecedent of these risk factors. In particular, we find indirect evidence that digital work can lead to a lack of control, high work demands and long working hours, which are important factors in mental wellbeing.

Finally, there is some evidence for the effectiveness of workplace mental health interventions, such as improving workers' mental health literacy interventions, have an impact, but our review could not establish how large.

12. Limitations

This REA aims to provide a balanced assessment of what is known in the scientific literature about antecedents of work-related mental wellbeing by using the systematic review method to search and critically appraise empirical studies. To be 'rapid', concessions were made in relation to the breadth and depth of the search process, such as the exclusion of unpublished studies, the use of a limited number of databases and a focus on empirical research published in the past 20 years. As a consequence, some relevant studies may have been missed.

A second limitation concerns the critical appraisal of the studies included, which did not incorporate a comprehensive review of the psychometric properties of their tests, scales, and questionnaires.

A third limitation concerns the focus on meta-analyses and longitudinal studies. As a consequence, new, promising findings from cross-sectional studies may have been missed.

Given these limitations, care must be taken not to present the findings of this REA as conclusive.

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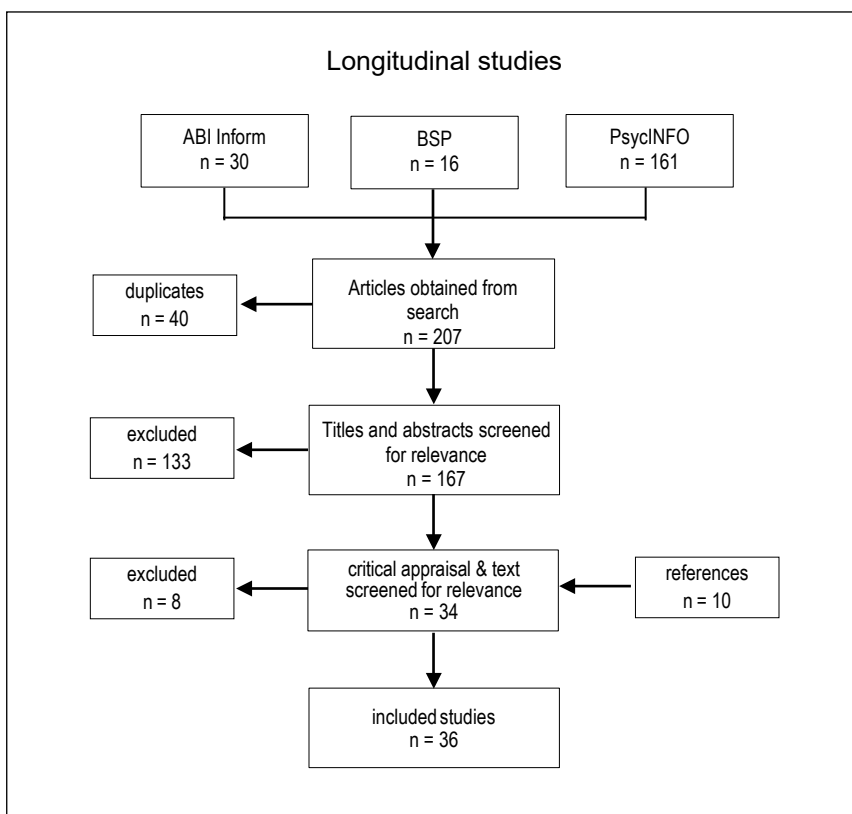
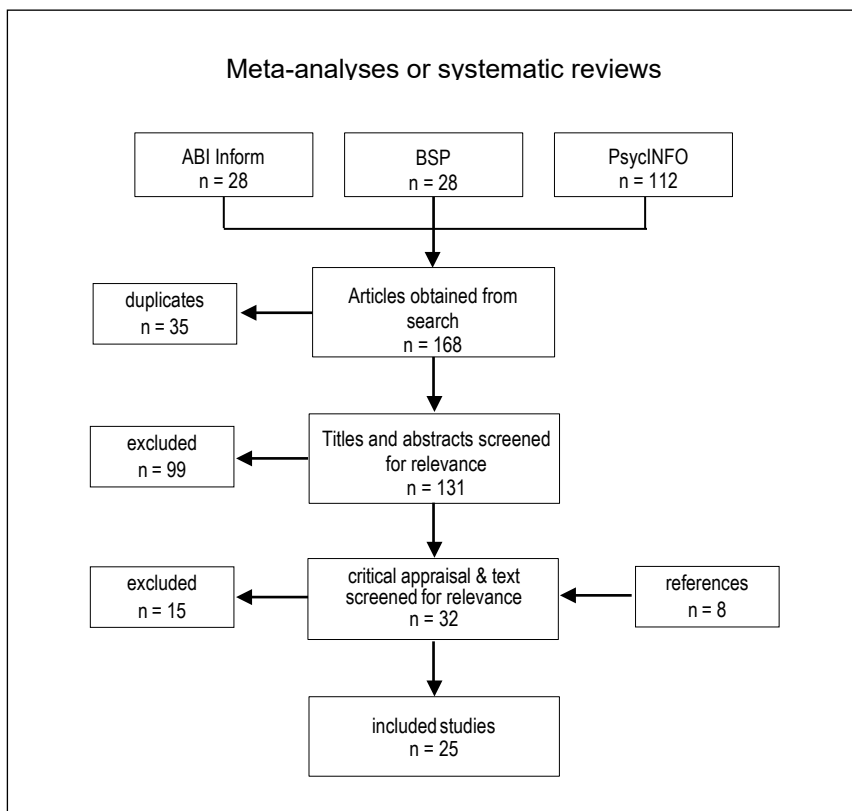
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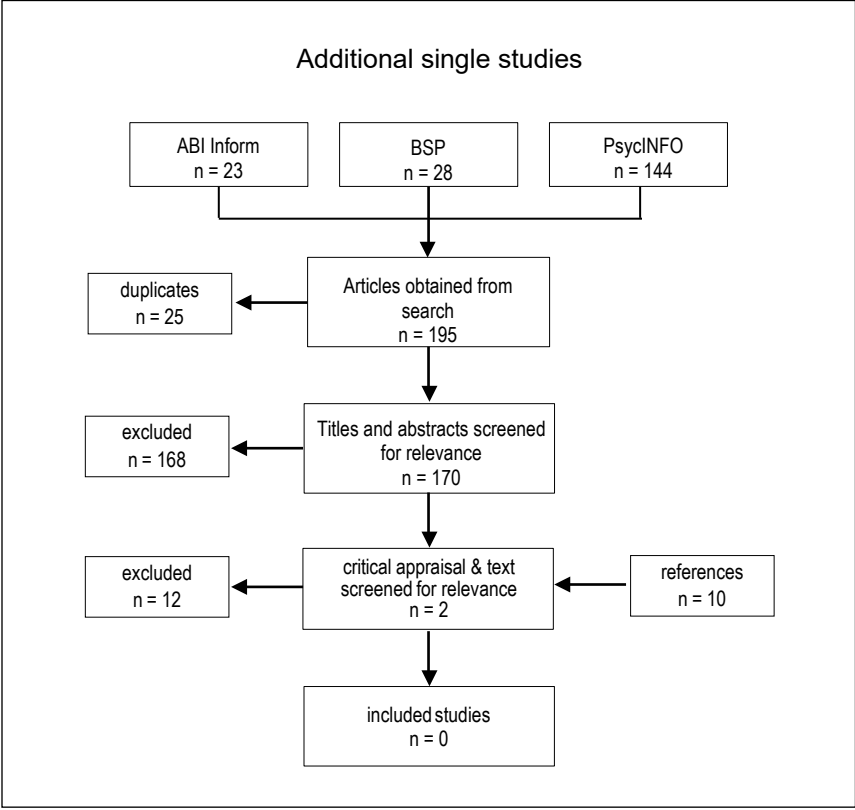
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Appendix 1: Search terms and hits

ABI/Inform Global, Business Source Elite, PsycINFO peer reviewed, scholarly journals, Nov 2019			
Search terms	ABI	BSP	PSY
S1: TI('mental wellbeing' OR 'mental well-being') OR AB('mental wellbeing' OR 'mental well-being')	313	252	2,131
S2: TI('mental health') OR AB('mental health')	10,416	9,394	131,196
S3: S1 OR S2	10,629	9,590	138,500
S4: TI(employe*) OR TI(work*)	86,434	101,276	110,060
S5: S3 AND S4	1,038	927	5,973
S6: S5 AND filter MAs or SRs, limit > 2000	28	28	112
S7: S5 AND filter prospective AND longitudinal studies, limit > 2010	–	–	120
S8: S5 AND ti(antecedent*) OR ti(predict*) OR ti(driver*) OR ti('risk factor*'), limit > 2010	30	16	81
S9: S7 OR S8	30	16	161
S10: TI(computer* OR digital* OR virtual* OR tele* OR 'remote work*' OR technostress OR 'digital stress') OR AB(computer OR digital* OR virtual* OR online OR tele* OR 'remote work' OR technostress OR 'digital stress')	108,993	216,239	193,915
S11: S5 AND S10 AND filter quantitative studies, limit > 2010	23	28	144

Appendix 2: Study selection





Appendix 3: Data extraction table

Effect size	Small	Medium	Large
Standardized mean difference: d, Δ, g	≤ .20	.50	≥ .80
ANOVA: η^2 , ω^2	≤ .01	.06	≥ .14
Chi-square: ω^2	≤ .10	.30	≥ .50
Correlation: r, ρ	≤ .10	.30	≥ .50
Correlation: r^2	≤ .01	.09	≥ .25
Simple regression: β	≤ .10	.30	≥ .50
Multiple regression: β	≤ .20	.50	≥ .80
Multiple regression: R^2	≤ .02	.13	≥ .26

Author & year	Design & sample size	Sector / population	Main findings	Effect sizes	Limitations	Level
1 Bartlett, 2019	meta-analysis, includes RCTs general mh k = 23 psych distress k = 8 anxiety k = 4 depression k = 8	Employees in range of sectors from USA, Canada, Australia, Colombia, Denmark, Italy, Netherlands, Scotland and Taiwan	1 Results indicate beneficial effects following training for mindfulness for the mental health indicators: anxiety (a) and psychological distress (b). No conclusions could be drawn for depression due to publication bias.	1a: g = .62 (moderate) 1b: g = .69 (moderate)	No serious limitation.	AA

2 Bernhard-Oettel, 2020	prospective (2-year) cohort study n = 6,997	Swedish workers participating in the Swedish Longitudinal Occupational Survey of Health (SLOSH) study	<p>1 There is a direct positive effect of job insecurity perceptions on depressive symptoms at the same point in time (H1).</p> <p>2 There is a direct negative effect of procedural justice on depressive symptoms at the same point in time (H3).</p> <p>3 There is no indirect effect of job insecurity perceptions on depressive symptoms via procedural justice at the same point in time (H4, fixed effect).</p> <p>4 There is a direct positive effect of job insecurity perceptions on depressive symptoms two years later (H5).</p> <p>5 There is a direct negative effect of procedural justice on depressive symptoms two years later (H6).</p> <p>6 There is an indirect positive effect of job insecurity perceptions on depressive symptoms via procedural justice two years later (H7).</p> <p>Thus, job insecurity perceptions were associated with a more negative evaluation of employers' procedural justice perceptions, which in turn were associated with depressive symptoms.</p>	<p>1: r = .30</p> <p>2: r = -.32</p> <p>3: r = -.17*</p> <p>4: r = .32</p> <p>5: r = -.35</p> <p>6: r = ns</p> <p>*multilevel analysis showed only significant outcomes for fixed effects models</p>	No serious limitations	B
3 Bjorklund, 2013	prospective (18 months) cohort study n = 577	Employees from two male-dominated middle-sized paper mill companies in Sweden	<p>1 A decrease in work motivation led to an increased risk of experiencing depression.</p>	Unclear (% for different change points are reported)	Limited generalisability (specific industry, male-dominated sample)	B
4 Bronkhorst, 2015	systematic review k = 21	Employees working in health care organisations	<p>1 Perceptions of a good organisational climate were significantly associated with positive employee mental health outcomes (lower levels of burnout, depression, and anxiety).</p> <p>More specifically, the findings indicate that group relationships between co-workers are very important in explaining the mental health of health care workers. There is also evidence that aspects of leadership and supervision affect mental health outcomes. Relationships between communication, or participation, and mental health outcomes were less clear.</p>	not reported	<p>The definition of mental health is rather broad</p> <p>Climate construct ill-defined</p> <p>Only studies published in peer-reviewed journals were included.</p>	C/D

5 Butterworth, 2016	cross-sectional design (part of larger longitudinal cohort study) n = 1,466	Residents of Canberra and Queanbeyan (Australia)	1 Workplace bullying, both, current (a) as well as previous experience of being bullied in the current workplace (b), is associated with increased risk of depression. 2 Workplace bullying, both, current (a) as well as previous experience of being bullied in the current workplace (b), is associated with increased risk of anxiety.	1a: OR=2.03 95%CI [1.41; 4.11] 1b: OR=1.79 95%CI [1.06; 3.02] 2a: OR=3.39 95%CI [1.59; 7.29] 2b: OR=1.79 95%CI [1.06; 3.68]	Self-reported measure of workplace bullying.	C
6 Carolan, 2017	meta-analysis, includes RCTs k = 21 n = 5,260	General working population, different countries (US, Germany, Netherlands, UK, Australia and Sweden)	1 Digital mental health interventions* had a statistically significant effect post-intervention on psychological wellbeing** * Most interventions were based on cognitive or cognitive behaviour therapy, stress and coping, mindfulness, social cognitive theory, problem-solving training, positive psychology, or acceptance and commitment therapy. The mean duration of the intervention was 7.6 weeks. ** The definition of psychological wellbeing seems rather broad (the included keywords included, for example, stress, resilience, mental health/illness/disorder, depression, anxiety, burnout...)	1: g = .37 95%CI [0.23; 0.50]	Broad definition of psychological wellbeing	AA
7 Clark, 2016	meta-analysis k = 18 n = 5,917	Unclear	1 Workaholism is related to decreased mental health*. * emotional/mental health included the related constructs of [lack of] psychological strain and psychological distress, emotional wellbeing, and mental health.	1: $\rho = -.39$ 95%CI [-0.46; -0.31]	The study included student samples and samples of individuals with clinical disorders.	C
8 Dietrich, 2012	systematic review k = 1	n/a	Study aimed to identify evidence-based indicated/secondary prevention strategies for depression in the workplace. A total of 9,173 articles were found, but only one study met all inclusion criteria.	n/a	no serious limitations	A

9 Egan, 2007	systematic review k = 18	Employees in a range of occupations.	<p>Systematic review of the health and psychosocial effects of increasing employee participation and control through workplace reorganisation.</p> <p>1 Improvement of employee control, decreased demands and increased support had beneficial effect on employee mental health, including reduction in anxiety and depression.</p>	not reported	Broad definition of mental health outcomes (general mental health, absenteeism, healthy lifestyle...).	A
10 Finne, 2014	prospective (2 years) cohort study n = 3,644	Employees recruited from 48 Norwegian organisations, representing a wide variety of job types.	<p>The study investigated prospectively a broad set of specific psychological and social work factors as predictors of potentially clinically relevant mental distress (anxiety and depression).</p> <p>1 The most consistent risk factors were role conflict (a), followed by experienced bullying (b), observed bullying (c), rumours of change (d), and procedural injustice (e).</p> <p>2 The most consistent protective factors were support from immediate superior (a), fair leadership (b), and positive challenge (c), followed by decision control (d), role clarity (e), empowering leadership (f), predictability during the next month (g), commitment to organisation (h), human resource primacy (i), and social climate (j).</p>	<p>1a: OR = 2.08 99%CI [1.45; 3.00] 1b: OR = 3.37 99%CI [1.45; 7.82] 1c: OR = 2.41 99%CI [1.28; 4.52] 1d: OR = 1.32 99%CI [1.06; 1.63] 1e: OR = 1.30 99%CI [1.01; 1.66]</p> <p>2a: OR = 0.56 99%CI [0.43; 0.72] 2b: OR = 0.52 99%CI [0.40; 0.68] 2c: OR = 0.60 99%CI [0.41; 0.86] 2d: OR = 0.58 99%CI [0.39; 0.86] 2e: OR = 0.57 99%CI [0.41; 0.78] 2f: OR = 0.64 99%CI [0.51; 0.81] 2g: OR = 0.65 99%CI [0.47; 0.90] 2h: OR = 0.65 99%CI [0.50; 0.86] 2i: OR = 0.53 99%CI [0.38; 0.74] 2j: OR = 0.43 99%CI [0.31; 0.61]</p>	<p>anxiety and depression scales used measured symptoms experienced during last week</p> <p>Climate construct ill-defined</p>	B

11 Finne, 2016	prospective (2 years) cohort study n = 4,158	Employees were recruited from 63 Norwegian organisations, representing a wide variety of job types.	<p>1 Work factors (baseline exposure) were related to mental distress two years after at the individual level: role conflict and rumours of change were associated with increased mental distress, while decision control, positive challenge, fair leadership, support from immediate superior, commitment to organisation, social climate, and human resource primacy predicted lower levels of mental distress. Such relationship was not found for the factor 'predictability during the next month'. At the department level, none of the work factors were statistically significantly related to subsequent mental distress.</p> <p>2 Work factors (average exposure: $[T1+T2] / 2$) were related to mental distress two years after at the individual level and the department level. Role conflict and rumours of change were associated with a higher level of mental distress, while decision control, positive challenge, fair leadership, support from immediate superior, commitment to the organisation, predictability during the next month, social climate, and human resource primacy were related to a decrease in the level of mental distress.</p>	Not reported	<p>anxiety and depression scales used measured symptoms experienced during <i>last week</i></p> <p>climate construct ill-defined</p> <p>missing values were replaced with means</p>	B
12 Fløvik, 2019	prospective (2 years) n = 5,297	Employees were recruited from 66 Norwegian organisations, representing a wide variety of job types	<p>The objective of the study was to examine the relationship between exposure to separate, multiple or repeated organisational change at both individual- and work-unit level and subsequent clinically relevant mental distress among employees two years after change had taken place.</p> <p>1 Separate change: At the individual level, company reorganisation (F1a), downsizing* (F1b) and layoffs* (F1c) were prospectively associated with mental distress. At work-unit level, company reorganisation (F1d) was associated with mental distress, but the statistically significant association diminished when adjusting for the work factors job control, job demands and support.</p> <p>2 Multiple changes: At the individual level, exposure to multiple organisational changes at baseline were associated with mental distress at follow-up.</p> <p>3 Repeated change: At the individual level, exposure to repeated organisational change was associated with mental distress at follow-up.</p> <p>* 'downsizing' refers to a temporary termination of contract with the chance of rehiring, while 'layoffs' refers to a permanent termination of the job contract.</p>	<p>1a: OR = 1.29 95%CI [1.01; 1.65]</p> <p>1b: OR = 1.51 95%CI [1.12; 2.03]</p> <p>1c: OR = 1.46 95%CI [1.01; 2.12]</p> <p>1d: OR = 1.46 95%CI [1.04; 2.04]</p> <p>2: OR = 1.75 95%CI [1.28; 2.38]</p> <p>3: OR = 1.84 95%CI [1.29; 2.63]</p>	<p>anxiety and depression scales used measured symptoms experienced during <i>last week</i></p>	B

13 Hinsch, 2019	prospective (2 year) cohort study n = 2,060	German employees participating in the Third German Sociomedical Panel of Employees	1 There was no direct effect of effort–reward imbalance (ERI) on mental health, but ERI affected mental health problems indirectly through overcommitment.	1: only SEM coefficients are reported, but the ORs seem rather low	small cohort (40–54 years)	B
14 Hunefeld, 2020	systematic review k = 28	Unclear	1 Temporary agency work was not consistently related to all investigated types of mental health impairments. However, when focusing on specific outcomes and comparing temporary agency workers with permanent employees, consistent evidence regarding higher levels of depression and fatigue among temporary agency workers was found.	not reported	The definition of mental health outcomes is broad (includes, for example, depression or anxiety, as well as burnout, fatigue, stress)	C
15 Inoue, 2013	prospective (1 year) cohort study n = 1,017	Employees from five branches of a manufacturing company in Kanto region, Japan	1 Low procedural justice was significantly associated with a higher risk of psychological distress at follow-up among non-permanent female employees (after adjusting for demographic characteristics, psychological distress, and neuroticism at baseline). 2 No significant association of procedural justice or interactional justice with psychological distress at follow-up was observed among permanent male or female employees.	1: OR = 2.84 95%CI [1.19; 6.75]	Limited generalisability (focus on a specific region)	B
16 Izawa, 2016	prospective (1 year) cohort study n = 1,017	Japanese male workers	1 High baseline levels of <i>overgeneralisation of stress</i> * were significantly associated with new-onset depressive symptoms, during the one-year follow-up period. 2 High baseline levels of <i>insensitivity to stress</i> ** were significantly associated with antidepressant use, during the one-year follow-up period. 3 No effect was found for <i>excessive self-efficacy for managing stress</i> *** and <i>evasive attitude towards stress</i> **** * for example, <i>I should not complain because everyone experiences stress.</i> ** for example, <i>I am far from being stressed.</i> *** for example, <i>I would never be overwhelmed by stress.</i> **** for example, <i>It is better to ignore stress.</i>	1: OR = 2.66 95%CI [1.54; 4.59] 2: OR = 4.91 95%CI [1.22; 19.74]	Limited generalisability (focus on a specific region, male sample)	B

17 Jensen, 2010	prospective (4 years) cohort study n = 13,423	Public service employees in Aarhus County, Denmark	1 A low satisfaction with work climate (psychosocial working conditions) was associated with an increased risk of any mental health disorder: depressive disorders (a), anxiety disorders (b), and reaction to severe stress and adjustment disorders (c). The lower the satisfaction level, the higher the risk of mental health disorders.	1 (combined): HR = 1.71 95%CI [1.04; 2.82] 1a: HR = 1.72 95%CI [0.86; 3.44] 1b: HR = 1.21 95%CI [0.59; 2.49] 1c: HR = 1.91 95%CI [0.80; 4.56]	Climate construct not defined and measured with only one item	B
18 Joensuu, 2010	prospective (15 years) cohort study n = 13,868	Forest company employees in Finland	1 High skill discretion* was associated with a reduced risk of hospital admission for all mental disorders. 2 High decision authority was associated with an elevated risk of hospital admission for all mental disorders. 3 Diagnosis-specific analysis: High skill discretion tends to associate with a reduced risk of both depressive (a) and non-depressive non-alcohol-related (b) mental disorders. High decision authority was a risk factor for alcohol-related (c) and depressive disorders (d). 4. Good co-worker support was associated with a reduced risk of non-depressive non-alcohol-related mental disorders. 5. Supervisor support was not associated with any mental disorders. * for example, <i>Is your work monotonous or variable?; Can you use your knowledge and skills in your work?</i>	1: HR=0.74 95%CI [0.58; 0.95] 2: HR=1.48 95%CI [1.17; 1.87] 3a: HR=0.59 95%CI [0.37; 0.92] 3b: HR=0.60 95%CI [0.39; 0.94] 3c: HR=1.62 95%CI [1.19; 2.22] 3d: HR=1.70 95%CI [1.12; 2.60] 4: HR=0.61 95%CI [0.41; 0.90]	No serious limitations	B
19 Jolivet, 2010	retrospective (2 years) cohort study n = 3,316	Female registered nurses and nursing aids working in 190 work units in seven French university hospitals	1 Poor relations between workers within work units were associated with higher depressive symptoms, independently of perceived effort–reward imbalance (ERI). 2 Low level of communication between workers in the unit was associated with individual perceptions of ERI and indirectly associated with depressive symptoms. 3 Understaffing and non-respect of planned days off and vacations were associated with perceived ERI but these organisational constraints were not associated with depressive symptoms.	only unstandardised betas are reported	Limited generalisability (female sample)	C

20 Joyce, 2016	systematic review, includes RCTs k = 20	Working population	<p>1 Impact of mental health interventions on symptoms reduction:</p> <p><i>Strong evidence</i> was found for: (a) cognitive behavioural therapy (CBT)-based stress management interventions (SMI) (b) exposure therapy for established anxiety disorders and post-traumatic stress disorder (c) CBT for established depression or anxiety disorder (d) medication.</p> <p><i>Moderate evidence</i> was found for: (e) physical activity.</p> <p><i>Limited (or contradictory) evidence</i> was found for: (f) workplace health promotion (g) screening (h) counselling.</p> <p><i>Strong evidence against</i> was found for: (i) psychological debriefing following a potentially traumatic event in the workplace.</p>	not reported	The definition of 'symptoms reduction' could have been more specific	AA
21 Kim, 2016	systematic review of prospective longitudinal studies k = 20	n/a	<p>1 Job insecurity was significantly related to a higher risk of depressive symptoms, especially by younger workers (< 40y).</p> <p>2 ORs for job insecurity were increased in longer exposure-outcome intervals (3–4 years).</p>	1: OR = 1.29 95 %CI [1.06–1.57]	no serious limitations	A
22 Kleppa, 2008	prospective (3 year) cohort study n = 1,350 vs 9,092	participants in the Norwegian Hordaland Health study (HUSK)	<p>1 Overtime workers of both genders had significantly higher anxiety (a) and depression (b) levels compared with those working normal hours.</p> <p>2 Findings suggested a dose–response relationship between work hours and anxiety or depression scores.</p> <p>Normal hours = 35 to 40 and 32 to 40 hours/wk for men and women, respectively Overtime = 41 to 100 hours/wk</p>	1a: men OR = 1.35 95%CI [1.13–1.61] women OR = 1.44 95%CI [1.06–1.95] 1b: men OR = 1.42 95%CI [1.16–1.74] women OR = 1.61 95%CI [1.06–2.45]		B

<p>23 Kuoppala, 2008</p>	<p>systematic review, includes RCTs</p> <p>k = 4 n = 2,113</p>	<p>Working population; samples from Finland, Sweden, Norway, UK, Netherlands, US, Ireland, France, Canada, Australia, Brazil, India</p>	<p>1 Work health promotion is likely to increase mental wellbeing (the strength of supporting evidence is weak).</p>	<p>1: RR=1.07 95%CI [0.77; 1.49]</p>	<p>The definition of mental health outcomes is broad (includes, for example, depression but also stress and coping)</p>	<p>AA</p>
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<p>24 Laaksonen, 2012</p>	<p>prospective (5 years) cohort study n = 5,786</p>	<p>40–60-year-old employees of the City of Helsinki, Finland</p>	<p>The aim of the study was to examine whether work arrangements*, physical working conditions** and psychosocial working conditions*** are associated with subsequent mental health problems, measured by prescribed psychotropic drugs.</p> <p>1 Working overtime was associated with purchases of sleeping pills among men but otherwise the associations between work arrangements and psychotropic medication were negligible.</p> <p>2 Desktop work was associated with purchases of sleeping pills among women.</p> <p>3 Among psychosocial working conditions, high self-assessed mental strenuousness was consistently associated with purchases of antidepressants (a), sleeping pills (b) and any psychotropic drugs (c).</p> <p>4 Among psychosocial working conditions, high self-assessed job dissatisfaction was consistently associated with purchases of antidepressants (a), sleeping pills (b) and any psychotropic drugs (c).</p> <p>* work arrangements: working overtime, shift work, temporary contract ** physical working conditions: hazardous exposures, physical workload, desktop work, physical strenuousness *** psychosocial working conditions: mental strenuousness, high job demands, low job control, low support, job dissatisfaction, poor workplace climate</p>	<p>1: HR=1.76 95%CI [1.08; 2.88]</p> <p>2: HR=1.11 95%CI [0.99; 1.25]</p> <p>3a: Women HR=1.16 95%CI [1.05; 1.29] Men HR=1.12 95%CI [0.90; 1.40]</p> <p>3b: Women HR=1.10 95%CI [0.98; 1.24] Men HR=1.18 95%CI [0.92; 1.52]</p> <p>3c: Women HR=1.13 95%CI [1.04; 1.23] Men HR=1.14 95%CI [0.95; 1.37]</p> <p>4a: Women HR=1.16 95%CI [1.05; 1.28] Men HR=1.29 95%CI [1.07; 1.56]</p> <p>4b: Women HR=1.12 95%CI [1.00; 1.25] Men HR=1.01 95%CI [0.79; 1.29]</p> <p>4c: Women HR=1.14 95%CI [1.05; 1.24] Men HR=1.20 95%CI [1.02; 1.42]</p>	<p>The way of reporting the results is rather unclear</p> <p>Small cohort</p>	<p>B</p>
<p>25 Lee, 2014</p>	<p>systematic review, includes RCTs k = 5</p>	<p>Workers in male-dominated industries in Japan and Finland</p>	<p>1 The available evidence suggests that effective interventions to address anxiety and depression in male-dominated industries include: improving mental health literacy and knowledge, increasing social support, improving access to treatment, providing education for managers and addressing workload issues.</p>	<p>not reported</p>	<p>No serious limitations</p>	<p>AA</p>

26 Limmer, 2021	longitudinal (3 year) study n = 4,313	participants of the German socio-economic panel study (GSOEP 2017)	1 Weekend work (a), time pressure (b), frequent interruptions (c), job insecurity (d), and conflicts at work (e) were negatively related to mental health.	1a: $\beta = nr$ 1b: $\beta = -.65$ 1c: $\beta = -.40$ 1d: $\beta = -.35$ 1e: $\beta = nr$	No serious limitations	B
27 Llosa, 2018	meta-analysis general k = 56 n = 53,405 depression k = 11; n = 16,684 anxiety k = 7 n = 2,677	n/a	1 Job insecurity is related to mental health. More specifically, job insecurity is related to depression (a) and anxiety (b).	1 (general): $r = .21$ 95%CI [0.19; 0.24] 1a: $r = .21$ 95%CI [0.16; 0.25] 1b: $r = .17$ 95%CI [0.09; 0.24]	The definition of mental health outcomes is broad (includes, for example, stress, wellbeing, depression, anxiety, burnout, psychological health, satisfaction with life)	C
28 Lomas, 2017	systematic review, includes RCTs general k = 242 depression k = 30 anxiety k = 25	Employees in a range of occupations	1 Mindfulness appears to have an overall beneficial impact upon mental health*, although the pattern of results can by no means be regarded as conclusive. 2 With depression, although the large majority of studies overall found an improvement in relation to a mindfulness intervention (MBI), while four of the high-quality trials did, three found no such improvement. 3 With anxiety, of the 21 high-quality trials, 4 found an improvement in relation to a mindfulness intervention (MBI) – mostly with moderate effect sizes – compared with two which found no effect. * The general definition of mental health is broad (includes, for example, anger, anxiety, burnout, depression, distress, stress, satisfaction, wellbeing).	not reported	no serious limitation	AA

29 Loretto, 2010	prospective (2 years) cohort study n = 5,400	Employees in six UK National Health Service trusts	<p>1 Perceived autonomy and control showed a positive association with wellbeing*.</p> <p>2 Increasing overtime was associated with a decreasing relative risk of psychiatric morbidity AUTHOR'S INTERPRETATION: <i>Taken together with the finding on WLB, it may be that working overtime has positive effects (such as additional income) for an individual, but longer hours which lead to disruption of home and/or family life have a negative effect on employee mental health.</i></p> <p>3 Respondents who reported an increase in the amount of work (work content factor) over the previous year were more likely to be classed as cases of psychiatric morbidity risk.</p> <p>4 Increased training and promotion (a) and improved job security (b) both had a beneficial effect on employee health.</p> <p>5 Amount of change appeared to show a somewhat ambiguous relationship with general health status: greater perceived change was associated with poorer health (F5a), but the additive score of number of changes showed a small positive effect.</p> <p>6 The rating of managers' effectiveness in informing employees (communication) was significantly associated with risk of psychiatric morbidity: decreasing effectiveness was associated with a higher likelihood of psychiatric morbidity. Neither channels of communication nor extent of consultation appeared to affect employee health.</p>	<p>1: OR=0.81 99%CI [0.63; 0.99]</p> <p>2: OR=0.67 99%CI [0.46; 0.98]</p> <p>3: OR=1.20 99%CI [1.01; 1.39]</p> <p>4a: OR=0.66 99%CI [0.55; 0.79] 4b: OR=0.83 99%CI [0.67; 0.99]</p> <p>5: OR=1.21 99%CI [1.06; 1.38]</p> <p>6: OR=1.16 99%CI [1.01; 1.34]</p>	outcome concerned <i>short-term</i> changes in mental health measured with 12-item version of the General Health Questionnaire (GHQ)	B
30 McLeod, 2010	systematic review, includes pre-post studies k = ?	Wide range of counselling client populations and models of therapy	<p>1 The findings of the studies included suggest that workplace counselling has consistent and significant short-term benefits, in terms of effects on psychological functioning*, when comparisons are made between levels of symptoms reported by clients pre- and post-counselling.</p> <p>* Outcome variables measured in the included studies were depression, anxiety, self-esteem, symptoms, phobic anxiety, somatic anxiety, emotional exhaustion, depersonalisation, personal accomplishment.</p>	not reported	<p>The search and review procedure is underdeveloped</p> <p>Inclusion/exclusion criteria and selection procedure are unclear</p> <p>The definition of the outcome variables could have been more specific</p>	C
31 Madsen, 2014a	prospective (six year) cohort study	participants of the Danish Work Environment Cohort	1 Good leadership (supportive, appreciative, informative, listening) does not substantially ameliorate any effects of emotional demands at work on employee mental health.	ns	primary outcome is perceived emotional demands	B

	n = 6,096	Study (DWECS), and the Swedish Longitudinal Occupational Survey of Health (SLOSH)			rather than mental health	
32 Madsen, 2014b	prospective (8 months) cohort study n = 1,351	Danish human service workers	1 Unnecessary work tasks (perceived) were prospectively associated with a decreased level of mental health (adjusting for baseline mental health and controlled for work environment factors such as job demands and decision latitude). 2 This association was stronger for employees with poor baseline mental health and tended to be more pronounced among older employees.	only unstandardised betas are reported	no serious limitations	B
33 Marchand, 2011	prospective (8 years) cohort study n = 5,500	participants of Canada's National Population Health Survey (NPHS) 1994–2003	1 Over the study period (1994–2003) 46.4% of workers reported one episode of psychological distress, 23.5% more than one, and 10.6% three or more. 2 Psychological distress decreased over time and varied significantly between individuals and neighbourhoods. 3 Occupation was not significant, but psychological demands, job insecurity, and social support in the workplace were important determinants (note ORs are very small). 4 The results showed strong contributions of individual and outside work factors (family, social support, neighbourhood). 5 Each year of increased age reduced the risk by 3%, whereas the number of physical health problems was associated with a 13% risk increase. 6 Women were at higher risk. 7 Each additional point increase on the internal locus of control and sense of cohesion scales led to 11% and 6% reductions in the development of chronic psychological distress. Note: outcome concerns the risk of <i>repeated</i> episodes of psychological distress.	3: (ORs) psy dem = 1.04 job ins = 1.09 soc sup = 0.94 4: (ORs) family income = .89 marital status (couple) = .74 couple-related strain = 1.21 child-related strain = 1.24 social support outside of work (high) = .56 6: (ORs) gender (female) = 1.44 7: (ORs) locus of control = .90 sense of cohesion = .94 self-esteem = .99 ns phys activities = 1 ns	outcomes concern ORs/relative risks, baseline risk somewhat unclear	B
34 McGovern, 2011	prospective (12 months) cohort study n = 554	Employed women from Minneapolis and St Paul, Minnesota, US	1 As total workload (TWL) increased, mothers' mental health scores worsened and the number of symptoms increased. 2 Mothers' mental health was positively related to available social support from family and friends (third hypothesis). 3 Mothers' mental health was positively related to perceived control over work and home activities across time (fourth hypothesis). 4 Mothers' mental health was inversely related to infant sleep problems.	only unstandardised betas are reported	very specific population	B

35 Mesmer-Magnus, 2017	meta-analysis k = 114	n/a	<p>1 Trait mindfulness was found to be positively correlated with (a) mental health, while also reducing (b) burnout.</p> <p>2 Trait mindfulness was found to be negatively correlated with (a) perceived life stress, (b) negative emotions, (c) anxiety, and (d) depression.</p> <p>3 Meta-analytic regressions also suggest trait mindfulness adds incremental predictive variance over more traditional predictors of employee burnout.</p> <p>Trait mindfulness = a dispositional tendency toward mindfulness.</p>	<p>1a: $\rho = .38$ 1b: $\rho = -.48$</p> <p>2a: $\rho = -.43$ 2b: $\rho = -.40$ 2c: $\rho = -.34$ 2d: $\rho = -.38$</p>	design of included studies not reported scales used to measure mental health not reported	C
36 Ndjaboue, 2017a	prospective (5 year) cohort study n = 2,273	white-collar workers from three Canadian public organisations	<p>1 No deleterious effect of high job strain was found among men, whereas a moderate risk was found among women having high strain.</p> <p>2 Among men, the effect of effort–reward imbalance (ERI) on medically certified absence for MHP was weak. Adjustment for job strain led to an increase (+23%) of the estimate. A higher risk was found among women.</p> <p>3 Among women, a two-fold risk of medically certified absence for MHP was found for combined exposure to high strain and ERI compared with no exposure. This combined effect was 16% higher than the effect of high strain only and 30% higher than the effect of ERI only.</p>	2: men HR = 1.33 women HR = 1.58	unclear how many participants completed all three measurements	B
37 Ndjaboue, 2017b	prospective (5 year) cohort study n = 1,742	white-collar workers from three Canadian public organisations	<p>1 Compared with unexposed workers, those with repeated exposure to effort–reward imbalance had a two times higher prevalence of psychological distress at 3-year follow-up.</p> <p>2 Most effects observed at the 3-year follow-up persisted at the 5-year follow-up.</p>	1: men PR = 1.97 women PR = 2.02 2: men PR = 1.91 women PR = 2.48	effect sizes concern prevalence ratios	B
38 Ng, 2008	meta-analysis of cross-sectional studies k = 23/38	n/a	<p>1 Hours worked are positively related to job stress (H11a) and mental strain (H11b).</p> <p>2 There is a curvilinear relationship between hours worked and mental wellbeing variables (the slope became less positive as average work hours increased), suggesting that, at already intense levels of mental strain, the addition of more work hours creates hardly any more stress.</p>	job stress: $r = .13$ mental strain: $r = .06$ curvilinear relationship: $\beta = -.53$	measures for job stress and mental strain were subjective/self-report	C
39 Ng, 2013	meta-analysis of cross-sectional studies k = 40/49	n/a	<p>1 Age was generally not positively associated with greater mental health problems; the corrected correlations for general mental health, low positive mood, depression, anxiety, and irritation are all very weak in magnitude and negative in direction. Thus, there is little evidence that older workers suffer from more mental health problems.</p>	all r 's below .1	mental health variables were rather broad (for example, negative mood, anger, etc) and all involved self-report measures	C

40 Niedhammer, 2020	prospective (26 years) cohort study n = 1,496,332	data from several national cohort studies (for example, DARES, COSMOP), and the French national death registry	1 Low decision latitude among men and low social support among both genders increased the risk of suicide. 2 Job strain and iso-strain were risk factors for suicide for both genders. 3 Passive job and high strain were found to be significant risk factors for men.	HRs men/women 1: low dec lat: 1.34/1.28 ns low soc supp: 1.34/1.37 2: job strain: 1.28/1.35 iso-strain: 1.29/1.36 3: pass job: 1.32/1.03 ns high strain: 1.41/1.31 ns	constructs (for example passive job) are ill-defined	B
41 Nielsen, 2012a	prospective (2 year) cohort study n = 1,775	Norwegian employees	1 After adjusting for baseline distress and age, exposure to sexual harassment at baseline was associated with psychological distress at follow-up among women but not men.	women: OR = 2.03 men: OR = ns	scales used measured symptoms experienced during last week	B
42 Nielsen, 2012b	meta-analysis of cross-sectional and longitudinal studies k = 66/13	n/a	1 Exposure to bullying is associated with (a) mental health problems, (b) anxiety, (c) depression, (d) symptoms of post-traumatic stress, and (e) burnout. 2 Baseline exposure to workplace bullying is significantly related to mental health problems at follow-up. 3 Mental health problems at baseline is significantly related to increased exposure to bullying at follow-up.	1a: r = .34 1b: r = .27 1c: r = .34 1d: r = .37 1e: r = .27 2: OR = 2.33 3: OR = 2.02	scales used measured symptoms experienced during last week	C/B
43 Oksanen, 2010	prospective (3.5 year) cohort study n = 25,763	Finnish public sector employees	1 The odds for new physician-diagnosed depression and antidepressant treatment were 30–50% higher for employees with low vertical or horizontal workplace social capital than for their counterparts with high social capital at work. Vertical workplace capital = norms of respect and network of trusting relations between workers and groups across hierarchical levels. Horizontal workplace capital = relations of trust and reciprocity between workers and groups at the same hierarchical level.	1: hor (low) OR = 1.47 ver (low) OR = 1.42 (high = 1)	no serious limitations	B
44 Pahkin, 2011	prospective (5 year) cohort study n = 4,279	Private sector industrial employees within a multinational forest industry corporation with domicile in Finland	1 Employees with a weaker pre-merger sense of coherence (SOC) were at a higher risk of perceiving the organisational change negatively and had an elevated risk of post-merger psychiatric events. 2 A stronger SOC decreased the adverse effect of negative appraisal of change on psychiatric events.	1: SOC – neg perc change: OR = 1.83 SOC – psych events HR = 1.42	no serious limitations	B

			Note: The HR for psychiatric events during the follow-up was 2.20 among those with a weaker SOC at baseline and with a negative appraisal of the organisational change (95% CI: 1.38 to 3.49) compared with those with a strong SOC and no change during the merger.			
45 Peters, 2018	prospective (3 year) cohort study n = 1,886	German employees with sickness absence exceeding six weeks	1 Employees with low social support compared with high social support had poorer mental health. 2 Low social support was not associated with increased odds of consulting a psychologist.	1: only unstandardised betas are reported 2: OR = 1.30 ns	small cohort (age 40–55 years)	B
46 Quesnel-Vallée, 2010	prospective (2 and 4 years) cohort study n = 2,186	participants of the U.S. National Longitudinal Survey of Youth 1979 (NLSY79)	1 Results indicate that subjects who had been exposed to temporary work in the two years preceding the outcome measurement report more depressive symptoms. 2 Non-significant results were found for outcomes measured immediately after exposure and 4 years post-exposure.	1: unclear, text suggests a 50% increase from the average level of depressive symptoms in this population	sample of temp workers was rather small (n = 150) control for confounders (for example pre-existing factors) somewhat unclear	B
47 Robbins, 2012	meta-analysis k = 22	n/a	1 Results suggest that perceptions of unfairness were associated with mental health problems. 2 Perceptions of unfairness are more strongly associated with strain-related indicators, such as burnout, perceived stress, and negative emotional state. 3 Injustice contributed to the prediction of mental health problems above and beyond that accounted for by psychological contract breach alone. 4 Psychological contract breach contributed to the prediction of strain-related indicators of health above and beyond that accounted for by injustice alone.	1: $p = .23$ 2: burnout $p = .35$ stress $p = .33$ neg em state $p = .35$ 3&4: Injustice Dis/Proc/Int mental health $\rho = .42/.20/.18$ $\beta = .42/.01/-.01$ burnout $\rho = .30/.31/.36$ stress $\rho = .32/.31/.32$ neg state $\rho = .31/.37/.31$ 3&4: psych contr breach: mental health $\rho = .30/\beta = .45$ burnout $\rho = .46$	design of the included studies unclear psychological contract breach was strongly correlated with distributive injustice (.60)	C

				stress $p = .38$ neg state $p = .38$		
48 Robertson, 2015	systematic literature review of (at least) pre-post studies. k = 14, n = 800	n/a	1 Resilience training has a positive effect on mental health	no pooled ES are reported anxiety d = -1.32 /-1.38 depression d = -1.54 /-.45 /-.75	study does not consistently distinguish mental health outcomes from other outcomes (for example subjective wellbeing, stress) number of studies on mental health effects rather small (2 & 3)	B
49 Rugulies, 2012	prospective (5 years) cohort study n = 2,701	Danish employees who participate in the Danish Work Environment Cohort Study (DWECS)	1 High effort–reward imbalance (ERI) predicted onset of severe depressive symptoms at follow-up, after adjustment for co-variables and occupational grade. 2 Participants with high ERI and low occupational grade showed a considerably higher ORs compared with participants with low/medium ERI and low grade, high ERI and high grade and low/medium ERI and high grade (reference group). Thus, adverse psychosocial working conditions predicted onset of severe depressive symptoms. The effect was stronger among employees of lower occupational grades compared with those of higher grades.	1: OR = 2.19 95% CI = 1.12–4.25 2: high/low OR = 2.43 95% CI = 1.07–5.53 low/med OR = 1.45 95% CI = 0.72–2.92 high/high OR = 1.26 95% CI = 0.59–2.70 low/med/high OR = 1 (ref)	relatively small number of cases (severe depression)	B
50 Shields, 1999	longitudinal study	participants of the Canadian National Population Health Survey	1 Women who worked long hours at baseline had a higher risk of experiencing a major depressive episode compared with those who worked standard hours. 2 For men, no relationship was found.	1: OR = 2.2	data is rather old (1994–1997)	C
51 Sköld, 2019	meta-analysis of RCTs k = 22	n/a	1 Workplace exercise generally has limited effects on employees' mental health. The majority of the included studies reported no or limited effects on a single or few parameters measured.	not reported	heterogeneous outcome measures (varying from vitality to severe depression)	AA

52 Slempp, 2019	meta-analysis of RCTs, quasi-experiments, and uncontrolled pre-post interventions k = 119	n/a	<p>1 Results suggest that contemplative interventions were generally effective in reducing employee distress, yielding small to moderate effects that were sustained at last follow-up (ranging from 1 month to 3 years).</p> <p>2 Effects were moderated by the type of contemplative intervention offered: (a) mindfulness, (b) mediation, (c) combination, (d) Acceptance and Commitment Therapy.</p> <p>3 Although contemplative interventions performed better than no-intervention comparisons or comparisons that received education only, they were not substantively better than active control comparisons that received another type of therapeutic training (e.g. non-contemplative types of therapeutic training would include CBT or IPT).</p> <p>4 We did not find effects to diminish as a function of follow-up time lag. Although this might suggest that effects are long-lasting, it is also possible that effects were maintained for reasons that were not reported within the studies. For example, it was often unclear whether followed-up participants continued to regularly engage in their contemplative practice or other variants of therapy after the conclusion of intervention training, which might explain this finding.</p>	<p>1a: post-intervention RCT/Quasi general distress d = .39/.59 depression d = .42/.46 anxiety d = .58/.32 burnout d = .20/.33</p> <p>1b: follow-up RCT/Quasi general distress d = .36/.52 depression d = .78/. anxiety d = .74/. burnout d = .20/.</p> <p>2a: d = .47 2b: d = .67 2c: d = .33 2d: d = .19</p>	no serious limitations	AA
53 Stratton, 2017	systematic review of RCTs, controlled trials & pre-/post-trials k = 23	n/a	<p>1 Overall, small positive effects of eHealth interventions at both post-intervention (a) and follow-up (b).</p> <p>2 There were differential short-term effects seen between the intervention types whereby (a) mindfulness-based interventions (MBI) showed larger effects than (b) cognitive behaviour therapy (CBT) and (c) and stress management.</p> <p>3 The effect of stress management interventions differed between selected and unselected employees at both post-intervention and follow-up.</p>	<p>1a: g = .24 95% CI = .13 – .35</p> <p>1b: g = .23 95% CI = .03 – .42</p> <p>2a: g = .60, 95% CI = .34 – .85</p> <p>2b: g = .15 95% CI = .02 – .29</p> <p>2c: g = .17 95%CI = -.01 – .34</p>	no serious limitations	AA
54 Stuber, 2012	systematic review of cohort studies and RCTs	n/a	<p>1 The included studies showed mixed evidence for the effect of leadership interventions on mental health.</p>	n/a	no serious limitations	AA

	k = 7		2 Leadership interventions with reflective and interactive parts in group settings at several seminar days seem to be the most promising strategy to address mental health in health care employees (but the evidence is limited).			
55 Strazdins, 2011	prospective (2 years) cohort study n = 1,975	Australian employees aged 40–48	1 Changes in job security were associated with corresponding changes in mental health. 2 Changes in job control were associated with corresponding changes in mental health. 3 Changes in job demands were associated with corresponding changes in mental health. mental health = symptoms of depression or anxiety	1: depr β = .39 95% CI = .26 – .53 anx β = .43 95% CI = .27 – .60 2: depr β = –.55 95% CI = –.79 – .30 anx β = –.61 95% CI = –.90 – .32 3: depr β = .20 95% CI = .02 – .37 anx β = .47 95% CI = .26 – .68	very small cohort	B
56 Theorell, 2012	prospective (5 year) cohort study n = 5,141	Swedish employees who participate in the Swedish Longitudinal Occupational Survey of Health (SLOSH)	1 'Self-centred' as well as 'non-listening' leadership significantly predicted employee depressive symptoms after adjustment for socio-demographic variables and depressive mood at baseline. 2 These predictions became non-significant when adjustment was made for job conditions (demands and decision latitude) in the 'non-listening' leadership analyses, whereas predictions of depressive symptoms remained significant after these adjustments in the 'self-centred leadership' analyses. Note: The leadership variables were associated with socioeconomic status (and consequently employee mental health): Non-listening leadership was associated with low income and low education.	z.o.correlations depressive symptoms self-centred r = .19 non-listening r = .24 demands r = .27 dec latitude r = –.13 1: self-cent – depr β = .18 non-list – depr β = .16 2: self-cent – depr β = .13 non-list – depr β = ns	very small betas	B
57 Theorell, 2014	prospective (2 year) cohort study n = 6,177 (2,731 men and 3,446 women)	Swedish employees who participate in the Swedish Longitudinal Occupational Survey of Health (SLOSH)	1 Overall, women reported higher levels of job strain and less decision authority than men. 2 Job strain was related to depressive symptoms. 3 The relationship between demand and decision authority and job strain on one hand and depressive symptoms on the other hand was not statistically different.	all betas reduced below .1 after adjusting for age, income, and depressive symptoms at baseline	no serious limitations	B

58 Thun, 2014	prospective (3 year) cohort study n = 633	Norwegian nurses	<p>1 Results revealed that night workers and nurses who changed from day work to night work during the study period did not differ from day workers either in terms of baseline symptoms of anxiety or depression, or in terms of trajectories of these symptoms.</p> <p>2 However, nurses who changed from night work to day work reported a significant decrease in symptoms of both anxiety and depression over time compared with day workers.</p>	<p>2: DN vs ND anxiety β = ns vs -.42 depr β = ns vs -.39</p>	anxiety and depression scales used measured symptoms experienced during <i>last week</i>	B
59 Torquati, 2019	meta-analysis of prospective cohort studies k = 7 n = 28,431	n/a	<p>1 Shift work was associated with increased overall risk of adverse mental health outcomes combined (a) and specifically for depressive symptoms (b).</p> <p>2 Gender differences explained more than 90% of heterogeneity, with female shift workers more likely to experience depressive symptoms than female non-shift workers.</p>	<p>1a: ES = 1.28 95% CI = 1.02–1.62 1b: ES = 1.33 95% CI = 1.02–1.74 2: OR = 1.73 95% CI = 1.39–2.14</p>	Effect sizes were extracted for both crude and adjusted models of OR, RR, or HR, but it remains unclear what they entail, but can most likely be interpreted as RRs	A
60 Väänänen, 2011	prospective (4 year) pre-post study	Finnish industrial employees	<p>1 Negative self-reported change in the work organisation during a merger was associated with increased risk of post-merger psychiatric event.</p> <p>2 This association was independent of mental health-related factors measured before the merger announcement, such as demographic characteristics, occupational status, personal orientation to life, self-rated health, self-reported psychiatric morbidity or chronic disease.</p> <p>Note: outcome concerned hospitalisation for psychiatric disorders, prescription of psychotropic drugs, or attempted suicide.</p>	<p>1: HR = 1.60 95% CI = 1.19–2.14</p>	no serious limitations	B
61 Virtanen, 2011	prospective (5 year) cohort study n = 2,960	Full-time middle-aged British civil servants who participate in the Whitehall II study	<p>1 Results showed an increased risk of (a) depressive symptoms and anxiety symptoms among employees working more than 55 h/week compared with employees working 35–40 h/week.</p> <p>2 Sex-stratified analysis showed an excess risk of depression and anxiety associated with long working hours among women (a) but not men (b).</p>	<p>1a: HR = 1.66 95% CI = 1.06 – 2.61 1b: HR = 1.74 95% CI = 1.15 – 2.61 2a: depr HR = 2.67 95% CI = 1.07 – 2.19 anx HR = 2.84 95% CI = 1.27 – 6.34 2b: depr HR = ns anx HR = ns</p>	small cohort (44–66 years)	B

Excluded studies

1st author & year	Reason for exclusion
1 Dragano, 2020	Traditional literature review.
2 Barley, 2011	Mostly qualitative data are used (interviews).
3 Engelen, 2019	Mental wellbeing measure included stress, exhaustion/fatigue, communication, interactions and collaborations, concentration, control, privacy, work performance, satisfaction with the physical space. Mental health was not measured.
4 Ganster, 2018	Non-systematic review of studies about working hours and wellbeing.
5 Gustafsson, 2011	Poor measure of mental health.
6 Kulik, 2019	Mental wellbeing measured with Positive and Negative Affect Schedule.
7 Law, 2020	Systematic review, no (pooled) effect sizes are reported.
8 La Torre, 2019	Systematic review, provides only a narrative synthesis of the findings.
9 Leijten, 2015	Poor measure of mental health.
10 Lim, 2010	Focus on burnout among mental health professionals.
11 Mark, 2020	Outcome was stress, as measured by heart rate variability.
12 McNall, 2010	Study does not differentiate between mental and physical health.
13 Memish, 2017	Study examines the quality and comprehensiveness of guidelines developed for employers to detect, prevent, and manage mental health problems in the workplace.
14 Mento, 2020	Findings are descriptive, no quantitative outcomes are reported.
15 Nexø, 2018	Study examines the quality and comprehensiveness of guidelines developed for employers to detect, prevent, and manage mental health problems in the workplace.
16 Norgate, 2020	Outcome measures concerned mainly stress and subjective wellbeing.

17 Schlachter, 2018	Systematic review, provides only a narrative synthesis of the findings.
18 Stadin, 2019	No direct measure of mental health (only self-rated general health).
19 Taloyan, 2012	Study does not directly measure mental health. Health outcome was measured with one self-rated question ('How do you perceive your general health?') with a five-point Likert scale that was dichotomised into (1) good (good or very good) versus (2) suboptimal (fairly bad, bad, and very bad).
20 Valencia, 2019	Included studies used mainly (self-report) measures of perceived stress; in addition, no pooled ESs are reported.
21 Vedaa, 2016	Systematic review of studies investigating the relationship between quick returns (that is, 11 hours or less between two consecutive shifts) and health measures.
22 Virtanen, 2010	Study measures work disability, but does not distinguish between physical and mental work disability.
23 Wilness, 2017	Study (MA) does not differentiate between studies that used clinical relevant measures of mental health (such as anxiety and depression), and studies that used general composites of psychological wellbeing (such as sadness and negative mood).

Appendix 4: Overview of risk factors

Risk factor	Effect size			ADY/100	Level of evidence	Studies
	mental health*/ mental health problems	anxiety	depression			
Bullying	– OR = 3.37 OR = 2.33	OR = 3.39 – r = .27	OR = 2.03 – r = .34	58–103	C B B	Butterworth, 2016 Finne, 2014 Nielsen, 2012b
Climate (social)	– OR = 0.43 – HR = 1.71* –	– – – HR = 1.72 –	– – – HR = 1.21 –	24–31	C B B B B	Bronkhorst, 2015 Finne, 2014 Finne, 2017 Jensen, 2010 Laaksonen, 2012
Communication (effectiveness)	OR = 1.16*	–	–	26	B	Loretto, 2010
Control (job, employee, decision)	– OR = 0.58 – – HR = 1.48* – OR = 0.81 HR = 1.34(m) 1.28(f) –	– – – – – – – – β = -.61	– – – – HR = 1.70 – – – – β = -.55	12–21	A B B B B B B B B	Egan, 2007 Finne, 2014 Finne, 2017 Flovik, 2019 Joensuu, 2020 Laaksonen, 2012 Loretto, 2010 Niedhammer, 2020 Strazdins, 2011

Demands (work, job, psychological)	- - - OR = 1.20 OR = 1.04 HR = 1.30 - $\beta = -.65^*$	- - - - - $\beta = .47$ -	- - - - - $\beta = .20$ -	2-13	A B B B B B B B	Egan, 2007 Flovik, 2019 Laaksonen, 2012 Loretto, 2010 Marchand, 2011 Niedhammer, 2020 Strazdins, 2011 Limmer, 2021
Effort-reward imbalance	HR = 1.33(m) 1.58(f) HR = 2.0 (f & job strain) PR = 1.97 (m) 2.02(f) -	- - OR = 2.19	- - -	14-44	B B B	Ndjaboue, 2017a Ndjaboue, 2017b Rugulies, 2012
Job insecurity	r = .21 OR = 0.83* OR = 1.09 - - $\beta = -.40^*$	r = .17 - - $\beta = .39$ - -	r = .21 - - $\beta = .43$ r = .30 OR = 1.29 -	4-7	C B B B B A B	Llosa, 2018 Loretto, 2010 Marchand, 2011 Strazdins, 2011 Bernhard-Oettel, 2020 Kim, 2016 Limmer, 2021
Leadership – fair	OR = 0.52 -	- -	- -	20	B B	Finne, 2014 Finne, 2017
Leadership – empowering	OR = 0.64	-	-	16	B	Finne, 2014
Leadership – supportive, appreciative, listening	ns	-	-	-	B	Madsen, 2014a
Leadership (self-centred, non-listening)	-	$\beta = .18$ (S), $.16$ (N)	-	-	B	Theorell, 2012
Locus of control	OR = .90	-	-	4	B	Marchand, 2011
Mindfulness (trait)	$\rho = .38$	$\rho = -.34$	$\rho = -.38$	-	C	Mesmer-Magnus, 2017

Org. change (multiple, repeated, neg perceived)	OR = 1.32 – OR = 1.75(M), 1.85(R) OR = 1.21 (M/R)	– – – –	– – – –	9–37	B B B B	Finne, 2014 Finne, 2017 Fløvik, 2019 Loretto, 2010
Org. change (reorg., downsizing, layoffs)	OR=1.29(R), 1.51(D), 1.46(L)	–	–		B	Fløvik, 2019
Org. change (neg perceived, merger)	HR = 1.60	–	–		B	Väänänen, 2011
Organisational commitment	OR = 0.65 –	– –	– –	15	B B	Finne, 2014 Finne, 2017
Predictability	OR = 0.65 –	– –	– –	15	B B	Finne, 2014 Finne, 2017
Procedural injustice	OR = 1.30 OR = 2.84 $\beta = .42$ –	– – – –	– – – $r = .32$	13–80	B B C B	Finne, 2014 Inoue, 2013 Robbins, 2012 Bernhard-Oettel, 2020
Psychological contract breach	$\beta = .45$	–	–	–	C	Robbins, 2012
Role clarity	OR = 0.57	–	–	19	B	Finne, 2014
Role conflict	OR = 2.08 –	– –	– –	46	B B	Finne, 2014 Finne, 2016
Sense of coherence	OR = .94* HR = 1.42–2.20	– –	– –	18–52	B B	Marchand, 2011 Pahkin, 2011
Sexual harassment	OR = 2.03 (f)	–	–	44	B	Nielsen, 2012a
Shift work	RR = 1.28	–	RR = 1.33	12	A	Torquati, 2019
Skill discretion (job variety)	HR = 0.74	–	HR = 0.59	11	B	Joensu, 2010

Stress (downplaying, insensitivity)	-	-	OR = 2.66 (D), 4.91 (I)	-	B	Izawa, 2016
Support (C= co-worker / S = supervisor / outside work, eg family)	- OR = 0.56 (S) - HR = 0.61 (C) ns (S) - OR = 0.94 OR = 1.34 (low) - OR = 0.56 (O)	- - - - - - - -	- - - - - - - -	15	A B B B B B B B	Egan, 2007 Finne, 2014 Finne, 2016 Joensuu, 2020 Laaksonen, 2012 Mrachand, 2011 Niedhammer, 2020 Peters, 2018 Marchand, 2011
Temporary work	- -	- -	- -	-	C B	Hunefeld, 2020 Quesnel, 2010
Unnecessary work tasks (perceived)	-	-	-	-	B	Madsen, 2014b
Workaholism	$\rho = -.39$	-	-	-	C	Clark, 2016
Work motivation	-	-	-	-	B	Bjorklund 2013,
Working hours, overtime	- curve linear - - -	- - HR = 2.84 (f), ns (m) OR = 1.35 (m) 1.44 (f) -	- - HR = 2.67 (f), ns (m) OR = 1.42 (m) 1.61 (f) OR = 1 (m) 2.20 (f)	80	B C B B C	Laaksonen, 2012 Ng, 2008 Virtanen, 2011 Kleppa, 2008 Shields, 1999
Workplace capital (horizontal/vertical)	OR = 1.47* (H) 1.42*(V)	-	-	20	B	Oksanen, 2010

¹ Two of these studies were not found through our database search, but were referenced by other studies.

² Prevalence is the proportion of a population who have a specific characteristic (for example depression) in a given time period (for example a year), regardless of when they first developed the characteristic.

³ See for example McManus, S., Bebbington, P., Jenkins, R. and Brugha, T. (eds) (2016) *Mental health and wellbeing in England: adult psychiatric morbidity survey 2014*; Abuse, Substance, and Mental Health Services Administration. (2014) *National survey on drug use and health*; Mental Health Foundation. (2016) *Fundamental facts about mental health 2016*. London: Mental Health Foundation; Office for National Statistics. (2001) Psychiatric morbidity report; Baker, C. (2020) *Mental health statistics for England: prevalence, services and funding*; Netherlands Mental Health Survey and Incidence Study-2 (NEMESIS-2); Mental Health America. State of Mental Health in America 2020.

⁴ See Finding 2: unemployment is a risk factor for the development of depression and anxiety.

⁵ For an overview of the current state of burnout, see Bianchi, R., Schonfeld, I.S. and Laurent, E. (2019) Burnout: moving beyond the status quo. *International Journal of Stress Management*. Vol 26, No 1. p36.

⁶ Prevalence is the proportion of a population who have a specific characteristic (for example depression) in a given time period (for example a year), regardless of when they first developed the characteristic.

⁷ See for example McManus, S., Bebbington, P., Jenkins, R. and Brugha, T. (eds) (2016) *Mental health and wellbeing in England: adult psychiatric morbidity survey 2014*; Abuse, Substance, and Mental Health Services Administration. (2014) *National survey on drug use and health*; Mental Health Foundation. (2016) *Fundamental facts about mental health 2016*. London: Mental Health Foundation; Office for National Statistics. (2001) Psychiatric morbidity report; Baker, C. (2020) *Mental health statistics for England: prevalence, services and funding*; Netherlands Mental Health Survey and Incidence Study-2 (NEMESIS-2); Mental Health America. State of Mental Health in America 2020.

⁸ Controlled for co-morbidity, age, gender, education, income status, living conditions, and type of employment.

⁹ See Finding 2: unemployment is a risk factor for the development of depression and anxiety.

¹⁰ See CIPD Factsheet on Harassment and bullying at work:

<https://www.cipd.co.uk/knowledge/fundamentals/emp-law/harassment/factsheet>



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