

# HSE Workplace Health Expert Committee (WHEC)

## Interrelationship between musculoskeletal problems and mental ill health

WHEC-05 (2019)  
WHEC Report



## HSE Workplace Health Expert Committee (WHEC)

# Interrelationship between musculoskeletal problems and mental ill health

This report, its contents, including any opinions and/or conclusions expressed, are those of the committee members alone and do not necessarily reflect HSE policy.

Completed February 2018



## Foreword

The development of policy in HSE needs to be informed by the best available contemporary scientific evidence. In 2015, HSE formed the Workplace Health Expert Committee (WHEC) to provide independent expert advice to them on:

- New and emerging workplace health issues
- New and emerging evidence relating to existing workplace health issues
- The quality and relevance of the evidence base on workplace health issues

Questions about workplace health issues come to WHEC from many sources, which include HSE, trade unions, employers, interested individuals and members of WHEC. WHEC's responses to these questions are published online as reports to HSE, as position papers following investigation, or as a briefer response where the current evidence is insufficient to warrant further investigation. In cases where the evidence-base is limited WHEC will maintain a watching brief and undertake further investigation if new and sufficient evidence emerges.

In its formal considerations, WHEC aims to provide answers to the questions asked based on the available evidence. This will generally include review of the relevant scientific literature, identifying the sources of evidence relied on in coming to its conclusions, and the quality and limitations of these sources of evidence.

The purpose of WHEC reports is to analyse the relevant evidence to provide HSE with an informed opinion on which to base policy. Where there are gaps in the evidence, which mean that this is not possible, WHEC will identify these and, if appropriate, recommend how the gaps might be filled.

## Executive Summary

Since mental ill-health and musculoskeletal pain often coincide in affected individuals, the Health and Safety Executive asked the Workplace Health Expert Committee (WHEC) to consider whether preventive policies should give consideration to tackling these problems jointly rather than separately. For example, could tackling mental ill-health at work prevent some work-associated musculoskeletal ill-health and would tackling work-associated musculoskeletal problems prevent or lessen some episodes of mental ill-health? If so, to what extent, in which groups, and by what means?

This report summarises information on the matter identified by the WHEC, together with the invited comments of eight international experts in musculoskeletal research, some with a special interest in the psychosocial aspects of musculoskeletal ill-health. Evidence was found that these common and sometimes disabling conditions co-exist more often than expected simply by chance and that they can predict one another. In principle, interventions to solve one problem might be expected to help the other, and in the therapeutic context there is trial evidence for this – treatment of one of the two conditions can help relieve symptoms of the other. However, in the occupational context, there appears to be little or no empirical evidence that workplace interventions targeted at one condition will benefit the other. Various recommendations are made regarding research needs, awareness, and information gathering.

## 1. Background and introduction

Previous reports of the Workplace Health Expert Committee (WHEC) have focussed on work-related stress and mental ill-health, and on musculoskeletal problems in the workplace. A related question concerns whether there could be advantages in addressing these two common, related problems jointly, rather than separately. Thus, to what extent could reducing mental ill-health at work lead to a reduction in work-associated musculoskeletal ill-health? And might reducing work-associated musculoskeletal problems also lessen episodes of mental ill-health?

To raise awareness and inform discussions among the Health and Safety Executive's policy-makers and stakeholders, WHEC has reviewed the relevant literature and posed these questions to several international experts in musculoskeletal research (acknowledged in an appendix). This paper sets out the findings from this evidence-gathering exercise, together with recommendations for the way forward.

## 2. The impact and interrelationships between musculoskeletal problems and mental ill health

### *a. Mental health and musculoskeletal problems are very common; they can both be disabling*

According to a report by the King's Fund (Naylor et al, 2012), mental health problems are the largest single source of disability in the UK, accounting for 23% of the 'total burden' of disease (a composite measure of premature mortality and reduced quality of life), while spending on mental health services represents 11% of the secondary healthcare budget for the NHS (Department of Health, 2011). These costs do not factor in the bill for mental health in primary care, or the economic impact of mental health problems on employment and workplace productivity, or the substantial costs of informal care borne by third parties (Centre for Mental Health 2010; McCrone et al, 2008). Data from the Adult Psychiatric Morbidity Survey for England in 2014 indicate that in a given week ~1 in 6 people report experiencing a common mental health problem, while formal diagnoses of mixed anxiety and depression, generalised anxiety disorder and depression can be made respectively in 7.8, 5.9 and 3.3 people in every 100 (McManus et al, 2016). The lifetime risk of suicidal ideation was estimated at 20.6% and that of attempted suicide at 6.7%. According to HSE's Health and Safety Statistics, some 526,000 people reported "stress, depression or anxiety" believed to be caused or made worse by work in 2016/17, including 236,000 new cases with an attributed loss of 12.5 million working days.

Estimates for musculoskeletal ill-health, including the part attributed to work, are similarly high. One review of low-back pain (LBP) that drew data from 165 studies in 54 countries put the median point estimate of prevalence at ~15% and that of lifetime prevalence at 42% (Hoy et al, 2012); LBP in the previous four weeks affected ~1 in 3 people aged 50-59 years in a survey of people aged >50 years from North Staffordshire (Thomas et al 2004); in Finland, Sweden and Canada, chronic neck pain is said to affect ~14% to 23% of the population; in the UK, >2 million working-aged people have sought treatment

for knee osteoarthritis (OA), there are ~400,000 cases of rheumatoid arthritis, >30,000 people visit their GP annually because of ankylosing spondylitis, and 620,000 women aged 45-64 years have sought treatment for hand or wrist OA (Arthritis Research UK, 2014). According to HSE's annual statistics report for 2016/17, 507,000 people in Great Britain were estimated to have a musculoskeletal disorder (MSD) that they believed was caused or made worse by their work, including 159,000 "new" cases; work-related MSDs were considered to have caused the loss of ~8.9 million working days.

Estimates of incidence and prevalence differ considerably by case definition, from the common (e.g. back pain, mental distress) to the relatively infrequent (e.g. connective tissue disease, schizophrenia), but broadly speaking, mental and musculoskeletal ill-health are among the commonest health problems that adults of working age face; at the extremes, they are also among the more disabling of health problems, and they impair quality of life and capacity to work.

### *b. Mental health and musculoskeletal problems often co-exist; the one can predict the other*

Since mental health problems and musculoskeletal pain are both common it follows that they will often co-exist in the same individuals by chance alone. However, they cluster together more often than would be expected by chance, as evidenced by innumerable scientific reports.

By way of example, in a registry study involving over 260,000 residents of a Swedish county, 1 in 8 of those consulting with depression also consulted with back pain or OA, far above that expected by chance (Carstensen et al, 2012). In a telephone survey of chronic pain involving 46,394 respondents from 16 countries, 21% had been diagnosed with depression because of their pain (24% in respondents from the UK) (Breivik et al, 2006). In a study of 85,000 people from 17 countries across the world (the World Mental Health Surveys), the pooled odds of formally diagnosed mood disorder (major depression and dysthymia), anxiety disorder (generalized anxiety disorder, panic disorder, agoraphobia, post-traumatic stress disorder, social anxiety disorder) and alcohol

abuse or dependence were raised 1.6 to 2.3-fold in those with chronic back or neck pain relative to those without (Demyttenaere et al, 2007). In a Canadian survey of 36,984 randomly selected subjects from the general population, the prevalence of major depression was 5.0% in those with arthritis and rheumatism, 6.2% in those with back pain and 13.4% in those with fibromyalgia versus 2.4% among those free of chronic conditions, while panic disorder was 3.6 times more common in subjects with back pain and 5.2 times more common in those with fibromyalgia, relative to the same comparison group (Patten et al, 2006). A systematic review by Dickens et al (2002) found that depression was more common in patients with rheumatoid arthritis than in healthier controls. In a Finnish study of 2,310 suicides committed in 1988-2007, more than 1 in 5 had a medical history of hospital-treated musculoskeletal pain (Lofman et al, 2011). Tsang et al (2008) found similar associations between chronic pain and anxiety-depression across a number of developed and developing nations using a common survey questionnaire. In a survey of 2,981 subjects from the Netherlands Study of Depression and Anxiety, the worse the grade of chronic pain the stronger the association with co-morbid mental ill-health (de Heer et al, 2014).

It should also be noted that the two sets of conditions do not merely co-exist at a point in time: the one can predict future occurrence of the other. In a systematic review, Linton (2000) identified 37 cohort studies that considered psychological risk factors for neck and low-back pain. Distress, depressive symptoms, measures of neuroticism, hysteria, somatization and catastrophizing could all be related to the development of pain, and its disability and intensity measured in various ways including medical care and sick leave; psychological factors could be related to pain from its inception through acute illness to chronic symptoms. In a survey of over 91,000 community-dwelling over 65 year-olds, depressive symptoms at baseline increased the odds of disabling LBP after two years of follow-up, independently of sociodemographic characteristics, medical and functional status, while disabling LBP at baseline increased the odds of depressive symptoms after two years to a similar degree (Meyer et al, 2007). When Dorner et al (2015) considered the relation between sick spells for back pain

in 2005 and subsequent disability pensioning (DP) during 2006-10 among 4.8 million working-aged Swedes, they found that while relative risks (RR) for DP were markedly elevated for musculoskeletal diagnoses (RR 23.9), they were also raised 2.5-fold for mental health diagnoses; and that while sick leave for a depressive episode in 2005 predicted a very high subsequent rate of DP on mental health grounds (RR 25.3), it also significantly predicted job loss for musculoskeletal reasons (RR 4.4). In the large prospective population-based Hordaland Health Study, widespread pain was a strong predictor of subsequent all-cause and musculoskeletal DP, but it also predicted pensioning for mental disorders (RR 3.1) (Øverland et al, 2012). In a smaller sample of young Swedish workers who had had at least one sick leave spell of >28 days for back, neck or shoulder pain, about 1 in 5 was awarded a DP over 11 years of follow-up; in three-quarters of cases the award reflected musculoskeletal disability, but in 22% of awards there was a contributory psychiatric diagnosis (Alexanderson et al, 2005).

Reasons for the relationship between the two conditions and causal mechanisms are more open to debate.

One expert commented: *“... substantial epidemiological evidence ... suggests a two-way pathway (psychological distress - depression/anxiety - preceding and increasing the likelihood of low back pain and other single site pain, plus also the move to multi-site pain AND musculoskeletal conditions preceding and increasing the risk of psychological distress) and a more complex feedback between the two especially in the development of chronic long-term problem”*.

Another said: *“Musculoskeletal pain could very well cause mental health symptoms (low vitality, tiredness, depressed mood etc). It may seem less obvious why mental health symptoms should cause musculoskeletal symptoms, but depressive symptoms and mood may possibly colour a person’s perception of many different bodily functions or could possibly lower the musculoskeletal pain/discomfort threshold. These explanations would place musculoskeletal and mental health on the same causal path with causality possibly going both ways”*.

A further possibility was identified, however: “. . . complaining of adversities (mental health, musculoskeletal health, occupational exposures etc.) is quite common and linked to personal circumstances and/or personality as a common cause, and this is a major reason why we so often find associations between self-reported symptoms and self-reported exposures (for example self-reported job strain on self-reported musculoskeletal complaints). This is a “confounder” explanation..”; or more succinctly: “I think it is a morass of causal paths..”. Another expert was “not entirely convinced that the typical psychosocial risk factors are independent risk factors for MSDs”.

### **c. Having both conditions has a bigger impact than having only one of them**

People with both musculoskeletal and mental health problems fare worse than people having only one of these conditions. In the Canadian Community Health Survey, each condition contributed independently to disability, but their effects in combination multiplied (Patten et al 2006). In the same survey, self-assessed presenteeism (attending at work while ill and being less productive than normal) was investigated in 120,000 people aged 25-74 years: having arthritis increased the risk of this outcome ~3 fold, but having a mood disorder on top increased it 5.8-fold (Bielecky et al, 2015). In studies of inflammatory arthropathy and connective tissue disease, the additional presence of depression raised the odds of work disability by ~70% relative to having only the MSD (Lowe et al, 2004; Panopalis et al, 2007). In a cohort study from English primary care, odds of work restriction were doubled in patients with depression and OA relative to OA alone (Wilkie et al, 2013); in the Finnish Health 2000 Survey DP rates were about twice as high among those with both a chronic MSD and a common mental health disorder relative to those having one or other but not both of these conditions (Kaila-Kangas et al, 2014); the authors described the effects as “additive”.

One expert commented: “If mental health means significant mental illness (depression meeting DSM criteria, etc.) there is good evidence that this makes most conditions worse, and that a fair number of clinic visits for

*pain, palpitations, headache, etc. are actually secondary to depression or other mental illness. Some conditions (e.g. fibromyalgia) seem rather tightly linked to mental health.”*

### **d. There may be differential associations by diagnosis**

Musculoskeletal and mental health problems exist across a spectrum of diagnostic specificity. In the case of musculoskeletal ill-health, one end of the range can be exemplified by demonstrable joint damage on a radiograph, such as joint-destroying inflammatory arthropathy (which can be prevented nowadays by expensive modern therapies) or hip OA (the symptoms of which tend to be alleviated fully by joint replacement). Towards the other end of the spectrum are conditions like widespread pain in the absence of an established underlying diagnosis, and LBP where, although spinal imaging abnormalities are frequently demonstrable, they are often non-specific (found commonly also in asymptomatic individuals – e.g. Van Tulder et al, 1997; Endean et al, 2011; Brinjikji et al, 2015). Mental health problems are similarly diverse in nature, ranging from everyday symptoms, such as feeling down in spirits, anxious, nervous, or panicky, which may not amount to psychiatric disease *per se*, through to clinically severe mental health diseases (e.g. schizophrenia) that can seriously disrupt everyday functioning.

A question arises as how the relationship between musculoskeletal and mental ill-health varies across the diagnostic spectrum. Many studies do not provide comparative data by diagnostic subgroup, but some do. In a nationally representative community sample of 4,181 Germans, chronic pain was associated with formally diagnosed anxiety and depressive disorders (Beesdo et al, 2010). However, the relationship was stronger for ‘medically unexplained’ than for ‘medically explained’ pain: odds for major depression, dysthymia, anxiety disorders, phobias and panic disorders were 71% to 265% greater in the former group than in the latter. In the context of musculoskeletal sick leave predicting DP on mental health grounds, an analysis of DP in 4.8 million

Swedes considered how risks varied by sub-diagnosis of MSD (Jansson et al, 2013). For a category called “arthropathies and systemic connective tissue disorders”, the attributed sickness absence initially raised the incidence of mental health DP over follow-up by 3.8-fold, but this rose to ~6-fold for absences attributed to dorsopathies (spinal problems) and soft tissue conditions. (These groups bear some relationship to better and worse explained medical pain, and so tend to support the report by Beesdo et al.) In a survey which considered non-specific (less well explained) regional pain at different bodily sites (back, neck, shoulder), all were associated with mood and anxiety disorders, and so was the complaint of headache (Williams et al, 2012), emphasising the relative non-specificity of associations.

One expert commented: *“I think that the evidence for a link between mental health and musculoskeletal health decreases when musculoskeletal health is defined as diseases with a definite pathology (e.g. hip arthrosis, lumbar disc herniation) compared to unspecific musculoskeletal disorder (e.g. LBP).”*

Another said: *“The link is very much at the level of clinical manifestations (pain, disability, psychological symptoms). It becomes trickier when focusing on pathological diagnoses such as radiographic osteoarthritis, where ... the direct causal pathways are more tenuous. I personally do not think this makes the links any the less strong but it is important that it is ‘pain and disability’ that is involved.”*

It appears then that relations between non-specific complaints may be relatively stronger; but there is strong evidence that serious joint pathology can cause major depression, so there is no clear dividing line. Whether schizophrenia can predict disability from back pain is not clear, but in general different forms of musculoskeletal and mental ill-health can be related to one another, albeit to differing degrees.

### 3. Interventions for musculoskeletal problems and mental ill health

#### ***a. Do medical interventions to treat one of mental or musculoskeletal ill-health help the other condition? It appears so.***

Trial evidence on interventions to support treatment approaches is much scarcer than observational data of the kind described above.

However, with the help of one expert a small number of studies were identified that suggest that treating one of these conditions does help outcomes in the other.

For example, in a study by Lin et al (2003) older adults with confirmed OAs were randomised to receive depression care management or care as usual and were followed over 12 months with assessment of the pain from their joint disease. Relative to the control group, they reported a significantly lower intensity of pain and particularly of pain interference with everyday activities over follow-up; improved function status and quality of life were evident benefits. Other studies confirm Lin's findings. In a randomised trial of patients with major depressive disorders (Kroenke et al, 2008), baseline pain and the amount of pain improvement over time were associated with the remission of depression, prompting the authors to conclude that "recognizing and optimizing the management of comorbid pain that commonly coexists with depression may be important in enhancing depression response and remission rates". In another trial, of patients with chronic LBP, hip pain, or knee pain and moderate to severe depression, optimized antidepressant therapy resulted in substantial improvement in depression as well as moderate reductions in pain severity and disability (Kroenke et al, 2009). In a cluster randomised trial of patients with moderate to severe musculoskeletal pain and disability lasting  $\geq 12$  weeks, a programme of pain relief resulted in a significant improvement in depressive symptoms (Dobscha et al, 2009).

#### ***b. Do workplace interventions to prevent either work-associated mental ill-health or work-associated musculoskeletal ill-health help the other condition? We cannot draw firm conclusions.***

A first consideration is whether good trial evidence exists to demonstrate that interventions to prevent work-associated musculoskeletal ill-health or work-associated mental ill-health are effective in their primary goal; beyond that, do they benefit the other condition, as a secondary outcome?

First principles, observational epidemiology, and the trial evidence relating to medical (as compared with occupational) interventions would suggest these possibilities.

The experts we consulted commented variously:

- *"In principle, an intervention based on biopsychosocial principles could reduce (prevent) work-relevant symptoms arising from musculoskeletal and mental health problems, thus reducing sickness absence and disability"*
- *"... my reasoning would be that if you could identify common risk factors for MSDs and mental health problems, that you would also have a common point of entry for prevention"*
- *"I would think that an intervention study which improves mental wellbeing (job satisfaction etc.) will also reduce unspecific musculoskeletal complaints but not specific musculoskeletal diseases. I would also think an intervention which reduces musculoskeletal complaints by training or reducing musculoskeletal loads would improve mental wellbeing"*
- *"I think prevention of disability needs to address psychological factors... But this is probably true for all diseases, not just MSD"*

Unfortunately, direct empirical evidence is scant.

As reported previously (WHEC, 2017a), because musculoskeletal pain is multifactorial and only sometimes caused by work, and appropriate work system changes are difficult to execute and to sustain, formal trials of ergonomic interventions in the workplace have often had only limited impact on the primary and secondary prevention of MSDs (Hignett, 2003; Boocock et al, 2007; Driessen et al, 2011; Verbeek et al, 2011; Palmer et al, 2012), albeit that such trials are fraught with methodological challenges. Also

as reported previously (WHEC, 2017b), there have been relatively few formal evaluations of HSE's Management Standards for work-related stress, one cluster randomised trial showing for example that an e-learning programme for managers had limited subsequent effect on employee well-being, sickness absence and GHQ score (Stansfeld et al, 2015).

The experts WHEC consulted were unaware of evidence from randomised controlled trials (RCTs) that workplace interventions directed at work-associated musculoskeletal ill-health were effective in preventing work-associated mental ill-health or vice versa.

They commented variously:

- *"I am not aware of trials to prevent one effect [that] also examines the other as a secondary outcome"*
- *"I'm not aware of any trials that have specifically set out to answer the question of whether an intervention to prevent one of the conditions has a preventive effect on the other"*
- *"I doubt that there will be any RCT available that addresses work-related factors and shows beneficial effects across an array of diseases"*
- *"I am not aware of any such trials, although mental health may have been assessed as a secondary outcome in some therapeutic trials"*

However, one RCT identified by the WHEC's search suggests that a degree of caution is needed. Haukka et al (2008, 2010) randomised municipal kitchens in Finland to receive or not receive the intervention of "participatory ergonomic change" (a process in which workers and managers with knowledge of working conditions together identify beneficial ergonomic adjustments). More ergonomic changes were made in the intervention kitchens. No impact was found on musculoskeletal pain or associated sickness absence (the primary outcome), but secondary analysis indicated a worsening of perceived job stress, job dissatisfaction and co-worker relationships.

One expert cautioned on this account: *"The reciprocal trends in long-term incapacity for work attributed to MSDs and mental health problems suggest that preventing one might sometimes lead to an increase in the other."*

***c. Is there a case for treating the two conditions together? Perhaps for treatment, but not yet for prevention.***

As highlighted above, in considering the question posed by the HSE, one expert said that this *"would be very reasonable ... since there is substantial epidemiological evidence that they are linked"*. Clearly, the evidence for such an association is overwhelmingly strong. However, several experts qualified their remarks in terms of health definitions, one suggesting that the link is *"very much at the level of clinical manifestations (pain, disability, psychological symptoms) rather than pathological diagnoses"*, and broadly speaking, the WHEC's literature review supports this view.

When it comes to considering interventions, the findings above suggest that, while medical treatment of one of mental or musculoskeletal ill-health may well help the other condition, there is not yet firm evidence that preventing one will help prevent the other. One expert drew a distinction between *"preventing illness or injury (pathology), preventing symptoms, preventing work-relevant symptoms, preventing sickness absence, or preventing disability"*. It is perhaps the case that treating these two conditions together is relevant in some of these areas of prevention, but not others. The extant research does not give insights into which of these might or might not work jointly.

#### 4. Conclusions and recommendations

The review presented here clearly shows that mental health and musculoskeletal problems are both very common and can both be disabling. In addition, having both conditions has a bigger impact than having only one of them. In terms of interrelationships, these conditions co-exist more often than would be expected by chance and they can predict one another. In principle then, interventions to solve one problem might be expected to help the other. While intervention studies are sparse, there is some evidence that *treatment* of one of the conditions can help relieve symptoms of the other; however, evidence for *workplace interventions* to prevent either condition helping the other is almost non-existent and the one study identified that has looked at this suggests that a degree of caution may be needed, at least in implementation.

The recommendations from this review are as follows:

- Considerably more research is needed to explore the potential for intervention at different levels of prevention (e.g. preventing illness/injury, symptoms, work-relevant symptoms, sickness absence or disability) to explore whether preventing one out of mental health and musculoskeletal problems can help prevent the other. The HSE could play a role in commissioning this research and encouraging other research-funding bodies to do the same. Account should be taken of the possibility of harms as well as benefits from trialled interventions. It will be important that the research includes consideration of the implementation of any intervention (e.g. the care with which employee needs and health are considered, the degree to which employees participate in decision making around what is implemented) as this in itself is part of the psychosocial intervention and might affect one or both outcomes.
- Those medically treating one out of mental health or musculoskeletal problems should be encouraged to consider whether it would be helpful to treat the other. The HSE could play a role in encouraging dissemination of the information to relevant practitioners and clinicians, and development of policy around this by relevant governmental and healthcare bodies.
- While the case for applying preventative interventions to jointly address mental health or musculoskeletal problems is not yet proven, the HSE needs to keep a watching brief on developments in this field and might want to consider development of policy on joint intervention as and when the research evidence emerges. (Preventative measures believed to be effective for each condition in its own right should not be neglected in the process.)

## References

- Alexanderson KAE, Borg KE, Hensing GKE. Sickness absence with low-back, shoulder, or neck diagnoses: An 11-year follow-up regarding gender differences in sickness absence and disability pension. *Work* 2005;25:115-124.
- Arthritis Research UK. Arthritis in the UK – facts and statistics, Dec 2014. <http://www.arthritisresearchuk.org/arthritis-information/data-and-statistics.aspx>
- Beesdo K, Jacobi F, Hoyer J, Low NCP, Höfler M, Wittchen H-U. Pain associated with specific anxiety and depressive disorders in a nationally representative population sample. *Soc Psychiat Epidemiol* 2010;45:89-104.
- Bielecky A, Chen C, Ibrahim S, Beaton DE, Mustard CA, Smith PM. The impact of co-morbid mental and physical disorders on presenteeism. *Scand J Work Environ Health* 2015;41:554-564.
- Boocock MG, McNair PJ, Larmer PJ, et al. Interventions for the prevention and management of neck/upper extremity musculoskeletal conditions: a systematic review. *Occup Environ Med* 2007;64:291-303.
- Breivik H, Collett B, Ventafridda V, Cohen R, Gallacher D. Survey of chronic pain in Europe: Prevalence, impact on daily life, and treatment. *Eur J Pain* 2006;10:287-333.
- Brinjikji W, Luetmer PH, Comstock B, Bresnahan BW, Chen LE, Deyo RA, Halabi S, Turner JA, Avins AL, James K, Wald JT, Kallmes DF, Jarvik JG. Systematic literature review of imaging features of spinal degeneration in asymptomatic populations. *Am J Neuroradiol* 2015;36:811-816.
- Carstensen J, Andersson D, Andre M, et al. How does comorbidity influence healthcare costs? A population-based cross-sectional study of depression, back pain and osteoarthritis. *BMJ Open* 2012;2:e000809.
- Centre for Mental Health (2010). The economic and Social Costs of Mental Health Problems in 2009/10. London: Centre for Mental Health. Available at: [www.centreformentalhealth.org.uk/pdfs/Economic\\_and\\_social\\_costs\\_2010.pdf](http://www.centreformentalhealth.org.uk/pdfs/Economic_and_social_costs_2010.pdf) (accessed on 19/7/17)
- De Heer EW, Gerrits MMJG, Beekman ATF, Dekker J, van Marwijk HWJ, de Waal MWM, Spinhoven P, Penninx BWJH, van der Feltz-Cornelis CM. The association of depression and anxiety with pain: A study from NESDA. *PLoS One* 2014;9:e106907.
- Demyttenaere K, Bruffaerts R, Lee S et al. Mental disorders among persons with chronic back or neck pain: Results from the World Mental Health Surveys. *Pain* 2007;129:332-342.
- Department of Health (2011). No Health Without Mental Health: A cross-government mental health outcomes strategy for people of all ages. London: Department of Health.
- Dickens C, McGowan L, Clark-Carter D, et al. Depression in Rheumatoid Arthritis: A systematic review of the literature with meta-analysis. *Psychosomatic Medicine* 2002;64:52-60.
- Dobscha SK, Corson K, Perrin NA, Hanson GC, Leibowitz RQ, Doak MN, Dickinson KC, Sullivan MD, Gerrity MS. Collaborative care for chronic pain in primary care. A cluster randomized trial. *JAMA* 2009;301:1242-1252.
- Dorner TE, Alexanderson K, Svedberg P, Ropponen A, Stein KV, Mittendorfer-Rutz E. Sickness absence due to back pain or depressive episode and the risk of all-cause and diagnosis-specific disability pension: A Swedish cohort study of 4,823,069 individuals. *Eur J Pain* 2015;19:1308-20.
- Driessen MT, Proper KI, Anema JR, Knol DL, Bongers PM, van der Beek AJ. The effectiveness of participatory ergonomics to prevent low-back and neck pain — results of a cluster randomized controlled trial. *Scand J Work Environ Health* 2011; 37:383-393.
- Endean A, Palmer KT, Coggon D. Potential of MRI findings to refine case definition for mechanical low back pain in epidemiological studies: A systematic review. *Spine* 2011;15:160-169.

Haukka E, Leino-Arjas P, Viikari-Juntura E, Takala E-P, Malmivaara A, Hopsu L, Mutanen P, Ketola R, Virtanen T, Pehkonen I, Holtari-Leino M, Nykänen J, Stenholm S, Nykyri E, Riihimäki H. A randomised controlled trial on whether a participatory ergonomics intervention could prevent musculoskeletal disorders. *Occup Environ Med* 2008;65:849-856.

Haukka E, Pehkonen I, Leino-Arjas P, Viikari-Juntura E, T E-P, Malmivaara A, Hopsu L, Mutanen P, Ketola R, Virtanen T, Holtari-Leino M, Nykänen J, Stenholm S, Ojajarvi A, Riihimäki H. Effect of a participatory ergonomics intervention on psychosocial factors at work in a randomised controlled trial. *Occup Environ Med* 2010;67:170-177.

Hignett S. Intervention strategies to reduce musculoskeletal injuries associated with handling patients: a systematic review. *Occup Environ Med* 2003;60:e6

Hoy D, Blain C, Williams G, March L, Brooks P, Blyth F, Woof A, Vos T, Buchbinder R. A systematic review of the global prevalence of low back pain. *Arthr Rheum* 2012; 64: 2028–2037.

Jansson C, Alexanderson K. Sickness absence due to musculoskeletal diagnoses and risk of diagnosis-specific disability pension: A nationwide Swedish prospective cohort study. *Pain* 2013;154:933-941.

Kaila-Kangas L, Haukka E, Miranda H, Kivekäs T, Ahola K, Luukkonen R, Shiri R, Kääriä S, Herliövaara M, Leino-Arjas P. Common mental and musculoskeletal disorders as predictors of disability retirement among Finns. *J Affect Disord* 2014;165:38-44.

Kobayashi Y, Kaneyoshi A, Yokota A, Kawakami N. Effects of a worker participatory program for improving work environments on job stressors and mental health among workers: A controlled trial. *J Occup Health* 2008;50:455-470.

Kroenke K, Bair MJ, Damush TM, Wu J, Hoke S, Sutherland J, Tu W. Optimized antidepressant therapy and pain self-management in primary care patients with depression and musculoskeletal pain. A randomized controlled trial. *JAMA* 2009;301:2099-2110.

Kroenke K, Shen J, Oxman TE, et al. Impact of pain on the outcomes of depression treatment: Results from the RESPECT trial. *Pain* 2008;134:209-215.

Lin EHB, Katon W, Von Korff M, Tang L, Williams JW, Kroenke K, Hunkeler E, Harpole L, Hegel M, Arean P, Hoffing M, Penna RD, Langston C, Unützer J, for the IMPACT Investigators. Effect of improving depression care of pain and functional outcomes among older adults with arthritis. *JAMA* 2003;290:2428-2434.

Linton SJ. A review of psychological risk factors in back and neck pain. *Spine* 2000;25:1148-1156.

Löfman S, Räsänen P, Hakko H, Mainio A. Suicide among persons with back pain. A population-based study of 2310 suicide victims in Northern Finland. *Spine* 2011;36:541-548.

Lowe B, Willand L, Eich W, Zipfel S, Ho AD, Herzog W, et al. Psychiatric comorbidity and work disability in patients with inflammatory rheumatic diseases. *Psychosomatic Medicine*. 2004;66(3):395-402.

McCrone P, Dhanasiri S, Patel A, Knapp M, Lawton-Smith S (2008). *Paying the Price. The costs of mental health care to 2026*. London: The King's Fund.

McManus S, Bebbington P, Jenkins R, Brugha T (eds.) (2016). *Mental health and wellbeing in England: Adult Psychiatric Morbidity Survey 2014*. Leeds: NHS Digital. Meyer T, Cooper J, Raspe H. Disabling low back pain and depressive symptoms in the community-dwelling elderly. *Spine* 2007;32:2380-2386.

Naylor C, Parsonage M, McDaid D et al, on behalf of The King's Fund. Long-term conditions and mental health. The cost of co-morbidities. Feb 2012. [www.kingsfund.org.uk/sites/files/2012/field\\_publication\\_file/2Flong-term-conditions-mental-health-cost-comorbidities-naylor-feb12](http://www.kingsfund.org.uk/sites/files/2012/field_publication_file/2Flong-term-conditions-mental-health-cost-comorbidities-naylor-feb12).

Øverland S, Harvey SB, Knudsen AK, Mykletun A, Hotopf M. Widespread pain and medically certified disabled pension in the Hordaland Health Study. *Eur J Pain* 2012;16:611-620.

Palmer KT, Harris EC, Linaker C, Barker M, Lawrence W, Cooper C, Coggon D. Effectiveness of community - and workplace-based interventions to manage musculoskeletal-related sickness absence and job loss – a systematic review. *Rheumatology* 2012;51:230-42.

Panopalis P, Julian L, Yazdany J, Gillis JZ, Trupin L, Hersh A, et al. Impact of memory impairment on employment status in persons with systemic lupus erythematosus. *Arthritis Rheum* 2007;57:1453-6

Patten SB, Williams JVA, Wang JL. Mental disorders in a population sample with musculoskeletal disorders. *BMC Musculoskeletal Disorders* 2006;7:37 doi: 10.1186/1471-2474-7-37.

Stansfeld SA, Kerry S, Chandola T, Russell J, Berney L, Hounsborne N, Lanz D, Costelloe C, Smuk M, Bhui K. Pilot study of a cluster randomised trial of a guided e-learning health promotion intervention for managers based on management standards for the improvement of employee well-being and reduction of sickness absence: GEM Study. *BMJ Open* 2015; 5: e007981. doi:10.1136/bmjopen-2015-007981.

Thomas E, Peat G, Harris L, et al. The prevalence of pain and pain interference in a general population of older adults: cross-sectional findings from the North Staffordshire Osteoarthritis Project (NorStOP). *Pain* 2004;110:361-8.

Tsang A, Von Korff M, Lee S, et al. Common chronic pain conditions in developed and developing countries: Gender and age differences and comorbidity with depression-anxiety disorders. *The Journal of Pain* 2008;9:883-891.

Van Tulder MW, Assendelft WJ, Koes BW, Bouter LM. Spinal radiographic findings and nonspecific low back pain. A systematic review of observational studies. *Spine* 1997;22:427-34.

Verbeek JH, Martimo KP, Karppinen J, Kuijper PP, Viikari-Juntura E, Takala EP. Manual material handling advice and assistive devices for preventing and treating back pain in workers. *Cochrane Database Syst Rev*. 2011;6:CD005958.

Wilkie R, Blagojevic-Bucknall M, Jordan KP, Pransky G. Onset of Work Restriction in Employed Adults with Lower Limb Joint Pain: Individual Factors and Area-Level Socioeconomic Conditions. *Journal of Occupational Rehabilitation* 2013;23:180-8.

Williams LJ, Pasco JA, Jacka FN, Dodd S, Berk M. Pain and the relationship with mood and anxiety disorders and psychological symptoms. *Journal of Psychosomatic Research* 2012;72:452-456.

WHEC position paper. Work-associated musculoskeletal pain: the role of HSE. 2017a  
<https://webcommunities.hse.gov.uk/connect.ti/WHEC/view?objectId=654501>

WHEC position paper. Work-related stress and psychological health. 2017b  
<https://webcommunities.hse.gov.uk/connect.ti/WHEC/view?objectId=654533>

## Acknowledgements

We are grateful to the following individuals who have contributed expert opinion to this review:

Professor Alex Burdorf, Erasmus University, Rotterdam

Professor Kim Burton, University of Huddersfield

Professor David Coggon, University of Southampton

Professor Peter Croft, University of Keele

Professor Alexis Descatha, Versailles St-Quentin University, Inserm

Professor Bradley Evanoff, University of Washington

Dr Sigurd Mikkelsen, Bispebjerg University Hospital, Copenhagen

Professor Eira Viikari-Juntura, Finnish Institute of Occupational Health

## **What is WHEC?**

The Workplace Health Expert Committee (WHEC) provides independent expert opinion to HSE by identifying and assessing new and emerging issues in workplace health. Working under an independent Chair, WHEC gives HSE access to independent, authoritative, impartial and timely expertise on workplace health.

<https://webcommunities.hse.gov.uk/connect.ti/WHEC/view?objectId=235408&exp=c1>

## **WHEC membership**

Professor Sir Anthony Newman Taylor (Chair)

Professor Peter Buckle

Professor John Cherrie

Professor Paul Cullinan

Emma Donaldson-Feilder

Professor Len Levy

Professor Keith Palmer

Professor Martie Van Tongeren