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PSYCHOLOGICAL AND PSYCHOSOCIAL DETERMINANTS OF MUSCULOSKELETAL PAIN AND ASSOCIATED DISABILITY

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Abstract

Although much attention has been given to the physical determinants of common musculoskeletal complaints such as back and arm pain, research points to a stronger influence of psychological factors. Multiple studies have implicated poor mental health and somatisation (a tendency to worry about common somatic symptoms) in the incidence and chronicity of musculoskeletal pain and associated disability. Also important are adverse beliefs about the prognosis of such disorders, and about the role of physical activity in their development and persistence. Differences in societal beliefs may have contributed to major variation in the prevalence of disabling musculoskeletal pain that has been observed between countries and in the same countries over time. Psychosocial aspects of work have also been linked with musculoskeletal pain, although relative risks have generally been smaller. There is a need to take account of psychological factors in the clinical management of patients with back, neck and arm pain.

Keywords

Musculoskeletal pain; mental health; somatisation; health beliefs; psychosocial factors

Historically, attempts to prevent incapacity for work from musculoskeletal disorders have focused mainly on the physical demands of employment. It has been assumed that symptoms and disability arise from injury to tissues, and can be prevented by better ergonomic design of occupational tasks to reduce mechanical loading. This biophysical paradigm may be appropriate for some types of musculoskeletal disease – for example, osteoarthritis of the hip caused by heavy lifting (see Chapter X) and degenerative meniscal

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tears in the knee caused by prolonged kneeling and squatting Chapter X). However, it has become increasingly apparent that the model has only limited applicability to common painful disorders of the back, neck and upper limb, which are the main musculoskeletal causes of disability for work.

Most disabling pain of the back and upper limb is non-specific in nature with no clear evidence of underlying injury to tissues, and even where pathology can be demonstrated (e.g. herniation of an intervertebral disc in people with back pain), it appears often not to be the explanation for the symptom [1]. Furthermore, there have been major temporal changes in the prevalence of musculoskeletal illness and disability that cannot be explained by altered physical exposures. For example, social security statistics indicate that in Britain, long-term incapacity for work because of back pain increased more than eightfold between 1950 and the early 1990s [2], at a time when the physical demands of work were declining because of greater mechanisation and a shift in employment from manufacturing to service industries. And in Australia, there was a major epidemic of arm pain during the 1980s among office workers, which was not paralleled in other countries that were using similar technology [3].

These observations indicate that factors other than mechanical loading have much greater impact on common disabling musculoskeletal disorders, and that they can vary importantly over time. Several lines of investigation have suggested that the drivers of the observed trends are psychosocial. This chapter considers the evidence implicating psychological and psychosocial influences in the causation of disabling musculoskeletal pain, and their potential to account for observed variations in its occurrence. It focuses in particular on the role of mental health, tendency to somatise, health beliefs and expectations, and psychosocial aspects of work. Implications for clinical practice and priorities for further research are highlighted.

Mental health

Definition

Mental health refers to emotional and psychological well-being [4], impairment of which may adversely affect an individual's cognitive or social functioning, making it harder to cope with the demands of daily life, including among other things, the ability to work productively and efficiently.

Problems with mental health range from the minor distress that all people experience at times in response to life's challenges, through to major long-term clinical illness which can be severely incapacitating and may require psychological therapy or pharmacological treatment. According to the biopsychosocial paradigm [5,6], common psychological symptoms, such as low mood, importantly influence the occurrence and prognosis of musculoskeletal pain.

Methods of assessment

In studies of musculoskeletal pain, mental health is generally assessed through questionnaires. Many have used questions derived from the 36-item Short Form Health

Survey (SF-36) [7]. This is a valid and reliable tool, designed for self-administration, which covers various aspects of health and quality of life and has been translated to local languages in almost 50 different countries. It is made up of 36 items organised in eight scales, one of which (also known as Mental Health Inventory-5) concerns mental health. This comprises five questions about how much of the time during the past month individuals have: been very nervous; felt so down in the dumps that nothing could cheer them up; felt calm and peaceful; felt downhearted and blue; and been a happy person. Each of the five questions is rated on a 5-point scale, ranging from “all of the time” to “none of the time”. An overall measure can then be derived by assigning numerical scores to each answer (higher values indicating better mental health), and summing across questions. This may be analysed as a continuous variable or partitioned into categories.

Other validated instruments that have been used to assess mental health include the Beck Depression Inventory (BDI) [8] and the Patient Health Questionnaire (PHQ-9) [9]. The BDI comprises 21 self-reported items, while the PHQ, which is the self-administered version of the Primary Care Evaluation of Mental Disorders (PRIME-MD) Questionnaire, scores the occurrence of the nine DSM-IV diagnostic criteria for major depressive disorder.

Association with musculoskeletal illness

Poor mental health is more common in people with musculoskeletal pain, particularly when it is disabling [10-14]. The relationship has been examined in several systematic reviews, which have indicated, for example, that depressive symptoms are related to higher levels of pain intensity, more functional limitation and disability and worse prognosis [15]; are strongly associated with knee pain [16]; and predict the transition from acute to chronic low back pain [17,18] and neck pain [18].

Cross-sectional associations with low mood may in part reflect distress that occurs as a consequence of pain. However, recent findings from longitudinal studies suggest that among individuals who are initially free from musculoskeletal pain, those with low mood are more likely subsequently to develop pain and associated disability (Table 1). In addition, there is some evidence from experimental studies that induction of negative mood reduces pain tolerance and leads to higher levels of self-reported pain severity [32].

Some investigators have looked for biological mechanisms that might explain the link between low mood and musculoskeletal pain, including the possible role of neurotransmitters [33] and cytokine receptors [34]. However, there is still no established neuro-chemical explanation for the association. It could also occur because some people are generally more aware of symptoms, and predisposed to report them, whether they are mental or physical in nature. As an extension of this, it is also possible that individuals who experience low mood tend to worry about their health, give more attention to pain, and as a consequence are more inclined to avoid activities that exacerbate their symptoms, thus inhibiting recovery [35].

Conclusions

Although the causal pathways linking mental health with musculoskeletal pain have yet to be fully elucidated, it is evident that low mood influences both the occurrence and

persistence of pain symptoms. Moreover, its impact on the disability that arises from musculoskeletal pain appears to be even greater [36]. This suggests a need to assess mental health in patients presenting to medical care because of musculoskeletal pain. Those with low mood are at greater risk of poor outcomes, and may benefit from more intensive management, including treatment of their depression if it is of sufficient severity.

Somatising tendency

Definition

Somatising tendency is a predisposition to be more aware of, and to worry about, common somatic symptoms. It is characterised by: i) a constant scanning of the environment for threats (hypervigilance); ii) a tendency to focus on certain relatively weak and infrequent body sensations; and iii) a predisposition to intensify somatic sensations, making them more alarming, noxious, and disturbing [37]. Compared to others, individuals with a high tendency to somatise have been found to report impaired social and occupational functioning [38], to make greater demands on medical care [39,40], and to be less satisfied with the care that they receive [41].

Methods of assessment

Tendency to somatise is normally assessed through questionnaires. For example, the Brief Symptom Inventory (BSI) [42], which is a shortened form of the Symptom Checklist-90 Revised (SCL-90-R), includes a section relating to “somatisation”. This comprises seven questions covering general (“faintness or dizziness” and “hot or cold spells”), cardiovascular (“pains in the heart or chest”), respiratory (“trouble getting your breath”) gastrointestinal (“nausea or upset stomach”) and neuromuscular (“numbness or tingling in parts of your body” and “feeling weak in parts of your body”) symptoms during the past week. Each item is rated on a 5-point scale of distress, ranging from “not at all” to “extremely”, and individuals can be classified by assigning scores to each answer and summing across questions [43], or simply by counting the number of symptoms that have caused distress above a specified threshold (e.g. at least moderately distressing) [14]. In studies of associations with musculoskeletal illness, the questions relating to neuromuscular symptoms may be omitted since they could be a direct consequence of musculoskeletal pathology. The BSI has been translated into several languages and is a validated and reliable tool [42].

Other questionnaires that have been used to ascertain somatising tendency include the General Health Questionnaire (GHQ) [44], the Modified Somatic Perception Questionnaire (MSPQ) [45] and the Somatic Symptom Scale (SSS-8) [46]. The GHQ is available in versions of 12, 28, 30 and 60 items, and has been tested as a screening tool for the assessment of short-term distressing somatic symptoms [47]. The MSPQ has 13 items (each of which is scored on a four-point scale), and the SSS-8 has 8 items (each scored on a five-point scale).

Association with musculoskeletal illness

There is now strong evidence that somatising tendency is importantly associated with common musculoskeletal disorders such as back and arm pain. Many of the relevant studies

have been cross-sectional in design [13,43,48-55], and these have found relative risks or odds ratios of up to 4-5 for pain at specific anatomical sites. Moreover, the relationship extends to widespread pain [56], and there are indications that relative risks are even higher for pain occurring at multiple sites [10,12]. In particular, a large international study which compared associations with risk factors for different patterns of musculoskeletal pain, found that relative to no pain, pain that affected six or more anatomical sites showed a stronger association with tendency to somatise than pain involving fewer than four anatomical sites [57].

Importantly, the relationship is not only with awareness and reporting of musculoskeletal symptoms, but also with disability for everyday activities as a consequence of musculoskeletal pain [10,12-14,49].

It is possible that the development of a musculoskeletal disorder could sensitise an individual to other symptoms. However, findings from longitudinal studies suggest that causation is in the reverse direction – i.e. that people with somatising tendency are more prone to develop musculoskeletal pain and associated disability. Thus, among subjects who initially were free from pain, higher scores for somatisation have predicted future incidence (Table 2). Again, associations have applied to disabling pain as well as to self-reported pain. Moreover, in community- and workforce-based studies, the prevalence of somatising tendency sufficient to carry an important increase in the risk of disabling pain has been substantial (some 10-20%) [10,14].

An effect of somatising tendency on the development of non-specific musculoskeletal disorders is mechanistically plausible. Transient pain can be expected to occur quite frequently because of everyday physical strains or minor external trauma, but in a person who is predisposed to notice and worry about somatic symptoms, the sensation may be amplified and become more persistent. Systematic reviews of longitudinal studies have concluded that, as with poor mental health, somatising tendency is importantly implicated in the transition from acute to chronic musculoskeletal pain [17,18].

Interestingly, there are indications that the relationship to somatising tendency is weaker for musculoskeletal disorders with clear underlying pathology. Thus, in a case-control study of patients presenting for neurophysiological investigation because of suspected carpal tunnel syndrome, somatising tendency was less frequent in those with confirmed impairment of median nerve conduction than in those whose nerve conduction was normal (OR 0.6, 95%CI 0.4-0.9) [59].

Conclusions

It is clear that somatising tendency contributes importantly to the overall burden of non-specific musculoskeletal illness and associated disability. Therapeutic interventions aimed at reducing tendency to somatise have been disappointing [60]. However, it is possible that its effects are modified by other risk factors which are more amenable to alteration, and as a first step, it would be useful to understand better the interactions between somatising tendency and other causes of common musculoskeletal disorders.

In clinical practice, a tendency to somatise suggests a worse prognosis in patients presenting with musculoskeletal pain, and may indicate a need for more intensive management.

Health beliefs and expectations

Definition

Health beliefs are ideas, attitudes or expectations that influence the experience of health and illness, and related behaviours [61]. They develop over the course of life through experience and learning, and embrace the individual's perceptions of: i) personal vulnerability to illness; ii) the medical and social consequences of being ill; iii) the effectiveness of behaviours in reducing the risk of illness; and iv) how barriers can be overcome to adopt those behaviours [62].

The fear-avoidance theoretical model of exaggerated pain perception proposes an important role of health beliefs and expectations in musculoskeletal pain and disability [63,64], and it has been suggested that pain and coping behaviours are influenced by culturally-determined health beliefs that are prevalent in the society in which a person lives, as well as by individual perceptions [35]. It is possible that differences in societal beliefs might explain, at least in part, marked variations in the prevalence of common musculoskeletal complaints and associated disability that have been reported among workers carrying out similar jobs but in dissimilar cultural settings [11,14].

A particular focus of interest has been “fear-avoidance” beliefs concerning the effects of physical activity and work on musculoskeletal pain, and the seriousness of musculoskeletal symptoms and their prognosis. These include a conviction that prolonged rest will improve pain and disability by allowing injuries to heal, that musculoskeletal pain associated with minor physical stresses such as from using a computer keyboard can be seriously harmful, and that neglecting such pain can cause permanent health problems.

Related concepts that have been studied in relation to musculoskeletal pain are catastrophising and kinesiophobia. Catastrophising is a tendency to magnify the threat posed by pain stimuli, to feel helpless in the context of pain, and a relative inability to inhibit pain-related thoughts in anticipation of, during or following a painful experience [65], while kinesiophobia is an “excessive, irrational, and debilitating fear of physical movement and activity resulting from a feeling of vulnerability to painful injury or re-injury” [66].

Methods of assessment

As with low mood and tendency to somatise, health beliefs and expectations are usually assessed by questionnaire. The Fear Avoidance Beliefs Questionnaire (FABQ) [67] comprises 16 items rated on a 7-point likert-scale, ranging from “completely disagree” to “completely agree”. These are divided into two subscales – the Work Subscale (items 1-5, about the work-relatedness of pain) and the Physical Activity Subscale (items 6-16, about how physical activity influences pain). Each subscale is assessed separately by summing scores for the responses to individual items, higher scores indicating greater fear and avoidance beliefs. The FABQ is a reliable and valid tool that was originally developed to examine the influence of beliefs in individuals with chronic and disabling low back pain.

However, questions adapted from the FABQ have also been used successfully to study the transition from acute to persistent pain in the low back [68] and at other anatomical sites [29], and to classify individuals when free from pain [25,30].

Other valid and reliable tools that have been used to determine fear-avoidance beliefs and kinesiophobia are the Pictorial Fear of Activity Scale-Cervical (PFAcS-C) [69], the Back Beliefs Questionnaire (BBQ) [70] and the Tampa Scale of Kinesiophobia (TSK) [66]. The PFAcS-C was developed in relation to neck pain following whiplash injuries. It uses a set of 77 pictures (plus 5 control pictures) depicting movements (which differ in degree, direction, arm position and weight loading). Individuals are asked to view each picture and indicate how worried or fearful they would be to carry out the activity shown in the picture, on a scale ranging from “no fear at all” to “extremely fearful”. The BBQ asks about agreement with 14 statements (including five control statements) and examines beliefs about back pain and its consequences. The TSK is a self-reported checklist of 17 items (rated on a 4-point likert-scale) that was developed to assess fear of movement or re-injury among patients with chronic low back pain. A higher total score indicates greater kinesiophobia. Catastrophising and coping behaviours in people with musculoskeletal pain can be assessed by the Pain Catastrophizing Scale [71], and the Coping Strategies Questionnaire [72].

Associations with musculoskeletal illness

Health beliefs and expectations have been linked with pain-related outcomes at various anatomical sites, including the low back and neck [48,52,55,57,73,74]. Moreover, the relationship extends to the disability that arises from musculoskeletal pain [12,14,73] and to the occurrence of pain at multiple anatomical sites. For example, in a large international study, a belief that musculoskeletal symptoms are commonly caused by people’s work showed rather stronger and more consistent associations with pain affecting six or more anatomical sites than with pain involving fewer than four sites [57].

Longitudinal studies have often found that the persistence of musculoskeletal pain is predicted by pessimistic beliefs about the prognosis of pain, and about the relationship of physical activity and work to musculoskeletal symptoms (Table 3), and adverse beliefs and expectations may have stronger influences on the persistence of musculoskeletal pain and associated disability [67,68,75,76] than on their initial development [77].

Whether the association is more with incidence or persistence, it is likely to arise through a nocebo effect [78]. Nocebo effects are analogous to more familiar placebo responses, and occur when the belief that an exposure is harmful leads to the occurrence of symptoms through psychological mechanisms.

While most of the evidence on health beliefs and musculoskeletal pain comes from observational studies, there have also been attempts to modify musculoskeletal outcomes through interventions targeted at adverse beliefs. Most notably, a mass media campaign in Victoria, Australia, which encouraged people with back disorders to remain active and at work, was associated with a reduction in workers’ compensation for back pain that was not paralleled in neighbouring New South Wales [79]. On the other hand, similar but more limited media campaigns in Scotland [80] and Canada [81] have been less successful.

Conclusions

Evidence from observational studies points to an important role of health beliefs in the occurrence and especially the persistence of musculoskeletal pain and disability. Although the benefits from interventions aimed at modifying relevant health beliefs and behaviours have been inconsistent, that may reflect the difficulties in effecting such changes at a population level. If nothing else, the findings to date should serve as a caution against overemphasising occupational risks of musculoskeletal disorders. Regulatory bodies and many health professionals still place great stress on protection of workers from hazards associated with mechanical loading, and it is possible that this reinforces workers' beliefs that they are exposed to serious risk of injury and thereby promotes disability, some of which would not otherwise occur.

In the management of patients with musculoskeletal pain, fear avoidance beliefs are an indicator of poor prognosis, and may be a target for intervention. There is good evidence that patients with back pain do better if they remain active within the limits posed by their symptoms [82]. The same is likely to apply to non-specific pain at other anatomical sites, but this needs to be tested in randomised controlled trials, one of which is currently on-going [83].

Psychosocial aspects of work

Along with the role of personal characteristics such as mental health and somatising tendency, there has been much interest in whether common musculoskeletal illness is influenced by psychosocial aspects of work. Various features of employment have been identified that could have psychological impacts on health, including job demands, control, support and satisfaction; imbalances between effort and reward; and the monotony of occupational tasks. These have been studied not only in relation to musculoskeletal disorders, but also as possible risk factors for mental illness and cardiovascular disease.

Methods of assessment and classification

Many different methods have been developed by which to assess and classify psychosocial characteristics of employment, mostly using questionnaires rather than more objective observation [84]. Some measures have focused on a single aspect of work such as job satisfaction or the repetitiveness of occupational tasks, while others have addressed more complex constructs based on theoretical models of work-related stress.

Among the most widely used instruments has been the job content questionnaire [85]. This comprises 49 questions that are grouped into scales covering psychological demands, decision latitude, social support, physical demands and job insecurity, each of which can be scored numerically. The reliability and validity of the questionnaire have been demonstrated in many occupational settings worldwide [85]. The concept of potentially harmful job strain, which was originally proposed by Karasek [86], refers to an imbalance between job demands and control, and can be defined to occur when the score for psychological demands is high (e.g. above the median) while that for decision latitude is low (e.g. below the median). It has been used successfully to predict risk of cardiovascular disease and of major

mental disorders [87]. Low social support may further increase the risk associated with job strain [85,88].

Another construct – that of effort-reward imbalance (ERI) – was developed by Sigrist [89]. This model assumes that work should be matched by socially defined rewards (e.g. salary, recognition, job security, promotion prospects), and that imbalance between effort and reward is stressful, particularly in people with an intrinsic tendency to over-commit to their work. Thus, health risks will depend not only on the circumstances of employment, but also on personal characteristics. Again, a questionnaire has been developed by which to measure the relevant components [90]. Scores for effort, reward and over-commitment, are derived from scales of six, eleven and six items respectively, and ERI is defined according to the ratio between the first two scores with an adjustment for the number items in each scale. In studies of heart disease and depression, job strain and ERI have been found to exhibit independent associations, suggesting that they represent distinct concepts [91,92].

Other aspects of work not measured directly by the job content or ERI questionnaires include job satisfaction and the monotony or repetitiveness of occupational tasks. These have sometimes been assessed by single questions – e.g. “How satisfied have you been with your job as a whole, taking everything into consideration?” [93]; “Does your job consist of constantly repeated tasks, meaning that you do the same thing hour after hour?” [94].

Associations with musculoskeletal illness

The evidence on associations between psychosocial aspects of work and musculoskeletal disorders has been examined in a number of systematic reviews, not all of which have come to the same conclusions. In an overview of reviews published up to February 2007, which focused on the influence of job demands, support, autonomy and satisfaction, Macfarlane et al found that for back pain, the most consistent findings related to high job demands and low satisfaction (four reviews positive out of six), while for pain in the neck and/or shoulder the most consistent results were for high job demands (four of six reviews positive) and low job demands (two of three reviews positive) [95]. Inconsistencies in conclusions were attributable to differences in the bodies of evidence examined (because of timing and specifications for inclusion of studies) and whether explicit criteria were applied in drawing conclusions about strength of evidence.

More recently, Lang and colleagues carried out a meta-analysis of risk estimates from longitudinal investigations looking at the relationship between psychosocial work stressors and subsequent musculoskeletal problems [96]. A total of 45 studies provided usable data on one or more of 23 combinations of stressor and musculoskeletal problem (for a combination to be included, there had to be data on it from at least five studies). Nine combinations related to lower back symptoms, seven to neck and/or shoulder problems, four to upper extremity symptoms, and three to symptoms in the lower limb. Meta-estimates of odds ratios (ORs) ranged from 1.13 (for low co-worker support and neck and/or shoulder symptoms) to 1.66 (for monotonous work and low back pain), and 17 were statistically significant. High job strain was significantly associated with symptoms in both the lower back (OR 1.38, 95%CI 1.07-1.78) and neck/shoulder (OR 1.33, 95%CI 1.08-1.62).

These findings accord with those from another recent systematic review which included 18 prospective longitudinal studies of neck/shoulder disorders [97]. The authors concluded that there was strong evidence for adverse effects of high job demands, low job control, low social support and high job strain.

Neither of these reviews presented results for ERI. However, the relationship of ERI to musculoskeletal outcomes was examined in a systematic review by Koch and colleagues [92]. The 19 studies that met specified inclusion criteria comprised 15 cross-sectional surveys, three cohort studies and one case-control investigation. They had been conducted in various locations (including Japan and the USA as well as Western Europe) and diverse industries, and focused on pain in the back, neck, shoulder, upper limb, hip and lower limb, either singly or in combination. In total, 13 investigations (10 cross-sectional) found statistically significant positive associations with ERI, as did four of eight studies that had examined links to over-commitment. One study suggested an interaction between ERI and over-commitment, but four others failed to confirm it. No quantitative estimates of risk were presented, but reports of the original primary research indicate that odds ratios were generally somewhat higher than have been found for job strain. This accords with the finding from a systematic review of work-related psychosocial risk factors and musculoskeletal disorders in hospital nurses and nursing aides, in which meta-analysis indicated an odds ratio of 6.13 (95%CI 5.32-7.07) for ERI and prevalent musculoskeletal disorder at any anatomical site [98].

Most of the research that has been conducted on psychosocial aspects of work has assessed the exposures of each participant through an individually completed questionnaire. As such, the measures derived will have reflected personal perceptions, which may vary between workers performing the same job. For example, one may be challenged by a role which another finds undemanding, and unsatisfying. Given that health effects will depend on the psychological impact in the individual, subjective perspectives may be the strongest determinants of outcome, and this is the basis for models such as those of job strain and ERI. On the other hand, interventions which employers might make to improve work will often be at organisational level, and not specific to the individual employee. Moreover, self-report of both exposures and pain outcomes in the same study may lead to biased estimates of association, especially in cross-sectional investigations [99]. Thus, there is a place also for more objective psychosocial classification of jobs.

This has been pursued through the construction of job-exposure matrices, in which the exposures of individual subjects are classified according to the perceptions of a sample of workers from the occupation in which they are employed. Through application of such a matrix to data from Finnish National Health and Work Surveys, it was possible, for example, to demonstrate significant associations of low back pain with monotonous work, although odds ratios were only about 1.2 [87].

Conclusions

Overall, observational studies provide fairly consistent evidence for associations of musculoskeletal pain with various psychosocial aspects of work. Links have been found with pain in the back, neck, arm and lower limb, and are unlikely to be explained entirely by

reporting bias. Relative risks appear to be modest, although they may be rather higher for measures that embrace the worker's personal characteristics and perceptions as well as more objective features of the occupational environment. Interventions to reduce psychosocial stressors in the workplace are thus unlikely to have a major impact on musculoskeletal illness, although they might have other benefits – for example on mental health or cardiovascular disease.

Stratified management for patients with musculoskeletal pain

As described above, psychological characteristics such as low mood, somatising tendency and adverse health beliefs carry an adverse prognosis in people with musculoskeletal pain. A recent randomised controlled trial found that stratifying the management of patients who consulted general practitioners with low back pain according to a prognostic screening tool that included items on anxiety, low mood and fear-avoidance beliefs, led to cost-effective improvements in disability at 12 months [100]. This supports the value of simple psychological assessment as a routine in patients presenting with back pain, and is an encouragement to further research to confirm the finding and extend it to non-specific pain at other anatomical sites.

Summary

It is now well established that low mood, somatising tendency, and adverse health beliefs about causes and prognosis are important determinants of non-specific musculoskeletal pain, and especially of its chronicity and associated disability. Differences in societal beliefs may have contributed to major variation that has been observed in the prevalence of disabling musculoskeletal pain, both between countries, and within the same countries over time. However, the extent of their role has yet to be established. Psychosocial aspects of work such as job demands, control, support and satisfaction, imbalance between effort and reward and monotony of occupational tasks, have also shown fairly consistent associations with common musculoskeletal complaints in observational studies. In general, relative risks have been modest, but may be rather higher for measures which embrace workers' personal characteristics as well as more objective features of the occupational environment. The established role of psychological factors in the occurrence and outcome of common musculoskeletal disorders has implications for the clinical management of patients. Evidence is emerging that stratification of treatment according to psychological and other prognostic characteristics can improve outcomes for low back pain in a way that is cost-effective, and although it has yet to be confirmed empirically, it seems likely that this finding will extend to non-specific pain at other anatomical sites. In addition, low mood in patients with musculoskeletal pain may benefit from psychological or pharmacological treatment if sufficiently severe.

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Practice points

- There is a need to assess mental health in patients presenting to medical care because of non-specific musculoskeletal pain in the back, neck or limbs, since they have higher risk of poor outcomes, and may benefit from more intensive management, including treatment of depression if it is of sufficient severity.
- In managing patients with non-specific musculoskeletal pain, clinicians should avoid undue emphasis on risks from physical activities, since this may impact adversely on health beliefs, leading to greater disability and slower recovery.
- Misplaced adverse beliefs about prognosis and risks from physical activity may be a useful target for intervention as part of the clinical management of patients with non-specific musculoskeletal pain.
- Evidence is emerging that stratifying the treatment of musculoskeletal pain according to psychological and other prognostic indicators can produce cost-effective improvements in long-term outcomes.

Research agenda

- It would be useful to understand better the interaction between somatising tendency and other causes of common musculoskeletal disorders.
- Trials are needed to assess the impact of advice to remain active in patients with non-specific musculoskeletal pain at sites other than the back.
- Further trials are needed to assess the cost-effectiveness of stratifying care for patients with non-specific musculoskeletal pain according to psychological predictors of prognosis.

Table 1
Longitudinal studies of mental health and musculoskeletal pain

Reference	Country	Study sample	Duration of follow-up	Exposures compared	Pain outcome	Risk estimate (95%CI)	Adjustment for confounders
Snedley et al. 1997 [19]	UK	961 nurses initially free from LBP for 1 month	1.5 year (mean)	Report of frequent v none or occasional low mood	Incident low back pain leading to absence from work	OR: 3.4 (1.4-8.2)	Age, height, history low back pain and report of headache, period pain, fatigue, stress
Miranda et al. 2001 [20]	Finland	2094 forestry workers initially free from shoulder pain for 12 months	1 year	Mental Stress: rather much or much v not at all	Incident shoulder pain	OR: 1.9 (1.1-3.3)	Age, sex, body mass index, work-related tasks and leisure-time physical activity
Elliott et al. 2002 [21]	UK	852 adults from general population, who initially were free from chronic pain	4 years	Lowest quartile of SF-36 mental health scores v other	Chronic pain at follow-up	OR: 1.6 (1.2-2.2)	None
Eriksen et al. 2004 [22]	Denmark	2292 adults from general population, who initially were free from moderate or worse pain	6 years	Poor v good SF-36 mental health	Moderate or worse pain at follow-up	OR: 3.3 (2.5-5.0) ^a	Age and sex
Smith et al. 2004 [23]	UK	1219 adults from general population, who initially were free from chronic back pain	4 years	Lowest quartile of SF-36 mental health scores v other	Chronic back pain at follow-up	OR: 2.0 (1.5-2.7)	None
Palmer et al. 2007 [24]	UK	788 adults from general population, who initially had been free from knee pain for >12 months	1.5 years	Worst v best third of SF-36 mental health scores	Knee pain in past 4 weeks at follow-up	OR: 1.4 (0.9-2.3)	Age, sex and general practice
Palmer et al. 2008 [25]	UK	613 adults from general population, who initially had been free from arm pain for >12 months	1.5 years	Worst v best third of SF-36 mental health scores	Arm pain in past 4 weeks at follow-up	OR: 1.7 (1.1-2.8)	Age, sex and general practice
Solidaki et al. 2013 [26]	Greece	168 nurses, postal clerks and office workers, with pain at <2/6 anatomical sites in past 12 months at baseline	1 year	Worst v best third of SF-36 mental health scores	Pain at 2/6 anatomical sites in past month at follow-up	OR: 1.5 (0.5-4.9)	Age, sex and occupation

Reference	Country	Study sample	Duration of follow-up	Exposures compared	Pain outcome	Risk estimate (95%CI)	Adjustment for confounders
Sadeghian et al. 2013 [27]	Iran	245 nurses and office workers, who initially had no neck or shoulder pain in past month	1 year	Worst v best third of SF-36 mental health scores	Neck or shoulder pain in past month at follow-up	PRR: 1.8 (1.0-3.0)	Age, sex, occupational physical activity, psychosocial aspects of work, and somatising tendency
Sadeghian et al. 2014 [28]	Iran	385 nurses and office workers	1 year	Worst v best third of SF-36 mental health scores	Low back pain in past month at follow-up	PRR: 1.3 (0.9-1.7)	Age, sex, occupation, occupational lifting, psychosocial aspects of work, somatising tendency, beliefs about back pain, history of low back pain at baseline
Vargas-Prada et al. 2013 [29]	Spain	971 nurses and office workers	1 year	Worst v best third of SF-36 mental health scores	Disabling pain in past month at follow-up at an anatomical site which was free from pain in past month at baseline	OR: 1.5 (1.0-2.3)	Age, sex, occupation, pain at same anatomical site in year before baseline, occupational physical activity, job satisfaction, somatising tendency and adverse beliefs
Vargas-Prada et al. 2013 [30]	Spain	579 nurses and office workers with no low back pain in past month at baseline	1 year	Worst v best third of SF-36 mental health scores	Disabling low back pain in past month at follow-up	PRR: 1.9 (0.9-4.0)	Age, sex, occupation, occupational lifting, adverse beliefs, somatising tendency, smoking, low back pain in past year at baseline
Vargas-Prada et al. 2014 [31]	Spain	971 nurses and office workers	1 year	Worst v best third of SF-36 mental health scores	Pain in past month at follow-up at an anatomical site in upper limb which was free from pain in past month at baseline	OR: 1.4 (1.0-1.9)	Age, sex, and occupation

OR = odds ratio PRR = prevalence rate ratio

^aPublished risk estimate was for good v poor mental health, and has been inverted to be consistent with estimates from other studies

Table 2
Longitudinal studies of somatising tendency and musculoskeletal pain

Reference	Country	Study sample	Duration of follow-up	Exposures compared	Pain outcome	Risk estimate (95%CI)	Adjustment for confounders
Macfarlane et al. 2000 [58]	UK	1260 adults from general population, who initially were free from forearm pain	2 years	2 v 0 somatic symptoms from somatic symptom scale	Forearm pain in past month at follow-up	RR: 1.7 (1.0-3.0)	Age and sex
Palmer et al. 2007 [24]	UK	788 adults from general population, who initially had been free from knee pain for >12 months	1.5 years	Worst v best third of somatising scores derived from BSI questions	Knee pain in past 4 weeks at follow-up	OR: 1.6 (1.0-2.7)	age, sex and general practice
Palmer et al. 2008 [25]	UK	613 adults from general population, who initially had been free from arm pain for >12 months	1.5 years	Worst v best third of somatising scores derived from BSI questions	Arm pain in past 4 weeks at follow-up	OR: 2.0 (1.2-3.4)	age, sex and general practice
Solidaki et al. 2013 [26]	Greece	168 nurses, postal clerks and office workers, with pain at <2/6 anatomical sites in past 12 months at baseline	1 year	2 v 0 somatic symptoms at least moderately distressing in past week	Pain at 2/6 anatomical sites in past month at follow-up	OR: 1.8 (0.5-5.7)	Age, sex and occupation
Sadeghian et al. 2013 [27]	Iran	245 nurses and office workers, who initially had no neck or shoulder pain in past month	1 year	2 v 0 somatic symptoms at least moderately distressing in past week	Neck or shoulder pain in past month at follow-up	PRR: 1.2 (0.8-1.8)	Age, sex, occupational, physical activity, psychosocial aspects of work, and mental health
Sadeghian et al. 2014 [28]	Iran	385 nurses and office workers	1 year	2 v 0 somatic symptoms at least moderately distressing in past week	Low back pain in past month at follow-up	PRR: 1.1 (0.9-1.4)	Age, sex, occupation, occupational lifting, psychosocial aspects of work, mental health, beliefs about back pain, history of low back pain at baseline
Vargas-Prada et al. 2013 [29]	Spain	971 nurses and office workers	1 year	2 v 0 somatic symptoms at least moderately distressing in past week	Disabling pain in past month at follow-up at an anatomical site which was free from pain in past month at baseline	OR: 3.5 (2.2-5.6)	Age, sex, occupation, pain at same anatomical site in year before baseline, occupational physical activity, job satisfaction, mental health and adverse beliefs
Vargas-Prada et al. 2013 [30]	Spain	579 nurses and office workers with no low back pain in past month at baseline	1 year	2 v 0 somatic symptoms at least moderately distressing in past week	Disabling low back pain in past month at follow-up	PRR: 1.4 (0.7-3.0)	Age, sex, occupation, occupational lifting, adverse beliefs, mental health, smoking, low back pain in past year at baseline

Reference	Country	Study sample	Duration of follow-up	Exposures compared	Pain outcome	Risk estimate (95%CI)	Adjustment for confounders
Vargas-Prada et al. 2014 [31]	Spain	971 nurses and office workers	1 year	2 v 0 somatic symptoms at least moderately distressing in past week	Pain in past month at follow-up at an anatomical site in upper limb which was free from pain in past month at baseline	OR: 2.2 (1.6-3.1)	Age, sex, and occupation

RR = relative risk OR = odds ratio PRR = prevalence rate ratio

Table 3
Longitudinal studies of health beliefs and persistence of musculoskeletal pain

Reference	Country	Study sample	Duration of follow-up	Exposures compared	Pain outcome	Risk estimate (95%CI)	Adjustment for confounders
Jensen et al. 2009 [77]	Denmark	1566 newly qualified health care workers With previous low back pain	1 year	Increases of one in z-scores for adverse beliefs about work-relatedness of low back pain and about effects of physical activity	>30 days v no low back pain during 1 year of follow-up	Adverse beliefs about work-relatedness: OR: 1.6 (1.2-2.0) Adverse beliefs about effects of physical activity: OR: 1.3 (1.0-1.6)	Age, smoking, leisure time physical activity, body mass index, emotional job demands and influence at work
Palmer et al. 2007 [24]	UK	468 adults from general population, with knee pain in past 12 months at baseline	1.5 years	Concerned that knee pain would still be a problem in 12 months	Knee pain in past 4 weeks at follow-up	OR: 3.3 (2.0-5.5)	age, sex and general practice
Palmer et al. 2008 [25]	UK	643 adults from general population, who had arm pain in past 12 months at baseline	1.5 years	Belief pain caused or made worse by work Concerned that arm pain would still be a problem in 12 months	Arm pain in past 4 weeks at follow-up	Adverse beliefs about work-relatedness: OR: 1.8 (1.3-2.5) Adverse beliefs about prognosis: OR: 2.6 (1.8-3.9)	age, sex and general practice
Solidaki et al. 2013 [26]	Greece	350 nurses, postal clerks and office workers, with pain at 2/6 anatomical sites in past 12 months at baseline	1 year	Strong belief pain caused or made worse by work v none Belief that physical activity should be avoided	Pain at 2/6 anatomical sites in past month at follow-up	Adverse beliefs about work-relatedness: OR: 2.2 (1.3-3.8) Adverse beliefs about effects of physical activity: OR: 0.7 (0.4-1.1)	Age, sex and occupation
Sadeghian et al. 2014 [28]	Iran	385 nurses and office workers	1 year	Adverse beliefs about work-relatedness of low back pain, effects of physical activity and prognosis	Low back pain in past month at follow-up	Adverse beliefs about work-relatedness: PRR: 1.3 (1.0-1.5) Adverse beliefs about effects of physical activity: PRR: 0.8 (0.6-1.1) Adverse beliefs about prognosis: PRR: 1.0 (0.6-1.4)	Age, sex, occupation, occupational lifting, psychosocial aspects of work, mental health, somatising tendency, other beliefs about back pain, history of low back pain at baseline
Vargas-Prada et al. 2013 [29]	Spain	971 nurses and office workers	1 year	Adverse beliefs about work-relatedness of low back pain, effects of physical activity and prognosis	Disabling pain in past month at follow-up at an anatomical site which was associated with disabling pain in past month at baseline	Adverse beliefs about work-relatedness: OR: 1.4 (0.5-4.2) Adverse beliefs about effects of physical activity: OR: 1.3 (0.6-2.6) Adverse beliefs about prognosis: OR: 2.4 (1.1-5.1)	Age, sex, occupation, occupational physical activity, job satisfaction, mental health, somatising tendency and other adverse beliefs

Reference	Country	Study sample	Duration of follow-up	Exposures compared	Pain outcome	Risk estimate (95%CI)	Adjustment for confounders
Vargas-Prada et al. 2013 [30]	Spain	191 nurses and office workers with disabling low back pain in past month at baseline	1 year	Adverse beliefs about work-relatedness of low back pain, effects of physical activity and prognosis	Disabling low back pain in past month at follow-up	Adverse beliefs about work-relatedness: OR: 1.0 (0.7-1.6) Adverse beliefs about effects of physical activity: OR: 0.9 (0.7-1.2) Adverse beliefs about prognosis: OR: 1.1 (0.9-1.3)	Age, sex, occupation, occupational lifting, other beliefs about low back pain, mental health, somatising tendency, smoking, low back pain in past year at baseline
Vargas-Prada et al. 2014 [31]	Spain	971 nurses and office workers	1 year	Adverse beliefs about work-relatedness of low back pain, effects of physical activity and prognosis	Pain in past month at follow-up at an anatomical site in upper limb which was associated with pain in past month at baseline	Adverse beliefs about work-relatedness: OR: 1.4 (1.0-1.9) Adverse beliefs about effects of physical activity: OR: 0.9 (0.7-1.2) Adverse beliefs about prognosis: OR: 1.4 (1.0-1.8)	Age, sex, and occupation

OR = odds ratio PRR = prevalence rate ratio