Shoulder pain at the workplace

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Shoulder pain is among the most common of regional musculoskeletal complaints in the work environment. It is also a very common problem in the broader community. A challenge to health professionals working in this area is that only a small proportion of shoulder pain at work can be explained by conditions that are readily identifiable (such as rotator cuff disease) and can be adequately managed in a medical model. A greater proportion of shoulder pain at work cannot be understood in this way, and standard medical management is unlikely to offer the best chance of recovery. Furthermore, current research suggests that traditional work-related associations and risk factors only explain a minor part of the total problem and that ergonomic approaches focusing on primary prevention are also unlikely to adequately address the problem. This article examines recent research in the area of work-associated shoulder pain. It focuses on the recent literature examining classification of shoulder pain, and the assessment, management and prognosis of this challenging, regional musculoskeletal pain problem and argues for a more encompassing approach to its management.

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Musculoskeletal pain is an inescapable part of the human experience. The shoulder is among the most common sites of musculoskeletal complaints. Most estimates of community prevalence rates of shoulder pain are between 16% and 26% [1,2]. There are multiple recognised causes for this problem. Shoulder pain is more common in middle-aged and elderly people [3], and there are a number of recognised medical conditions associated with shoulder pain. For example, over 90% of patients with rheumatoid arthritis report shoulder involvement [4]. Shoulder pain may also arise from anatomical structures remote from the shoulder, including the neck, lung or diaphragm. Work-related shoulder pain is also a common reason for people to seek medical advice. In Australia, approximately 13% of all shoulder problems presenting to general practitioners are considered work related [5]. A recent cross-sectional survey of 10,000 adults in the North Staffordshire regions of the UK (where the age-standardised 1-month period prevalence of shoulder pain was 31.7%) suggested that the population attributable fraction for exposure to work activities was 24% [6]. Work-related shoulder pain presents a number of significant challenges for practitioners. Clinical classification, work attribution, the contribution of physical and psychological working conditions to aetiology and designing appropriate treatment strategies are just some of them.

This article outlines some of these challenges and attempts to synthesise the best evidence in the field so as to address these issues. The material used in the article is mainly that published after 2006, when the area was last reviewed in this series. Seminal work and significant reviews prior to this date are included where relevant. This article is restricted to issues pertaining to the shoulder within the so-called CANS model (complaints of arm, neck and/or shoulder) defined as “musculoskeletal complaints of the arm, neck and/or shoulder not caused by acute trauma or by any systemic disease [7].” Although not dealt with in this article, it is acknowledged that traumatic shoulder injury is an important (although numerically much smaller) issue in the work environment. The other important point to note in any discussion of work-related musculoskeletal pain is the distinction between the presence of symptoms, the reporting of symptoms, attribution of symptoms to work, seeking health care, loss of time from work and long-term damage, all of which may have different determinants [8]. Where possible, these separate (but related) issues have been clearly identified in the discussion.

Methods

Literature relevant to this review was identified using the following databases: PubMed (including Medline), EMBASE, PsycINFO, Cochrane Database of Systematic Reviews (CDSR), Cochrane Central Register of Controlled Trials (CCTR), Database of Abstracts of Reviews of Effectiveness (DARE) and Turning Research into Practice (TRIP). Retrieval was restricted by publication year (2006 to search date 28 July 2010) and English language, but not to any particular publication type. The basic search strategy used for PubMed (and subsequently translated into the specific search syntax required for the other databases) was: Shoulder* AND (occupation* OR workplace* OR industr* OR job* OR “work-related” OR employ*) AND published in the last 5 years AND English [lang].

An additional PubMed search combined the term ‘shoulder*’ with all citations appearing in a constructed search set of 47 journal titles oriented towards occupational diseases, such as the International Journal of Occupational and Environmental Health and Occupational & Environmental Medicine, was undertaken.

The focus of the article is on systematic reviews and reviews with extensive narrative. Where individual studies added new or specific information, these were included.

Classification

Classification systems are rules that define minimum criteria that are required to be met in order to establish the existence of a disorder. They help clinicians and researchers communicate about prevalence and incidence, the impact of disorders and prognosis. They may provide insight into some relevant aspect of current experience (pathology, pain and disability) or future course (response to treatment) [9]. Ideally, such systems should be valid, reliable, easy to use and generalisable. Symptoms in the shoulder may arise from discrete pathological conditions, such as rotator cuff tendonitis. Alternatively, presentations may be non-specific or mixed, reflecting pain associated with other factors,
which limit the ability to make a clear pathoanatomical diagnosis. There is a lack of consensus as to what constitutes a precise and rigorous case definition of a number of shoulder complaints, and the clinical assessment process is complicated by the indirect links between aetiology, pathology, diagnostic label and the subsequent impairment and disability. The area is also further complicated by a medicolegal environment, which can be acrimonious and occasionally adversarial, and, sometimes, a workers’ compensation system where access to financial support is determined in part by a legal (as well as a medical) process.

There is considerable uncertainty as to the classification of upper-limb disorders in general, and shoulder problems, more specifically. This classification is further complicated when issues of work-relatedness are considered. This lack of operational definition for these conditions is a frequently cited problem for epidemiological research and indeed for clinicians managing these issues. A number of frameworks have been proposed to address this issue. Van Eerd et al. found 27 different classification systems for work-related upper-extremity conditions [10]. A more recent review of the classification and diagnosis of work-related upper-extremity conditions was published in 2009 [11]. What emerged from this review confirmed that there is marked inconsistency in the terminology and classification of upper-limb conditions worldwide. The reviewers concluded that upper-limb conditions could be classified into three broad categories: (1) ‘specific conditions’ with evidence-based diagnostic criteria (such as rotator cuff syndrome), (2) ‘other specific conditions’ with no clearly defined diagnosis (such as acromioclavicular syndrome) and (3) ‘non-specific conditions’ characterised by pain, discomfort, fatigue, limited movement and loss of muscle power without a pattern allowing a specific diagnosis to be made. The authors argued that currently terminology used to describe work-related upper-limb conditions is deficient in the sense that it often fails to encapsulate an appropriate meaning consistent with all conditions. Terms sometimes define the condition by a single risk factor as the proposed disease mechanism (e.g., repetitive strain injury) or may be too restrictive in terms of anatomical regions. As a consequence, the labelling may provide little useful insight into the anatomy affected, disease severity, appropriate treatment or expected prognosis [12]. They suggest a dynamic model with an emphasis on specific diagnosis, where conditions currently classified as ‘other specific conditions’ could move to the ‘specific conditions’ category as new evidence becomes available and consensus is reached as to their status. With respect to the shoulder, they propose that the following specific diagnoses be included: rotator cuff ‘syndrome’ (with specific diagnostic definitions including signs and symptoms of tendon inflammation, degeneration and rotator cuff tears), shoulder capsulitis (frozen shoulder) and ‘pain syndromes’ (including fibromyalgia). The category of ‘other specific conditions’ includes those conditions for which there are low prevalence rates, difficult or controversial diagnoses, difficulties in establishing work-relatedness, or where there is an unclear relationship to potential risk factors. It is proposed that this category includes bicipital tendonitis, acromioclavicular syndrome, glenohumeral joint degenerative disease, subdeltoid bursitis, shoulder pain and scapulothoracic pain syndrome. Non-specific shoulder conditions characterised by pain, discomfort, fatigue, limited movement and loss of muscle power without a pattern allowing a specific diagnosis to be made are included in the schema as a separate category.

Of course, the classification of most soft-tissue disorders of the shoulder relies heavily on the clinical opinions of assessors using clinical assessment tools with limited sensitivity, specificity and reproducibility. This is a problem for both clinicians and their patients, whose clinical progress may be complicated by receiving conflicting diagnostic labels and advice. It is also a major issue for researchers, where misclassification may compromise trials, leading to uncertainty over multiple issues from pathology to causation.

Causality

It is estimated that 65–70% of all shoulder pain is due to rotator cuff disease. This is associated with overloading, instability of the glenohumeral and acromioclavicular joint, muscle imbalance due to adverse anatomical features, cuff degeneration with ageing, ischaemia and musculoskeletal diseases resulting in wasting of the cuff muscles. Adhesive capsulitis accounts for nearly 2% of cases of shoulder pain and is associated with female sex, older age, shoulder trauma, surgery, diabetes, stroke, thyroid disease and cardio-respiratory disorders [13].
There is increasing recognition that there are multiple risk factors for developing shoulder pain. Other than the well-recognised associations listed above, occupation has been extensively studied and factors associated with this domain extensively reported, despite its limited overall role in the primary causation of shoulder pain in the community. The more recent work in this area is reported below. However, literature is emerging, which focusses across both work and non-work domains. Leijon et al. recently reported on different rates of shoulder pain in a cohort study of 1095 individuals clustered into 11 groups with different combinations of working and living conditions and followed up for 5 years [14]. They found several groups to have increased burdens of musculoskeletal pain, including those in “onerous human service jobs,” “free agents,” those with a “family burden” and those “mentally stretched,” as well as the “physically strained” group. They argue that such analyses may assist in the development of broad-based prevention strategies, as opposed to the more common modification of the single-risk-factor approach. Cultural factors have also been the subject of some recent studies. Madan et al. found higher rates of back, neck and arm pain in UK white manual workers compared with workers from the Indian subcontinent. They hypothesised that societal beliefs about such illness and illness causation influence its occurrence [15].

The proportion of work-related shoulder pain caused by identifiable clinical conditions, such as rotator cuff disease, differs from the background rates in the general community. It appears that the proportion of shoulder pain cases with non-specific shoulder pain is far higher in the working population. For example, a Finnish study compared the rates of shoulder pain with a specific diagnosis versus non-specific shoulder pain in a population of adults, who had worked in the last 12 months. They found the rates of non-specific shoulder pain to be approximately 6 times greater (12%) than shoulder pain with a specific diagnosis (2%). They also found distinct differences in the determinants of the two groups, arguing that this suggests that the two are distinct entities, rather than the non-specific pain being a precursor of a more severe, clinically specific disease. Specifically, they argued that non-specific symptoms without clinical findings seemed to be associated more strongly with psychological factors and personality traits, rather than biologic, metabolic and biochemical features [16].

The occupational associations and risk factors for the development of shoulder pain have been the subject of a huge number of studies and systematic reviews [17]. Potential risk factors relate to physical factors and include heavy workload, awkward postures [18], working above shoulder height [19], carrying weights on one shoulder [20], repetitive movements [21], vibration, pushing and pulling [22] and duration of employment. There is evidence that cumulative intensive shoulder work, particularly incorporating combinations of exposures, is associated with significantly increased rates of prevalence of shoulder disorders [23]. The exposures that are suspected of causing or aggravating these problems are complex and difficult to measure [24]. Recently, however, there have been some attempts made to measure workload more objectively [25]. Much of the work on associations has been cross-sectional (therefore reporting associations rather than risk factors) and often used self-reported data. A recent prospective study, however, has showed that occupational physical loading increases the risk of a subsequent clinical shoulder disorder. In this Finnish study, 909 participants were re-examined 20 years after a national survey, which had gathered data on occupational exposures. The risk of developing a chronic, physician-diagnosed shoulder disorder was increased by 80–150% when workers were consistently exposed to a combination of heavy lifting, working in awkward postures, work involving vibration or repetitive movements [26]. In a recent review for the Health and Safety Executive, Burton et al. reported that more recent epidemiological studies involving longitudinal designs also suggest an association between physical exposures and the development of upper-limb disorders, but they report the effect size to be rather modest and largely confined to intense exposures. The primary outcome investigated in relevant studies (primary causation, symptom expression or symptom modification) is inconsistent across studies and remains a subject of debate [27].

Many studies have assessed psychosocial risk and found associations less consistent than those with physical factors. These studies are also difficult to perform and assessment methods vary considerably [28]. Psychosocial factors studied include pain associated with high psychological demands, poor control at work, poor social support and job dissatisfaction [29]. Newly employed workers were the subject of a study by Nahit et al. [30], with follow-up 12 months later [31]. One-fifth (20%) of 1081 workers in their study reported shoulder pain, and this was associated with individuals perceiving
their job as stressful most of the time. At 12 months, psychological distress (odds ratio (OR) 2.1), job demands, support from colleagues and satisfaction with work (OR between 1.4 and 1.7) were all associated with increased odds of reported pain. Exposure to monotonous work [32], psychological distress [33], low work control, poor relationships with colleagues [34] and individual psychological factors, such as anxiety and depression [35], have all been suggested as factors associated with shoulder pain in various studies.

Recently, a task force commissioned by the European League against Rheumatism (EULAR) examined the strength of evidence in published review articles relating to the topic of workplace psychosocial factors and musculoskeletal pain [36]. With respect to shoulder/neck pain, they concluded that the most consistent findings were with high job demands (four reviews positive out of six) and low job demands (two reviews positive out of three). They were critical of the reviews in the sense that they found they often evaluated different bodies of evidence (according to their search criteria, year of review, the quality assessment of the studies included and the combination of risk factors included in the studies) and varied in whether explicit criteria for making conclusions based on the strength of evidence were stated. The review pointed out the relative lack of longitudinal studies in this area.

Although the burden of reported shoulder pain with no specific diagnosis far outweighs that with a specific diagnosis, it appears that there is evidence that the latter group is still associated with a number of the work-related risk factors reported earlier. For example, rotator cuff syndrome has been found to be associated with forceful exertion and shoulder flexion [37], repetitive movements of the shoulder, working with the hand above the shoulder and high psychosocial job demand [38]. Adhesive capsulitis is associated with exposure to overhead work, work involving lifting weights, poor workplace support from colleagues and supervisors and psychological morbidity [24].

The pathophysiological link between work and pain is an area of current research. Recent work in this area includes demonstrating that shoulder pain is associated with vasodilatation in the trapezius muscle but not with muscle activity [39]. The authors of this work postulate that the interaction between blood vessels and nociceptors may be important in the activation of muscle nociceptors in people with chronic shoulder and neck pain. Autonomic imbalance or increased activity of the sympathetic–adrenal medullary system [40] in patients with chronic local or regional pain is also under investigation. The physiology of neck–shoulder pain and trapezius myalgia was the focus of a previous review in this series [41].

Assessment

Imaging is often considered as part of the medical assessment of shoulder pain. The approach is the same, regardless of the potential work-relatedness of the condition. There has been considerable literature on the role of diagnostic imaging in this context. If traumatic shoulder injury is excluded, then the role of shoulder imaging is limited and, in all likelihood, overperformed [42]. This is especially the case with diagnostic ultrasound with a significant potential for false positive findings [43]. This technique should probably be reserved for individuals complaining of shoulder or lateral upper-arm pain, localised to these regions on clinical examination. This should reduce the risk of an incorrect diagnosis in patients with non-specific shoulder region pain, which is often localised to the trapezius or scapular regions. Likewise, magnetic resonance imaging should only be employed when a surgical approach is being considered [44]. Plain X rays are useful in helping rule out red flag pathology or for assessing the acromioclavicular joint.

Management

Given the burden of disease and its complex aetiology, it is unrealistic to consider shoulder pain as entirely preventable. Indeed, given that most people suffer from upper-limb symptoms at some stage (many do not even seek medical care), some argue that having one or more musculoskeletal complaints can be considered normal. A management approach to workplace shoulder pain that is focussed solely on either medical treatment or ergonomic solutions is unlikely to be effective. A multimodal approach emphasising a biopsychosocial model and early return to work or work retention, where possible, has considerable appeal.
There is an extensive literature examining the efficacy of common medical treatments for shoulder pain due to readily identifiable pathologies. These have been the subject of a number of reviews, including several Cochrane reviews. Table 1 summarises the current common medical treatment options for symptomatic rotator cuff disease (the most common specific shoulder disorder) and the possible limitations of that treatment [45].

The treatment for adhesive capsulitis has been the subject of a recent systematic review. The reviewers found strong evidence for the effectiveness of steroid injections and laser therapy in short-term follow-up, and moderate evidence for steroid injections in mid-term follow-up. Moderate evidence was found in favour of mobilisation techniques in the short- and long term, for the effectiveness of arthrographic distension alone and as an addition to active physiotherapy in the short term. There was also evidence for the efficacy of oral steroids compared with no treatment or placebo in the short term, and for the effectiveness of suprascapular nerve block compared with acupuncture, placebo or steroid injections [54].

The treatment for the problem of workplace shoulder pain that does not meet the criteria for symptomatic rotator cuff disease or acromioclavicular syndrome is far less clear. Avoiding over-medicalising the majority of work-related shoulder pains appears to be important. Based on their review of the literature, The US Work Loss Data Institute recommends prescribing an alteration of

<table>
<thead>
<tr>
<th>Treatment</th>
<th>Evidence</th>
<th>Limitation</th>
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<tr>
<td>Simple analgesia, eg. paracetamol 1 g 4–6 hourly up to 4 g per day</td>
<td>Useful for musculoskeletal pain but limited evidence specifically for rotator cuff disease [13].</td>
<td>Stronger analgesia may be needed for adequate pain relief but this is associated with significant risk of side effects, particularly in the elderly, and should only be used for a short period of time</td>
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<td>Non-steroidal antiinflammatory drugs including non-selective NSAIDs and COX 2 inhibitors</td>
<td>Limited evidence that oral and topical NSAIDs provide small benefit in terms of pain relief [46]</td>
<td>Risks may outweigh benefits in high-risk patients. Consider possible cardiovascular, renal and GI side effects and potential drug interactions (eg. Warfarin); particular care is needed in the elderly.</td>
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<tr>
<td>Manual therapy combined with strengthening exercises for the cuff and scapular stabilisation</td>
<td>Limited evidence that exercise therapy is beneficial. Manual therapy may provide additional benefits when used with exercise [47]. Combination may be more beneficial for improving strength and function than pain and these benefits may take time to accrue (3–6 months)</td>
<td>Minimal risks but long-term adherence to exercise program may be difficult to maintain</td>
</tr>
<tr>
<td>Other physical therapies</td>
<td>Conflicting evidence for low-level laser therapy, ultrasound and pulsed electromagnetic therapy; acupuncture may provide transient pain relief [48].</td>
<td>Limited or unproven benefit</td>
</tr>
<tr>
<td>Subacromial injection of depot corticosteroid mixed with local anaesthetic</td>
<td>Evidence of rapid pain relief, effect lasts 4–6 weeks. Injection may be repeated if necessary [49]. No evidence that image-guided injection is more effective than traditional injections performed using anatomical landmarks. Two trials have reported similar efficacy from intramuscular injection suggesting it may be the systemic steroid effect that is therapeutic [50,51].</td>
<td>Low risk of adverse effects; may include transient rise in blood sugar in people with diabetes, transient flushing and pain at injection site. Training required.</td>
</tr>
<tr>
<td>Suprascapular nerve block</td>
<td>Evidence of limited short-term benefit for people with shoulder pain. Can be repeated if necessary [52].</td>
<td>Minimal risk of adverse effects; training required</td>
</tr>
<tr>
<td>Surgical decompression of the subacromial space, with or without rotator cuff repair</td>
<td>Limited evidence that outcome from surgery is similar to an active rehabilitation program that includes exercise [53].</td>
<td>Usual risks of surgery; recovery from surgery usually takes 3–6 months, post-operative capsulitis occurs in up to 37%</td>
</tr>
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Table 1
Medical treatment options for symptomatic rotator cuff disease.
activity for mild/moderate shoulder pain at the first visit, then physical therapy at the second visit (day 8–20, if not improving), followed by a trial of a local corticosteroid injection at the third visit, if there is no improvement [55]. There is little consistent evidence that ergonomic interventions in themselves are effective in reducing the prevalence of work-related shoulder pain [56]. They are, however, important in improving comfort and safety at work and, therefore, retain a role.

The biopsychosocial model acknowledges that biological, psychological and social factors can all play a significant role in the development and maintenance of health problems. There is an increasingly accepted need to shift the culture surrounding the relationship between work and health [57], and it is clear that multiple factors (biological, psychological and social) are relevant to shoulder pain problems. Despite the appeal of this approach, there is little evidence currently that a multimodal model involving a biopsychosocial approach is efficacious for managing upper-limb- and shoulder pain problems [58]. However, there does appear to be considerable opportunity for more integrative interventions in workplace musculoskeletal problems [59]. There is certainly wide consensus that a focus on early return to work is appropriate, and work may have health benefits in itself [60]. There is also acknowledgement that such return to work will often require transitional work arrangements as a facilitator [61], taking into account both biological and psychosocial obstacles [27]. Although there are considerable gaps in the data, adopting a biopsychosocial perspective for managing shoulder problems at work appears to be the rational way forward. In addition, a stronger focus on modern concepts of rehabilitation [62,63] may have better yields in terms of vocational outcomes than previously reported. Shared involvement of workers, employers and health professionals is an emerging trend in the area of rehabilitation [60]. For example, involving workers in self-management and managers in planning modified work and return-to-work programmes, and introducing health professionals to organisational cultures where the rehabilitation takes place is a start towards the difficult problem solving required in more complex rehabilitation cases.

Prognosis

Much shoulder pain appears to be short-lived and probably goes unreported. There is evidence, however, that at least a subgroup of people with shoulder pain at work have persistent problems. Bonde et al. studied a cohort of Danish workers with shoulder tendonitis and found that the mean duration of symptoms was 10 months but that 25% had ongoing symptoms at 22 months [64]. Higher age was associated with slower recovery, but physical job exposures were not. Perceptions of high job demand and low social support at the time of diagnosis were associated with less favourable clinical course. Grooten et al. recently attempted to determine associations between work-related exposures and the prognosis of self-reported neck/shoulder pain [65]. In a prospective cohort study of 803 workers reporting neck/shoulder pain at baseline, only 36% of subjects were symptom free 5–6 years later. Simultaneous exposure to at least two of “manual handling,” “working with hands above shoulder level” and “working with vibrating tools” appeared to be risk factors for ongoing pain, whilst working in a sedentary job enhanced the prospect of being symptom free. A higher level of pain intensity may also be a negative prognostic factor [66]. There is some evidence that perceived physical workload may hamper return to work [67], emphasising the need for work modification in certain return-to-work programmes. Descatha et al. reported poor recovery rates of workers (17 out of 74) with shoulder pain with 3 years’ follow-up in a cohort exposed to repetitive work [68]. Finally, there is further evidence concerning the negative effect of workers’ compensation on outcomes. Henn et al. followed 125 patients for 12 months after a rotator cuff repair and found that after controlling for multiple possible confounders, workers’ compensation status was a predictor of worse outcomes as measured by the Disabilities of the Arm, Shoulder and Hand (DASH) index [69].

Conclusions

Shoulder pain has been the subject of a very large number of publications in the medical literature in the past decade, reflecting its importance as one of the most common of musculoskeletal pain problems at work and in the community. Much of the published work has been in the area of work-related upper-limb or musculoskeletal pain more generally, and the authors of this review
acknowledge that given the nature of the problems often faced by clinicians (i.e., regional pain), to focus exclusively on the shoulder is somewhat restrictive. Nonetheless, what is clear from this review is that clinicians working in this area still face a number of significant challenges. We are still struggling to speak the same language when faced with a patient with shoulder pain, we are probably over-investigating and our management strategies are almost certainly too narrow in their focus. Combined with these challenges, many of us are faced with working within workers' compensation systems that are almost certainly causing our patients harm. Seen in this context, it is no wonder that a significant proportion of the patients presenting to us will have persistent pain problems for far longer than we (or they) would hope. A more inclusive and less medically focused approach to dealing with these patients may be the way forward, but requires a considerable change in the way health providers, employers, insurers and patients think and act.

**Practice Points**

- Shoulder pain is very common in the workplace, but only a relatively small proportion of this is caused by work.
- In many cases of shoulder pain, no readily identifiable cause can be found.
- Managing shoulder pain at work using a medical model is unlikely to be effective in a large number of cases, and may be detrimental in some.
- A biopsychosocial model with a focus on early return to work is likely to have the best chance of good vocational outcomes.

**Research Agenda**

- Classification of shoulder (and all upper-limb) disorders remains a significant problem, which hampers clinicians and researchers alike. There is a significant need for a simple, reliable and generalisable classification system, which minimises misdiagnosis and facilitates communication and research.
- A significant proportion of shoulder pain at work has no easily identifiable pathology, and is resistant to standard medical therapeutic intervention. A better understanding of the aetiology and natural history of this group is required to improve its management.
- There is a need for good-quality trials in the area of the management and rehabilitation of upper-limb (including shoulder) pain at work. Novel studies involving multimodal approaches are required.

**References**


