

The biopsychosocial model of pain 40 years on: time for a reappraisal?

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1. Historical background

Like other models or explanations for health conditions,¹⁴ the biopsychosocial model of pain has provided a framework for the assessment and management pain and associated phenomena. It should be acknowledged this is a conceptual, rather than a mathematical, model and that it applies to all pain, acute and chronic.^{38,50}

The initial versions of the biopsychosocial model of pain can be traced to 2 surgeons, John Loeser⁸⁶ (in 1982) and Gordon Waddell¹⁴⁸ (in 1984). In both cases, the impetus for their proposals derived from their observations that surgical treatments for low back pain were often ineffective and they argued the problems being experienced by many of their patients with low back pain could not be accounted for by pathology in the spine alone. Loeser⁸⁶ argued for what he called a “learning-based model that includes all of the known contributors to chronic pain behavior (p. 148),” which he contrasted with “the biomedical model” and he urged (medical and surgical) specialists to “look beyond the technological aspects of their special interest areas and consider the patient as a whole person, subject not only to internal pathological processes but also to the stresses of his or her environment (p. 148).”

Contemporaneously with Loeser and Waddell’s thinking, George Engel, a psychiatrist, was publishing similar ideas about mental illnesses and posited that symptoms should be conceptualised as the result of a dynamic interaction between psychological, social, and pathophysiological variables.^{35,36} Every student of pain will be familiar with the so-called “onion-model” diagram of pain (**Fig. 1**) described by Loeser⁸⁶ and Waddell et al.¹⁴⁸ At its core, there was a biologic process (now called “nociception”) wrapped in succeeding layers of perception, affect, behaviour, and environmental factors—to indicate different categories of common contributors to the experience and impact of pain, as well possible targets for treatments.

Turk and Flor¹³⁹ summarised supporting evidence for this model of pain from experimental and clinical studies in the 1980s and 90s, and numerous subsequent researchers have added to

their list of confirmatory studies and explored multiple contributing processes.^{10,12,20,38,56,61,90,94,107}

Alongside the mounting evidence for the core elements of the model, debate over the roles of biological and psychosocial factors in the experience and impact of pain has persisted.^{47,62,154} In addition, while accepting the basic tenets of the biopsychosocial model (that the experience and impact of pain reflects contributions by biological, psychological, and social or environmental factors), many authors have argued that in its interpretation and application the model has significant shortcomings.¹⁵⁰ For example, some have argued that despite its holistic framework, the model’s application often seems to reflect a biomedical reductionist perspective that gives primacy to the biologic aspects of pain¹¹⁷ and, therefore, could be considered no different to the old “mind–body dichotomy” it was supposed to have replaced. To make their point, some authors proposed inverting the order of the 3 main components of the model by relabelling it as “sociopsychobiological” or “sociopsychobiomedical” models to provide what they saw as a more accurate perspective in which the social or environmental and psychological factors (including meaning) were more salient than just secondary reactions to biological events.¹⁹

Regardless of these more theoretical and even philosophical debates, the biopsychosocial model has long been cited as providing the theoretical basis for multimodal and multidisciplinary treatments for pain.^{8,27,47,70,88,109} The central thesis of the model is that if presenting patients report pain the onus is on the attending clinician(s) to identify the likely cause(s) of the patient’s pain, and this should include consideration of the possible contributing biological (somatic), psychological, and social or environmental factors.^{43,86} Once this has been completed, the next step is to implement appropriate interventions (treatments) to address these contributors. The question is as follows: To what extent does this happen in clinical and research practice?

Unfortunately, examinations of many studies of treatments described as being based on a biopsychosocial model have revealed wide discrepancies in the content and focus of these interventions that are, ostensibly, based on the same model of pain. Kaiser et al.⁶⁹ concluded that “views on the definition, content, and design of IMPT [interdisciplinary multimodal pain treatments] are in some cases widely diverging” (p. 1856) and that this variation was an obstacle to the evaluation of their effectiveness. Kamper et al.⁷⁰ and van Erp et al.¹⁴³ expressed similar concerns. In 2007, Blyth et al.¹¹ noted possible “fuzzy thinking” about what might constitute “psychosocial factors” in many treatment studies, not to mention a common failure to consider how psychosocial factors might operate in these studies and whether this might have important implications for treatment outcomes.

Similar “fuzzy thinking” might also be found in references to “social or environmental factors” although most could be summarised as

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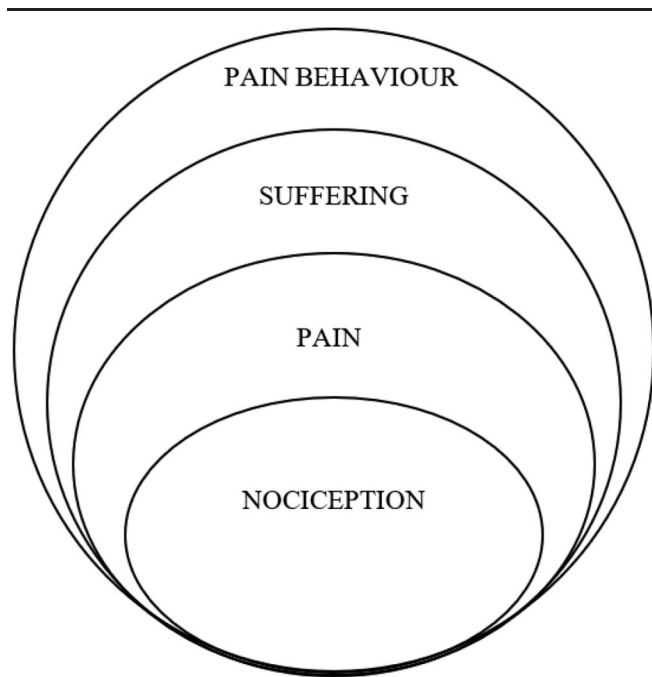


Figure 1. A multifaceted model of the components of pain. Loeser JD. Concepts of pain. In: M. Stanton-Hicks, RA Boas, editors. *Chronic low back pain*: Raven Press. Wolters Kluwer Health, Inc. 1982. Copied with permission.

contextual factors within which pain behaviours and experience (and treatments) occur. For example, within this rubric, Jensen⁶⁸ included the responses of people in the patient's immediate environment (including both health care providers and family members), whereas others have identified socioeconomic status¹³⁵ and literacy or education^{71,135}, the workplace and insurance or compensation systems,⁹² and culture (of both the patients and healthcare providers).^{71,103} In examining the application of the biopsychosocial model to pain treatments, this article will take a pragmatic approach whereby "social or environmental" factors will be taken to refer to contextual factors covering the range identified above, particularly those that are potentially modifiable.

Despite these debates and concerns over the last 20+ years, many recent publications^{21,31,137} have continued to endorse the relevance of the biopsychosocial model of pain in explaining and treating pain. At a minimum, this suggests the model has commendable resilience, even if its impact on treatment contents and outcomes is unclear. In 2013, Pincus et al.¹¹⁶ concluded that in relation to the treatment of low back pain, the utility of the biopsychosocial model could not be adequately assessed because of deficiencies in its application.

As it is now 40 years since Loeser first published his initial version of the model out of a concern for improving the treatment of back pain, it seems timely to reappraise its impact and utility in its various forms since then, but this time for pain in general.

2. The biopsychosocial model and the treatment of pain

Since its inception, the biopsychosocial model has been cited as underpinning several mechanism-based approaches to assessing and treating pain. Primarily, these have involved biological (or biomedical) and psychological approaches, but some social or environmental interventions have also been described, albeit much less often, and rarely have all 3 domains been addressed in a coordinated manner. This section will examine how the model

has been applied in a range of common treatments for pain. Where possible, only studies that met criteria for systematic reviews will be used as these reviews are frequently cited to substantiate the use of particular treatments.

2.1. Psychological treatments

Psychological treatments for pain are typically based on the assessment that psychological factors, such as mood disturbance, high levels of unhelpful thought processes (eg, catastrophizing and fears) and low levels of helpful beliefs (eg, self-efficacy and acceptance), as well as certain behaviour patterns (eg, excessive resting or avoidance) seem to be playing mediating or modulating roles that lead to greater or lesser effects of pain on functional activities, such as work and activities of daily life, and that these may be influenced by the environmental context in which they occur.^{10,18,68,71,80,92,97,103,131,132,147} As each of these factors seems potentially modifiable, psychological treatments targeting these variables for change have been associated with improvements in functional activities and reductions in disability, pain severity, distress, and the use of analgesics.^{101,104,126,140,153} Although these changes are often statistically significant and clinically worthwhile, the size of these effects have generally (on average) been found to be small or moderate in systematic reviews of randomised controlled trials with chronic pain samples.^{100,151,152}

However, the extent to which the contributing biological and social or environmental factors were adequately addressed or even assessed is unclear. An indication could be provided by an examination of the healthcare professionals involved and whether there were signs of engagement with possible biological and social or environmental contributing factors.

Examination of the studies selected for the Williams et al.'s¹⁵² systematic review of psychological treatments for chronic pain reveals a mix of treatments, many conducted only by psychologists, with others that used 2 or more disciplines, although psychologists and physiotherapists were the most common. Typically, the physiotherapists' contribution included education about pain and guidance on exercises and other daily activities. The psychologists' contributions often involved the implementation of behaviour change methods throughout the treatment program, teaching pain coping strategies, as well as teaching patients ways of dealing with unhelpful thought processes and behaviour patterns, mood disturbance, and communication skills. Some also had medical or nursing input, in the form of education and medication management (see Williams et al.,¹⁵³ for an example). Accordingly, it could be claimed that at least some of the biological and psychological contributors to the patients' pain were targeted in these treatments. However, it was much harder to find evidence that social or environmental factors were addressed as well. In fact, of 77 studies in the 2020 review, only 6 mentioned specific inclusion of the patients' spouse and 3 mentioned contacts with the patients' workplaces. Although most of these treatments included components such as skills training to improve patients' ability to manage more effectively in their social environment, it is less likely to be effective without engaging with key people, such as the spouse or the employer.^{25,93,95,99}

Of course, the broader social contributors to pain and its impact such as social inequalities, poverty, and cultural expectations of health care are, understandably, outside the remit of most individualised interventions, including psychological treatments. However, some creative ways of delivering psychological treatments to disadvantaged groups have been reported.¹³⁶ The overall impression was that, apart from a few notable exceptions, these psychological treatments for patients with chronic pain

conditions could be described more accurately as “biopsych” or even just “psycho,” rather than “biopsychosocial” in nature.

One area of psychological treatments for pain that is typically associated with the involvement of family members in the treatment process is the treatment of pain in children. A recent systematic review of psychological treatments for pain in children and adolescents included 47 studies covering a range of pain conditions (including headaches, abdominal pains, and mixed pains).³⁹ The involvement of parents in these treatments was routine and included directly training them in the use of operant strategies (eg, reinforcement for desirable behaviours, such as school attendance), communication strategies, and problem-solving skills they could use with their child. A side benefit is that these methods can also reduce distress in the parents of children with chronic pain (see Palermo¹¹²). Thus, unlike the overwhelming majority of psychological treatments described for pain in adults, the literature on the psychological treatments for pain in children and adolescents reveals that, consistent with the biopsychosocial model of pain, combinations of biological, psychological, and social or environmental interventions are regular features.

2.2. Biomedical treatments

At the biological level, a range of mechanisms involved in the perception of pain have been identified. Broadly, these include nociceptive, neuropathic, and, recently, nociplastic processes,⁷⁸ but discriminating between them is the subject of continuing debate.¹²⁴ Loeser⁶⁷ recently divided most biological mechanisms into 2 main groupings, peripheral and central, and argued for different treatment approaches according to this division. Cohen²¹ considered that acute pain was mainly related to peripheral mechanisms, especially inflammatory processes. In relation to chronic pain, in their comprehensive review, Borsook et al.¹⁵ described biological factors as including genetics, age, sex, sleep, hormones, and endogenous opiate systems. These researchers also described how biological processes such as homeostasis, resilience, allostasis, drug-induced hyperalgesia, synaptic plasticity, endogenous regulation, centralization, and sensitization could influence these effects. Of course, many of these biological factors are not readily modifiable, and perhaps inevitably, it is possible to think the science may have gone beyond what current biologically focused (or biomedical) treatments can offer. However, Fillingim³⁸ described in some detail how clinicians (of all disciplines) might use many of the findings summarised by Borsook et al.,¹⁵ as well as those from the psychological and social research literature to better individualise and target the multiple contributors to a patient’s pain and its characteristics, consistent with the theme of Loeser’s original model. Biological-level (or biomedical) treatments have typically involved therapies such as pharmacotherapy, nerve blocks, as well as electrical and other forms of stimulation. Exercises may also be considered a type of biological intervention. Geneen et al.⁴⁸ claimed exercises are commonly aimed at reducing physical deconditioning, increasing endogenous opioid production, achieving weight loss (and associated reduced pressure on joints), and, in the case of resistance exercises and strength training, improving a person’s capacity to support bone and cartilage through strengthened musculature around a joint. In the case of chronic low back pain, Geneen et al.⁴⁸ described research, suggesting that resistance training may affect disc metabolism and repair.

On their own, justifications can be provided for each of these biomedical interventions, but the question is how well do they

address the challenges posed by Loeser in 1982 and now by Fillingim³⁸—to incorporate the possible psychological and social contributors to pain in their treatments?

When considering the extent to which biological treatments have been applied within the context of the biopsychosocial model, it may be important to bear in mind the traditional view, summarised by Collett,²² that therapies such as pharmacotherapy and nerve blocks are often provided with the aim of bringing a patient’s pain under control to facilitate the introduction of psychological and physical therapy interventions. This perspective suggests that even before it is established that the biological factors are the primary contributor to a patient’s pain, they should still have priority over any psychological or social or environmental factors identified. This would seem to be at odds with the biopsychosocial model. Unfortunately, tests of this treatment order hypothesis are hard to find, although it has long been accepted clinical wisdom that multidisciplinary pain management programs should only be considered once all physical or biological modalities have been tested and failed. Wilson¹⁵⁵ wrote that in considering a patient for admission to a multidisciplinary pain program “the sine qua non of the process was that there was no specific ‘curative’ treatment for the underlying pathology, if any” (p. 620). Essentially, it can appear that underpinning the biomedical approaches is the belief that pain mechanisms only refer to biological ones and that psychological and social or environmental contributors to pain are secondary.

Examination of reviews of exercises, spinal cord stimulators, and opioids for patients with chronic pain for signs of adherence to the biopsychological model yields a finding broadly consistent with the earlier examination of the psychological treatment literature. Some examples will be described next to illustrate this point.

A Cochrane review of exercise treatments for chronic low back pain by Hayden et al.⁵⁸ described some 249 trials of exercises that met their search criteria. Examination of the methods used in these treatments revealed that the majority, with a few exceptions (eg, Bendix et al.,⁷ where the treatment was conducted within a rehabilitation facility), involved only the patients with no obvious engagement with the patients’ environmental contexts, such as their workplace or family. Most did encourage the participating patients to practice the exercises at home but that cannot be assumed as the equivalent of engaging with the patients’ significant others in promoting the exercises as intended. In addition, although most studies reviewed by Hayden et al.⁵⁸ included some education of the patients about pain mechanisms and the possible benefits of exercising, any possible psychological or environmental contributors to the patients’ chronic pain were rarely mentioned even when measures of these were included in the studies. Examination of the recruitment criteria for exercise studies indicates that, in general, no assessment of the biopsychosocial contributors to patients’ pain was conducted, apart from exclusion criteria, such as evidence of previous drug abuse or psychiatric conditions (eg, Goode et al.⁵²). The report of low back pain for a given period and being aged within certain years were typically the main inclusion criteria in most studies. For example, Cruz-Díaz et al.²⁴ stated the inclusion criteria were as follows: “age between 18 and 50 years and suffering from low back pain for at least 3 months” (p. 1250). Interestingly, that study did ask participants to complete a measure of fear avoidance, but it was not used in treatment planning. In relation to chronic low back pain, Hush⁶³ wrote “it is a multidimensional condition and it is time to move beyond simplistic unimodal treatments” (p. 2249). Unfortunately, it is hard to see how this might happen if the multiple dimensions likely to underpin a patient’s pain condition

are not assessed before treatment starts. Fortunately, this image may be changing, with the relatively recent move to explicitly encourage physiotherapists to assess possible psychological contributors to a patient's pain and to address these, to the extent of their training, in combination with pain education and the more exercise-based treatments.^{69,103}

However, it should also be possible to go beyond the likely psychological factors. A recent study by physiotherapists treating injured workers in primary care in Sweden provides a good example of how primary care clinicians can engage with the workplace to achieve better outcomes. The workplace intervention entailed a meeting of the key stakeholders (in this case, the primary care physiotherapist, the employer, and injured worker) to discuss on how they could collaborate to support the worker's sustainable work ability and, as appropriate, return to work (RTW).¹²²

Another widely promoted biomedical treatment for a range of chronic pain conditions is implanted spinal neuromodulation. Examination of the studies included in a Cochrane review of these devices by O'Connell et al.¹¹¹ reveals a similar story to the exercise studies. In this case, 15 studies met the inclusion criteria, and of these, all were directed solely at the putative biological mechanisms in the participating patients and any psychological or environmental contributors to the patients' chronic pain were not specifically mentioned or addressed. The only exceptions were those who were provided what was called "conventional medical treatment" by their usual treating physician or other health care providers. However, what this term covered was often opaque and seemed to vary between studies. One of the more descriptive studies³⁴ did mention this could include "oral medication (eg, opioids, nonsteroidal anti-inflammatory drugs, antidepressants, anticonvulsants or antiepileptics, and other analgesic therapies), nerve blocks, epidural corticosteroids, physical and psychological rehabilitative therapy, or chiropractic care." It was also interesting to note that, possibly due to ethical considerations, many of the reviewed studies compared "conventional medical treatments" vs a combination of the implanted spinal devices and the "conventional medical treatments." Where the implanted (combined) group did better, the results were typically interpreted (by the investigators concerned) as indicating superiority for the devices, but from a biopsychosocial perspective, it might be wondered if the combination might have been more effective than either alone.

As with the exercise studies, it was not obvious whether the investigators considered the biopsychosocial contributors to the pain in the recruited patients, apart from the exclusion criteria (cancer, psychiatric conditions, histories of drug abuse, etc). Even so, some of the investigators in these studies did at least display an awareness that other factors, besides the biological ones, may have contributed to their findings. For example, Tjepkema-Cloostermans et al.¹³⁶ acknowledged that "QoL [Quality of Life] can be influenced not only by pain but also by other factors for which we cannot correct." However, this may be even harder if these other factors are not assessed for their modifiability in the first place. It might also be pointed out that by "covarying out" potential confounders to establish a specific treatment effect, the researchers risk isolating the effect from the context in which it is applied.

Perhaps, the most common biomedical treatment for chronic pain is pharmacotherapy. In this case, the use of opioids for chronic low back pain was examined in a systematic review by Shaheed et al.¹¹⁹ Shaheed et al. used a methodology similar to that used by the Cochrane reviews and included studies examined in Cochrane reviews. Shaheed et al. identified 20

studies (19 dealing with patients with chronic low back pain and one with subacute low back pain). Of the 20 studies, none specifically assessed any psychological or social or environmental factors that may have been present. The only exceptions were incidental, where pre-existing therapies were permitted to continue, providing they were not changed during the opioid trial. These may have included physical therapy, biofeedback therapy, acupuncture, or herbal remedies.¹²⁹

In summary, despite the exhortations by Bonica,¹³ Loeser,⁸⁶ and Waddell et al.,¹⁴⁸ the overwhelming impression left by these common biological treatment studies over the last 30 years or so is that they reflect mostly a biomedical perspective and what has been termed a "unimodal" (or single modality, such as pharmacotherapy, nerve blocks, etc) approach.⁶⁶ Remarkably, few of these studies could be described as reflecting a biopsychosocial appreciation of pain. In considering the importance of this apparent bias towards unimodal treatments for multidimensional conditions, the systematic review by Machado et al.⁹¹ of a range of mostly unimodal treatments for chronic low back pain compared with placebo controls provides evidence of their limitations in achieving pain relief. More recently, Peppin et al.¹¹⁴ illustrated the extent to which unimodal treatments, especially pharmacotherapy, have been relied on for treating chronic pain in the United States. With the notable exception of psychological treatments for pain in children, a similar narrow focus limitation can also be seen in many of the psychological and exercise treatments for pain in adult pain studies.

Sullivan and Ballantyne¹³⁰ pointed out the fundamental error that seems to underpin many biomedical treatments for pain when conducted in isolation: "The experience of chronic pain is not simply the perception of an aversive sensation of some specific intensity" (p. 66) and that titrating pain treatment to effect on a measure of pain intensity was quite inappropriate in chronic noncancer pain. Hush⁶³ demonstrated this oversight was not restricted to pharmacotherapy for pain; it applies to many physiotherapy treatments as well.

Unfortunately, it seems the focus on pain ratings continues to be the primary metric in most biologically focussed treatments. Although some do include quality of life measures as well, frequently these are seen as secondary outcomes and, unlike the details provided on biological mechanisms, the actual mechanisms by which changes in pain intensity might achieve improved quality of life outcomes are usually unstated or just assumed. As noted earlier, Tjepkema-Cloostermans et al.¹³⁶ acknowledged that "other factors" might also be playing a role here, but unfortunately, these authors adopted a rather pessimistic outlook when they said they "can't be corrected." In fact, there is ample evidence that many of these "other factors" can be modified. A recent topical review summarised a number of possibilities regarding important social outcomes of treatment that clinical researchers might find helpful.⁵

2.3. Psychosocial factors and treatments for pain

Despite the evidence from the bulk of the psychological and biomedical treatment studies described earlier, it has long been recognised that those who design treatments should consider more than their components. As Vlaeyen and Morley¹⁴⁶ argued, the questions about treatments for pain that researchers should be addressing are more than whether or not a given treatment "works" (whatever that might mean), but instead, we should also be asking about which treatments and for which people. This call has been repeated by subsequent Cochrane Reviews of psychological treatments but has rarely been acted on.¹⁵² Simply

defining a sample by its main pain site, such as back pain, is overly simplistic, especially if back pain is to be conceptualised within a biopsychosocial paradigm.⁶³ An early demonstration of this was provided by Jellema et al.⁶⁷ who found that simply applying a guideline-based psychosocial (mainly advice) intervention to patients with subacute low back pain in a primary care context was no more effective than usual care. Their explanation for this outcome included the recognition there had been “a suboptimal identification of psychosocial factors” (p. 350) in the intervention group. Essentially, the patients in the intervention group all received the same psychosocial (as they called it) intervention regardless of the presence of psychosocial contributors, which had not been identified. We know there are many possible psychosocial contributors that can influence the experience and impact of pain, and it is unrealistic to lump them together in a single category and to assume they have equivalent effects on a person’s pain.^{38,63,74}

The importance of identifying biological, psychological, and social or environmental contributors to a person’s chronic pain is spelt out in the new ICD-11 classification of chronic pain.¹³⁷ In using ICD-11, it is recommended that the presence of significant psychological and social factors could be documented with an extension code when they were judged by the clinician to contribute to the onset, the maintenance, or exacerbations of pain or consequences of pain (ibid). Examples of possible psychological and social contributors were also provided. Importantly, Treede et al.¹³⁷ stated as follows: “Because all chronic pain is regarded as a multifactorial, biopsychosocial phenomenon, this extension code is available for all chronic pain diagnoses” (p. 24).

It may be too soon to expect to see the ICD-11 approach being applied routinely in the pain literature, but it is concerning to see how the National Institute for Health and Care Excellence (NICE)¹⁰² in the United Kingdom seems to have misinterpreted ICD-11 in its new guidelines on the assessment and management of chronic pain in people aged more than 16 years. Although few would object to the NICE recommendation that clinicians should take a “person-centred” (ie, individualised) approach to assessing and managing chronic pain, it is their reference to the new classification of chronic primary pain¹⁰⁸ that is of particular concern. Others have already voiced their concerns so they will not be repeated here,^{33,37,77,134} but the NICE report’s representation of chronic primary pain as something arrived at by exclusion is quite inaccurate, as is the claim that distress and disability are particularly prominent in presentations of chronic primary pain.¹⁰² The authors of ICD-11 were careful to avoid any impression of diagnosis by exclusion and made it clear that chronic primary pain can also have biological, psychological, and social or environmental contributors which should be described. The issue of pain-related distress and disability being judged as “out of proportion” with any observable injury or disease is not mentioned in the chronic primary pain section of ICD-11.¹⁰⁸

A narrative review of the early psychosocial intervention literature for low back pain by Nicholas et al.¹⁰⁷ concluded that the prerequisite for a psychosocial intervention should be the identification of psychosocial factors that appear to be contributing to the presenting case. In the main, these factors included those identified by prospective studies as often predictive of future pain-related disability.^{6,20,23,81,85,94,98,115,128,131,138} Importantly, many of these are potentially modifiable. Main and Burton⁹² divided these so-called “psychosocial factors” into 2 broad categories: psychological and social or environmental factors. The psychological factors included unhelpful beliefs and appraisals, distress, worries, and fears, as well as behaviours

such as avoidance of activities due to fears about pain. Kendall et al.⁷⁶ characterised these as “yellow flags.” By contrast, the social or environmental factors included the perceptions by the patient of a stressful, unsupportive, and excessively demanding environment. In the case of injured workers, this would generally apply to their workplace, but it could equally apply to the patient’s home environment. Main and Burton⁹³ termed these immediate environmental factors as “blue flags,” and the more objective and observable aspects of their workplace (for injured workers) as “black flags” that might include the nature of the person’s work and the insurance and compensation system under which the workplace injuries are managed.

The key issue here is that, perhaps for the first time, researchers had tried to break down the amorphous construct of “psychosocial factors” into identifiable and measurable variables, albeit often correlated. In turn, to the extent that these might be modifiable, it meant that interventions could be developed to address these if they were believed to be operating in a particular case. This meant that mechanisms that might contribute to the explanation of pain and associated problems in patients presenting for help with their pain could now extend beyond the purely biological domain and that clinicians would have more potential targets to address in the interventions (see Jensen,⁶⁸ for an extended discussion on this framework). Importantly, as much of this early research was conducted on people with acute pain (pain of less than 3 months), this work offered the possibility that future chronic, disabling pain might be prevented or greatly limited. Indeed, in their narrative review of studies up to 2008, Nicholas et al.¹⁰⁸ found that randomised and controlled studies which identified these modifiable psychological risk factors and addressed them as part of the treatment plan^{26,46,55,82,89,120,127,142} appeared more successful than those that provided similar treatments without selecting cases according to possible psychological risk factors^{3,49,51,57,60,67,72,113,145}. Following these early trials of screening for modifiable psychological risk factors for chronic pain-related disability, researchers in the United Kingdom developed the 9-item STarTBack Tool⁵⁹ as a means of screening patients presenting with low back pain in primary care settings for psychological risk factors and then allocating them to different levels of psychologically informed physiotherapy. In these studies, the higher-risk cases received more comprehensive care than the lower-risk cases. Results have shown both improved patient outcomes and reduced costs.⁴⁴ Importantly, Foster et al.⁴⁴ demonstrated a viable alternative to the common practice of assuming everyone with low back pain belonged to a homogeneous group. Of course, the screening of patients using an instrument like the STarTBack is just screening and not assessment. It may not provide much information on an individual patient’s concerns—that would require directly asking the patient. Fillingim³⁸ provided a compelling case for the importance of recognizing often substantial differences between individuals in pain. A simple screening scale cannot do justice to that reality, but it can provide part of the solution.¹⁰⁶ The development of psychologically informed physiotherapy methods for musculoskeletal (MSK) pain does show that more individually tailored interventions might be possible.^{4,74,110}

In summary, there is evidence that when patients are carefully selected on the basis of the presence of psychological risk factors and when an intervention known to address these factors is competently applied, good outcomes can be achieved.¹⁰⁷ By contrast, when patients are not selected for the presence of psychological risk factors and psychological interventions are provided indiscriminately, the outcomes are often disappointing

(*ibid.*) Pincus and McCracken¹¹⁵ made a similar case in relation to psychological interventions for low back pain when they recommended a focus on matching patient problems to treatment processes designed to address those problems, as opposed to the more scatter-gun attempts to address amorphous “psychosocial” factors. At the very least, this literature has demonstrated it is possible to move beyond unimodal treatments applied in the hope that meaningful clinical outcomes may be achieved without addressing the numerous other factors that may be contributing to a patient’s pain and associated problems.

2.4. Social or environmental aspects of treatments

Simply matching a treatment to a patient’s psychological risk profile alone does not guarantee successful outcomes.⁹ This section will consider interventions that include relevant social–environmental factors. Treatments for pain in children have already been mentioned as an example of engaging the important figures in the children’s lives in the treatment processes, alongside the biomedical and psychological treatments. The engagement with the workplace in the treatment of injured workers is another example.

Loisel et al.⁸⁹ tested what they called the comprehensive Sherbrooke model (combined occupational and clinical interventions). This was an RCT with injured workers who had been off work for at least 4 weeks. At long-term follow-up, the combined workplace and clinical intervention was found to be more effective in retention at work than either usual care or clinical intervention alone. Since then, incorporating the workplace into the treatment plan for injured workers has been generally recommended, but often not achieved. A recent systematic review of this literature²⁵ with 36 medium-quality and high-quality studies concluded duration away from work from both MSK or pain-related conditions and mental health conditions was significantly reduced by multidomain interventions encompassing at least 2 of 3 domains (health focus, service coordination, and workplace modification). Importantly, in the context of the present article, they also found that cognitive behavioural therapy interventions that did not also include workplace modifications or service coordination components were not effective in helping workers with mental health conditions in RTW. That means, just like in the case of reducing time lost at school for children in pain, the treatment providers for adults in pain for whom RTW is a goal should liaise closely with the workplace. Unfortunately, as the studies from the systematic reviews examined earlier for a range of common pain therapies indicated, engaging with the workplace as part of the treatment seems to be rarely attempted. Even engaging with a patient’s family occurred in only a few of the psychological treatments with adults in pain and almost never in the biomedical treatment modalities examined. However, there are examples of pain researchers engaging directly with the workplace to assist the RTW of workers with persisting back pain. Linton et al.⁸³ demonstrated that an injured worker’s workplace supervisor can be trained in effective communication skills to facilitate the worker’s RTW, similar to Palermo’s¹¹² accounts of the work with parents of children in pain. More recently, Shaw et al.¹²³ have also described a work-site health self-management intervention for workers with chronic health problems, including chronic MSK pain, and their employers in the United States. Although these approaches show promise and further trials are needed, they do illustrate potential opportunities for improving quality of life outcomes for people with chronic pain conditions when social or environmental contributors are identified and addressed as part of a treatment plan.⁵

Undoubtedly, arranging treatments that incorporate a biopsychosocial framework for adults is challenging in most clinical settings, especially those built around volume for treatments such as procedures or exercises, because of financial or health system demands or pressures that tend to favour unimodal interventions.¹¹⁴ These reflect the system-level challenges Main and Burton⁹² called “black flags.” Each country, and even different states within a single country, is likely to have a different system for organizing and funding health care for people in pain. The problem has been considered by many pain researchers.^{45,149} One approach explored by Main et al.⁹³ incorporated a conceptual framework outlined by Aarons et al.¹ from the new field of Implementation Science to describe the processes that might be required to reliably facilitate the successful RTW of injured workers. The Exploration, Preparation, Implementation, Sustainment (EPIS¹) framework for implementation research identifies 5 domains to be considered: intervention characteristics, outer setting (regulators and treatment providers), inner setting (workplace), characteristics of the individuals involved, and the actual process of implementation. Some of these issues were also touched on by Franche et al.,⁴⁵ but a recent successful example from Australia illustrates how a biopsychosocial approach with injured workers experiencing acute MSK pain can be made to work along the lines outlined by Aarons et al.¹ and Main et al.⁹³

The Work Injury Screen Early Study¹⁰⁶ entailed a coordinated intervention for recently injured workers identified by telephone screening (with the ÖMPSQ-10⁸⁴), within 15 days of the injury by the insurance claims manager, as being at high risk for delayed recovery and RTW. Full details can be found in the article,¹⁰⁶ but it involved the implementation of an agreed protocol for managing the high-risk injured workers with the employer (the state health department and participating hospitals), the workers’ compensation insurer, the state regulator of workers’ compensation, and participating injured workers, their trade union, and their treatment providers. High-risk workers from control (usual care) hospitals were managed by their treating doctor and physiotherapist as per usual, but they and the insurance claims manager were blind to the workers’ risk status. The high-risk workers at the intervention hospitals were offered additional help by a psychologist (up to 6 sessions) to address whatever psychological obstacles to RTW were identified in their initial assessment (no specific treatment was expected as it was to be based on the psychologist’s assessment—the important second phase of assessment after screening), and a workplace rehabilitation worker would assist with any workplace modifications assessed as required. The treatment providers, the workplace, and insurance claims manager for the high-risk workers in the intervention condition were advised of the workers’ risk status and collaborated in the management and RTW process for those workers, as per the agreed protocol. Importantly, and consistent with the findings of the Cullen et al.²⁵ review, the psychologists were expected to maintain regular contact with the workers’ medical team, the insurance claims manager, and the return-to-work coordinator at the workplace to promote consistency in management. At 24 months after injury, the mean lost workdays was 66.5 (SD = 116.2) for the control condition and 31.7 (SD = 36.7) for the intervention condition. As a result, once recruitment ended, the employer instituted the protocol for injured health workers in all public hospitals across the state with the research manager for the project seconded to assist in the implementation process. This study illustrates that a biopsychosocial approach does not have to be reserved only for people with chronic pain, the treatment should be based on the initial assessment and not

the pain site, and that it can be applied for people in acute pain, but it does require attention to each of the 3 domains of the biopsychosocial model.

A further illustration of the importance of incorporating relevant people from the patient's social environment in a treatment plan can be seen in a recent large study in the United States which attempted to replicate the methods and findings reported by Foster et al.⁴⁴ from the United Kingdom. The TARGET trial²⁹ also used the STarTBack Tool to identify patients with acute low back pain at high risk of future pain-related disability. As in the earlier UK studies, the intervention was conducted by physiotherapists using psychologically informed methods that included educating patients about their condition, reducing fear of movement, and improving coping skills, as well as addressing physical impairments. However, despite the high quality of its design, there was no difference in disability or chronic pain outcomes between the treatment and control groups. Opioid and imaging prescribing rates between the groups were also the same, but the researchers noted these were "nonconcordant with clinical guidelines." One possible explanation for the findings differing from the earlier UK study was that in the Delitto et al.²⁹ study, there appeared to be a failure to coordinate the treatments between the physiotherapists and the physicians. This may reflect differences in health systems between the United States and United Kingdom, but it points to the need for clinicians to consider ways to achieve a consistent management plan between health care providers. In the Delitto et al.²⁹ study, the patients' physicians could be considered an important part of their social or environmental milieu over which the physiotherapists had no control.

In some studies, the primary focus has been on the social environment for achieving successful RTW outcomes in injured workers with back pain. Buchbinder et al.¹⁷ described a public health approach using a media campaign to convey to the whole community in one state in Australia the key messages for dealing with acute back pain. This study involved well-known media figures, such as leading sports players, to deliver the message to the community about keeping active despite pain. Although the media campaign in that study attracted international attention, what may have been overlooked by many was the assiduous organizational work that went on in the background to gain the support of important stakeholders—the different medical, employer, trade union, and insurance regulatory organizations for the campaign. Simply mounting a media campaign in isolation from that background work may not have been as successful, as others have found subsequently.⁵⁴

One possible lesson from the studies considered in this section is that we need to broaden the research focus from treatment effectiveness to include a specific focus on implementation where "confounders" are part of the story rather than something to be factored out.

3. Interdisciplinary, biopsychosocial treatments for chronic pain

This review has tried to examine to what extent the key elements of the biopsychosocial model of pain has been reflected in studies of common pain treatments over the past 30+ years. It was noted that previous reviews of the model had identified often considerable divergence in the interpretation of the model, especially in relation to its psychosocial elements.^{11,71,143} Multidisciplinary pain management has long been touted as embodying a biopsychosocial approach to helping people suffering pain. In defining multidisciplinary biopsychosocial rehabilitation for

chronic low back pain, Kamper et al.⁷⁰ explained they were referring to rehabilitation programs that "adhere to the biopsychosocial conceptualisation of chronic pain and include more than just a physical treatment" (p. 5). Despite their concerns about definitions of biopsychosocial interventions, Kamper et al.⁷⁰ found that "a coordinated intervention covering several domains of the biopsychosocial model and delivered by clinicians from different backgrounds is more likely to benefit patients with chronic low back pain in the long term than is usual care or physical treatment alone" (p.5). In this case, the usual care and physical treatments could largely be described as unimodal in nature.

In recent years, the term multidisciplinary has been largely replaced by the term interdisciplinary which is intended to reflect the style in which multiple disciplines work collaboratively (see Kaiser et al.⁶⁹). The current IASP website⁶⁵ definition states interdisciplinary treatment is "multimodal treatment provided by a multidisciplinary team collaborating in assessment and treatment using a shared biopsychosocial model and goals." The definition goes on to say that the different disciplines should all be "working closely together with regular team meetings (face to face or online), agreement on diagnosis, therapeutic aims, and plans for treatment and review." It is important to note the emphasis on the need for the treatment team to reach agreement on diagnosis, goals, and treatment plans, hopefully before the plan is implemented. These features would seem to be some way ahead of many of the "biopsychosocial" and "biomedical" treatments examined earlier in this review. The Kamper et al.⁷⁰ review summarises supporting evidence for this approach with chronic back pain, but other studies have provided support for interdisciplinary, biopsychosocial approaches to the management of other pain conditions as well. Critically, and consistent with the case argued by Sullivan and Ballantyne,¹³⁰ there is a prospect of achieving a spectrum of goals rather than just having pain severity as the primary outcome and everything else being seen as secondary. Examples include Debar et al.,²⁸ Katz et al.,⁷³ Lambeek et al.,⁹⁶ Mayer et al.,⁹⁶ Mills et al.,⁹⁹ Rasmussen et al.,¹¹⁸ Simm and Barker et al.,¹²⁵ Schmidt et al.,¹²¹ Van Koullil et al.,¹⁴⁴ and Williams et al.¹⁵³

4. Summary and future research

Although the biopsychosocial model of pain has proven resilient as a construct and remains widely acknowledged as underpinning, our current understanding of pain and guiding its treatment, in practice, its presence is often hard to see in much of the common treatment literature. Loeser⁸⁶ drew attention to the limitations of treating chronic back pain with a unimodal intervention. The analysis presented in this article has indicated that across a range of current treatments for different chronic pain conditions, many treatments remain essentially unimodal with relatively little acknowledgement of other factors that might need to be addressed. It seems that too often treatments are provided in the hope that their benefits will somehow "trickle down" from the targeted domain. How this is supposed to happen is rarely made explicit. Hush⁶³ has reminded us that conditions such as chronic low back pain are complex, multifaceted problems and that we need to move beyond simplistic approaches to treating it. The same can be said for all chronic pain conditions. Researchers such as Borsook et al.¹⁵ have provided us with a sense of that complexity, although it may be tempting to say it is all too much and beyond our ability to change enough of the contributors to pain to make more than a small difference for our patients. However, Fillingim³⁸ provides several possible ways forward in

dealing with this complexity, and this article indicates that treatments for pain based on a biopsychosocial model can be more effective than unimodal therapies, but just as Pincus et al.¹¹⁶ found, implementation is a continuing challenge.

Given the limitations evident in the application of the biopsychosocial model across many common therapies, and by implication, including those who provide them, if the situation is to be improved, there is clearly a need to prioritise education and training for all health disciplines in conducting this work. In the past 9 to 10 years, undergraduate (prelicensure) education in pain management has received more attention and promotion,^{16,40,53} but at the postgraduate (or postlicensure) levels, generally accessible education or training in the application of the biopsychosocial model has been limited.⁶⁴ The IASP website does list a number of available courses around the world, many of which are available online. Formal degree courses (eg, at a masters level) can provide the necessary knowledge base, but training in pain management skills across disciplines requires access to practice and some form of mentoring and competence evaluation. Examples of these exist,^{30,53} but this training will need to reach much larger numbers than current resources can accommodate. IASP has facilitated such skills training in Southeast Asia with the development of a toolkit⁶⁶ and volunteer trainers contributing to its implementation, but much more is required.

The present article has also provided examples of practical solutions to the challenges often presented by both acute and chronic pain in clinical settings. The work of researchers in dealing with pain in children and in the workplace provides models and inspiration for those dealing with pain in other contexts. The development of approaches such as psychologically informed physiotherapy and early biopsychosocial interventions that use principles derived from implementation research as well as attempts to integrate self-management strategies with biomedical therapies in primary care demonstrate that change is possible and offer some direction for future research in pain management. A brief list of possibilities might include, but not be limited to, the following:

i. Biomedical treatments clearly retain their dominance in virtually all health systems, but examples are emerging of effective ways of integrating these in a manner more consistent with a biopsychosocial framework, especially with the growing recognition that pain self-management, by the patients, is an important ingredient in effective long-term pain management.¹⁰⁵ Turner et al.¹⁴¹ demonstrated that psychologists can train other health professions to combine a biomedical treatment and pain self-management instruction. There is still much to learn about how we can achieve such an integration and more effectively engage patients in this model. However, this work would be greatly assisted by a public health education approach to broaden the community's understanding, and expectations of pain management are likely to be needed.¹⁷

ii. The studies reviewed here indicate that it is possible to identify psychological contributors (risk factors) to the experience of pain and its impact when it is acute as well as when it is chronic. Importantly, many of these are modifiable. However, implementation of this approach in the clinic is inconsistent, and too few health care providers feel confident in their ability to provide this psychologically informed treatment. Education and training opportunities are urgently needed to address this, but health systems will also need to accommodate these new approaches if they are to flourish.^{2,16,30,110}

iii. Many of the social or environmental contributors to the experience and impact of pain can also be identified and used as part of a treatment plan. The literature on the treatment of pain in

children and injured workers clearly demonstrate this is both necessary and possible. However, there are real obstacles to the implementation of these methods more broadly with different age groups and patient groups, especially at the health and remuneration system levels. Applying knowledge gained from implementation science research offers potentially useful ways forward in this domain.⁹³

iv. Although many researchers and clinicians may prefer working in silos,⁴² there is a strong tradition in the pain field and in IASP to enable clinicians from all disciplines to work collaboratively in the assessment and treatment of people in pain. Naturally, there are obstacles, especially in the form of different health systems. The narrative review by Flink et al.⁴¹ offers a range of options across multiple domains for researchers to pursue. There are also useful examples of where these obstacles have been overcome, and we need to learn from them as well as to explore novel ways of extending the establishment and implementation of interdisciplinary pain management services for a range of pain conditions. The challenges the field has faced with the Covid pandemic offer inspiration in this regard¹³³ and the evidence for the value of the novel forms of service delivery are growing.³²

v. Research methods used in the evaluation of pain treatments also need more attention. The traditional "gold standard" of the RCT will remain an essential tool in the pain treatment field, but it has become clear that many of the pressing questions we need to address are not really suitable for the RCT approach. This has been a recurring challenge for the field,⁹⁹ but the realisation that interventions increasingly require multiple inputs from several domains and cannot be easily evaluated in RCT formats is still to gain real traction. Many possible options have been proposed,^{31,63,75,101,146,152} and they include the use of methods such as single-case design studies, pragmatic trials, and stepped wedge designs that are more feasible in clinical settings (see Keefe et al.⁷⁵ for a recent review). Identifying "which treatments for which patients" remains a challenge in the pain field,^{146,151} and from a biopsychosocial perspective, we might add, "under which conditions." This review suggests we have made some progress in addressing these questions, but there is still some way to go.

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