



Pain: real, imaginary or malingering?

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The Mechanisms of Chronic Pain Development

Dr Ian Yellowlees



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5 In 1953, Bonica first developed the idea that pain had more than a simple physical component. *“Pain is no longer considered exclusively either as a neurophysiological or a psychological phenomenon. Such a rigid dichotomy is obsolete, because pain is now recognised as the compound result of physiopsychological processes whose complexity is almost beyond comprehension.”*¹ The concept was integrated into Melzack & Wall’s well
10 known gate control theory of pain² and subsequently extended to the current ‘bio-psycho-social model of pain’. The basic ideas are widely accepted and now appear in standard textbooks for undergraduate doctors, nurses and physiotherapists. Detailed understanding of the issues forms part of the core curriculum for postgraduate training of specialist pain physicians^{3,4,5}. Unfortunately, surgical and orthopaedic textbooks in general pay scant regard
15 to pain except as an acute symptom of surgical problems, despite the fact that many patients attending chronic pain clinics have long term pain as a result of surgery⁶.

The physical, psychological and social causes of pain, both acute and chronic, are covered in great detail and presented in a very readable form in Waddell’s book *The Back Pain Revolution*⁷. Although most examples in the book relate to back pain as it is very common,
20 the underlying mechanisms are relevant to all forms of chronic pain. This appendix is a very brief account of the current understanding of the causes of chronic pain and includes some of the important references.

25 Definitions and the problem of diagnosis

The generally accepted definition of pain (from the International Association for the Study of Pain (IASP)) is:

30 *An unpleasant sensory and emotional experience caused by actual or potential tissue damage or described in terms of such damage*⁸.

The term ‘chronic pain syndrome’ is often used by non-specialist doctors but is not recognised as useful by those working in the field. The standard classification ICD-10
35 classifies disease by causal agent, systems of the body affected, pattern and type of symptom, and whether or not the disease is related to a medical procedure. Since chronic pain is, by definition, pain that has persisted beyond the time of healing, a classification based purely on causal agent is not achievable. The *Diagnostic and Statistical Manual of Mental Disorders*⁹ of the American Psychiatric Association contains the diagnosis ‘pain disorder’
40 which is the rough equivalent of ‘chronic pain syndrome’. It is purely a diagnosis of exclusion

in that there are no useful positive diagnostic signs or symptoms. 'Chronic pain syndrome' is often used by non-pain-trained doctors as a result of failure to identify a physical cause for the pain, and tends to imply that they attribute the pain to psychological causes. Neither of these coding systems is useful in consideration of chronic pain.

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The IASP has attempted to classify chronic pain according to descriptions of pain, but even this is limited in its ability to encompass the combination of sensory and emotional factors that is pain. Most specialists in the pain field do not make a diagnosis in the conventional sense, but rely on a description of the pain by the individual concerned and mechanisms considered to be important in each individual case.

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The term 'chronic pain condition' (or 'syndrome') is not a diagnosis that is generally recognised as useful by professionals working in the pain field. Chronic pain should be described by reference to the IASP definition.

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Mechanisms of chronic pain - physical

The mechanisms that link acute injury to long-term pain in the apparent absence of ongoing tissue injury have been under discussion and research for many years. In 1996 a whole plenary session and numerous break-out groups and workshops of the 8th IASP World Congress on Pain were devoted to the subject¹⁰. The basic principles are well established and concern the interaction of physical changes in the musculoskeletal system and the nervous systems with physical changes brought about by psychological components. The focus (especially of clinical meetings) has moved on to trying to prevent chronicity developing and to examining and planning how best to use psychological therapies that have been shown to be effective. Research has now demonstrated that these *psychological* therapies have *physiological* effects.

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The structural elements: X ray / MRI findings

Despite more than 100 years of research, orthodox medicine has failed to find a satisfactory cause for chronic musculoskeletal pain from consideration of structural elements such as bones, joints, ligaments and discs. Although injury or damage to these structures can give rise to pain there is now good evidence that changes seen on X-ray or MRI scan have no predictive value for future pain or disability. As well as patients who report pain but have "normal" investigations, many people have very abnormal findings on investigation but have no pain^{11 12}.

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Although indicated if there is a suspicion of a specific serious spinal pathology, X ray and MRI investigations are of little use in defining a cause for non specific musculoskeletal pain. This evidence is now reflected in the current UK and international guidelines on back pain management^{13 14 15}.

Soft tissue physiology and dysfunction

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Painful musculoskeletal dysfunction may occur in tissues that are structurally normal¹⁶. In the acute phase movements are restricted by reflex responses to pain. These abnormal patterns of movement may persist as the physiological changes of disuse start to occur in the soft tissues. These changes can occur very rapidly (within a few weeks) and include:

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- Abnormal muscular function, and imbalance between muscle units, giving rise to localised stress concentrations¹⁰
- Changes in muscle metabolism and electrophysiology¹⁷
- Increased fatigue and reduced endurance¹⁸

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The complex of physiological changes is generally known as 'disuse syndrome' or 'deconditioning syndrome'¹⁹. These changes may give rise to pain directly, or to increased fatigue and decreased function, which in turn lead to further deconditioning and the process becomes self perpetuating. Altered patterns of movement and muscle function may also become learned responses and form a protective habit²⁰. Prolonged immobilisation leads to deterioration of musculoskeletal, cardiovascular and central nervous systems¹⁴.

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It should be noted that the results of the above changes are generally measured as changes in performance, and performance relies on conscious drive to perform. It is to a great extent influenced by psychological components and thus treatment directed at the physical aspects of dysfunction only may not improve performance.

Nervous system changes

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The way in which pain nerves connect to each other, physically and chemically, within the spinal cord, changes in response to injury. Not only do the connections change, but the sensitivity of the cells can also change. These changes can become permanent and continue to cause pain in the absence of any other changes long after the initial injury has apparently healed²¹. This process is generally termed neuroplasticity^{22 23}. As a result of these changes

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the area of soft tissues and skin from which a central nerve cell can be activated (with the corresponding feeling of pain) is increased. Normal sensations from areas adjacent to the original injury can also trigger a pain response. This is termed hypersensitivity, and like the neuroplastic changes that cause it, can also become permanent.

115 Within the brain, the areas of the sensory cortex that are allocated to sensations from various part of the body are proportional to the sensitivity of the area. Thus the area representing the hand is relatively much larger than that representing the back or legs. This variation can be represented in picture form by the sensory homunculus:



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This pattern of sensory representation in the brain changes in chronic pain states such that the painful part of the body gains a larger area, corresponding to increased sensitivity. It has recently been shown that the changes in sensory representation can be changed back towards normal with cognitive behavioural techniques²⁴.

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Changes in the physical and chemical connections between pain nerves in the spinal cord and in the brain occur as a result of injury and can result in permanent pain long after the original injury has healed.

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Blood tests

As the changes noted above are physiological, not systemic, and not due to a disease process, there are no blood tests that will reveal any abnormality.

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The absence of abnormal findings on investigation does not mean that there are no abnormal physical components, but simply that the tests used did not detect any. There are several important physical changes that cause and perpetuate pain in the chronic situation, which cannot be detected by normal clinical investigations.

Mechanisms of chronic pain - psychosocial

The definition of pain underlines the fact that emotional aspects are not additional to the experience of pain but part of the sensation itself. Psychological factors influence how people react to and report pain and result in coping strategies which may be helpful or destructive in maintaining function.

Beliefs and coping strategies

Fear and avoidance

There is increasing evidence that fear of pain, and fear of hurt or harm, are major influences in the development of chronicity²⁵. For example, most people with chronic back pain limit travel by car, apparently because of the pain caused. However if they do not travel, they do not experience the pain, and it is actually the fear of the pain that prevents travel rather than the pain itself. Because pain is a symptom of acute tissue damage, most people associate pain with damage or injury. As discussed above, this is not the case in chronic pain but the persistence of the belief that pain = damage results in avoidance of activities *including treatments* that are painful.

Avoidance behaviour becomes self-perpetuating. In the example of car travel, avoidance of travel does reduce pain experienced, and is therefore a logical strategy if the patient believes that pain = damage. Unfortunately, the result is ever-decreasing activity levels and increasing deconditioning which leads to further pain on activity and a further turn in the disability spiral. These beliefs and fears can be shown to be acting within a few days of injury, and their presence can predict return to work outcomes²⁶.

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Catastrophising

One of the most harmful coping strategies is catastrophising. Catastrophising is being convinced that the worst will happen, often as a series of related disaster scenarios such as:

I can't work because of the pain → I can't earn any money → I can't pay the mortgage → I will lose my house → My family will leave me → I have nothing to live for → There is no point in trying any more .

Catastrophising leads to inactivity and a sense of helplessness and depression. Deconditioning is accelerated and the process is rapidly destructive of a person's role in life and their ability to fulfil it. Catastrophising is often based on one or two incorrect beliefs and is therefore treatable with cognitive therapy.

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Catastrophising – expecting the worst to happen – is very destructive of a person’s ability to cope with pain.

Personal responsibility and control

185 From early childhood one of our main goals is to try to gain some control over our lives. Tolerance of lack of control is very variable and is likely to be a product of learning and social conditioning. This concept of control has an important influence on how people react to adversity and illness^{27 26}. The ability to gain a sense of control over a chronic or acute pain problem is fundamental to successful coping and recovery. Low self-efficacy (little belief that one can successfully achieve a particular task) is one of the most important determinants of behaviour, performance and disability, for those with pain²⁸.
190 Low self-efficacy is akin to learned helplessness²⁹. Early life experience can lead to an individual developing a cognitive style in which they approach life in a helpless, dependent and passive manner. This cognitive style is inhibitory of adaptive coping and management of pain³⁰.

195 Depression

Depressive symptoms are very common in chronic pain patients. Studies give a prevalence of with 30-80% having some depressive symptoms and 20% meeting the criteria for a true major depressive disorder³¹.

200 Depression may aggravate pain and chronic pain and failed treatments may cause depression. Some of the symptoms of chronic pain are similar to those of depression (poor sleep, altered appetite, reduced concentration and memory, constipation, weakness, aches and pains) and so diagnosing and differentiating the depression in chronic pain patients is difficult³². Generally depression develops secondary to chronic pain and Waddell suggests that a suitable interpretation would often be ‘Learned helplessness in the face of severe and
205 chronic pain which the patient cannot control, and which impacts on the patient’s whole life’³³.

Social interactions

210 Back pain does not occur in isolation, but within a particular social setting unique to each individual. The social context influences the meaning of the pain for the sufferer, and also changes the behaviour of the sufferer. Persistent sympathy, attention and support encourage expressions of pain and feelings about it³⁴. The impact on the family is often very disruptive because of loss of income, roles, and avoidance behaviour. In some relationships the family support is very helpful, and this may be very important in recovery, whilst in others the dynamics are destructive and family input becomes a major problem³⁵.

215 Illness behaviour

'Illness behaviour is what people say and do that expresses and communicates that they are ill.'³⁶

220 Illness behaviour is not a conscious or willed behaviour, and generally reflects the physical aspect of the illness as that is usually the most prominent. For the patient with chronic pain the psychosocial aspects of the physical pain problem may predominate as far as they are concerned, and their illness behaviour will then reflect this. The more distressed they are about their situation, the more florid will be the illness behaviour as they attempt to communicate their distress. Illness behaviour may ultimately become part of the problem by further reducing performance and function. The finding in clinical examination of 'non organic signs' (clinical signs that do not fit with anatomy or physiology) should prompt the examiner to look for the cause, and not simply assume that the patient is exaggerating their symptoms for financial gain.

230 Illness behaviour reflects the illness as perceived by the patient. It is not 'abnormal' or 'normal' but can guide the therapist to important aspects of the pain problem. It may become part of the pain problem itself.

235 Assessment of psychosocial factors now forms part of UK and international guidelines on management of back pain^{11 12 13} and is generally referred to as *yellow flag assessment*. The guidelines state that assessment for yellow flags should be made at 4-6 weeks from onset if function is not improving and, if present, referral to a multidisciplinary team should be considered.

240 Predictors of chronicity

Waddell lists 19 studies, dating from 1996 – 2003, that have reviewed risk factors for chronicity. He summarises the literature and concludes that predictors of chronicity can be considered under two headings: clinical & psychosocial, sociodemographic³⁷.

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Clinical and psychosocial predictors

- Age > 50
- Previous history of back pain
- Nerve root pain
- Pain intensity / functional disability
- Poor perception of general health
- Distress & depression
- Fear avoidance
- Catastrophising
- Pain behaviour (non-physical illness behaviour)
- Job dissatisfaction
- Duration of sickness absence
- Expectations about return to work

Sociodemographic predictors

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- Marital / family status (single parent with young children, partner retired or disabled)
 - Health status (mental health, musculoskeletal conditions, comorbidities)
 - Occupational / educational level
 - Time since last worked

Summary: The Bio-Psycho-Social model of pain

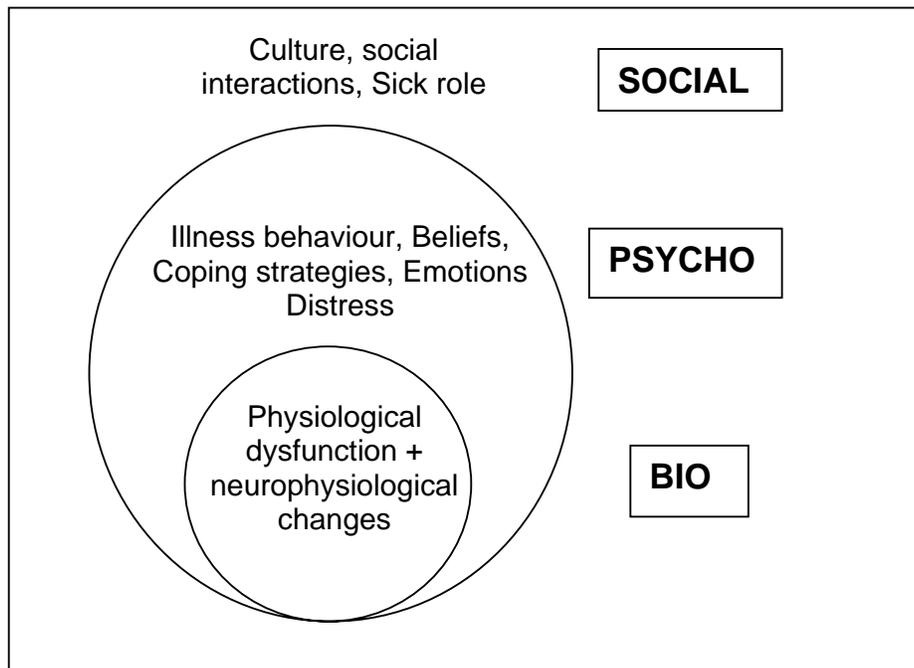
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All the strands discussed above occur to a greater or lesser extent in all patients. These key elements of physical dysfunction, beliefs and coping skills, distress, illness behaviour and social interactions are together known as the biopsychosocial model of pain³⁸. This model forms the basis of most treatment programmes for chronic pain patients.

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The model is often illustrated as shown below and has been linked to the International Classification of Functioning, Disability and Health³⁹.

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