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Reflections upon the pain experience – part 2: the determinants of chronic pain, or the possible diminishing role of chronic pain in chronic pain syndrome

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Physical pain however great ends in itself and falls away like dry husks from the mind,

whilst moral discords and nervous horrors sear the soul.

I suppose one has a greater sense of intellectual degradation after an interview with a doctor than from any human experience.

Alice James

Alice James (1848–1892) was daughter of Henry James Sr, a theologian and sister of psychologist and philosopher William James and novelist Henry James Jr, and probably had more of a right than most to speak about pain and suffering. Although born into a wealthy and intellectually active family, she developed psychological and physical problems that would plague her until the end of her short life. She suffered numerous major breakdowns before finally succumbing to breast cancer at the age of 43.[1]

Persistent pain can be experienced in the relative absence of ongoing 'pain generators'

Why do *some* people suffer so much with chronic pain, and can we predict who is going to get chronic pain?

The problem was highlighted again recently in a High Court case in which we were both called to present expert evidence (*Downing v Peterborough NHT Trust (2014) EWHC 4216 (QB)*).[2] Richard 'Ritchie' Downing, whom the Court heard was a brave and rising star in the British Armed Forces with an unblemished career record and commendations for bravery, underwent what was subsequently agreed to be an unnecessary operation in 2006, supposedly to alleviate snoring (the operation was in fact effectively useless, due to his condition being of a non-operable subtype). Unfortunately, as a result of the operation, he suffered a catastrophic severe reactive arthritis leading to the development of a chronic pain condition, which meant that he walked on tiptoes, hunched over and with painful joints all over his body.

By the time he was seen in 2013 for the purpose of a Pain Medicine report, it was clear (to me, R.M.) that he had mainly recovered from his reactive arthritis from the physical Pain Medicine point of view – suggesting significant potential for recovery from his condition. Like many soldiers, he put on a brave face at the time I examined him, and I was initially optimistic that despite the considerable time that had passed and the previous attempts to try and rehabilitate him, he might still improve.

Unfortunately, the psychiatric evidence (following examination in 2014; M.D.S.) indicated that in fact, despite apparent physical improvements, Downing had become entrenched in a pattern of pain behaviour and had already (and in retrospect, perhaps rather unsurprisingly after what had by then been some 8 years of chronic pain experience) become established within a vicious cycle of chronification of pain – involving psychological deteriorations including the development of depression and also *features of perceived injustice, loss of hope and lack of expectation* – which meant that his response to any physical rehabilitation was likely to be minimal. This

Photographs of Warrant Officer Peter Richard Downing (reproduced with his kind permission)

caused a radical shift in the Pain Medicine prognosis (R.M.) in this particular case.

The situation then arose that the High Court (in a case concerning *quantum* rather than *liability*) was required to judge how much to award an individual who, based upon objective physical measures, had largely improved from the original severe acute arthritic condition – but who continued to be grossly physically and psychologically disabled. There was a large claim including costs for care, assistance and loss of earning. Moreover, the Court was of course faced with the question as to how much physical care does one award a person whose requirement for such physical care was in large part psychologically mediated.

Let us make it clear the credibility of the Claimant was never ever in doubt. It was noted he had completely co-operated with all that the doctors had asked of him. Sir David Eady, sitting in judgment in the High Court, fully accepted the genuine nature of the significant chronic pain that the Claimant was suffering and indeed continues to suffer from and that it is fully expected that he will never work again. In the event, after the trial at the Royal Courts of Justice and after much detailed cross-examination of the experts, he was awarded a multi-million pound settlement.[2]

Cases such as these cause us as clinicians to reflect much. When one has an injury and suffers pain and then the pain does not get better despite apparent improvement in the underlying condition, what are the reasons for this?

Persistent experience of pain causes patients to litigate

Does a patient continue to 'feel' pain when an arthritic process has disappeared? There is certainly the suggestion from some studies that patients continue to 'perseverate', to continue to feel the pain as if they were experiencing it at the time of their injury. Indeed, it has been suggested that these are the patients who are more likely to litigate – in other words, that it is *the persistent experience of pain that causes one to launch proceedings*, rather than litigation being the cause of the persistent pain.[3,4] It is accepted that there are cases where of course the ongoing litigation will fuel the chronic pain experience – but it is a sobering thought that many patients only litigate because they continue to experience pain after a perceived injury.

A sense of injustice will fuel the chronic pain experience and may be associated with central dysregulation of pain control

Of particular relevance to the case discussed here, it is clear the literature now indicates that if there is a sense of perceived injustice involved (and of course there was perceived justice in spades in this case: understandably so, because the operation was pointless and, because of it, a promising career in the Army was ended), then such a sense of injustice can fuel the chronic pain experience, and the potent effect of this particular factor should not be underestimated.[5]

In Pain Medicine, when we are asked by the Courts to state what percentage of people suffering traumas go on to develop significant chronic pain, we (in my experience, R.M.) usually say about 10%. If the role of perceived injustice is particularly potent than we might expect, in such situations, the percentage continuing to experience chronic pain into the longer term will be much higher. In fact, one particular study investigated veterans of the 1973 Arab–Israeli War – who were tortured after being captured in battle. Participants were at that time all young adults 18–26 years, and in good physical condition. A total of 60 male ex-prisoners of war (exPOWs) were compared to 44 control males.

The exPOWs were severely tortured during periods of captivity lasting from 6 weeks to 9 months. They were held in solitary confinement, at times handcuffed and blindfolded. They were usually held in tiny unhygienic spaces and were subject to brutal torture, including severe beatings, penetrating injuries, suspension, positional torture, electric shock to sensitive organs, burns and systematic deprivation of food and water. Physical torture was applied to the entire body, particularly the head and neck, the back region, genitalia and feet. Injuries inflicted during captivity were hardly treated, and in many cases, torture was inflicted to the wounds. Oppression and humiliation included not being permitted to use the toilet, verbal abuse such as curses and threats, demoralising misinformation about their loved ones and mock executions.

Over 30 years later, compared to the control group, the group that had been

tortured continued to show altered pain processing in apparently unharmed parts of the body. Specifically, they were extremely sensitive in areas of the body that had not been subject to torture, indicating a centralised dysfunction of pain processing. Unsurprisingly, the incidence of chronic pain decades later was almost 90% among those who had been captured and tortured.[6]

The potent role of prior psychological/psychiatric experience in determining the development of chronic pain after trauma

One could argue that the latter was a rather extreme example as these soldiers apparently were mentally robust prior to being captured, but it does seem that the literature now suggests that prior (usually psychological/psychiatric) experience is an important determinant of chronic pain after a subsequent incident.

Nowhere is this more discussed than in the onset of chronic widespread pain after what may be seemingly minor road traffic accidents which cause little or no soft tissue injury. The original classic work suggested that whiplash injury to the neck, more than other trauma say to the lower limb, would cause greater chronic widespread pain by an order of magnitude. In the original study, the incidence of chronic widespread pain after a whiplash injury was in the order of 22%, compared to about 2% in the lower limb trauma group.[7]

Subsequent work suggested that in those patients who developed chronic widespread pain, a history of trauma was found within the preceding 6 months.[8,9] The latest evidence arising from a prospective study indicates that while trauma seems to be the 'trigger' for the development of a chronic widespread pain state, multivariate analysis suggests that the factors giving rise to the chronic pain outcome existed prior to the accident and were usually psychological/psychiatric factors. Importantly, collision-related factors such as the speed of impact played little or no part in determining the development of chronic widespread pain.[10,11]

Genetic and/or prior life experiences promote vulnerability to developing chronic pain after trauma

Observations such as these have led to speculation that either early or prior life experiences or perhaps genetic factors, or a combination of both, may provide the substrate for future pain experiences and may, on balance, predominantly determine outcome following many noxious events.

Genetic associations with chronic pain vulnerabilities are now well accepted. One study quotes heritability of chronic widespread pain as about 50%,[12] and another reports that monozygotic as compared to dizygotic twins are five times more concordant for low back pain – although also noted is the role of exercise and lifting.[13] The cold pressor test has been shown to have a larger genetic contribution as compared to heat sensitivity.[14]

Furthermore, a landmark study revealed that magnetic resonance imaging (MRI) measures of white matter fractional anisotropy (FA) recorded at the *onset* of acute low back pain accurately predicted which patients would go on to develop chronic low back pain.[15] Furthermore, prior pain experience seems to alter functional circuitry in the brain. The implications of all these studies are profound and suggest, as eloquently suggested by Irene Tracey, Katherine Bushnell and their colleagues, that there is a 'chronic pain endotype' and that chronic pain is a disease.[16–19]

Does the underlying (*so-called 'biological'*) pain not then matter?

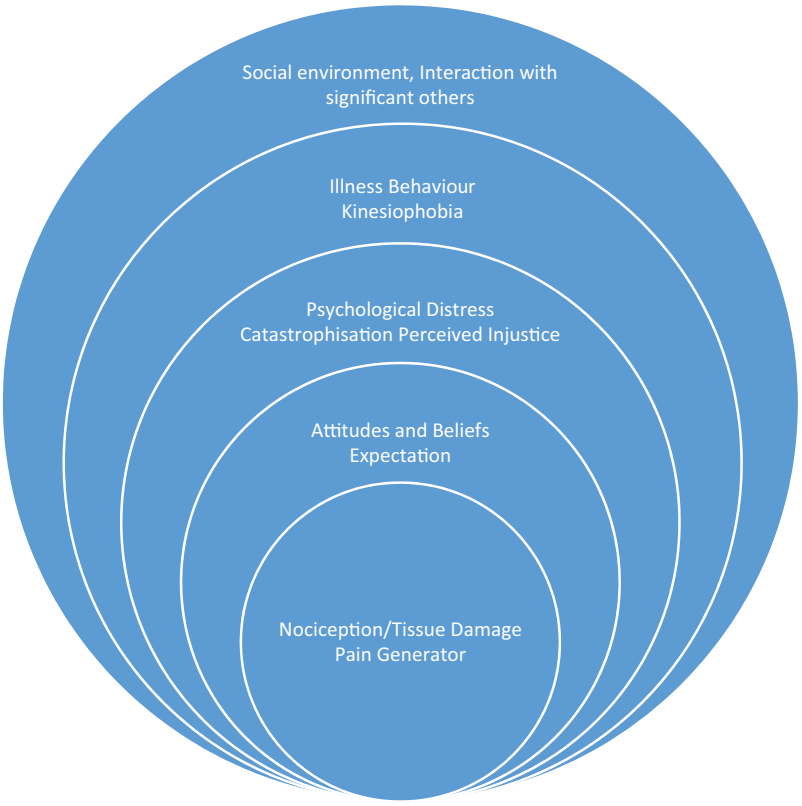
In contrast, there is little doubt that far from diminishing the role of biological/tissue substrate for chronic pain, genetic and trauma-related factors may play a significant role in causing development of altered peripheral and spinal functioning which gives rise to subsequent changes at a more cephalad level. These biological changes have been well described in the last three decades in particular including spinal cord apoptosis and reorganisation,[20–23] but more recently, it has been shown that as a result of immune–glia interactions at a cellular level, the usually inhibitory K channels become excitatory and promote increased afferent input, and the cellular basis of decreased morphine tolerance has been understood.[24]

It is likely for some individuals that these types of biological changes are the major trigger for chronic pain states, and treatment of these or ongoing peripheral pain generators (such as painful arthritic joints of the hip or spine) can be remarkably life-transforming. Intriguingly however, for many others, the eventual removal of the original or ongoing pain generator does *not* have the desired effect. There are too many other layers supporting and maintaining the pain experience.

While such interactions between the physical and the psychological are recognised within the 'biopsychosocial model', the model fails to capture what is considerable inter-individual variation in the relative importance of individual components – in that, for some, the physical pain generator is paramount and treatment of it can lead to significant improvements, whereas in others, removal of the physical pain source may make little difference

Is the biopsychosocial model of pain an appropriate model on which to base treatment?

The biopsychosocial model (or its variants) is often displayed as a core nociceptive or other pain generator surrounded by layers of other factors



which may diminish or enhance the pain experience all sitting within a social milieu.

This is not actually a useful model for treatment purposes as, for many, it implies there is a logical pathway to treatment of the pain starting with the innermost circle and working outwards. In many cases, one has to tackle other components directly and independently – as they themselves may actually be the ongoing critical 'pain generator'. In particular, we find that the belief structure and expectation of the patient is critical to whether the patient is ever going to improve.

Both R.M. and more recently Dr Christopher Bass have commented as regards how a simple diagnosis may promote disability – that is, the patient becomes disabled by simply knowing what the potential consequences of a disease state may be and becoming distressed and indeed disabled by it.

The matter is made worse when there may be doubt about the original diagnosis. Such diagnoses (often of exclusion, where there is no specific biomarker) may include chronic pain syndrome/disorder, myalgic encephalopathy/chronic fatigue syndrome (ME/CFS), fibromyalgia, chronic widespread pain and sometimes diagnosis of complex regional pain syndrome (CRPS), where it is uncertain (see previous article by R.M.). In the medicolegal setting, the negative effect of such a diagnosis can be profound in some patients due to secondary gain factors.

Although it may be the case that the achieving of a 'settlement' may ameliorate to a significant extent the sense of perceived injustice allowing a sense of 'closure', there is no easy or straightforward relationship between apparent improvement after a verdict and any possibility of malingering.[5,25–28]

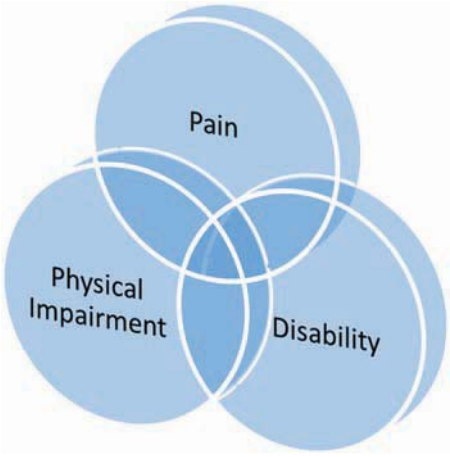
Practically, which are the major determinants of the chronic pain syndrome and can we ameliorate them?

Pain is not the same as disability, and in fact, neither has much to do with objective signs of physical impairment, with correlations of between 0.27 and 0.55 at most.[29,30]

The role of pain catastrophising and kinesiophobia and post-traumatic stress disorder

Going back to the reported case of Downing, despite the intensely painful arthritic process eventually largely improving, the intense pain caused the development of fear of movement, which has persisted, and has been accompanied by *pain catastrophising* and *kinesiophobia* ('fear of movement') – which are major predictors of pain behaviour for many.[31,32]

In some studies, the course of progression of pain experienced closely matches that of post-traumatic stress disorder (PTSD) symptoms, suggesting a strong role for this factor in the maintenance of the pain experience and indeed somatisation.[33] For others,



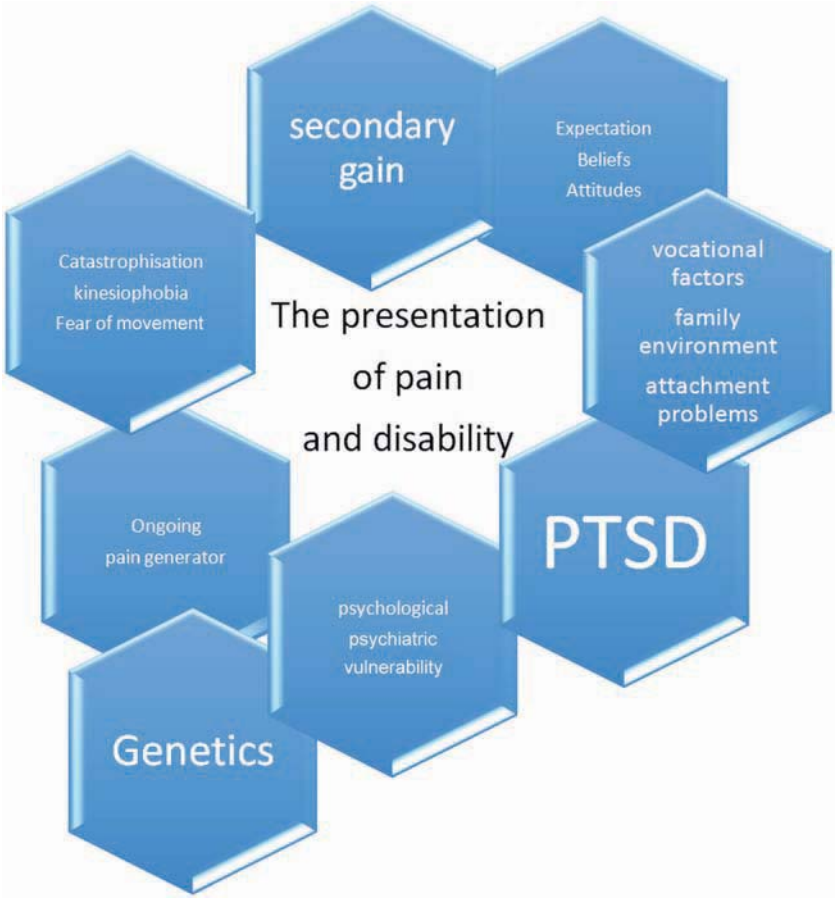
Pain, Physical Impairment, Disability are only poorly correlated and in some patients not at all

post-traumatic symptomology profoundly reduces chances of responding to treatment, an observation confirmed in veterans returning from the recent wars in the Gulf where it has been shown that there is effectively little point in trying to treat the pain until the PTSD has been dealt with. Interestingly, in many, treatment of the PTSD causes spontaneous reduction in pain experience.[34–37] These types of observation suggest that for many, psychological/psychiatric therapy may need to occur before treatment of any residual 'organic pain generator' or certainly the treatment has to occur concurrently. This would also match our own experience that for a proportion of patients/claimants, the secondary gain factors that can be induced by an ongoing medicolegal process have to be brought to an end before there can be any meaningful reduction in pain experience.

We therefore propose an alternative model in which various factors can cluster to bring about the experience of chronic pain. The various factors will interact with each other and also may diminish or enlarge with time.

It is valid to ask whether any 'half-decent' pain management programme couldn't sort this out. Unfortunately, a rigorous review suggested only modest improvements of 20%–30% on pain perception and function in only 50% of the patients selected for such programmes, and little or no effect on vocational outcome.[38]

Further caution about the prospect for improvement comes from the work showing the chances of improvement with rehabilitation dramatically falls away the longer definitive rehabilitation is delayed after injury.[39] Again, The Judge in the case, Sir David Eady, concluded that Downing would not work again and allowed future loss of earnings based on submissions of such evidence (by R.M.).



Proposed alternative model which allows the various factors to cluster and interact, and the role of each may change, diminish or indeed increase with time

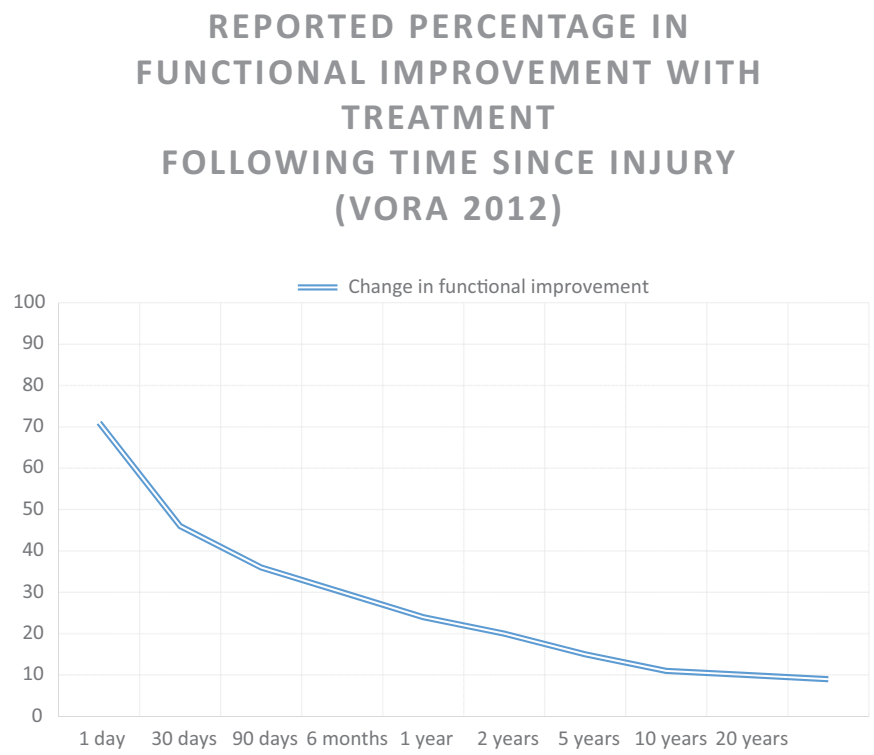
The power of expectation and psychosocial factors in determining outcome

The power of expectation and psychosocial factors are highlighted again in studies which suggest that how much the patient expects to improve and how much they enjoyed their work prior to suffering a lumbar disc prolapse were far greater determinants of outcome post-discectomy than any spinal, pain or medical factor. While improvements in pain scores with discectomy were predictive of short-term improvement, they had no bearing on the long-term outcome which was entirely determined by the psychosocial factors mentioned above.[40,41]

Concluding remarks

While we were both giving talks related to the subject of this article at the Royal Society of Medicine recently, at least one delegate commented that it could be argued that there was now no place for anaesthetists in the assessment of patients with chronic pain. We would agree that the time has passed for those without formal training or knowledge, based on experience of the breadth of pain medicine, to continue to run pain clinics.

However, in contrast, there is an absolutely critical role for Pain Consultants attuned to looking for ongoing (and hopefully treatable) pain generators, as well as being alert to patients' belief



The longer rehabilitation is delayed after the injury, the less likely it is to work

structures, expectations and significant psychological, psychiatric and social factors within which the pain is experienced. The setting up of the Faculty of Pain Medicine of the Royal College of Anaesthetists with the introduction of appropriate standards of training and examination is very welcome indeed.

Accredited Pain Consultants need to work closely with their Psychiatric and Psychological colleagues (who similarly should have a specific interest in chronic pain) in helping determine appropriate treatment pathways for these patients.

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Declaration of conflict of interests

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