**ARTICLE**

**Breaking the Pain Barrier: Understanding and Treating Human Suffering**

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**Introduction**

Virtually all of us have experienced physical pain of one form or another, varying from the relatively mild to the extreme. When pain occurs, it frequently functions as a barrier to on-going activity, in that we stop what we are doing and attempt to alleviate the discomfort. This response may be relatively brief and trivial such as sucking a pinched finger or more extended and serious involving, for example, an invasive medical operation. Implicit within this response to pain is the assumption that the discomfort must be removed, or at least reduced, before resuming normal activities. In most cases, this assumption is not problematic, and indeed sensible, because the pain may signal some form of structural fault or damage, which if ignored, could be exacerbated and perhaps lead eventually to death. Nevertheless, there are times when treating pain as a barrier may become more problematic than the pain itself. The current article will provide a brief review of the psychology of chronic pain with a particular focus on recent attempts to treat this disorder with acceptance-based therapies.

A diagnosis of chronic pain is not straightforward for example, it does not imply sensation in a specific region, nor stipulate a level of severity. However, a primary index of suffering is the level of intrusion or disability and the diagnosis frequently assigns a central role to psychological variables. Pain researchers (e.g. Gatchel, 2005) have distinguished between nociception (i.e. the neurological event) and pain perception (a personal interpretation of pain sensation), but insist that the relationship between these events is bi-directional. This interaction is often referred to as the pain-stress cycle, in that pain generates lifestyle changes which cause stress, which exacerbates pain, and so on. The importance of the perception of pain, rather than the pain itself, is reflected in the findings that: (1) the speed with which sufferers ‘return to normal life’ may be unrelated to specific symptoms and/or their severity (Englund, 2000); and (2) reactions to symptoms (rather than the symptoms per se) influence both the search for medical assistance and the overall level of resulting disability (Saunders, Korff, & Grothaus, 2000).

The Diagnostic and Statistical Manual (currently DSM-IV-TR) differentiates among three basic types of Pain Disorder that are: (1) associated with a General Medical Condition; (2) associated with psychological factors; and (3) associated with both. According to DSM, there must be evidence of clear neurological damage for (1) and (3), but not for (2). The issue of diagnosis is complicated, however, because there is considerable overlap among the symptoms that are used to identify the specific disorder. That is, all pain disorders have the following characteristics:

1. The disorder is reasonably stable across time;
2. The sufferer presents with evidence of distress and impairment in work, social, or personal functioning; and
3. There is no evidence of malingering (Morrison, 1995).

It is not surprising, therefore, that it is almost impossible to decipher one pain disorder from another.

In response to diagnostic difficulties, a wide range of clinical tools is used to aid the accurate measurement of pain disorders and their impact on sufferers. As expected, some of these tools assess the physical aspects of pain (e.g. the Multidimensional Pain Inventory, MPI, Kerns, Turk, & Rudy, 1985; and the Symptom Check List-90-Revised, SCL-90-R, Derogatis, 1994). Others focus on the sufferer’s distress (e.g. the Pain Anxiety Symptoms Scale, PASS, McCracken, Zayfert, & Gross, 1992 and the Beck Depression Inventory-II, BDI-II, Beck, Brown, & Steer, 1996) or levels of social impairment (e.g. the Sickness Impact Profile, SIP, Bergner, Bobbitt, Carter, & Gilson, 1981). A number of additional measures are concerned with the sufferer’s reactions to pain and the coping styles employed (e.g. the Chronic Pain Acceptance Questionnaire, CPAQ, Geiser, 1992). The aim of this sophisticated array of diagnostic tools, therefore, is to amass a full picture of the profile of chronic pain and the unique range of influences it has on the life of an individual sufferer.

**The Treatment of Chronic Pain**

The literature on the treatment of chronic pain is vast and has witnessed a critical conceptual shift within which the range of treatment modalities should be understood. The previously dominant view of the homogeneity of the profile of pain sufferers has given way more recently to specialised attempts to match treatment to specific pain types (Gatchel, 2005; Turk & Meehan, 2002; Turk & Okifuji, 1999). The latter perspective has emerged from evidence that patients with the same pain diagnosis may present differences in psychosocial and behavioural characteristics that contribute to different response patterns even in the context of the same treatment regime (Gatchel, 2005).

In a review of the literature on the treatment of chronic pain, van Tulder, Gossens and Nachemson (2000) concluded that an integrated multi-disciplinary approach is the most effective. For example, Flor, Fydrich and Turk (1992) reported that a combined approach was twice as effective as programs containing a...
The treatment programme involved relaxation; graded increase in physical fitness and exercise; increased control over chronic pain episodes; graded reduction of analgesies; and training in preventative strategies including mood control, anxiety management and activity pacing. Philips reported that the largest impact of the programme was recorded as significant decreases in sufferers’ affective reactions to pain and levels of avoidant behaviour associated with it. The latter finding was particularly noteworthy because in the pre-treatment phase, behavioural avoidance and level of complaints about pain were significantly correlated with participants’ evaluation of the size of the ‘problem’ (i.e. the more one avoided and complained, the more pain was perceived to be a problem). At a two-month follow-up, treatment gains were maintained and in some cases they were enhanced.

In a meta-analysis of 25 CBT outcome studies for chronic pain, Morley, Eccleston and Williams (1999) reported that CBT demonstrated significantly greater changes in pain experience, cognitive coping and appraisal, as well as reduced behavioural expressions of pain compared to waiting list controls and patients undergoing other treatment regimes (e.g. Education Family Support –Radojevic, Nicassio, & Weisman, 1992 and Structure Group Social Support Therapy – Bradley, Young, Anderson, Turner, Agudelo, et al., 1987). Similar outcomes have been reported by Linton (2000) in a meta-analysis of 28 studies and more specific, but equally positive, outcomes were recorded by Liptchik, Holroyd and Nash (2002) for the treatment of migraine and tension-type headaches.

Although the direct empirical support (as well as meta-analyses) for CBT is largely positive, Morley et al. (1999) summarised this evidence as “strong but not overwhelming” (p. 1). Specifically, one difficulty highlighted by Linton (and commonly raised about CBT in other contexts) concerns the treatment components employed across studies. That is, although the treatments share common generic themes, it is impossible to determine which components mediate the positive outcomes. Indeed, evidence regarding the unique contribution of processes within CBT, as well as the extent to which these potentially interact, is scarce (Vowles, Mc Cracken, & Eccleston, 2007). Nonetheless, certain components within CBT, such as cognitive distraction and suppression have attracted some systematic analysis. Regrettably, various researchers have painted a less than positive picture of their utility. Indeed, some authors have suggested that suppression and distraction increase (rather than decrease) a sufferer’s attention to pain and are therein counter-productive (Masedo & Esteve, 2007; Nouwen, Cloutier, Kappas, Warbrick, & Sheffield, 2006).

Mindfulness-Based CBT and Acceptance and Commitment Therapy (ACT)

In response to growing concerns about the effects of distraction and suppression, and other aspects of CBT in which patients are encouraged away from the pain and the psychological content associated with it, clinicians and researchers have begun to investigate two distinct but related approaches. The first of these is known as mindfulness, which in broad terms encourages patients to be present to, or even embrace, their pain. In Mindfulness-Based Stress Reduction (MBSR; Kabat-Zinn, 1994), for example, Eastern practices such as meditation and yoga are used in the treatment of chronic pain. According to Kabat-Zinn, mindfulness involves “paying attention in a particular way [to thoughts, emotions and physical sensations]: on purpose, in the present moment, and non-judgmentally” (1994, p. 4 – parentheses added). Mindfulness is believed to increase self-awareness and acceptance; reduce reactivity to thoughts and emotions; and improve the ability to make adaptive choices about responding to aversive experiences (Linehan, 1993a, b). In a recent meta-analysis including controlled trials of MBSR, the outcomes for the therapy were generally positive for a range of problems, including chronic pain, cancer, heart disease

Common medical/ physical interventions for chronic pain include: non-steroid anti-inflammatory drugs; muscle relaxants; antidepressants; epidural steroids; back exercise/schools; pain manipulation; acupuncture; braces; traction; and EMG biofeedback. Although these interventions may be categorised primarily as physical, they frequently contain social or psychotherapeutic elements, including: relaxation (Turner & Jensen, 1993); bibliotherapy (O’Leary, Shoor, Lorig, & Holman, 1988); spouse-assisted coping skills (Keefe, Caldwell, Baucom, Salley, Robinson, et al., 1996) and hypnosis (Gatchel, 2005). Indeed, it could be argued that it is not feasible for a pain intervention to be purely physical or even psychological, given the multi-dimensional nature of chronic pain itself.

Cognitive Behavioural Therapy (CBT)

This form of therapy is perhaps the most widely available programme of psychological intervention for chronic pain. Clinicians and researchers within this tradition have highlighted the importance of sufferers’ beliefs about pain, as well as their perceived levels of self-efficacy and control (Geiser, 1992; Weisenberg, 1987). Indeed, the CBT treatment model for chronic pain proposes that the experience of pain per se does not necessitate dysfunction (Flor, 1997). Rather, the critical relationship exists among the pain, the sufferer’s approach and reactions to pain, and the type of obstruction pain creates in their lives. A key aim in CBT, therefore, involves increasing exposure to the obstruction in order to undermine its potential to create dysfunction. In so doing, CBT aims also to increase an individual’s confidence in their ability to approach events that may be impaired by pain, but which do not need to be avoided in an absolute sense (Dahl, Wilson, Luciano, & Hayes, 2004). Indeed, CBT frequently focuses on patients’ levels of catastrophising about their pain and the necessity for it to impact negatively on valued living (e.g. Thorn, 2004).

A number of CBT outcome studies have been reported for chronic pain. For example, Philips (1987) examined the effect of a nine-week outpatient programme (i.e. 1½ hours per week) on 40 chronic pain sufferers. The
and depression (Grossman, Niemann, Schmidt, & Walach, 2004).

The second relatively novel approach, known as Acceptance and Commitment Therapy (ACT), overlaps to some extent with mindfulness, but emerges from a very different tradition, that of behaviour analysis, which is inherently experimental and empirically focused. Acceptance has been a central focus in ACT and, similar to mindfulness, it is employed to enable clients to embrace (rather than avoid) negative psychological content (Hayes, Strosahl, & Wilson, 1999). Clinicians in ACT, for example, make a strong distinction between emotional acceptance and avoidance and argue that the latter is correlated with psychological ill health, rather than well-being. Nevertheless, ACT involves much more than acceptance and includes a focus on cognitive defusion and working within the context of the client’s chosen values (Fletcher & Hayes, 2005). Indeed, ACT researchers have argued that avoidance may in fact exacerbate the psychological content associated with pain and thereby increase obstructions to valued living (Dahl et al., 2004; McCracken & Eccleston, 2003).

In developing ACT for the treatment of pain, some researchers have focused on the psychological processes involved in both acceptance and avoidance of pain-related content. This bottom-up, process-oriented strategy is particularly reflective of the behaviour-analytic tradition from which ACT emerged. In the next two sections, we will briefly consider the processes of avoidance and acceptance, respectively, as they apply to chronic pain.

Understanding Pain Processes: Avoidance
According to Wegner’s Theory of Ironic Processes (1992, 1994), attempts to suppress thoughts are counter-productive and actually increase psychological contact with the thought in question. Consider the example of a patient who regularly has the thought “I should be free of this pain”. According to Wegner, an intentional operating process searches for thoughts (e.g. “I’m okay now”) that are consistent with the desired state of suppression (e.g. freedom from pain). An ironic monitoring process then seeks out the to-be-suppressed thought (“I should be free of this pain”) in order to assess if this desired state has been achieved. Critically, however, the latter process involves a ‘rebound effect’ because the individual must register the thought to determine if it has been successfully suppressed. Although Wegner explicitly describes suppression, many researchers and clinicians use the terms suppression and distraction synonymously and subsume both under the generic term cognitive control. It is not clear in the literature if these concepts are functionally distinct in any way, and thus we have chosen to refer to them interchangeably in the current article, unless cited authors specifically employ one term over another.

In a review of the suppression of neutral and clinically relevant thoughts, Purdon (1999) concluded that the evidence overall is inconsistent. With respect to pain, for example, cognitive control strategies were found to be effective in increasing tolerance of low or moderate pain, but did not decrease pain intensity (Farthing, Venturino, & Brown, 1984; Mullen & Suls, 1982). In contrast, Cioffi and Holloway (1993) reported that cognitive control was associated with increases in the intrusions of pain-related thoughts for participants exposed to the Cold Pressor Task (see also Jaremko, 1978; Litt, 1988; Nouwen, Cloutier, Kappas, Warbrick, & Sheffield, 2006).

The finding that cognitive control strategies are not necessarily therapeutic, and may even be counter-productive, is consistent with the argument that these strategies sometimes involve what ACT researchers describe as psychological avoidance, a process which is associated with negative clinical outcomes. According to Hayes et al. (1999) the concept of avoidance applies when an individual is unwilling to be in contact with his or her private bodily sensations, thoughts, emotions or memories and this is more likely to occur when these events are negatively evaluated. Of course, certain forms of avoidance are adaptive (e.g. you might distract yourself briefly when you are in the dentist’s chair) and the outcome in this case is likely to be positive. However, long-term avoidance can itself become maladaptive and conflict with valued outcomes (Blackledge & Hayes, 2001). Based on the fact that pain sufferers frequently focus on pain removal, combined with the fact that their pain is often recurrent and thus very difficult to avoid, it has been argued that all attempts at reducing chronic pain and the seeking of treatment in which this is a primary objective, should be viewed as avoidance (McCracken, Gross, & Aikens, 1996; see also McCracken, 2005).

Empirical support for the argument that avoidance participates in, or exacerbates, chronic pain has been obtained from research that shows that the level of avoidance presented by chronic pain sufferers is positively correlated with levels of disability and depression (Asmundson, Norton, & Norton, 1999; McCracken et al., 1992). Consistent with these findings, Turk and Monarch (2002) suggested that it is the anticipation of pain, rather than the sensory experience, that mediates the avoidance of both the pain itself and normal functional activities. Indeed from a treatment perspective, Philip (1987) suggested that BT improvements in the treatment of chronic pain resulted primarily from significant reductions in pain avoidance behaviour; in affective reactions to pain; and in depression; as well as alterations in patients’ attitudes regarding levels of perceived pain control. Although further research is clearly needed on avoidance and its role in the diagnosis and treatment of chronic pain, the empirical evidence gathered thus far supports the view that avoidance is problematic. In any case, acceptance as a psychological process provides the flip-side of avoidance and, as we shall see below, there is growing evidence that it is beneficial in terms of coping with chronic pain.

Understanding Pain Processes: Acceptance in Clinical Contexts
McCracken (1998, 1999) defined the acceptance of chronic pain as living with pain without reaction, disapproval or attempts to reduce or avoid it. Positive support for the utility of acceptance in the context of pain can be obtained from a range of sources. For example, research has shown that chronic pain sufferers who accommodate to their pain through explicit attempts to incorporate it into their lives and still achieve high levels of life satisfaction show less overt pain behaviour and depression (Jacob, Kerns, Rosenberg, & Haythornthwaite, 1993). In interpreting these results, it has been suggested that acceptance in this context involves accommodating to the belief that cure of pain is unlikely and switching focus to the non-pain-related aspects of one’s life (Risdon, Eccleston, Crombez, & McCracken, 2003). Although little has been written about the actual process of acceptance in the context of chronic pain, Geiser (1992) argued that sufferers proceed through a number of defined emotional stages, not unlike mourning an irreversible loss. These stages include:
(1) recognising the presence of chronic pain;
(2) recognising that one struggles with the pain;
(3) recognising the cost of continuing to struggle with pain;
(4) giving up on the struggle; and
(5) identifying other goals and realistic activity interests.
Although Geiser’s stage model of acceptance has not been subjected to systematic empirical analysis, a number of studies have attempted to assess the relative effectiveness of acceptance in coping with chronic pain.

One of the first studies that attempted to compare an acceptance-based versus CBT approach to the treatment of chronic pain was reported by Geiser (1992) with 65 chronic pain in-patients. The acceptance condition focused on encouraging patients to give up the struggle with pain and to channel their efforts into other life goals. In contrast, the CBT condition focused on the enhancement of skills for managing or reducing pain as an important step towards living a full life. Both treatments produced significant improvements in pain acceptance, which then predicted increases in total activity and decreases in interference with daily schedules. However, two key differences distinguished the two outcomes. First, only participants in the acceptance condition demonstrated significant decreases in drug use. Second, participants in the CBT condition showed greater loss of initial treatment gains at follow-up in terms of levels of activity, mood and anxiety.

In an attempt to analyse the precise role of acceptance on clinical pain outcomes, McCracken (1998) reported that after controlling for pain intensity and any significant demographic variables, acceptance of pain significantly predicted the seven criterion variables: pain-related anxiety; avoidance; depression; physical and psycho-social disability; daily uptime; and work status. Furthermore, a relatively low correlation between pain intensity and acceptance indicated that acceptance is not merely a function of having a low level of pain. Further research has bolstered this general finding (Viane, Crombez, Eccleston, Poppe, Devulder, Van Honendhove, & De Corte, 2003). Specifically, Viane et al. examined the construct validity of acceptance by comparing the CPAQ; the Illness Cognitions Questionnaire (ICQ); the pain severity sub-scale of the Multidimensional Pain Inventory (MPI-DLV: Lousberg Van Breukelen, Groeneman, Schmidt, Arntz & Winter, 1999); the MOS 36-item Short Form Health Survey (Ware & Sherbourne, 1992); and the Pain Cognition List (PCL, Vlaeyen Geurts, Kole-Snijders, Schuerman, Groenmen & Van Eek, 1990). The analyses revealed that acceptance of pain was associated with less pain catastrophising, but not with pain severity, and furthermore its role in mediating mental health beyond pain catastrophising and severity was moderate and robust. With acceptance incorporated into a broader ACT package, Dahl, Wilson and Nilsson (2004) reported superior ACT outcomes relative to treatment as usual in a randomised control trial involving participants with stress and pain symptoms who were at risk of becoming long-term disabled. Specifically, ACT reduced the number of sick days absent from work over a six-month period by 91%.

Additional recent evidence to support the beneficial role of acceptance in coping with chronic pain comes from a study that incorporated ACT components into CBT (Vowles, McCracken, & Eccleston, 2007). Specifically, this research showed significant reductions in: pain; depression; pain-related anxiety; disability; and catastrophising; as well as increases in acceptance; walking speed and sit-to-stand frequency. Unfortunately, as is the case with all treatment packages, it is very difficult to determine the active ingredients that bring about beneficial change. Indeed, this is a particular problem when researchers mix and match different therapeutic components in the absence of a clear understanding of the processes at work. In response to this difficulty, some researchers have focused on experimental analyses of the putative processes that are assumed to mediate therapeutic outcomes. In the next section we will consider such analyses in the context of the acceptance of stress/pain induction.

Acceptance and Pain/ Stress Induction in Experimental Contexts

A range of stress induction methodologies have been used to model clinical pain and relevant coping strategies, including: the Carbon Dioxide (CO²) Challenge (Levitt, Brown, Orsillo, & Barlow, 2004); the Cold Pressor Task (Hayes, Bisset, Korn, Rosenfarb, Cooper, & Grundt, 1997); and Brief Electric Shock (Gutierrez, Luciano, Rodriguez, & Fink, 2004). With the Cold Pressor Task, Hayes et al. (1999) compared an Acceptance rationale, specifically aimed at disconnecting thoughts and feelings from behaviour, to Cognitive Control, comprised of stress inoculation (Turk, 1978), and Placebo. In this study, undergraduate participants used self-report measures to rate the level of pain intensity, total sensation and unpleasantness/adversity induced by the task. The results demonstrated that Placebo participants spent the least time with their hands immersed in the iced water, while Acceptance participants spent the longest time, although the subjective measures indicated that the latter group did not experience less pain. Furthermore, a primary mediator of the acceptance effect was reduced believability in thoughts and feelings about pain.

Similar findings were reported when Acceptance, Suppression and Placebo were compared for 60 patients with panic disorder exposed to the CO² challenge (Levitt et al., 2004). The subjective anxiety reported by participants in the Acceptance group decreased significantly, but increased for those in the Suppression group. Furthermore, the former participants reported the greatest willingness (i.e. less avoidance) to participate in a further challenge.

Equally positive effects have been reported for acceptance when employed as a strategy for coping with Brief Electric Shock. Specifically, Gutierrez et al. (2004) reported that 71% of non-clinical participants assigned to an Acceptance Condition increased their pain tolerance levels compared to only 11% of the Distraction Group. Once again, this increased pain tolerance was not mediated by reductions in pain severity. Indeed, the Acceptance condition accounted for the highest percentage of participants reporting the highest levels of pain while still increasing in tolerance (for a replication, see Johnson, Stewart, Barnes-Holmes, McHugh, Luciano, & Barnes-Holmes, 2004).

Acceptance and Radiant Heat Induction

The empirical evidence reviewed thus far provides strong positive support for acceptance-based strategies using the existing methodologies for the experimental induction of physical stress or pain. However, it remains the case that each of these procedures has established limitations (Mitchell, Mac Donald and Brodie, 2004). In an assessment of studies involving the Cold Pressor Task, for example, Mitchell et al., (2004) found a lack of standardised equipment, as well as variations in the number of immersions; immersion time; maximum tolerance time; and the manner in which hands are returned to normal temperature (e.g. some studies immerse the hand in water of 32°C post-immersion). The same researchers reported significant variations in water temperature across studies, ranging from 0 to 7°C, with only half of the experiments employing water circulation devices. According to Mitchell et al., significantly different pain sensations and experiences will likely occur with variations in temperature on the Cold Pressor Task. Although both the CO² Challenge and
Brief Electric Shock appear to permit greater methodological reliability than the Cold Pressor Task, one may raise concerns about their external validity. For example, one might question the extent to which a brief electric shock on your forearm resembles the symptoms of real-life chronic pain.

A number of researchers have begun to examine an alternative methodology that may offer a reasonably sound analogue of clinical pain. Radiant heat induction originated in the animal laboratory in attempts to examine the effects of motivational or emotional factors on animals’ ability to tolerate pain. In one study, for example, radiant heat induction was used to determine the point at which rats would tail-flick in response to pain (Meagher, Grau, & King, 1989). These researchers reported that rats exposed to shock or other stressors prior to the heat apparatus demonstrated longer heat tolerance that may be explained by the concept of ‘stress induced analgesia’.

Other researchers have employed a modified version of the heat-induced tail-flick test for use with human participants (Lee & Stitzer, 1995). In this study, radiant heat induction (i.e. placing the finger directly on the heat pad) was systematically compared to Brief Electric Shock, with two exposures to each procedure in a randomised counterbalanced design. The results of the study indicated greater stability of measures recorded across repeated exposures to the heat apparatus relative to the shocker. The same heat methodology was subsequently employed by Rhudy and Meagher (2003) who distinguished between fear and anxiety and attempted to assess the relative impact of each on heat tolerance. Fear was manipulated by actually exposing participants to moderate electric shock in between exposures to the heat pad, whereas anxiety was manipulated by informing participants that they would be shocked, but no actual shocks were provided. The results of the study demonstrated that the two emotional states had divergent effects - fear decreased pain tolerance, while anxiety increased tolerance.

Radiant heat induction appears to offer a high level of experimental precision that might also be harnessed as a sound analogue of chronic pain. Consider the following advantages:

1. All aspects of the procedure may be controlled by computer software, thus ensuring that the rate of temperature increase remains the same across all participants;

2. Participants can indicate in milliseconds the points at which the stimulation is registered as painful and intolerable, thus providing clear indices of the level of pain;

3. Participants have a sense of personal control over the apparatus because they can remove their hand at any point;

4. These aspects of control also ensure high levels of ethical adherence;

5. The automated delivery of heat is slow and intense, perhaps not unlike chronic pain, which is more likely slow to onset than sudden (as would be the case with Brief Electric Shock);

6. The apparatus is simple to use; and,

7. Recovery time is in the region of two minutes and no skin damage has ever been recorded at the temperatures presented.

Research currently underway at NUI Maynooth has attempted to extend the existing work on radiant heat induction, focusing in particular on the role of acceptance strategies in increasing pain tolerance. This research has involved four separate experimental studies comparing Acceptance, Distraction and Placebo on radiant heat tolerance.

**Current Research at NUI Maynooth**

Experiment 1 of the research conducted to date was a large-scale study (n = 127) that compared Acceptance, Distraction and Placebo interventions as coping strategies for experimentally induced radiant heat pain. All participants were initially screened on a battery of psychological measures, including The Acceptance and Action Questionnaire (AAQ-49, Hayes, Strosahl, Wilson, Bissett, Pistorello, & Curry, 2003) and The Fear of Pain Questionnaire (FPQ-III; McNeil & Rainwater, 1998) and all groups were balanced on scores obtained on these measures. Participants were also screened for their baseline levels of heat tolerance and were thereafter categorised as low, medium, or high tolerance. The heat pad itself measures 3.7 by 3.7 cm with a total of 13.7cm². When the heat is first switched on, the temperature of the pad is set at 0°C and slowly and systematically increased to a maximum of 50°C. The time period between 0 and 50°C is approximately 30 to 40 seconds. Most participants indicate that the heat is painful (referred to as tolerance) at a temperature of approx. 42°C and most find it intolerable (i.e. they remove their hands from the heat pad, referred to as threshold) at around 48-50°C. Once a temperature of 50°C is reached, the temperature is maintained and the software continues to record the length of time participants can retain their hands on the pad at this temperature. Hence, the software primarily records the length of time participants spend in pain between tolerance and threshold.

For the Maynooth studies, low heat tolerance was designated between 0 and 4.2 seconds; medium tolerance was 4.8-4.9 seconds, and high tolerance was 8.5-10.4 seconds. Because all aspects of the heat apparatus are controlled by software, the experimenter was not present in the room at any time during the heat tests. Participants from all three groups of heat tolerance were assigned to each of the three intervention groups.

The therapeutic interventions commenced only after participants had conducted two baseline tolerance tests on the heat pad. The two main interventions plus placebo were each delivered as a series of seven video clips presented to participants on a computer screen (again the experimenter was not present) as three core therapeutic features – the Walking Exercise, the Acceptance and Distraction interventions commenced with the Cards Exercise, in which participants were asked to write down three thoughts they had at the point at which they decided to remove their hand from the heat pad (during the previous baseline heat test) on three pieces of card and then leave the cards on the table.

During the Walking Exercise, participants in both groups were asked to remove a piece of paper from an envelope located on the table. The paper contained within the envelope and presented to participants in the Acceptance group presented the single sentence “I cannot walk”. These participants were then instructed to stand up and walk once around the room while repeating the sentence aloud (“I cannot walk, I cannot walk, I cannot walk”). The Walking Exercise in this case, highlighted the potential dissociation between thoughts and actions. In other words, one can say “I cannot walk” while still walking, hence our actions do not have to be controlled by our thoughts. Participants were then instructed to try to use this dissociation strategy during the heat task as follows: “Just like saying, ‘I cannot walk’ while walking around the room, you can have the thought ‘I can’t stand this...”
pain or heat’ and still continue with the task”.

The Walking Exercise presented to participants in the Distraction group was similar in format to Acceptance, but instructed participants on the benefits of distraction. These participants were first instructed to try to imagine a detailed pleasant scene. They were then asked to take one of the three cards on which they had written a pain-related thought and read the written thought aloud during the Walking Exercise (e.g. the card may have contained the written thought ‘I cannot stand this pain’). At the same time, participants were asked to try to distract themselves from the thought by imagining their pleasant scene as they walked around the room. Participants were then instructed to employ their pleasant scene as distraction during the heat tasks.

Immediately after exposure to the Walking Exercise, both groups were presented with the Swamp Metaphor that highlighted the similarity between walking through a muddy swamp and difficulties experienced while completing the heat task. The first part of the Swamp Metaphor was as follows for all participants:

Now I would like you to imagine that the next pain task you will experience is a bit like trying to cross a muddy swamp. Imagine that the swamp is full of dirt, rubbish and leftovers that smell really bad and really stink. What kind of thoughts do you think are going to occur in such a situation? It’s likely that thoughts such as ‘I can’t stand this. This is unbearable. I can’t do anything this unpleasant or disgusting. It’s not worth the effort. It’s nonsense’ will all show up.

The two groups were then differentiated in terms of the instructions they received on how to best use the metaphor to enable them to cope with the subsequent heat test. The Acceptance group were instructed as follows:
The best way you could possibly cross the swamp would be to try to think of more pleasant things, to imagine for instance that you are in a lovely landscape and meanwhile to keep crossing the swamp. It’s about removing distress and unpleasant thoughts and thinking of more positive things, so that you can get on with what you were trying to do in the first place—that is crossing the swamp and reaching the shore. In the same way that you can distract yourself from all the horrible thoughts and feelings that show up for you while crossing the swamp, you could distract yourself from all the negative thoughts and flings that show up during the heat task. While you are performing the pain task try to remove pain-related thoughts that show up and think of more pleasant and positive things because those thoughts will help you to keep performing the task.

After the Swamp Metaphor, participants were exposed to a third (post-intervention) heat test in order to determine any differences in heat tolerance relative to the pre-intervention baseline. Following the third heat test, participants were provided with a relevant therapeutic reminder video clip prior to exposure to the fourth and final heat test. Participants in the Placebo group were also exposed to a series of video clips (including reminder), but all of these presented informational content about nature. Hence, they had no relevance to the heat tests and did not attempt to advise participants on how to cope with any psychological content associated with them. In spite of this, the experimental sequence for these participants was identical to the other two groups. A series of adherence measures were conducted after the fourth heat test in order to determine that participants had followed the instructions regarding the use of the specific therapeutic strategy with which they had been provided.

The primary comparison in Experiment 1 concerned the differential impacts of Acceptance, Distraction and Placebo on heat tolerance from baseline to post-intervention and post-reminder. The mean tolerance times in seconds for each of the three groups on these three heat tests are presented in Figure 1. Although the three groups did not differ in heat tolerance at baseline, statistical analysis revealed that only the Acceptance group showed a significant increase in heat tolerance from baseline to post-intervention and to reminder. A small but non-significant improvement was observed for Distraction, and Placebo actually reduced tolerance during the post-reminder phase.

Although the positive outcome for Acceptance was consistent with experimental predictions, the small positive change for Distraction was also of interest, particularly because similar changes had been recorded by previous researchers (Gutierrez et al., 2004). Closer inspection of the Distraction intervention suggested a possible reason for the improvement. Participants in this group had been required to state aloud a pain-related thought while trying to distract themselves from this while walking around the room. Within ACT, the explicit repetition of one’s thoughts (commonly referred to as cognitive defusion) is used explicitly to facilitate acceptance. Thus, one might argue that the small positive outcome recorded for Distraction may be attributable to defusion/acceptance. This issue was addressed in Experiment 2.

In Experiment 2 (n=26), naïve participants were presented with a Distraction intervention in which the statement ‘I can walk’ replaced the pain-related thought during the Walking Exercise, while all other aspects of this condition remained the same. The results of this Revised Distraction Condition were then compared with the data for Distraction and Acceptance from Experiment 1, and the findings revealed strong similarities between revised Distraction and the previous Placebo condition. In other words, revised Distraction resulted in no improvements in tolerance across heat tests and in fact tolerance decreased, as had been the case with Placebo.

In order to determine more precisely which alternative features of the original Acceptance and Distraction...
interventions were responsible for generating the observed outcomes, we decided in the third experiment \( (n=39) \) to match the interventions more closely and present both groups with distraction during the Walking Exercise. However, the two groups differed in terms of what they were told to do with the distraction element of the exercise. Specifically, the Distraction group were told to use their pleasant scene to distract themselves from pain-related thoughts during the subsequent heat test, but the Acceptance group were asked to notice that they could imagine the pleasant scene and have pain related thoughts at the same time. Participants in the Distraction group were encouraged to: Notice that you can have a thought about heat or pain and distract yourself from it by imagining a pleasant scene. Notice that in order to get rid of the thought about pain you can use the pleasant scene as distraction. In this way, thinking about the pleasant scene will help you to get rid of, or replace, the thought about pain or heat.

In contrast, participants in the Acceptance group were instructed to: Notice that you can have a thought about pain and at the same time still do something else like imagining a pleasant scene. Notice that the thought about pain doesn’t have to control what you do. You can imagine your pleasant scene and have the thought about pain both at the same time. If you can have several thoughts at the same time no one thought needs to control your behaviour. They are all just thoughts anyway.

Once again, Acceptance generated significant increases in tolerance, but Distraction did not. Indeed, the outcome for Distraction was very similar to that recorded in Experiment 2 and that recorded for Placebo in Experiment 1. These findings highlight the importance of determining precisely what individuals do in terms of a coping strategy. Specifically, participants in the Distraction group were instructed to use their pleasant scene to remove unwanted thoughts about the pain. In contrast, Acceptance participants were allowed to generate a similar scene, but were encouraged to notice that both the scene and pain-related thoughts may occur simultaneously and that one need not be used to replace the other. The fact that practically all other aspects of the two conditions were identical suggests that this specific feature generated the differential outcomes for Acceptance and Distraction.

Although Experiment 3 had successfully highlighted a critical feature of the use of the pleasant scene as a coping mechanism to either distract or accept pain-related thoughts, it remained the case that there had been minor differences between the groups with regard to the Swamp Metaphor. Specifically, details of the metaphor had to match the instructions regarding distraction or acceptance in order to ensure the coherence of each intervention, and thus this additional feature had still separated the two groups (albeit perhaps in a minor way) in Experiment 3. Experiment 4 was designed to address this issue.

Experiment 4 \( (n=37) \) was identical to the previous study \( (i.e. \text{both groups were given distraction}) \), except that the Swamp Metaphor was removed. This modification to the intervention protocols ensured that only the explicit instructions regarding Distraction or Acceptance of the pleasant scene differentiated the two groups. As expected, the results from this study confirmed those observed previously, with increased tolerance for Acceptance, and no improvement for Distraction. Taken together, therefore, the results for Experiments 3 and 4 indicate that the use of the pleasant scene to either distract or accept pain-related thoughts was a critical feature of the positive outcomes for Acceptance and the lack of improvement for Distraction.

The research conducted thus far at NUI, Maynooth is the first, of which we are aware, to investigate clinical interventions as coping strategies for experimentally induced radiant heat pain. The Acceptance intervention repeatedly generated strong increases in pain tolerance, while Distraction and Placebo did not. Although a limited positive outcome for Distraction was observed \( (\text{Experiment 1}) \), it seemed likely that this effect was attributable to some features of acceptance that had incidentally occurred during the Distraction protocol. When these features were removed, Distraction was indistinguishable from Placebo. The latter experiments attempted a series of componential analyses of the interventions and highlighted the critical nature, not simply of creating a pleasant scene \( (\text{because both groups did this}) \), but of employing this to either accept or distract from pain-related thoughts. Once again, when used to distract oneself, the pleasant scene did not increase tolerance, but when used to highlight that thoughts and feelings do not have to control behaviour tolerance increased.

**Conclusion**

The psychology of pain has received increasing attention within the literature in recent years, and various psychologically-based therapies have emerged and will certainly continue to do so. In this rush to produce the best intervention, it is important that the basic psychological processes involved in either avoiding or coping with pain are subject to systematic experimental analysis. Psychotherapy, including CBT, is replete with self-styled gurus who create their own branded form of therapy that typically involves little more than a tiny variation on a therapeutic theme. A genuinely progressive scientific approach to understanding and treating the psychology of pain is unlikely to emerge from a scientific culture of personality-driven therapies. On the contrary, what seems to be needed is a process-oriented research programme that aims to understand the psychology of pain and how to cope with it. If therapies are built from, and constrained by, this type of research it can only lead to more effective real-life interventions for human suffering.

Figure 1. Mean tolerance time for the three groups across heat pain tests. Figure 2. Heat induction apparatus.
References


can we learn to live with pain? A Q-methodological analysis of the diverse understandings of acceptance of chronic pain, Social Science and Medicine, 56, 375–386.


