

Relaxation and Mindfulness in Pain: A Review

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Relaxation and Mindfulness in Pain: A Review

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SUMMARY POINTS:

- This article reviews the existing, peer-reviewed evidence for the use of relaxation and mindfulness in both acute and chronic pain.
- There is some evidence that relaxation can reduce pain outcomes in both acute and chronic pain, however there is evidence that these improvements are not maintained over time.
- More limited research suggests that mindfulness can lead to improvements in psychological measures and physical functioning and these improvements appear to be maintained at follow-up.
- Further research is needed. Both researchers and practitioners need to be clearer on the outcomes that their techniques best facilitate and the processes which are active within them.

Outline

This article provides a selective narrative review of the existing, peer-reviewed evidence for the use of relaxation and mindfulness with individuals suffering from pain. Having defined both terms, the paper will outline the scope of its review before presenting its findings. It concludes by discussing broader areas relevant to this review as well as potential research directions.

Terms

An observer watching either a relaxation or a mindfulness class through the glass of a door might struggle to tell them apart. Both would probably involve a group of participants sitting or lying still with their eyes shut. However the differing definitions associated with these techniques hint at the significant variations in what they aim to achieve.

Relaxation has been defined as “those practices whose primary stated goal is elicitation of a psychophysiological state of relaxation or hypoaousal” (p.132)¹. A common definition of mindfulness is “paying attention in a particular way: on purpose, in the present moment, and non-judgmentally”². For the purpose of this article we suggest the following parallel definitions of relaxation and mindfulness, deliberately - and possibly over-simplistically - set up to contrast one another: Relaxation aims to allow individuals to reduce their feelings of stress or tension, while mindfulness aims to allow individuals to observe their feelings of stress or tension.

Relaxation as a clinical technique comes in many different forms including: progressive muscle/muscular relaxation, autogenic training, biofeedback and guided imagery. Different varieties of mindfulness also exist such as Mindfulness-Based Stress Reduction (MBSR), Mindfulness Based Cognitive Therapy (MBCT) as well as existing within different therapeutic models such as Acceptance and Commitment Therapy (ACT) and Dialectical Behaviour Therapy (DBT)³.

It is clear from the paragraphs above that differences exist between relaxation and mindfulness. Of course people who are learning mindfulness might find the exercises relaxing and those who are relaxed might find it easier to live mindfully. However it appears that the techniques have different agendas.

Review Method

This article does not aim to provide a quantitative or meta-analytic review of the evidence base for relaxation and mindfulness. Instead it hopes to give a more general overview of the current state of the literature. Searches using Web of Science and PsycINFO databases were conducted on 7th August 2008. They were limited between the years 1958 and 2008 and used the terms “relaxation” and “pain”, and “mindfulness” and “pain”. The review targeted previous systematic reviews and group-based research studies published in peer-reviewed journals using either relaxation or mindfulness in pain populations (either acute or chronic). Article abstracts were read by one author and excluded if they: a) used relaxation or mindfulness as only one part of a wider therapeutic intervention; b) did not include a separate

measure of pain in the outcomes; c) were dissertations or case studies; d) contained no abstract; or e) were not written in English. In cases of uncertainty surrounding whether an article met the inclusion criteria, clarification was sought through discussion with the other author.

The research community has had substantially longer to establish an evidence base for relaxation techniques and the term 'relaxation' relates to many other things, for example the physiological relaxation of a muscle in surgery. Accordingly it was unsurprising that the searches initially produced 1505 results for relaxation and pain, and 114 for mindfulness and pain.

Evidence for Relaxation and Pain

The relaxation research evidence covers a wide span of time and a wide variety of pain experiences. Fortunately, given this breadth and depth, 3 systematic reviews^{4,5,6} published in 1998 and 2006 provide overviews, but not meta-analyses, of the evidence base for relaxation between 1950 and 2005 for both acute and chronic pain in adult populations. These reviews will form the basis of the relaxation findings for this article.

Seers and Carroll's (1998) systematic review of relaxation in acute pain identified seven randomised control trials which met their specific inclusion criteria⁴. All investigated the use of relaxation, either during or following a surgical procedure. In terms of pain outcomes (e.g. pain sensations and pain distress), only 3 of 7 studies reported significant reductions^{7,8,9}. Five studies included measures of wider psychological outcomes (e.g. anxiety, mood, coping), of which only 1 study reported a significant reduction⁸. Several methodological weaknesses were highlighted, such as unclear definitions of relaxation, small sample sizes and relaxation interventions combining different techniques. Seers and Carroll concluded that based on the existing evidence it is not possible to draw conclusions about the effectiveness of relaxation interventions in acute pain.

Within chronic pain, Carroll and Seers (1998) identified 9 randomised control trial studies (7 studying non malignant pain, 2 studying cancer pain) meeting their inclusion criteria⁵. Only 2 out of 7 studies focusing on non-malignant pain (e.g. rheumatoid arthritis and fibromyalgia) reported significant pain reductions at post-treatment^{10,11}. Three of these studies conducted follow-ups^{11,12,13} at time intervals ranging from 4 weeks to 4 months but none found that significant improvements were maintained. Within oncology, 2 studies were identified and 1 reported significant differences in pain outcomes when relaxation was compared to controls¹⁴. When compared to other interventions, the review found relaxation to be less effective than hydrotherapy, biofeedback and oral splint devices.

Kwekkeboom and Gretarsdottir (2006) conducted a more recent systematic review of the efficacy of relaxation techniques in both acute and chronic pain⁶. Overall relaxation was found to have a significant effect on pain outcomes in 8 of 15 randomised control studies. Progressive muscle relaxation was found to reduce pain

sensation in chronic low back pain, arthritis and pregnancy-related pain. Autogenic training, jaw relaxation and systematic relaxation were found to reduce postoperative pain. Rhythmic breathing and other relaxation interventions were not found to be effective. In the 2 studies where follow-up data were included, improvements were not maintained at 3 and 6 months^{15,16}.

Evidence for Mindfulness and Pain

Of the 114 initial results from the searches only 13 studies met the inclusion criteria of this review. A number of these studies randomised participants and/or used control groups to some extent, however many were pilot studies. Ten articles were treatment outcome studies investigating the effectiveness of mindfulness within adult chronic pain populations. The remainder included either mixed samples or investigated acute pain tolerance within healthy participants. A summary of the 13 studies reviewed are presented in *Table 1*. The following text discusses the studies by pain presentation (chronic pain, fibromyalgia, arthritis, mixed and community samples and healthy participants).

Kabat-Zinn and his team conducted some of the first research studies into the effectiveness of mindfulness^{17,18}. Interestingly, these utilised chronic pain populations. This research found improvements in physical and psychological measures and these improvements were maintained up to 15 months later. More recently a study compared mindfulness to massage therapy and standard care controls in a randomised control trial¹⁹. Participants in the mindfulness condition reported no difference in either physical or psychological symptoms directly following the intervention, but at 12 week follow-up reported significant improvements on psychological measures. In contrast, participants in the massage condition reported a significant pain reduction immediately following the intervention but this was not maintained at follow-up. Mindfulness interventions have also been found to lead to significant reductions in depression, anxiety and pain-related grief²⁰ and significant long term improvements in pain acceptance and physical functioning when compared to controls in a randomised control trial (RCT)²¹. Furthermore, evidence from face to face and distance mindfulness interventions reveals significant improvements in psychological distress, emotional and social functioning and pain catastrophising when compared to a control condition²².

A small number of studies have been conducted with fibromyalgia sufferers. In RCTs, mindfulness interventions have been found to significantly reduce symptoms of depression²³ and increase sense of coherence²⁴. Furthermore, recent research reports that mindfulness interventions lead to significant reductions in anxiety and depression and increases in reported quality of life when compared to relaxation, exercise and social support²⁵. These improvements were maintained at a 3 year follow-up. With rheumatoid arthritis sufferers, no difference was found at the end of treatment or indeed at the 2 month follow-up. However at the 6 month follow-up, those in the mindfulness condition reported significant improvements in psychological distress and well-being in comparison to waiting list controls²⁶.

One study used a mixed sample consisting of a variety of medical conditions, including 37 chronic pain patients and 6 fibromyalgia sufferers. Following the mindfulness intervention significant improvements in physical and psychological distress, and health-related quality of life were reported²⁷. However, it is difficult to generalise from these results as pain participants made up small percentages of the sample (26% and 5% respectively) and no control or follow-up data was included. Mindfulness has also been compared to a cognitive behavioural stress reduction (CBSR) intervention in a community sample treated for “stress reduction” where pain was measured²⁸. The mindfulness intervention was found to demonstrate better outcomes when compared to the CBSR condition however it is important to note the relatively low average pre-treatment levels of pain and high variations of pain scores within and between the samples in this study. Finally, the effect of mindfulness and guided imagery on pain tolerance within healthy subjects has been investigated in an RCT²⁹. Participants in the mindfulness condition demonstrated increased pain tolerance during an experimentally induced acute pain task; however, the authors concluded that this was not related to the acquisition of mindfulness skills.

Discussion

Despite the fact that relaxation techniques have a considerable time advantage in establishing their empirical evidence base, it is interesting that the literature in pain is not more compelling in outcome. Generally speaking, there is some evidence that relaxation techniques can reduce pain outcomes in acute pain but the research is not overwhelming. In chronic pain, again there is some supporting evidence but follow-up data suggests that the usefulness of relaxation reduces over time. Mindfulness research has tended to focus on chronic pain conditions and interestingly the current evidence is generally better than relaxation at follow-up even if results immediately after the intervention are not always so strong.

When interpreting the findings from this review it is important to note the differences between the separate evidence bases. The review of the relaxation literature was based on 3 existing systematic reviews whereas the review of the mindfulness literature was based on actual studies. The systematic reviews of the relaxation literature applied more rigorous selection criteria than those in the review of the mindfulness literature. Therefore caution is needed when interpreting the findings from this review as some of the mindfulness studies were, for example, uncontrolled and/or contained relatively small sample sizes. Indeed it is possible that studies with better control and larger numbers might not continue to support the current findings and until more research has been carried out no firm conclusions can be made.

If research methodology and control is not the reason for the above results it is possible to hypothesize other reasons. One possibility is that it is difficult to generalise and maintain relaxation skills outside of the classroom/therapy environment. Indeed it may be particularly hard to engage in such behaviour during times of high stress within everyday life. Mindfulness, on the other hand, explicitly teaches

moment to moment awareness so that people can better notice their tendencies to act in life as it unfolds. Subtle but important differences like this may be part of the reason for the results presented above.

As ever, more rigorous methodologies with better controls, more careful selection of outcome measures and longer follow-up periods are required. Studies which directly compare relaxation and mindfulness would also be useful. At present, research tends to measure different outcomes which makes inter-study comparison difficult. Researchers also need to consider which outcomes are most appropriate. Measuring pain is intuitive; assessing the impact of other psychological variables such as anxiety and depression is also useful. However, future research should also consider measuring levels of individual functioning. This will allow researchers to assess if relaxation and mindfulness allow subjects to do more in their everyday lives even if pain or psychological distress do not decrease.

Further research also needs to investigate the processes involved in relaxation and mindfulness so that their usefulness can be evaluated and their teaching improved. Despite the relatively short time it has been a subject of western scientific study, mindfulness has already started to explore these questions³⁰. Some of this work has even been done with chronic pain patients³¹. Research suggests that under the umbrella term ‘mindfulness’ coexist a number of interrelated psychological processes which closely mirror important factors in contemporary contextual psychological research and therapy³². Paying more attention to processes such as cognitive fusion (where entanglement with thoughts and feelings dominate over other possible influences on an individual’s behaviour), acceptance/willingness and contact with the present moment, may allow us to improve our ability to teach mindfulness in the future (see Hayes, 2006, for more information and explanation of these terms³²).

As yet, many questions still remain about the makeup of the active ingredients inside relaxation. It is possible that ‘control’ or ‘distraction’ have an important role to play. If so, the experimental literature may already allow us to make some comparisons between aspects of relaxation and mindfulness. For example, healthy subjects have demonstrated increased pain tolerance in a cold pressor task when applying acceptance (mindfulness) rather than control (relaxation)³³. Equally, healthy subjects who received electric shocks found acceptance to be more useful than distraction (relaxation)³⁴. Of course distraction has been found to be clinically effective in the reduction of paediatric pain during immunizations³⁵, but these are short lived procedures and their utility for chronic conditions is less certain. Indeed there is an extensive literature which suggests that forms of thought suppression can actually be counterproductive³⁶.

Discussions of this nature highlight how important it is for practitioners and researchers to be clear about what they want to achieve and what their techniques actually do. Due to the current state of the literature it is only possible to draw tentative conclusions about the efficacy of both of these interventions. However, based on the existing evidence it would appear that whilst relaxation interventions can be beneficial in the short term, mindfulness may be

more useful in the long term if the desired result is the acquisition of skills which are useful outside of the therapy room.

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Table 1. Summary of Mindfulness Studies Involving Pain					
Author	Total N (control[s])	Random allocation	Mindfulness treatment	Main outcome for mindfulness group	Follow-up: Result
Gardener-Nix et al. (2008)	278 (99 face to face, 57 video conferencing, 59 waiting list)	No	10 weeks, 10 hours per week.	Significant improvements in pain level, catastrophising, and mental health scores compared to controls.	None.
Grossman et al. (2007)	58 (13 active social support)	Quasi random allocation	8 weeks, 2.5 hours per week.	Significant improvements in quality of life, coping with pain, anxiety, depression, somatic complaints and pain ratings, compared to pre-intervention and control conditions.	3 years: Improvements maintained.
Kabat-Zinn et al. (1982)	51 (0)	No	10 weeks, 2 hours per week.	Significant reductions in pain ratings, mood disturbance and psychiatric symptomatology.	2.5, 7 months: Improvements remained relatively stable.
Kabat-Zinn et al. (1985)	142 (21 standard care, 21 waiting list)	No	10 weeks, 2 hours per week.	Significant improvements in present moment pain, physical functioning, mood, psychological measures such as anxiety and depression. Improvements not observed in the control conditions.	2.5, 4.5, 7, 12 and 15 months: Improvements sustained except for present moment pain.
Kingston et al. (2007)	42 (21 guided imagery control)	Yes	6 x 1 hour sessions.	Significant improvement in pain tolerance in healthy subjects compared to controls. Authors conclude this was not due to mindfulness skills.	None.
Morone et al. (2008)	37 (18 waiting list)	Yes	8 weeks, 1.5 hours per week.	Significant improvements in acceptance, activity engagement and physical functioning compared to the control condition.	3 months: Improvements maintained.
Plews-Ogan et al. (2005)	30 (10 massage condition, 10 standard care control)	Yes	8 weeks, 2.5 hours per week.	No significant differences in pain or mental health ratings compared to controls.	12 weeks: Significant improvements in mental health ratings compared to controls.
Pradhan et al. (2007)	63 (32 waiting list)	Yes	8 weeks, 2.5 hours per week.	No significant difference compared to controls.	6 months: Significant improvements in psychological distress, well-being, depressive symptoms and mindfulness.
Reibel et al. (2001)	136 (0)	No	8 weeks, 2.5 hours per week & 1 x 7 hour day.	Significant improvements in health-related quality of life, physical and psychological distress in a mixed diagnosis sample.	1 year: Improvements maintained.
Sagula et al. (2004)	57 (18 waiting list)	No	8 weeks, 1.5 hours per week.	Significant reductions in depression and state anxiety. Moved more quickly through the stages of pain-related grief compared to the control group.	None.
Sephton et al. (2007)	91 (40 waiting list)	Yes	8 weeks, 2.5 hours per week.	Significant improvement in depressive symptoms compared to controls.	2 months: Improvements maintained.
Smith et al. (2008)	50 (14 cognitive behavioural stress reduction condition)	No	8 weeks, 3 hours per week.	Significant reductions in pain, perceived stress, depression, psychological well-being, neuroticism, energy, binge eating and mindfulness.	None.
Weissbecker et al. (2002)	61 (24 waiting list)	Yes	8 weeks, 2.5 hours per week.	Significant increase in sense of coherence compared to controls.	None.